Making the Connection: Moore's Theory of Transactional Distance and Its Relevance to the Use of a Virtual Classroom in Postgraduate Online Teacher Education

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Abstract

This study explored the use of the Web-based virtual environment, Adobe Connect Pro, in a postgraduate online teacher education programme at the University of Waikato. It applied the tenets of Moore's Theory of Transactional Distance (Moore, 1997) in examining the efficacy of using the virtual classroom to promote quality dialogue and explored how both internal and external structural elements related to the purpose and use of the classroom affected the sense of learner autonomy. The study provides an illustration of the complexity of the relationship that exists between the elements of Moore's theory, and how the implementation of an external structuring technology such as the virtual classroom, can have both positive impacts (dialogue creation) and negative impacts (diminished sense of learner autonomy). It also suggests that, although Moore's theory provides a useful conceptual "lens" through which to analyse online learning practices, its tenets may need revisiting to reflect the move toward the use of synchronous communication tools in online distance learning. (Keywords: online, synchronous, virtual, communication, community, classroom, distance, learning)

Although the use of synchronous tools in distance learning is a relatively new phenomenon (Dammers, 2009), internationally universities and other educational and social institutions have been exploring their potential for enhancing participation and interaction in a range of contexts. These studies have largely focused on examining how synchronous communication can help break down a sense of isolation many feel when working or studying at a distance, assist in the formation of communities of practice, promote interaction, and further personal and cognitive participation (see Dal Bello, Knowlton, & Chafin, 2007; Fox, Morris, & Rumsey, 2007; Gosmire, Morrison, & van Osdel, 2009; Hrastinski, 2008; Schullo, Hilbelink, Venable, & Barron, 2007; Sharma, 2006; Yang & Liu, 2007). Much of this work has involved technologies such as synchronous online messaging, teleconferencing, and more recently videoconferencing, but with the advances afforded by Web2 technologies and improved broadband capacity, the use of more interactive, multimedia, and participatory online learning resources has become a viable option for many institutions.

This paper explores the use of one such resource, the Adobe Connect virtual classroom (VC) within a tertiary education institution and uses Moore's Theory of Transactional Distance (1997) to explore the extent to which it had an impact on Moore's elements of learner autonomy and the establishment of quality dialogue in postgraduate online teacher education courses. For the purposes of this study, a virtual classroom is defined as a synchronous online learning environment that "not only delivers course materials to learners, but also provides a live, contextual, and interactive environment for learners. It supports active learning by providing an environment with the learning tools, learning materials, and opportunities for contextual discussion" (Yang & Liu, 2007, p. 171–172).

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Synchronous Tools in Distance Learning

There has been a concerted move in recent years by higher education institutions to offer courses and qualifications through distance education and an increasing emphasis on offering these via online distance learning (ODL) using the Internet (see Allen & Seaman, 2004; Deloach & Greenlaw, 2007; Snyder, Tan, & Hoffman, 2006). Traditionally, these ODL programmes have emphasised the use of asynchronous communication systems for the delivery of course content and for course-related communication and interaction (for example, WebCT, Moodle, Blackboard, InterAct). Typically, the use of such systems requires students to log in to a website on a regular basis and download relevant documents, such as readings, course outlines, and assessment information, and possibly participate in forum "discussions" related to the range of topics the course covers.

The reasons for learners opting for distant learning programmes are varied. Although there is no doubt distance learning offers learners independence, flexibility, and choice in how, when, and where they study, significant research also indicates the importance of regular interaction to success in distance learning—whether this interaction is teacher–student, student–student, or student–content (Anderson, 2003; Fahraeus, 2003; Fich-Benbunan & Arbaugh, 2006; Haythornthwaite, 2002; Hillman, 1999; Hrastinski, 2008; Levine, 2007; Martyn, 2005; Moore, 1997; Schullo et al., 2007; Sharma, 2006). Schullo et al.'s (2007) study, for example, indicated that ongoing, regular interaction between teachers and students in distance education programmes through the use of synchronous systems "improves attitudes, encourages earlier completion of coursework, improves performance in tests, allows deep and meaningful learning opportunities, increases retention rates, and builds learning communities" (p. 2).

Schullo et al.'s (2007) perspective is supported by the earlier work of Collis (1996), who claims that interaction and a sense of contribution can be enhanced through the use of synchronous systems. According to her, the use of synchronous tools in distance learning enhances student motivation and engagement; supports group identity and community formation; allows for timely, high-quality feedback provision; and assists students in structuring their learning and identifying study priorities. Schullo et al. (2007) takes this further by commenting that, from an e-teacher's perspective, using synchronous systems as part of their practice facilitates more effective teaching. They claim that teachers are better able to formatively monitor feedback from their students and assess their levels of knowledge and understanding, making ongoing changes to instructional strategies and content accordingly. It is this formative element enabled by synchronous communication that could also be of considerable value to students, by providing, as Pan and Sullivan (2005) point out, "just-in time clarification and information" (p. 30). This perspective is further supported by McBrien, Jones, and Cheng (2009), who add that synchronous communication, by virtue of the fact that it more readily supports two-way interaction, "has the power to increase dialogue more than one-way methods of communication" (p. 4). As outlined in the next section, Moore (1997) has theorised that the establishment of quality interaction and dialogue is a critical component in breaking down barriers to success in ODL.

