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Videoconferencing and the networked provision of language programs in regional and rural schools

Abstract

The use of videoconferencing technology for educational purposes shows great potential for supporting the delivery of language programs in regional and rural settings where a lack of access to specialist teachers limits equitable access to education. In this study we look at the establishment of two regional and rural primary school networks in Australia. Using a structuration lens, we examine how the technology they use both changes and is changed by its use in language learning, and how schools and teachers take control of technology and adapt their educational approaches. Dual case studies were built using multiple data sources, including interviews and observation of language classes. The findings demonstrate that even with the same conceptual foundations and aims, divergent models of practice emerge as sustainable adaptations to localised factors. These differences are shaped by, amongst other things, an interplay between the quality of infrastructure, prior knowledge, and the 'material properties' of the technology, including its functions, limits, and deployment in physical space. A closer look at these practices illustrates limitations and possibilities specifically for language education, but more broadly, illustrate how the success of these videoconferencing initiatives are influenced by a nuanced combination of social, educational and technological factors.

Key words

Videoconferencing, second language learning, structuration theory, distance education, language teaching methodology.

1 Introduction

Over the past two decades, there has been steadily growing interest in the use of videoconferencing for language learning in a variety of settings, motivated by providing greater access to language acquisition, but also by the potential benefits of intercultural exchange. At a broader educational level, for schools in rural and regional settings, mechanisms such as videoconferencing tools play a critical role in providing equitable access to educational opportunities, most particularly for specialised content areas, when access to specialist teachers is inhibited by distance. In many jurisdictions around the world, this equates to subject areas such as science, Mathematics and, as is the focus of this study, second or foreign language education (e.g. Kleinhenz, Wilkinson, Gearon & Ingvarson, 2007; Pritchard, Hunt & Barnes, 2010). While this technology plays a crucial role in providing access to education, questions persist about the effectiveness and relevance of videoconferencing in language learning and uncertainties remain about how to design and implement sustainable language programs (e.g. Comber & Lawson, 2013). In this study we explore the shape of this challenge in two networks of primary schools in regional and remote contexts in Australia where shared teachers and distance learning are key parameters in delivering language programs.

2 Videoconferencing-based language learning

The potential for videoconferencing to facilitate and enhance interactive language learning has been actively pursued in international research since the 1990s, involving a range of languages, across different educational contexts. In practice, the tool itself is only one component in a complex array of technological, pedagogical, and infrastructure variables which impact upon sustainable language programs. Prior research has shown that significant and unexpected challenges can be encountered including technological challenges such as hardware and networking problems; *ad hoc* technical support; limited regular access to computers; restricted access to software and online forums including videoconferencing programs such as Skype, and insufficient understanding of technology and its suitable applications on the part of language teachers (e.g. Garrett, 2009; O'Dowd, 2015).

Pedagogically, the education and technology nexus provides additional challenges, heightened by the specific requirements of language learning. The potentially valuable experience of language learners and teachers feeling themselves to be in the presence of each other depends on subtle factors that are difficult to ensure through screen-based interaction, such as gaze tracking and eye-contact (Satar, 2013). Other technical difficulties that can diminish this experience include time lags, lack of lip synchronization, poor support for natural conversational turn-taking, and significantly reduced cues around non-verbal body language (Wang, 2004). Hampel and Stickler (2012) found that teachers in a videoconference can become too dominant, while conversely, Ornberg Berglund (2009) found that learners sometimes indulge in monologues, indicating that managing the roles of both the teacher and the learner is critical.

Familiarity with the use of technology in education can also play a crucial role in the effectiveness of videoconferencing. For example, it has been shown that more experienced language teachers perform better through videoconferencing than novice instructors, in part because they have additional skills of deployment such as careful framing of the shot, allowing better, richer gestural exchange (Codreanu & Celik, 2013). In their study of students learning French, Guichon and Cohen (2014:20) found that what was of most significance was 'a complex interplay of factors relating to the pedagogical actions that can be deployed verbally and non-verbally by the teacher', that is, the teacher knowing when to interrupt, prompt or employ paralinguistic skills.

