PERFORMING TEACHING AND LEARNING USING INTERACTIVE VIDEO-CONFERENCING

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ABSTRACT

The recent introduction of Interactive Video Conferencing (IVC) into Central Queensland University's (CQU) main teaching campus in Rockhampton in 1997 presented a range of new challenges to lecturers, students and administrators in pursuit of a new millennial education. Video cameras, monitors, interchangeable screens and live 'hook-ups' to satellite campuses demanded new kinds of learning spaces, and attentions to different dynamics between people and electronic artefacts. Drawing on a larger study of the design, development and implementation of IVC across CQU's various campuses, this paper presents a radical new methodology to understand the new, highly technologised learning spaces as, not simply an educational context where lecturers and students struggle to make the new technologies 'work', but as topological spaces of either regions, networks, fluids or fire (Law & Mol, 2001) where humans and non-human actants perform networks of relations in a constant struggle for representation. Such an understanding becomes possible through the conceptual tools of Actor Network Theory (ANT) whose major proponents (Law, 1986; Callon, 1986; Latour, 1996) claim a symmetrical handling of human and non-human actants provides better understanding of technological innovations such as IVCs. The ANT methodology presented highlights the need for the development of new skills and teaching methods, as IVCs become a more accepted mode of educational delivery.

INTRODUCTION

The current research project reported here is a study of how the interactive video-conferencing (IVC) facilities were designed, developed and implemented for use in teaching across Central Queensland University's (CQU) Central Queensland based campuses.
The main campus is in Rockhampton and it has four satellite campuses in the Central Queensland region: Bundaberg (350 kilometres to the south), Emerald (260 kilometres to the west), Gladstone (120 kilometres to the south) and Mackay (330 kilometres to the north).

The main focus of my research is how staff uses the IVC technology for teaching purposes. In response to very limited training when the facilities were first implemented, some of the users experimented with different techniques and teaching strategies until they found a way of teaching that fitted their content areas and teaching styles. They were constrained by the decisions made before implementation because the video-conferencing rooms were designed and built to replicate a tiered classroom such as those used for face-to-face teaching with the addition of cameras, microphones and television monitors. The more innovative lecturers found themselves constrained by the fixed nature of the furniture in the video-conferencing rooms. Other lecturers did not adjust their teaching strategies at all, while some rejected the technology altogether.

The IVC facilities at CQU are a complex system made up of technology, such as video cameras, monitors and electronic cables, and people, such as students, lecturers and technical staff. These facilities are spread over the Central Queensland campuses of CQU. To study them I needed to find a methodology that would allow me to take into account the social and technical aspects of the IVC facilities. The research methodology I chose was based on the methods and principles that underpin actor-network theory (ANT). A brief overview of ANT is given in the next section, after which I will describe how I am using the concepts ‘performativity’ and ‘spacial topologies’– derived from ANT – to analyse my empirical data.

**Actor-network theory**

ANT had its beginnings in the work of Callon, Latour and Law (Callon, 1986; Callon & Latour, 1981; Latour, 1996; Law, 1986). It is sometimes referred to as the sociology of translation (Callon, 1986). The aim of ANT is to explain how human and non-human actants (this term is used to avoid confusion since in the English language ‘actor’ is often limited to humans) are tied together in networks that
have been built and maintained to achieve a particular goal. It is used to study a phenomenon or set of phenomena, such as science (Latour, 1987) or technological innovation, in action. ANT draws attention to issues of network formation and maintenance. In ANT the term 'network' is not the same as the more commonly held meaning of this term, as in a computer network. Latour's definition of network is much broader and includes a metaphysical element. The 'actor-network' is more than just the nodes and a network; it includes the filaments that hold these nodes together and acknowledges that these filaments are not fixed in time or space (Latour, 1998).

I chose to use ANT as a conceptual framework for examining the creation and maintenance of networks of associations amongst human and nonhuman elements, which, in the case of the IVC facilities, include people, organisations, video cameras, television monitors, microphones, furniture, room design, software, computer and communications hardware and technical infrastructure. This is because an ANT informed study attends to both the social and the technical dimensions of this innovation.