Moore's Theory of Transactional Distance

Michael G. Moore, in his Theory of Transactional Distance, posits that in distance learning scenarios, separation between the teacher and students can "lead to communication gaps, a psychological space of potential misunderstandings between the behaviors of instructors and those of the learners" (Moore & Kearsley, 1996, p. 200). Giossos, Koutsouba, and Lionarakis (2009) further refine this notion in their review of the contemporary relevance of Moore's theory. They stated that:

> … the particularities of space and time pertaining to teacher and learner which characterise distance learning, create particular behavioural models for the teacher and the learner, psychological and communication distance between them, and insufficient understanding of each other. (Giossos, et al., 2009, p. 2)

According to Moore (1997), the nature of the transaction developed between teachers and students in distance learning needs to take into account three factors: dialogue, structure, and learner autonomy. Dialogue refers to more than simply two-way communication, but takes into account all forms of interaction, "within the context of clearly defined educational targets, cooperation and understanding on the part of the teacher, and, ultimately, it culminates in solving the learners' problems" (Giossos et al., 2009, p. 2).

Moore (1997) indicates the important consideration in this respect relates not to the frequency of dialogue, but to its quality and the extent to which it is effective in enabling the resolution of learning problems the distance learner may be experiencing.

The second factor Moore (1997) refers to is the nature of the course structure, which is described as the level of the course's rigidity or flexibility. This factor includes aspects such as the extent to which course goals and objectives are pre-prescribed, the pedagogical model used in teaching the course (e.g., teacher- vs. student-centred), the nature of course assessment, and the ability of the course to accommodate individual student needs (Zhang, 2003). The third factor, learner autonomy, is contingent upon the previous two, in that it refers to the sense of both independence and interdependence perceived by learners as they engage in the course. Learner autonomy is intimately tied in with a learner's sense of self-direction or self-determination, and this can be significantly affected by the dialogue, the level of rigidity or flexibility inherent in the course design and delivery, and the "extent to which the learner exerts control over learning procedures" (Giossos et al., 2009, p. 2).

Moore's theory asserts that an inverse relationship exists between these three factors, in that increases in one can lead to corresponding decreases in others (McIsaac & Gunawardena, 1996). For example, a course with an inflexible structure can lead to a decrease in the quality of dialogue and sense of learner autonomy, thereby increasing the students' perception of transactional distance. However, Moore (1997) also notes that when course structure drops below a particular threshold (although he does not specify what this is), the sense of transactional distance can actually increase, due principally to the potential for learner confusion or dissatisfaction.

A number of studies have been carried out to determine the empirical status of Moore's theory (for example, Bischoff, 1993; Bischoff, Bisconer, Kooker, & Woods, 1996; Chen, 2001a, 2001b; Force, 2004; Saba & Shearer, 1994), which, although not unanimously accepted (Gorsky & Caspri, 2005), generally confirm its usefulness as a framework against which to analyse distance education practice. As Garrison (2000) puts it, theories such as transactional distance "are invaluable in guiding the complex practice of a rational process such as teaching and learning at a distance" (p. 3), while Jung (2001) comments that it "provides a useful conceptual framework for defining and understanding distance education in general" (p. 527).

While acknowledging the design of this study was not experimental in the classical sense, Moore's theory was particularly relevant, as it offered a lens through which the researcher could assess the value of using the virtual classroom in online teaching to promote quality dialogue as a means of helping diminish learner perception of transactional distance. Through his discussion of the nature of quality dialogue and interaction, the diverse forms this takes, and how it affects the learner's experience, Moore's ideas provided a theoretical frame of reference, through which the researcher was

able to interpret and code the responses of the research participants into themes derived from the three research questions indicated below. Although not seeking to quantify the impact of the virtual classroom on the learners' experience, the study focused on exploring if and how it may have enhanced the quality of that experience through improving dialogue, and in doing so, may have helped to diminish their sense of transactional distance.

The Significance of this Study

Although the use of computer-mediated communication (CMC) is a feature of most e-learning scenarios, according to Hrastinski (2008) "few research studies have considered the effect of different CMC" (p. 1). By this he refers to the use of synchronous communication systems as a component of courses generally utilising only asynchronous systems, "the dominance of which can at least partly be explained by their anywhere, anytime feature" (p. 1). This perspective is further supported by Dammers (2009), who comments that this lack of research is largely due to the relatively recent advent of synchronous online technologies, "which allows personal computers to facilitate videoconferencing" (Dammers, 2009, p. 2) to support instruction. Although some studies have explored the use of synchronous systems to support collaboration and discussion in asynchronous courses (e.g., Mabrito, 2006; Schullo, et al., 2005; Spencer, 2002), these were largely limited to audio-only or text-based chat and did not utilise relatively complex technologies, such as the virtual classroom, which affords a complete suite of communication features, as described below. Generally, these studies also concentrated on logging and describing the purpose to which the students put the system—such as for information exchange vs. task and social support exchanges (Hrastinski, 2008)—rather than identifying any impact that using the system had on their perception of course quality, dialogue, community formation, or sense of transactional distance. Although acknowledging the relatively limited scope of this study, it does provide useful insights into these new areas of inquiry and identifies opportunities for further research into the use of new-generation synchronous communication systems in higher education.