Research into videoconferencing and language education identifies multiple elements of importance in the effective and sustainable provision of programs, however, this research has predominantly focused on the tertiary level, with some secondary school-level research (e.g. Norris and Coutas 2012). Relatively little research has been undertaken at the primary level, although there is a growing body of work which has examined primary schools accessing language programs across countries in order to augment language provision, or to circumvent the lack of specialist language teachers locally (e.g. Macrory, Chrétien & Ortega-Martín 2012; Whyte 2011). Other research has looked at tackling this issue domestically. For example, the MustLearnIT program operating across five European countries - the UK, Finland, Poland, Greece and Cyprus – researched web-facilitated language education between small, rural multigrade schools and central schools where language teacher specialists were located within each country (Luoto 2007). The remote students joined in with the central school through videoconferencing, taking language classes at the same time as the face to face students. The UK component of the project took a different form in that language classes

were provided by one secondary school teacher seated in front of a desk-based computer, simultaneously teaching classes to two remote primary schools (Pritchard *et al* 2010). Although this research provides valuable findings and insights, there remains a dearth of research, especially in a non-European context, into the use of videoconferencing for language teaching at the primary level, and in particular on what happens in domestically located and self-organized virtual networks, as occurs in our case, and also potentially elsewhere; a gap this research seeks to address.

3 Teaching practices, technology and structuration

Our study takes place in the Australian state of Victoria, where the provision of language education programs (languages other than English) is mandatory, but hindered by a paucity of qualified language teachers, particularly for primary schools in regional and remote locations (Kleinhenz *et al*., 2007). With the danger of deregistration if non-compliant, there is an urgent imperative for schools to provide programs. The Victorian government has been actively studying how emerging technologies can assist with the teaching of languages other than English in isolated areas. For example, the Innovative Language Provision in Clusters (ILPIC) Initiative examined the use of blended learning and online resources to strengthen language programs in Victorian schools (Zbar & Jane, 2012). While initial trials supported the potential value of online and digital technologies in language study, Zbar and Jane (2012) argue that case studies of successful strategies are urgently needed to assist schools in understanding how to sustainably increase and improve language education provision through online technologies.

One critical question then, is how schools might work to realise the potential of these emerging technologies while working within the technological limits and uncertainties around their integration into teaching practices. Although the success of a program depends partly on the chosen teaching techniques and the robustness of the technology, as detailed in some of the research above, videoconferencing based language programs must be *established, negotiated, managed and sustained*, that is, be constructed, in a real world setting (see e.g. Leonardi & Barley, 2010). Questions, therefore, about the effectiveness of videoconferencing, need to be set within a breadth of issues including matters of pedagogy, technological feasibility, and technology acquisition and maintenance, but also take into account the promotion and valuing of language education, interschool relations, staffing, scheduling, and physical accommodation, among other issues.

Our approach, therefore, to studying the adoption of videoconferencing in two primary school networks is informed by theories on the use of information technology in real settings. In particular the range of theories under the umbrella of 'structuration theory' that address evolving patterns of mutual accommodation between new technologies and existing human practices (e.g., Orlikowski, 2007) provide the epistemological basis for this study (cf. Norris and Coutas 2012). These theories argue that the shape of technologies in practice are ‘socially constructed’ rather than technologically determined (Leonardi and Barley, 2010). Our intention is not to address the many issues raised by structuration (see for example, Leonardi, Nardi & Kallinikos, 2012), but rather to use it as a set of sensitizing concepts (Van den Hoonaard, 1997) to illuminate the use of videoconferencing in language teaching. In our study, a structuration lens invites us to examine how the technology of videoconferencing both changes and is changed by its use in language learning. These changes refer to the

configuration, specific deployment and appropriation of the technology and the development of new teaching and learning practices.

Following this structuration perspective, the unit of our investigation is not the individual teacher or learner, nor even the class or the school, but a network of schools. Each network is a group of schools that has arranged to share the services of one language teacher. Our focus is on how two particular networks have emerged and now operate: what decisions were made, and re-made, and how teachers, schools, students and videoconferencing technology were brought together and integrated to make an effective network of primary school language education. The aim of our study is to examine how regional and rural schools, in particular in English speaking countries, might undertake this endeavour, guided by the following research questions:

- How have schools constructed videoconferencing-based language programs across rural and regional contexts?
- What variables are most influence the trajectory, quality and sustainability of these language programs?