I will now discuss the concept of performativity in relation to ANT and describe how I am using it to analyse my data.

The performative turn in science and technology studies

The conceptual lens of performativity that I am using in the analysis of my data is based on two works by Annmarie Mol and John Law (Mol, 2001; Mol & Law, 1994). These works form part of what has been called the performative turn in science and technology studies.

There is a subtle distinction to be made between the terms 'performance' and 'performativity'. 'Performance' tends to suppose an acting subject who was performing the performance; 'performativity', on the other hand, refers to the performance itself as an acting subject. Judith Butler (1993) makes this distinction clear. She says that it is important to distinguish performance from performativity: the former presumes a subject, but the latter contests the very notion of the subject. Thus to speak of a person's performance as a lecturer is essentially to state something about the person: his or her ability, brilliance or weakness in a certain capacity. But to speak of the performativity of
teaching is not primarily to speak about a particular lecturer's ability to teach or the students' ability to learn but to speak of what the teaching itself does or performs in the act of teaching. That is, what are the effects of teaching on the world? Using performativity for analysis is to say something about the opposite of performing: that is, it is not what people do when teaching but what teaching does with people. The relation between performance and performativity is therefore far from simple. Though closely connected, the terms highlight at times very different, almost contradictory, aspects of human activity.

Topologies or spatial types

One possible conceptualisation of performance is that of topologies or spatial types. The notion of 'topology' has been borrowed from mathematics (Mol & Law, 1994). Topology is a branch of pure mathematics that deals with spatial types (Jensen, 2001). Mol and Law (1994) have taken the notion of topology and applied it to social science. They argue "[t]he 'social' doesn't exist as a single spatial type. Rather it performs several kinds of space in which different 'operations' take place" (p. 643; emphasis in original). Mol and Law do not espouse that the social exists in different kinds of spaces. Rather, they say that the social performs spaces. They argue that the social performs a plurality of spaces, not just one.

In Regions, networks and fluids: Anaemia and social topology Mol and Law (1994) describe three different kinds of spaces: regions, networks and fluids. They describe these spaces by using examples of a study of anaemia and how it is performed in the Netherlands and in Africa. In a more recent article Law and Mol (2000) have added a fourth kind of space to their list: fire. In the following sub-sections I will describe in more detail each of these four different kinds of spaces.

Regions

Regions are generated when objects are "clustered together and boundaries are drawn around each cluster" (Mol & Law, 1994, p. 643). A problem with this concept is how to draw the boundaries between the regions. Mol and Law suggest that it is "possible to build a version of the social in which space is exclusive. Neat divisions, no overlap...each place is located at one side of a boundary.... What is
similar is close. What is different, is elsewhere (Mol & Law, 1994, p. 647). The regional maps thus created highlight the similarities within regions and the differences across boundaries.

Networks

According to Mol and Law, a “network is a series of elements with well defined relations between them” (1994, p. 649). The elements can be anything: a needle, a normal distribution of iron levels or a skilled nurse taking a blood sample. The relations can be of any imaginable sort. The main attribute of a network is that it hangs together in some conceivable manner. The proximity of a network is not related to physical distance. Instead, proximity has to do with location in the network of relations: “[p]laces with a similar set of elements and similar relations between them are close to one another, and those with different elements or relations are far apart” (Mol & Law, 1994, p. 649, emphasis in original).

Fluids

Mol and Law (1994) posit that sometimes “neither boundaries nor relations mark the difference between one place and another...sometimes boundaries come and go, allow leakage or disappear altogether, while relations transform themselves without fracture” (p. 643). They assert that sometimes social spaces act like fluids: they observe that elements of the clinical method do not hang together as invariant relations. In Africa because of problems of language, lack of access to laboratories and the severity of anaemia the diagnoses are often via the clinician observing the patient’s pale eyelids whereas in the Netherlands it would be very rare for a patient to present with anaemia so severe that their eyelids were pale. They point out that there are no clearly demarcated versions of health care in the Netherlands and in Africa nor is there an African anaemia and a Dutch anaemia. Therefore, the differences in the clinical method are not related to boundaries. The topology performed by the clinical method is called a fluid space.