Research Aim and Purpose

The overall aim of this study was to explore students' perceptions of the virtual classroom in terms of any impact they considered it made on their sense of transactional distance. It concentrated on three key areas: relationship formation, knowledge development, and communication of information. These areas were identified because they were compatible with Moore's (1997) dimensions of quality dialogue and could potentially affect their sense of learner autonomy. An additional aim was to identify aspects that affected students' engagement in the virtual classroom, with particular emphasis on affordances and/or impediments related to structural elements of its use (e.g., why and how it was set up and used).
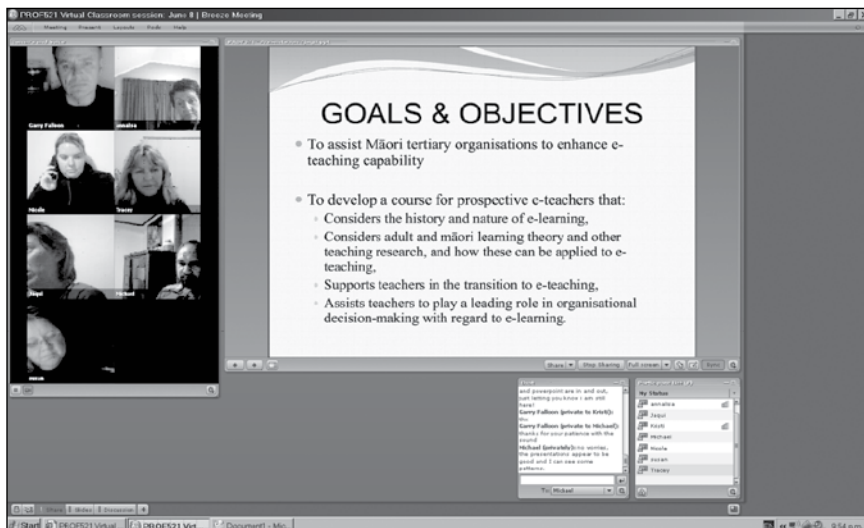
Figure 1. The Adobe Connect Virtual Classroom.

The findings of this study, at a practical level, are to contribute to wider university decision-making about the implementation of virtual classroom functionality in its online courses, which are currently limited to asynchronous communication via the institution's Moodle platform. Perhaps more important, it is expected that findings will add to broader understandings of if and how the use of synchronous systems in online learning can assist in breaking down isolation barriers and improving the learners' experience.

Research Participants and Context

The course coordinator/instructor undertook this research with the assistance of a postgraduate student research assistant. The coordinator/instructor generated the research questions and led the data analysis, and the research assistant completed the interviews to negate potential bias and enhance data validity. The research participants comprised 30 students who were studying online for their postgraduate diploma in education or their master's of education degree. They were invited to participate in the research through a formal letter of invitation following their enrolment in three courses with access to the virtual classroom space. The research had approval from the university's research ethics committee and followed standard informed-consent protocols.

Adobe Connect Pro was the virtual classroom platform for this trial. It is a remote server-hosted Web environment accessed through a custom URL that is unique to each meeting. In this instance, New Zealand's Ministry of Education hosted the environment and made it available to the university for the purposes of this trial. The virtual classroom (Figure 1) enables users to interact using audio, video, and text and to share files, resources, and presentations using applications such as PowerPoint and Flash. It also has functionality such as application and desktop sharing, which can be used

when collaborating on jointly developed documents, or for training purposes. The virtual classroom is modular in nature, built around a number of "pods" that can be revealed (or hidden) according to need and purpose. These pods include a shared whiteboard, seminar participants, camera and voice, filesharing, short-message text (one-to-one or whole group), notes, Web links, and Q&A. Capability also exists to share screens and documents, display PowerPoint, and collaborate in developing diagrams or other documents using the shared whiteboard.

Research Questions

The following research questions guided data collection for this study. They were used as the basis for developing interview schedules and other data-collection tools and informed the generation of the coding themes explained below. The research questions were:

1. What are the students' perceptions of the virtual classroom's effect on communication and relationship formation?
2. What are the students' perceptions of the virtual classroom's effect on knowledge development?
3. What aspects affected students' engagement in the virtual classroom, and how?

Methodology

This study adopted an interpretive case study methodology and utilised a range of data-collection tools consistent with qualitative studies of this type. Erickson (1986) described interpretive case studies as:

> … the intensive investigation of a single object of social inquiry such as a classroom … and that it holds major advantages in that it allows the immersion of oneself in the dynamics of a single social entity and enables the uncovering of events or processes that one might miss with more superficial methods. (Erickson, 1986, p. 238).

Burns (1997) further comments that case studies have a number of purposes or functions within educational research. Due to their intense and subjective nature, he states that they are particularly suited to acting as preliminaries to major investigations by providing a "source of hypothesis for future research" (Burns, 1997, p. 365) or by assisting in developing deeper understandings "of the class of events from which the case has been drawn" (p. 366). Although it acknowledges the limitations of case studies in terms of their lack of "generalisability," the methodology in this instance allowed the researcher to gain deep insights into any value the virtual classroom held from the students' perspective, and in the process, to learn more about how it could be used to enhance their learning experience by promoting quality dialogue.

Data Collection

We collected data using multiple methods compatible with qualitative research using a case-study methodology. A research assistant interviewed 30 research participants (three groups of approximately 10) twice during the study using semiformal schedules. The research assistant delivered and recorded the interviews using a Polycom audioconference system, and each interview was fully transcribed. The interviews took place during two university semesters in 2009, immediately in the week following the first and final virtual classroom seminars, the first in the second month of each course (one in each of semesters A and B), and the final in the last week. The focus for the first seminar was on allowing students the opportunity to share and gain feedback on their initial proposals for an assessed project, which was a major component of the overlapping assessment for both papers. The second seminar required students to present a summary of their project, including significant learning and outcomes, and a personal reflective account of their experience of implementing it. For both seminars, the presentations used a combination of audio via an audioconference line and VOIP (voice over IP) for overseas students, in conjunction with PowerPoint or Flash slideshows and streamed video, delivered through the virtual classroom video pod.

Both seminars were recorded using an application called iShowU HD. This program recorded as video all screen activity and associated audio, which we then played back and analysed. Although the audio track of the video was not fully transcribed, we replayed the video several times and noted audio data (using time-mapping), which was deemed useful in responding to the research question–generated themes. We also captured stills from the video to illustrate the functions and facilities of the virtual classroom and to provide visual insights into the activities that were undertaken there. We also collected additional written data from the online forums that were integral to the asynchronous component of the courses. In the week following each seminar, participants made a number of written comments in the discussion forums about their experience, which we included in the analysis data.