4 Research method

Two key variables have underpinned our research paradigm for this project. First, has been a pragmatic urgency based on the need for all Victorian government schools to provide language programs, with the possibility of deregistration if non-compliant. With a vast majority of schools without programs in rural and regional areas at the time this research was undertaken, we were seeking to identify generalizable principles that could inform the development of other sustainable videoconferencing-based networks across schools hindered by a lack of access to specialist teachers. The second variable has been the structuration lens and its impact methodologically. Two different networks of schools accessing a language program through a host school have been documented for this project. Our intention has not been to identify one model as superior, nor to try to define best practices, if indeed they exist. Both networks we examined are emerging approaches as each continues to address its particular challenges and our study reflects a snap-shot of their development. Rather, our aim has been to better understand the process whereby models of practice emerge for videoconferencing in language learning; processes from the establishment of networks, through to their sustainable management. This has required a multi-focal approach to data collection.

For the purposes of this study, we adopted a dual case-study method (Yin, 2010) that compared two school networks of language learning based on mixed face-to-face and videoconferencing delivery. Two networks of schools were chosen as containing members that were typical of regional and remote rural primary schools in the Australian setting. However, at the same time they can be regarded as ‘revelatory’ cases, in Yin’s (2010) terms, due to their different approaches to language provision through videoconferencing and through their value in identifying some emerging challenges and opportunities in integrating videoconferencing into language learning.

The first school cluster, Network One (N1), is comprised of 12 primary schools spread over approximately 20,000 square kilometres across South Western Victoria. Enrolments at the schools range from 10 to 174 students. Four schools within this network took part in this

research. The second school cluster, Network Two (N2), comprises three schools in relatively close proximity across 400 square kilometres in the North East region of Victoria. Here school enrolments range from 15 to 69 students, with two of the three schools participating in the project. Participation of individual schools and their staff in the research was voluntary and university and State government ethics protocols were completed.

4.1 Data collection and analysis

Understanding the emergent practices in language education and videoconferencing within and across schools in each network has required engagement and observation from multiple viewpoints, as detailed in Table 1. First, multiple perspectives were sought through interviews with school principals (identified in the data analysis as P1, P2, etc.), language teachers (LT), and/or classroom teachers (CT) in participating schools. In total, 11 school staff members from across the two networks took part in interviews, either individually or in groups, which were recorded and transcribed with their permission. Given the interdisciplinary focus of the research, the topics of the interviews were broad ranging, but tailored to the role of each participant, including language education program development, teaching methodology, curriculum development, the technological bases of programs, staff proficiency with technology, the efficacy of the technology itself, and student engagement.

Observations of the language teacher delivering a class were undertaken at each host school, as well at a receiving school in each network as a class was delivered to the students. In N1, the language teacher delivers the language lessons, in a small room containing the videoconferencing system and her teaching materials. The lessons are delivered to either whole school classes in the very small schools, or to combined year levels, for example Years 4 to 6, in the larger schools. In N2, classes are delivered to one class face to face, while simultaneously being delivered via a videoconferencing system to classes at two additional schools. Observations were focused on the role and use of technology during the delivery of a language lesson.

Table 1. *Data collection in Network 1 and Network 2*

Network 1	**Network 2**
Interviews: Six participants *Host school* • Principal (P1) • Language teachers (LT1 & LT2)[1] *Receiving schools* • Principal (P3) • Principal (P4) • Principal (P5)	**Interviews: Five participants** *Host school* • Principal (P2) • Language teacher (LT3) • Classroom teacher (CT1) *Receiving schools* • Principal (P6) • Principal (P7)
Observations Network 1 • The delivery of a language lesson via videoconferencing from host school to P4's school • The delivery of the language lesson from the receiving school's perspective (at P4's school)	**Observations Network 2** • The delivery of the language program via videoconferencing from host school to P6's school • The delivery of the language lesson from the receiving school's perspective (at P6's school)

Consistent with case study methodology, we have constructed accounts of each network based on multiple sources of evidence. Transcribed interview data and observational notes were thematised into numerous categories under the interview themes identified above. This analysis, along with school-based data (e.g. enrolments, location, socio-educational index), examination of relevant government policy documents related to language education, as well as digital learning and technology infrastructure, have informed the development of each case study; the key elements of which are presented in the findings and analysis.