Fire

In a recent article Law and Mol (2000) have added a fourth space to their original list: fire space. They describe three characteristics of fire
space. As with fluid space movement rather than stasis is crucial. The
difference is that constancy in fluid space depends on gradual change,
whereas in fire space constancy is formed by sudden and irregular
movements. They use a funeral pyre “as a metaphor for treating the
continuity of shape as an effect of discontinuity” (p. 5, emphasis in original).
The second characteristic is that fire spaces can be thought of as a
“flickering relation between presence and absence” (p. 5, emphasis in original).
The constancy of the shape, which is present, depends on that which is
absent. The third characteristic is that fire space can be thought of as a
star pattern. That which is present is a single centre and this can be
linked to multiple absent others. They sum up the characteristics of fire
space by stating “that there are stable shapes created in patterns of relations
of conjoined alterity” (p. 6, emphasis in original). To illustrate the fire
space Law and Mol (2000) use an example based on an aerodynamic
expression (a formalism) that was used by aircraft designers in the 1950s.
They describe how the use of this formalism is dependent on factors
such as the forces that make pilots vomit in a plane and the speed of
Russian fighter planes that may shoot down the plane the aircraft
designers are building. The vomiting pilots and the Russian fighter
planes are not present in the room with the aircraft designers yet they
still have an influence on the work of the aircraft designers. That is,
what is absent has an effect on what is present in the room.

The topologies of teaching using interactive video-conferencing

In this section I use the language of performativity and the four spacial
topologies to analyse teaching across several campuses of CQU using
the IVC facilities. The analysis is similar to the model developed by
Torben Elgaard Jensen (2001) in his doctoral thesis on the
performativity of social work in Denmark. Instead of analysing the
space by ‘identifying’ causes or structures I am going to use this
analysis to develop conceptual tools to ask necessary empirical
questions about the spatial patterns (the effects of the social)
functioning in the IVC facilities at CQU. There are two main areas
that I am interested in addressing. The first is about spatial differences
(What kinds of space are being performed? Does it resemble regions,
networks, fluids, fire or something else?) and the second is about
the effects the performance of these spaces has on teaching and
learning with the IVC facilities.
Spatial differences

As part of my data collection I observed a two-hour video-conferenced lecture for an Environmental Science course. Analysis of my data revealed at least one example of each type of space. I observed how each campus performed as a separate region during the IVC session. The physical classrooms are in different campuses located in different cities and are linked by communications technology. The class is described as a single class but in many ways each physical classroom performs as a separate region. It was noted that this particular course was team-taught. The teaching team performs as a network across three campuses. The university wants to have the same model of teaching independent of the campus that the students are enrolled in. This means that teaching using IVC is performed as a fluid. When lecturing staff are preparing to conduct classes using the IVC they are performing within a fire space – there will always be students whom lecturers cannot see but must take into consideration in the conduct of their classes. The physical network that links all the campuses together in the video-conference is also performs as a fire space. It is also invisible to the lecturing staff yet the success of the class depends on all the equipment being hooked up correctly and in working order. A failure of any component or accidentally linking in the wrong classroom could cause problems teaching the class.

Clearly, there are different special topologies operating in the IVC classrooms at the CQU. I will now discuss each of these spatial topologies in more detail.