Data Coding

We coded data using deductive thematic analysis (Braun & Clarke, 2006), which is described as "a method for identifying, analysing, and reporting patterns (themes) within (qualitative) data…. A theme captures something important about the data in relation to the research question and represents some level of patterned response or meaning within the data set" (p. 80). This study identified four themes, against which we coded data. These were:

1. The virtual classroom and relationship formation: its impact on students' sense of belonging to a learning community, getting to know their fellow learners, and developing a sense of "who they are as a person"

2. The virtual classroom and knowledge development: how students perceived the virtual classroom as affecting the construction of new, or confirmation of existing understandings
3. The virtual classroom and communicating information: how students perceived the virtual classroom as affecting the communication of practical and logistical information about the course
4. Aspects affecting student engagement in the virtual classroom: affordances and impediments to student participation

The researcher and a postgraduate student research assistant coded data independently. Partway through the initial round of coding, we calculated an interrater reliability correlation (Cohen's Kappa) on the sample data that we had been coded to date. This yielded a score of .62, indicating only a moderate level of agreement between raters (Landis & Koch, 1977). Resulting from this, we had further joint discussion and analysis, during which we moderated additional sample data to try to gain greater consistency of interpretation. We then re-evaluated all data and collated results. A second (final) correlation yielded a much better reliability rating of .78, indicating substantial agreement (Landis & Koch, 1997). Following this coding by theme, both raters further coded data under each theme as being essentially Positive (supportive/affirming), Neutral (indifferent), or Negative (critical/unfavourable) in relation to each of the theme areas. Upon completion, this was also subjected to interrater correlation, which yielded a rating of .76. Sample data classified under each of the themes described above have being entered into the tables in the Results and Findings section below.

Results and Findings

As introduced previously, we collected data related to the four themes of relationship formation, knowledge development, communication of information, and aspects influencing engagement, which were consistent with Moore's three factors influencing transactional distance—namely dialogue, learner autonomy, and structure (Moore, 1997). We have organized the data below under these themes, which represent a qualitative analysis of the interviews, the IShowU video captures, and the documents as described earlier. We have arranged the data into tables, supplemented by textual summaries and relevant quotes from interviews, online forums, and the video.

Due to the volume of responses, it was not possible to record them all in the tables. The results below record sample data responses as quotes (as indicated) and/or paraphrased summaries, coded within each of the themes introduced previously. The second column (#) within each classification (positive, neutral, negative) indicates the number of responses participants made that were coded of a similar nature.

Table 1. Sample Data: Student Perceptions of the Virtual Classroom as Affecting Relationship Formation (Theme 1)

Sample Positive	#	Sample Neutral	#	Sample Negative	#
"It helped 'humanise' the learning environment and assisted in getting to know each other better. I got a better 'feel' for the group. It helped build a 'fuller dimension' to the individual."	8	"It should have been used earlier in the course to help break the ice. While it helped in getting to know people better, perceptions of people had already been formed by the time of the first seminar."	5	"I didn't feel comfortable offering a 'dissenting voice' and there was too little time to think of meaningful questions or comments." There was a lack of feedback from, and interaction with, other participants.	7
"It helped to cement relationships initially formed during the online forums (asynchronous). I got to know people's backgrounds—their whakapapa (Maori)."	6	"Initial perceptions of people created through interaction in the forums were confirmed in the virtual classroom."	3	"Asynchronous forums are better for getting to know people. There is more opportunity to develop a discussion over time and therefore get to know individuals as people, and how they think and work."	6
"It was good for networking. It helped to form links with others of similar interests or teaching in similar situations. It helped to break down isolation and assisted in developing group cohesiveness."	12	"It would be useful for general relationship building. Students should be able to access the virtual classroom outside of seminars for social purposes, and for assignments that require collaboration."	4	The experience lacked a sense of contributing to the formation of a real community, and it felt artificial. "It was not the same as having an audience in your face."	6
"It helped remove the impersonal element of online learning."	4	"I was more at ease during the second session. We had familiarity with each other and the technology, and that contributed to a more positive experience on the second occasion."	6		
"The experience helped to build trust, respect, and rapport. I consider the virtual classroom contributed to creating a safer place to learn."	8				
Assisted in building a sense of learning community.	4				

Theme 1: The Virtual Classroom and Relationship Formation

The first theme related to how the virtual classroom affected student relationship formation. Data indicated that, for the majority of students, using the classroom helped build trust and rapport and went some way toward developing a sense of identification with others in the group—three important components in relationship formation. Although this was by no means universal, we coded 42 positive comments to this effect from a total of 79, and the balance was distributed between 19 negative and 18 neutral. Table 1 presents sample data illustrating this.

Interview responses supported the value of the classroom for enhancing relationship formation for the majority of students. They made specific comments (n = 12) about features that enabled this, particularly the value of being able to see and hear each other and interact in "real time," which helped

participants construct a "more complete picture" (Student 5, transcript 2, section 3) of their colleagues. As one participant commented, for her, this benefit appeared to "spill over" into subsequent written discussions online:

> … online we hadn't really chatted … we hadn't bantered. We were both trying to connect up and she was laughing and I was laughing … we had that connection. And I know when I went back to the discussions (forums), I took that warmth with me … the audio and visual dimension gives you a fuller understanding of their (other participants') identity… (Student 3, transcript 1, section 5)