4.2 Reflexivity in analysis

A key opportunity for reflexivity arose through a parallel endeavour during the writing process. A primary concern of our research has been the accessible dissemination of the findings to rural and regional school communities. To facilitate this process, based on the initial research findings, the Victorian Department of Education agreed to fund the development of resources showcasing videoconferencing as a viable language provision option, featuring N1. With ethical consent, the delivery of a language lesson was filmed simultaneously from a host school and a receiving school, and transformed into three digital stories, presenting the perspective and insights of the receiving school, of the language teacher and of the principal of the host school. These perspectives are accompanied by a

[1] LT1 went on leave during the research project, was replaced by LT2, and then returned during the follow up phase of the research. LT1 and LT2 had worked closely together on the development of the program and were interviewed together.

'How to' manual for schools interested in investigating the option of language education through videoconferencing. This project involved filming and re-interviewing teachers and principals, as well as interviewing members of the school board and students to create the digital stories.[2] The retelling of these stories served as a form of participant checking of our analysis of the research data, as their stories confirmed, clarified and deepened our analysis.

5 Analysis and findings

Following the structuration perspective, our emphasis is on how each system of technology-supported language teaching took and takes shape. Based on documentary analysis and project interviews, we first trace the antecedent sources of support and attempts to develop sufficient technological knowledge. We then draw upon the interviews and observations to describe and compare the distinct approaches and outcomes that emerged in the two networks. This allows us to identify key interrelated themes about how technology and teacher-time were deployed, the critical use of classroom space, and techniques to create a sense of presence that serves to bridge the 'transactional distance' between teacher and pupils (Moore, 1993).

5.1 *Critical groundwork*

As supported by previous research (refs?) the two case studies have shown that he reliability and quality of key infrastructure have been critical to the success of both language teaching networks. While many schools across the Victorian education landscape have been engaged with the use of technology in education for decades recent infrastructure changes have significantly increased the viability of digital learning. Numerous initiatives by the Victorian state government relating to both infrastructure and expertise have played a critical role in enabling the N1 and N2 schools to engage with digital endeavours. Most directly relevant, is that all schools in both networks have secured a commercial videoconferencing system (Polycom) through either Federal or State level grants aimed at facilitating digital learning across Australia. These high-quality videoconferencing systems typically cost more than $10,000 and are beyond the budget of most regional and rural schools.

Government initiatives have also contributed important resources and support. The VicSmart project (2005-2011) has connected every Victorian Government school to an optical fibre broadband network, while also working to further upgrade available bandwidth (VAGT, 2012). DET now also provides a centralised internet service to government schools, with access to phone support for technical issues. Additionally, all government schools have weekly onsite visits from an IT technician who assists with IT infrastructure and technical issues in schools (DEECD, 2014). Access to expertise is also central to the success of digital learning initiatives, with government schools, including those in our networks, having access to a range of support personnel charged with providing expert advice and support. These include both Regional Digital Learning Officers (DLO) who advise on all aspects of education and technology, and Regional Language Officers (RLO) who advise on language

[2] See: https://fuse.education.vic.gov.au/ResourcePackage/LandingPage?ObjectId=dff6e866-448c-4ebc-98e9-e1281cbc9480&SearchScope=All

education methodology, resourcing and delivery of programs in Victorian government schools.

While technical issues with videoconferencing still exist within N1 and N2, such as an audio time lag and occasional dropouts - issues which commonly frustrate the efficient use of videoconferencing in remote and rural locations around the world, (e.g. Luoto, 2007; Pritchard *et al*, 2010) - the broad coalition of highly co-ordinated infrastructure development, resourcing and expert support services provided by the state-level government has helped scaffold the networks beyond these infrastructure challenges, enabling them to gain momentum in their program development.

5.2 Building on prior knowledge

Prior knowledge plays a critical role in the lead-up to the adoption of videoconferencing, a time when an approach is conceived and designed, and the various elements of infrastructure are established. Our use of the term 'infrastructure' refers to technical equipment and the physical and technological set up of spaces, as well as the incorporation of the programs into the existing school timetable and curriculum (Garrett, 2009).