Regions

The co-ordinator of the Environmental Science course is located in Rockhampton. This course is interdisciplinary in that it cuts across the disciplines of biology, physics and chemistry. A team of people teach in this course: three are in Rockhampton (a chemist, a biologist and a physicist) and one each in Bundaberg and Mackay. The staff in Mackay and Bundaberg are general scientists and they cut across the discipline areas of chemistry and biology. Essentially this is a single class in that all the students are studying the same curriculum and undertake the
same assessment but they also act as separate regions during the lecture and in other class contact. In the lecture I observed the course co­ordinator started the class by talking about housekeeping issues. During this time he kept referring to “Bundaberg students”, “Mackay students” and “the Rocky class”, thus highlighting the students at each campus as belonging to separate regions. During the class three lecturers gave input into the teaching of the content. They were located at each of the three campuses. When they were teaching they were teaching to the whole class though they could see only the students in front of them and the class on the monitor which would have been the site at which a student was the most recent speaker. When asking questions they would ask questions to each campus such as, “Rockhampton, do you have any questions?” or “Mackay, do you have any questions?” This again highlighted each campus as a separate region. Sometimes, when the lecturer asked questions of the campus, no one would answer. As there was a staff member at each campus the lecturer asking the question would then direct that question – or make a comment to – the staff member at that campus. The students at Rockhampton (where I was located while observing the class) talked to one another but there was no student interaction across campuses. These communication patterns illustrate how each site was performed as a regional space delineated by the physical classroom at each campus. 

**Networks**

The class also performed as a network and as part of a larger nest of networks operating in very similar ways. The enactment of teaching, for example, was the same with all three lecturers who taught content during the class. The class was team-taught and there was input from lecturers in Bundaberg, Mackay and Rockhampton. The lecturers all used visual props that they referred to (such as photographs on the document camera and images and words embedded in PowerPoint slides), they all explained concepts to the students and they all followed up with question time. These were elements of the network in the sense that the lecturers and the students performed their roles in a similar manner regardless of campus.
Fluid spaces

Having been a member of the lecturing staff at CQU when the IVC equipment was installed I know that the senior university administrators have requested that every student should have the same model of teaching regardless of the campus at which they are enrolled. In reality this is difficult to achieve given that in the class I observed there are internal students at three of the Central Queensland centres and distance education students who may or may not be able to attend the classes. It is impossible for all of these students to experience the same teaching model. (The desire to achieve a similar teaching model for all students is pedagogically questionable but was not a policy position that I chose to pursue in my research). The very fact that the students and the staff are not all physically in the same room at the same time implies that the teaching and learning experience for each student and staff member will be different. The students at the receiving sites could see only the images that were broadcasted on the equipment. This means that if the PowerPoint slides or document camera images were being broadcast then the students were not able to observe the non-verbal communication of the lecturer.

In another example, a student in Mackay does not have an opportunity to ask a question of the Rockhampton-based course co-ordinator before the class starts or in the mid-lecture break as do the Rockhampton-based students who were observed asking questions of the Rockhampton-based course co-ordinator before he started the class. If a Mackay student wanted to ask a question he or she would have to ask it using the microphone which meant that every person at all the campuses linked using the IVC facilities could hear the question and the response.

The desire was to create the same model of teaching across all the campuses. However, the reality is that the model is different according to the location of the student in relation to the teaching staff. Of course this model could change again if one of the lecturers were to travel to a different campus to teach the lecture in a particular week. For example, if the Rockhampton-based lecturer travelled to Mackay to give a lecture then the Rockhampton students and the Rockhampton lecturer would
need to use the microphones to speak to one another. These examples illustrate teaching and learning being performed as a fluid space.

**Fire spaces**

Preparing for teaching an IVC class is an example of teaching being performed as a fire space. The lecturer needs to be aware of people he or she cannot see when he or she is preparing for their class. The Rockhampton-based lecturer will have never seen the Mackay or Bundaberg students except through a television monitor unless he or she had travelled to the other campuses and given a class from that campus. This means that when lecturing staff are preparing to take classes using the IVC facilities they need to be aware of students that they cannot see while also taking into consideration the conduct of their classes. The lecturer must also have a contingency plan as to how to proceed with the class if the equipment that links all the campuses in the video-conference were to fail. This happened in the class I observed when the link to Bundaberg dropped out for several minutes. The lecturer at Rockhampton chose to use this time to talk to the Rockhampton students about a tutorial that was scheduled to be run two days later. During this time the students and staff member in Mackay were ignored though they could see and hear what was happening in the Rockhampton classroom. When the Bundaberg link was re-established the class proceeded as scheduled. This incident highlights how teaching using the IVC is performing a fire space.