For others, the ability to see and hear each other appeared to help cement relationships that had started to form asynchronously online (video capture, seminar 1, 16:18), and in one or two instances, assisted in changing or modifying an initial perception that may not have been entirely accurate. Interestingly, a number of comments (n = 8) specifically identified the audio component as being more important than the video in this respect. One participant stated that for a recipient, the audio was critical, as "you could actually hear the presenter and pick up the nuances of what the person's about. It enabled you to connect with the presenter earlier and get that sort of engagement" (Student 7, transcript 2, section 10). Another commented that they viewed the audio function of the virtual classroom as being "not so public." That is, she perceived that in the forums, comments were more permanent because they were "out there in print" for all to see and critique, which appeared to discourage her from contributing. The synchronous or "nonpermanent" nature of the virtual classroom appeared to afford her security in being able to make comments with a level of confidence:

> … I like to communicate ideas … as I said before, you think, "oh, I've got to tell my idea," but I don't want to put it up (on the forums). But here (in the virtual classroom) you are able to discuss it with others and they might agree or disagree, and it might be for only a few minutes rather than a couple of hours or even days … (Student 8, transcript 2, section 12)

Others (n = 5) stated that, although the virtual classroom seminars detracted from the flexibility of the course in that they needed to "turn up" at a specific time, participation did help them to get to know others better and to gain an appreciation of the different contexts and projects their fellow participants were involved in. For some (Students 3, 4, 5, 6, 14, 22), recognising that others were in similar positions and held similar interests to themselves was gratifying; six commented that they intended to make informal contact with others in the group to share ideas and experiences outside of the paper (Moodle forum, August 20, 2009, thread 6a).

Although most comments (n = 60) viewed the virtual classroom as positive or neutral in this theme, others (n = 19) indicated that it had a negative impact. They cited the principal reasons for this as a lack of feedback and

interaction during and after seminars and the absence of a "common thread" tying the seminars together to make them more of a meaningful whole. Comments these students made indicated that they were unable to see any relevance for them in the seminars of others, and their presence was more motivated by the paper's assessment (which indicated compulsory attendance) than any expectation of personal value or learning. As one student succinctly put it, "You might as well go on and do your own assignment … there's no need to interact with other people or to collaborate. If you don't need to, then why bother?" (Student 8, transcript 2, section 5). The link between identifiable personal relevance (or what's in it for me?) and perceptions of value from the classroom interaction was strong for a small but significant number of students.

Theme 2: The Virtual Classroom and Knowledge Development

The second theme related to the virtual classroom and how it affected student knowledge development. Table 2 summarizes sample data from this theme.

Data in this theme were generally supportive of the contribution the classroom made to knowledge development, with 28 positive comments coded. However, the significant number of neutral comments made ($n = 24$) indicated that potential existed but did not consider that this potential had been realised. Of these, nine indicated that a lack of understanding of the "rules of the game" and unfamiliarity with both the environment and expectation around feedback and interaction affected their willingness to contribute and engage with others. Data also indicated that this aspect was tied in with the formal presentation-style structure of the seminars, with comments ($n = 10$) that it had the effect of closing down opportunities to contribute and interact. These students appeared to view the sessions more as information-dissemination events than opportunities for professional debate and dialogue, and as a result, they saw themselves as passive recipients of information rather than active contributors to knowledge development.

This issue also appeared linked to the fact that, for a few ($n = 6$), the virtual classroom did not greatly assist in developing a sense of belonging or membership of a community of learners, and this perception carried over into a lack of confidence they had in offering sometimes dissenting views:

> …we didn't interact as much as, say, if you were in a classroom with each other, so you didn't get to know each other properly, you were just communicating information. We were reading what everyone else was communicating, rather than in the classroom you have full-on discussions about particular things, face to face…. it's harder (online) 'cause you are not getting to know everybody … you need to talk and think about what others are saying to learn anything… (Student 9, transcript 2, section 6)

Table 2. Sample Data: Student Perceptions of the Virtual Classroom as Affecting Knowledge Development (Theme 2)

Sample Positive	#	Sample Neutral	#	Sample Negative	#
"Having to present project ideas to others helped consolidate and clarify my thinking. It was an ideal forum to reflect on and evaluate personal work using 'real-time' discussion and feedback from others—something that is not easily possible in forums."	8	"It has potential as a medium for socially constructing knowledge, but it had limited impact on this occasion, as use was generally restricted to 'one-way' transmission of information—presentation of ideas for individual projects and outcomes—rather than being focused on a common topic where everyone had opportunity to contribute."	10	"Little new knowledge was developed for me as some projects were not relevant. It was difficult to 'hook in' to what other students were saying, as the contexts of their projects, and their reasons for undertaking them, were unclear."	4
"It expanded my personal knowledge of other aspects of e-learning that were unfamiliar. It was useful for forming knowledge of the work of others and developing a better understanding of the different situations they face. It was an effective addition to the forums—easier to clarify understanding through being able to really discuss what they were saying."	7	"Although potential exists, it was challenging to debate ideas and what was said, as I was unsure of the 'rules of the game' for the classroom and had little previous knowledge of the contexts, backgrounds, and focuses of other people's projects. It could have been more effective if we had some background information on the projects and how we could feed back on them."	9	"I was not confident to comment on something 'on the hoof' which I know little or nothing about. To learn something new, one needs to have time to reflect upon and build knowledge from the information."	3
"I got to learn how to use a new technology—and solve basic technical problems. It was good that we were 'forced' to access and learn about new devices."	5	"The medium would be very useful for students to access and use independently for study groups or for professional learning groups. It has significant potential to support collaboration."	5	"Maintaining concentration on what others were saying was hard, as the seminars were long, and holding a telephone and listening to someone for a long time was difficult."	2
"The classroom enables immediate feedback, and you are more easily able to build understanding through interaction and dialogue." Feedback can have greater depth, as it can be elaborated upon easily.	8			"I didn't learn anything new, as there was a lack of interaction between participants. Interaction was limited to one or two presentations of a more general nature."	4
				To build knowledge, there needs to be meaningful personal and cognitive interaction.	