The N1 language program was co-created by the language teacher (LT1) and the principal (P1) at the host primary school leading the network. The school had previously engaged in a videoconferencing based language program, where a language teacher from a regional secondary college had provided weekly French lessons to a number of primary schools in the region. The program was supported by a research grant from the government, but once the funding ended, LT1 and P1 were in agreement that the delivery of the language program from a secondary to a primary school was not financially affordable, nor pedagogically appropriate. Despite repeated attempts to address these issues, acceptable changes were not implemented, rendering the program unviable. P3, principal at a neighbouring primary school also agreed that inappropriate pedagogy and inhibitive costs forced their withdrawal from the program.

> The cost was going to be broken up and shared through the schools that were involved, but it was far beyond our funding capabilities… it's quite prohibitive because the teacher was a senior teacher, so it was… you know like it was thousands of dollars. It was thousands, it wasn't just hundreds. (P3)

In creating their own model of provision, LT1 and P1 were able to build on their prior experience with technology, coupled with assistance from the technology and digital learning support officers and the language officer, but also informed by an understanding of the financial imperatives that challenge many small, multigrade schools (Luoto, 2007). At the recommendation of the DLO, P1 attended a professional learning seminar in a neighbouring state, South Australia, to observe their approach to distance language education using desk-based videoconferencing. By drawing on this observation and on past knowledge and experiences, P1 conceived a more efficient and sustainable approach for her region than was previously achieved:

> The videoconferencing program could be seen as a lot of work for a small school, but we just took it as a natural progression of what resources we already had in our school. We had the Polycom unit, we had the amazing teacher, and it all came

> together. And as we work through the program, we're having more schools come into our program. So we really are proud of what we're doing, we feel that it's really working and the children are learning (P1).

The schools in N2 did not have prior experience of language education through videoconferencing to draw upon, but had previously shared science lessons across local schools via the same mechanism. In seeking to address the immediate need to staff a language program in a cost-effective manner, the principals in N2 agreed to employ a language teacher through a staffing agency, who works across the three schools one day a week. The language teacher (LT3) is both an early career teacher and new to videoconferencing, and has therefore had to build from a smaller base of professional experience and technological knowledge. LT3 sought guidance from the DLO and the RLO, the local IT technician and the DET Internet Service Provider helpdesk. The differences in prior experience across N1 and N2 have led to significantly different approaches and outcomes for language provision in the two networks.

5.3 Diverging approaches to new ideas

A central observation of our account, therefore, is that the two networks have appropriated the same technology in different ways and set in motion two different evolving approaches. This is consistent with a structuration perspective: new technologies do not predetermine a particular way of using them; rather, they are appropriated within an emerging set of new arrangements to orchestrate teachers, pupils, learning materials, class-room space, and so on. The material features and functions of the technologies have nevertheless constrained and influenced the direction of the overall system of which they are a part, as have the broader demands on language teaching across the two networks. Hence, the two networks also inform us about the shared challenges of videoconferencing for language learning.

In N1, the language program is based out of one small primary school of just 23 students. The Japanese language teacher (LT1) has her own small videoconferencing room set up specifically to provide Japanese lessons to interested schools. These lessons are supported at each location by in-class teachers without Japanese language skills. Teaching is delivered in a specially tailored format comprising a morning session of instruction between LT1 and a single class for 30 minutes, which might be the whole school depending on student numbers, followed by 30 to 60 minutes of learning activities led by the classroom teacher offline. The class then logs back on for an afternoon session with one or two other schools in N1, where students have the opportunity to share their work across schools. Schools also have the option of signing in for 30-minute hiragana (writing) sessions designed to extend older students.

In N2, the three schools share one Indonesian language teacher (LT3) for one day a week. LT3 visits each school in turn once every three weeks where he teaches a face-to-face class, while simultaneously using videoconferencing to teach classes at the other two schools. Each school therefore has a face-to-face lesson once every three weeks, with videoconference based classes in the other two weeks. The lessons are planned around grouped year levels, although this is dependent, in practice, on how many students are at each school and in each year level.