The lecturer must think about the experience for those students he or she cannot see. Even when the equipment is working properly one can see only the campus where a person spoke last (the switching software is voice-activated). This means that in the class I observed there was always one campus that was not visible to the lecturer. It would be possible for that campus to drop out of the link and the lecturer not be aware it had happened. It is also a fire space because one is depending on equipment one cannot see (for example, the microwave link to Bundaberg) and people one cannot see (for example, the technicians who set up the link for the class and who need to reconnect the link if it were to fail). These elements of a video-conference are not present in the room when the lecturer is preparing his or her
class but they have an influence on the preparation the staff member needs to make when preparing for each class.

**Learning from an ANT analysis**

Introducing new educational technologies to support teaching and learning activities means that academic staff need to think about the spaces they are performing. It is not enough for them to perform the teaching in the same manner as a face-to-face class. For the teaching and learning to work well they need to be aware of the spaces created by the educational technology. The specific regions, networks, fluid and fire spaces that are created by a new technology such as IVC will be unique to each example of educational technology.

Thinking about teaching and learning by keeping in mind the different spaces that are created by the performance of the teaching allows academics to plan their classes to take into account the differing needs of the different student groups through thinking about the spaces that are being performed. Analysis of the regional space indicates that the group of students at each site is performed differently depending on their physical location compared to the lecturer. Regions at a distance from the lecturer can be communicated with only by using the technology and all the communication is public and hence likely to be formal. If the students are physically close to the lecturer there are opportunities for informal contact before and after the lecture as well as during the lecture break. This indicates that lecturers may need to explore informal avenues of communication with their students in different regions.

The performance of the network spaces seemed to work well. The lecturers reproduced techniques that they used in face-to-face classes to teach using the IVC facilities. In Rockhampton the students appeared to be taking an active interest in what was happening regardless of the location of the staff member who was teaching as they were all quiet and attentive until a few minutes before the lecture finished. A significant aspect of using the IVC for teaching is that the lecturer must always be aware of the image that is being broadcast to the other sites. If lecturers rely on non-verbal communication to get their point across then they must be aware of the need to switch the image back to
themselves while they are talking. Also as the image for the other campuses is displayed on a television monitor they must remember that they are broadcasting a screen image to the other sites. A screen image of a lecturer can be thought of being similar to the image of a newsreader. For most of the class the only image the students have of the lecturer is his or her head and shoulders. In a face-to-face class the lecturer has a stage presence (Bigum & Appleton, 1997). This means that the students can see the lecturer’s whole body and are able to see his or her non-verbal communication, similar to an actor on a stage.

It is the performance of the fluid spaces that I believe is the most difficult to engage with when preparing for an IVC class. In my own experience when I have taught across multiple campuses using the IVC facilities I have tried to travel to each campus at least once a term to meet the students face-to-face. If at all possible I do the visits on the day that the class is scheduled so that I can use the IVC facilities to teach my class. The behaviour of the students is noticeably different. For example, my base campus is Rockhampton so the majority of my IVC teaching originates from Rockhampton. The students in Rockhampton will ask me questions and though I can hear the question (I am in the same room as them) I ask them to use a microphone so that the students at the other sites can hear the question too. The students in Rockhampton either agree to use the microphone or ask me to repeat the question so the other sites can hear. Students in Mackay, Gladstone and Bundaberg are accustomed to using the microphone to ask me questions because it is the only way they can be heard during class time. The only time I observed students at Mackay, Gladstone and Bundaberg being reluctant to use the microphones to ask questions when I was in the same room as them. Even though they had used the microphones in the preceding weeks to ask questions when I was in the same classroom as them they exhibited similar behaviour to the Rockhampton students.