Other students ($n = 6$) made reference to the fact that it was very difficult to make meaningful contributions to topics they knew very little about and that going in cold to the seminars stifled their ability to engage. Still others ($n = 3$) mentioned the role of reflective time in knowledge development and commented on limitations when needing to think on the spot rather than having time to reflect on what was presented and develop an informed and considered response, such as was possible in the online forums. One participant, in commenting on the importance of reflective time, said, "I always take two or three days to process something, and in the virtual classroom it was challenging to provide intelligent feedback about unfamiliar topics without sufficient reflective time" (Student 3, transcript 1, section 4). On the other side of the coin, eight participants considered the requirement to present their project ideas and outcomes to others served to consolidate and/or clarify their thinking, and in six of these instances, they indicated feedback

from others in the group was valuable in informing changes to their project focus and methods. One participant commented, "It was good to do it (present) live—even though nobody said much about it—hearing myself say it made me think, does this really make sense?" (Student 19, transcript 2, section 2)

Theme 3: The Virtual Classroom and Communicating Information

The third theme explored the virtual classroom as a system for communicating information. This referred to how students perceived the classroom as affecting the communication of practical, logistical, or organisational information about the course. Table 3 summarises sample data on this theme.

Most benefits from using the virtual classroom under this theme related to notions of efficiency and a perception that the communication tools embedded in the classroom gave a sense of confidence in being able to ask each other questions without possible embarrassment. Nine comments indicated that students considered the classroom enhanced "information efficiency"— that is, it assisted in getting (usually administrative) messages across to the whole group more effectively, without duplication. They commented on the value of being able to interact directly with the lecturer to clarify assessment requirements or discuss readings or other resources without the need to undertake often protracted and time-consuming asynchronous online dialogue. One claimed that for her this was a "big plus, as I have real issues trying to explain myself properly in the forums" (Student 15, transcript 1, section 9).

Eight students considered the anonymous nature of the synchronous chat function allowed them to communicate with each other about course administration and assignment requirements without "appearing dumb" to the whole group. This appeared to be particularly important to one student, who had commenced the course after the others and considered she was in "catch up" mode. She was able to communicate anonymously using the chat pod with another student as the synchronous discussion progressed to clarify what requirements needed to be met:

> … using the chat thing was good. I started the paper after everyone else and they all seemed to know what to do … but I didn't have a clue. I typed a message to Sue and she replied with what I needed to know. It was good, and I didn't look a Charlie (sic) … (Student 13, transcript 2, section 5)

Interestingly, although some saw the availability of video images as a plus ($n = 6$), a slightly larger number of students ($n = 7$) did not view them as being as important as the audio. In terms of communicating information, although the video enabled access to visual cues such as facial expression and body language, the effectiveness of this appeared limited by the small image size and the "head and shoulders only" nature of the visual (video capture,

Table 3. Sample Data: Student Perceptions of the Effect of the Virtual Classroom on Communicating Information (Theme 3)

Sample Positive	#	Sample Neutral	#	Sample Negative	#
"The virtual classroom has a variety of communication tools suited to different learning styles and purposes (e.g., the private 'chat' is useful for anonymous questions and comments. It ensures you 'don't look silly' in front of others.) You can ask someone else a really basic question about the course or something and nobody else knows."	8	"Using the audioconference alone would not have detracted significantly from the value of the experience. The audio is more important than the video for communicating information." Voice was "not as permanent" as text on screen (i.e., forums) and was viewed as 'safer' and less available to criticise.	7	"The presenters didn't read the class very well. They seemed too busy with their presentation or giving out information that they didn't see half the class were not listening". "To make having sight and sound worthwhile, presenters need to be aware of their group."	4
"It is very useful being able to 'see' others and read their body language and nuances. Visual cues are important in getting an idea of what others think, feel, and understand. People nodded when Dave showed the course map. He knew they understood."	6	The level of enthusiasm about what is being said able to be conveyed through facial and body expression in the classroom is limited by the need to hold the phone for audio and the small video image size.	4	"I wasn't sure when or how I should ask a question about the assignment. There didn't seem to be a place to do this." Some participants were unsure of communication protocols. How and where to respond and interact with each other was not clearly defined.	4
"Using the virtual classroom is the electronic equivalent of meeting someone in the corridor. It is a useful way of communicating information formally or informally."	2				
"It was easy to ask questions and clarify assignment requirements. It was more efficient dealing with a whole group with similar questions than having to repeat answers many times in the forums."	9				

seminar 1, 41:20). One student commented that she felt the audio was most valuable, as it did not leave a permanent accessible "footprint" of comments made that could be open to subsequent review and possible critique (Moodle forum, May 22, 2009, thread 2c). Four students commented specifically on the quality of the dialogue generated using the audioconference system, and one of them went as far as claiming that:

> …we didn't really need any pictures at all. I mean it was nice to put a face to a name, but that was about it. I got a lot more information from what they were saying than by seeing them. It's amazing just how much you can pick up from someone's voice. You can tell if they are enthusiastic or know their stuff… done their homework… that sort of thing. (Student 1, interview transcript 1, section 9)

Another student observed that the video functionality did not appear to be well used by some presenters, who "appeared to be more concerned with reading from their script than addressing their audience" (Student 3, interview transcript 2, section 8). This lack of group awareness and failure

to engage their audience through the effective use of the video functionality eventually contributed to the disengagement of some students, some of whom had visually "switched off" well before the end of the seminars (video capture, seminar 2, 25:24).