At the heart of the N1 and N2 delivery models is a response to the question of how to best use a single language teacher across schools and across different year levels. With previous knowledge and experience of the success and failure of other videoconferencing based programs, LT1 and P1 in N1 have centralised the effective use of the technology over traditional timetabling structures. As we have seen, their program is divided into a series of components, with the morning sessions generally based around language acquisition activities and the afternoon sessions focusing on language production or cultural activities. This component structure, with its mix of language teacher-led sessions and classroom teacher-led sessions, gives schools the flexibility to tailor the program to their circumstances and still benefit from economies of scale across the network. While most schools access all components, some of the very small schools (with less than 10 students) access only the basic component.

N2's combination classes, in which LT3 simultaneously delivers a face-to-face class with two online classes, provide a different innovative response where the elements of prior knowledge have led to a view of videoconferencing as implicitly providing a kind of substitute for having a teacher present in the classroom. This is the received 'spirit' (De Sanctis and Poole, 1994) of videoconferencing technology, that is, its implied claim of being able to render an absent person present. The consequence of holding this view in N2 can be seen in the way the online classes were confined, as for any normal class, to the strictures of the school timetable, and took the form of 90-minute standard lessons, but with LT2 online, and delivered to grouped year levels. This contrasted sharply with the approach in N1 that views videoconferencing as a resource to be appropriated into different activities and to be accommodated more flexibly within the timetable. This has resulted in N1's component model that provides a variety of lesson formats over the day, most of which were optional. The difference between the networks, therefore, was that N1 allowed a greater structural integration between teaching practice and the technology. In summary then, although very different, the approaches of N1 and N2 to videoconferencing were both carefully designed, resourceful uses of both finances and language teachers, as appropriate for their respective networks.

5.4 The response to distance: the creation of presence

Also very much at the heart of both delivery models, alongside the careful use of limited teacher time, is a response to the challenge of how to overcome the 'tyranny of distance' between teacher and pupils. This refers not simply to physical distance but also to the resulting transactional distance between teacher and learner. One factor affecting this is the capability of the videoconferencing technology to create a sense of 'presence' (see Lombard & Ditton, 1997), with each party experiencing the other's company in something resembling face-to-face interaction. Research into numerous 'components' of presence such as gaze tracking, eye contact, lip synchronisation and time lag have been outlined above. However, although these dimensions are indeed important, the maintenance of presence also depends on wider social relationships that are forged through and around the delivery of the lessons (e.g. Anastasiades, Filippousis, Karvunis, Siakis & Tomazinakis, 2010; Austin, Hampel & Kukulska-Hulme, 2017). On this point, the approach of the two models have departed quite significantly.

The method of LT3 in N2 of visiting each school every three weeks might seem to offer a stronger basis to create and maintain a relationship with each school, compared to the approach in N1 of conducting all classes at a distance through technology. However, the practices adopted in N1 have led to an equally strong sense of presence, a key factor being the nature of the partnership between schools. When initiating relationships with schools in N1, of critical importance has been the development of a social compact between the teachers, principals and students, around the value of language education and its positioning in both the school environment and the curriculum. P1 facilitates this process by seeking an agreement from school administrators that they will commit to the program for an agreed period of time:

> I really feel it's important that the principal actually is part of those classes and knows what's going on, so that they value the program. This goes through to the children: if the principal values the program, the children will value it as well. And that's where the learning all happens (P1).

While P1 and LT1 seek to construct consensus around the importance of both language education and the use of videoconferencing, they recognise that the outcome can be determined by technological challenges if an effective level of support is not provided. They therefore seek to create the necessary technological momentum in each school, recognising that, as Comber & Lawson (2013:652) argue, developing expertise in the use of videoconferencing in education requires 'a unique combination of knowledge and enthusiasm which few others' have, requiring these experts to become the drivers of innovation. The videoconferencing-based language lessons consequently evolve over time, as school personnel develop the confidence and skills to manage the situation. P1 and LT1 understand that they must commit themselves to be mentors to assist schools in developing the technological knowledge they may need to build to ensure the effective and sustainable development of the videoconferencing program:

> Well it's more so about connectivity from other schools. Most of the time people ring it's, 'I can't get on, I can't get on', you know. And I just try and talk them through and 'Try this plug, do this sort of thing'. It's fairly ad hoc and there has been times when some schools have missed their lesson because they just couldn't get on… But most of the time it's…very basic stuff… but they're just not, their heads aren't around that sort of thing (P1).