Performing teaching within the fire space presents a number of challenges. Lecturers have to contend with a number of unseen elements when preparing their class. All the components of the technology must be working for the IVC class to proceed with all campuses being involved. Lecturers must practise beforehand to ensure
that the material they are preparing is suitable for the IVC link, that is of a size and colour that can be seen via the monitors at the other end. Even the lecturers’ choice of clothes can affect the image that is transmitted (for example, clothes with small stripes can cause wavy lines to appear on the screen). In the lecture I observed the Rockhampton-based course co-ordinator was relieved when he saw that the Bundaberg lecturer was wearing a dress that was dark and solid in colour and appearance. He made a comment that the week before the stripes she wore had flared the screen and made it difficult to look at on the monitor. It is as though every single thing one does in preparation must be considered for how it will come across on the technology. There must also be contingency plans for the link to one or more sites going down. The contingency plans must be conveyed to the other campuses before a failure. In the class I observed there was a staff member at each campus so it was possible that in the event of failure the local staff member could enact the contingency plan. But not all IVC classes at CQU have staff members present at each campus. The class I observed was an interdisciplinary class that was taught by a team of people. If one were the only staff member present then one would need to think and articulate the contingency plan to the students very early in the teaching term. Before, during and after the IVC class the performance of the teaching is significantly different from a face-to-face class.

Conclusion

The analysis of the performativity of special topologies when using the IVC for teaching and learning at CQU has implications for the use and effectiveness of educational technologies. The teaching model described above demonstrates the complexity of CQU as an institution. This in turn has implications for devising policies around teaching and learning that are inclusive of that complexity and its associated diversity, while also being efficient in terms of time and costs. The existing teaching and learning policies are based on a face-to-face model of teaching and also a distance education (or correspondence) model of teaching. To the best of my knowledge there are no specific IVC policies nor are there references to IVC in the suite of teaching and
learning policies. The teaching and learning policies do refer to on-line teaching and learning but only in a perfunctory way.

Thinking about teaching and learning as performing in different spatial topologies is a constructive way to think about and prepare for teaching using the IVC. CQU should consider using that knowledge to improve the training that is provided to staff who are using the IVC facilities for teaching and learning. Using the concept of performativity to think about teaching and learning as performing in different spatial topologies provides valuable insights in preparing for classes regardless of the technology that is used to support the delivery of the content. For example, performativity could be used to analyse teaching and learning using the World Wide Web (on-line teaching and learning). Analysing the performance of regions, networks, fluid and fire spaces in on-line teaching and learning could assist staff to think about and prepare for the challenges of on-line teaching for both staff and students. In an on-line teaching and learning environment the regions being performed do not fall neatly into the physical classroom spaces apparent in the IVC teaching model. Each individual student may be performing in their own separate region, which would imply that each student has unique needs in the on-line teaching model.

Endnotes
1 I have drawn on Luck (2003) in presenting the background material in this chapter.
2 The brief introduction to ANT is based on that described in Luck (2003).
3 A number of other authors have done related work on performativity. Some of these are: Anni Dugdale, Donna Haraway, Bruno Latour, Ingunn Moser, Vololona Rabeherisoa and Vicky Singleton
4 This term is borrowed from post-structuralist literature. It means the state of being different.
5 CQU has been a distance education provider since 1974. The first intake of students was in 1967 (Retrieved August 1, 2003 from the World Wide Web http://www.cqu.edu.au/about/history.htm).
6 CQU has been using on-line teaching and learning since the late 1990s. There was no directive from Chancellery for staff to be involved in on-line teaching and learning as there was with interactive video-conferencing. Innovative staff started to teach using on-line technologies through personal interest so it is difficult to pinpoint exactly when on-line teaching and learning began at CQU. In 2000 CQU adopted WebCT as a centrally supported course management system and in 2003 they changed to Blackboard.
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