As with the previous themes, most negative data could be linked to how the classroom was used and the structures (or lack of them) around that use, rather than the classroom itself. These once again referred to uncertainty about protocols, and the lack of specific opportunities or procedures for communication. The absence of any formal agenda was mentioned as one example of this, with one participant stating that "we kind of worked out things as we went along.… we needed more of a guide of what was expected … and when things were to happen, a plan" (Student 18, interview transcript 1, section 2)

Theme 4: Aspects Affecting Student Engagement in the Virtual Classroom

The final theme explored aspects that affected student engagement in, and attitude toward, the virtual classroom (Table 4). These included both affordances and impediments to engagement and were mainly technical, organisational/logistical, and programme structural in nature.

The main factors affecting student engagement were of a technical nature, but were also aligned with structural elements such as the course assessment, a lack of clarity of purpose for using the classroom, poor initial organisational structures for the seminars, and practical considerations such as access to childcare and transportation.

Data indicated that a significant issue related to structural elements such as how the seminars were organised and managed. Nine comments made during the first interview indicated the desirability of having distributed in advance a set agenda with defined presentation times, along with explanatory notes and background information summaries of the presentations. Comments indicated that doing this would enable participants to undertake preliminary research if they so wished, and would allow them to be in a better position to ask useful questions. Additionally, the provision of such a structure was seen as a means of moderating or controlling the input of presenters, some of whom, it was observed, had tended to dominate and consume more than their fair share of time. As one student commented:

> … it's got to be controlled … people controlled, you know it's like a meeting, we're only going for an hour or so, that sort of thing … and everyone's got 5 minutes to say what they think. You have the same problems like in any discussion whether you're face to face or not … someone dominating it and then people get hoha (annoyed - sic). It turns you off—you just switch off. (Student 8, transcript 2, section 10)

Table 4. Aspects Affecting Student Engagement In, and Attitude Toward, the Virtual Classroom (Theme 4)

Sample Positive	#	Sample Neutral	#	Sample Negative	#
"The experience was 'technically easy.' All content was preloaded, filesharing could be used to download presentations to be revisited later if needed, and the environment worked smoothly on the available bandwidth. I did not need to purchase additional equipment."	6	"My Ministry laptop was not up to speed for use with the virtual classroom." Additional equipment such as webcams needed to be purchased. Seminar requirements gave a reason for some participants to purchase equipment they had been meaning to.	4	Poor level of infrastructure available at home and school (computer speed, broadband speed fluctuation, no landline telephone access, etc.). Technical difficulties in setting up Flashplayer and installing plugins (Adobe Connect was version sensitive).	9
"I had a sense of empowerment in being able to control the technology." Participants were able to lead their presentation and manage its delivery on remote computers.	3	"The optional technical set up session should have been made compulsory. The 'practise' session held before each seminar was valuable for sorting out technical issues, but not all attended which caused delays."	10	Some participants needed to travel to their workplace to take part. Difficulties in managing childcare and other family commitments so they could participate in the 8.00 pm sessions.	5
"The agenda and guidelines for feedback provided for the second seminar helped by structuring the session, ensuring times ran to schedule, and encouraged more interaction."	9	Integrating the virtual classroom with Moodle. While having to access a third-party site to enter the virtual classroom was not unduly problematic, it was seen as desirable to have a 'one stop shop' by having the facility integrated with the course's learning management system.	4	"The need to 'attend' class on a set time and day detracted from course flexibility." Scheduled sessions undermined one of the main advantages of distance learning. Compulsory attendance was seen as a 'trade off' of student choice for course requirements.	7
"The seminars required participants to be ready to present on time, and assisted with time management. It was the presenter's responsibility to ensure technical reliability of their equipment and presentation."	4	"It takes time to 'win' teachers over to new technology and for them to see worth in it. There will always be teething problems and that is part of the learning." It is acceptable that not everything will run smoothly when attempting something new.	5		

We took this feedback into account between the first and second seminars, when we circulated an agenda, presentation order, and some background information two weeks in advance. Comments regarding this change were generally positive, with one student commenting, "… it was a good idea (the agenda). I went and did a little reading on one or two of them (seminars). It was good to have some background." (Student 14, transcript 2, section 7)

The second structural issue of note was how some students (n = 7) perceived the compulsory requirement of attending and presenting a seminar online as detracting from their personal flexibility and choice, which were two of the principal reasons for them opting for online study. They saw the need to "turn up" on particular days and times as an inconvenience and an at least partial undermining of their autonomy in being able to implement their own learning plans. As one commented, "You might as well get in your car and drive to Uni." (Student 14, transcript 2, section 18)

Other issues were of a technical nature and mainly related to poor broadband access and the low specification of laptops supplied by the Ministry of Education's Laptops for Teachers (TELA) programme. As some participants (n = 5) were in rural districts where broadband was not available in private residences, the need to travel to school in the evening to participate was problematic and often had a domino effect by necessitating childcare or personal security arrangements. Seven participants also commented that they experienced technical problems concerning setting up cameras for video streaming, issues in managing access through school Internet firewalls, and compatibility with different versions of Flashplayer (used by Connect for presentations). However, as one student (Student 6) commented, it is part of the professional responsibility of being a student to try new things, and as long as the intention to use new tools had been "flagged" before the courses commenced, then it was a matter of individual responsibility to ensure readiness:

> … this is all part of distance learning, you do what you have to do to do it, does that make sense? You have made a commitment to do the course, so you have to work around things to actually get it done. I think it comes down to access to resources on a personal level really…. (Student 6, transcript 2, section 9)

On the positive side, four students considered that completing a virtual classroom seminar was a valuable structuring activity in its own right, in that it assisted them with time management and required them to develop a level of technical competence to ensure a trouble-free presentation. Five positive comments also addressed the value of the experience for developing personal technical knowledge and introducing new technologies. Specifically, these comments referred to both the need to master an array of new devices and software to gain access to the classroom and an awareness of what the classroom (and like technologies) had to offer. For some, it had the effect of taking them outside of their comfort zone, which they viewed positively:

> … before this course I didn't even have a webcam. It was good … I had to buy one and learn how to use it and then solve a whole lot of problems … like getting Flash installed … and it had to be the right one. It made me do the sort of things I had always been intending to do, but (you know) never got around to. (Student 17, transcript 2, section 7)

Discussion

Although it is not possible to discuss in detail every finding, the following represents what the researcher considers to be the most relevant in terms of the conceptual framework introduced in the literature review.

When reflecting upon Moore's (1997) Theory of Transactional Distance in relation to the outcomes of this study, it appears that the use of the virtual classroom can potentially, at least, contribute to the development of quality dialogue, but consistent with Moore's theory, it is something of a "double-

edged sword," in that the extent this is possible is contingent on structural aspects and, consequently, student perception of learner autonomy.

As indicated by theme 1 and 3 data, while most students held generally positive views of the usefulness of the classroom in supporting these two aspects of dialogue creation, this was tempered somewhat by a range of structural elements that detracted from more significant benefits being realised. Although much data indicated the classroom helped reduce isolation by "humanizing" the learning environment and generally building a greater sense of community—two critical elements identified by Moore as helping diminish transactional distance—there were clearly issues around structural aspects such as the purpose of use; the personal relevance for use; and organisational, communication, and feedback protocols. In many ways, deficiencies in these areas had a "neutralizing" effect on the previously described benefits, as a significant number of participants indicated they could see the potential in the environment but it had not been fully realised through the approach to, and content of, the seminars. In considering this in relation to Moore's (1997) dialogue criteria, it appears that tools such as the virtual classroom are best suited for use for collaborative purposes, where students are able to take a more active and equal role in deciding on the purpose and context for use, and how interactions within the classroom are to be set up and managed. The potential inherent in such tools lies in their ability to facilitate meaningful, real-time, two-way interaction and dialogue, and their use for essentially transmissive seminar presentations did not allow this potential to be realised.

Second, and in some ways countering the above, for some the fact that the environment was synchronous in nature worked against their engagement in purposeful dialogue. A significant number of participants commented that they felt reluctant to contribute because the environment did not afford sufficient reflective time to generate comments or input that was informed and relevant, and they did not want to run the risk of "looking silly" in front of their peers. This was also related to structural issues, particularly the lack of prior information provided about the projects, the absence of an internal structuring tool such as an agenda, the fact that each project was individualised and not immediately relevant to all group members, and a lack of clarity around how to provide feedback. However, for others this was not the case, and some commented that the temporary nature of the synchronous exchanges actually encouraged them to contribute, in the knowledge that once they had said something it was not permanently "etched" in the asynchronous forums for others to review and possible criticise later on. In considering this issue in relation to Moore's ideas, although the synchronicity of the classroom can encourage dialogue for some, it would be fair to say that the quality of this dialogue is dependent upon other factors independent of the classroom itself. If the full benefit of such tools is to be realised, issues such as those listed above need

to be addressed, so that every participant is in the best possible position to make informed and worthwhile contributions.

Third, Moore's theory calls for a workable balance to be struck between learner autonomy and course structure, so that learners maintain a sense of empowerment and ownership of the learning (content and process), while at the same time working within a structure that provides adequate direction and communicates clearly standards and expectations of performance. The advent of the virtual classroom in this instance appeared, for some, to impose an unwanted external structure on their learning and took away some of the sense of learner autonomy developed through being able to plan their study to suit their needs and schedules. There was no doubt that the regular sessions were an inconvenience for some and worked against the very reason for them opting for online study. Although Moore (1997) does not indicate the specific balance that needs to be arrived at in this respect—as the balance will inevitably be different for different group and contexts—online educators should be mindful of the impact that too regularly scheduled synchronous interactions might have on learner autonomy, and hence, sense of transactional distance.

The final factor, which certainly affected participants' ability to engage in dialogue, was the impact of technical and infrastructural issues. In terms of Moore's theory, these could be broadly defined as structural in nature but exist external to the course itself. That is, although Moore's theory adequately accounts for internal structural factors that affect dialogue and autonomy (such as course content and design, pedagogical models used, and assessment), in the era of online learning and with the use of increasingly complex digital technologies such as the virtual classroom, an argument could be made to extend this to take into account external factors, such as access to and quality of broadband, computer equipment of adequate specification, and levels of student technical competence. In this study, there was no doubt that participant engagement (and hence dialogue) was significantly affected by these factors, which should not be taken for granted when making decisions about using such tools.

Conclusion

Applying the tenets of Moore's (1997) theory to this study has provided a valuable measure of the efficacy of using the virtual classroom to enhance quality dialogue, while at the same time identifying areas where the theory may need reconsidering in light of the advent of digital technologies and online learning to the distance learning landscape. It has revealed the extreme complexity of striking an effective balance between Moore's elements of structure, dialogue, and learner autonomy, and has provided an illustration of how imposing an external structure such as the virtual classroom may affect the generation of quality dialogue and learner autonomy. Unpicking the various nuances of how each element interacts and affects the others

has been a challenging task, and one that this paper has only just begun to explore. Although it would be easy to dismiss Moore's theories as dated or irrelevant in the digital age, this study indicates that this is far from the case. What it does show, however, is that the theory needs to be revisited to reflect the move toward using synchronous tools for distance learning, particularly its definition and view of structural elements and how synchronicity affects learner autonomy.

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Author Note

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