When a new school joins the network, LT1 generally visits it once, regardless of distance. She uses these opportunities to develop a rapport with the classroom teacher, principal and students, which can be built on during the lessons. LT1 also brings a 'culture box', which she leaves at the school, containing cultural artefacts and small prizes that can be dispensed by class teachers during lessons. This establishes the importance of the classroom teacher as an active manager of the lessons. LT1 and P1 both believed strongly that the rapport and respect derived from the initial visit of their 'television language presenters' greatly enhances student engagement and increases their subsequent interest and engagement in language learning; a view supported by Pritchard *et al's* (2010) research. Indeed the active positioning of the classroom teacher was deemed critical, where a kind of division of labour between the act of language learning and the act of classroom management was encouraged, an important distinction for the both the language teacher and the classroom teacher.

> I do find when they're playing the games… kids get very, very excited and because LT1's not there, I've got to make sure I keep a lid on, they can go off task. Of course [LT1] can't bring them back then, on the Polycom. I've got to manage it, really. [LT1]'s doing the teaching and I've got to manage the behaviour, you can't manage behaviour through the Polycom units. You just haven't got that eye to eye contact (P3).

> So that's when you've got to rely on teachers really to help. So you often say to the teacher on the other end, 'Sensei could you choose someone who's sitting up beautifully?' or 'Could you choose someone to be a new leader for this activity?', so you need a really good relationship with the teacher at the other end (LT1).

In N2, the unfolding approach has taken a different path. Consensus around the mutual construction of a technological-driven language program has not been created in the same way as it has been in N1. While N1 was envisioned by staff at one school, N2 was created around an agreement by all three schools to assist each other in meeting requirements around language education. One consequence of this style of partnership, is that while the principals have agreed on implementing the program, not all of the classroom teachers are committed to the endeavour and LT3 recognises that classroom management is the biggest hurdle. With some classroom teachers taking on a passive role during the 90-minute lessons, students become distracted and demotivated:

> Because I think, that's the big hurdle now, is getting the classroom teachers to understand that this is not some sort of like quiet time, this is active participation time and the… classroom management can't be done across sites… You're still in charge of managing your classroom, in doing the additional teaching, and supporting [P7].

5.5 The use of space and technology: techniques of engagement

The differences in the relationships and roles established around the videoconferenced classes set the scene for different outcomes in the two networks with regards to the kind of presence achieved and the ability of teachers and pupils to cross the transactional distance of online delivery. Indeed, how physical spaces and technology are deployed has a substantial impact on the creation of presence, where the restrictive positioning of teachers as 'stationary and seated' can greatly impinge on the need to convey expressive and paralinguistic meanings to facilitate language learning (Pritchard *et al*, 2010: 214).

A critical feature of N1 is that L1 is provided with her own dedicated space in which to develop and deliver her online teaching. This space is not desk-bound and stationary, but involves an area captured within the visual range of the videoconferencing system, allowing her to draw on nuanced techniques which could otherwise be diminished through online activities.

In evolving her technological practices, LT1 has also developed significant expertise in the use of presets. Presets are a feature of the Polycom units that allows the system to be pre-coded to focus on different locations. LT1 uses presets to try to create a sense of engagement that would normally be generated through conventional face-to-face interaction. For example, LT1 sets one preset close to her face for when she is interacting directly with students; a second preset is focused on a spot on the whiteboard where instructions, text or

objects may be displayed; and a third preset is a location on her desk where objects or books and other items can be displayed. LT1 switches smoothly between these presets so that students can always clearly track the focal point of the conversation. LT1 can also remotely manipulate the presets at the receiving school, which allows her to see the whole class at once, but also to isolate a place where students can stand to show her their work close up. This use of presets maximises the use of paralinguistic cues by LT1 to direct, encourage and engage with students, while the students can more ably access cues that LT1 is providing. This innovative use of presets has not been reported on yet in research into language education and videoconferencing, providing valuable insights into its role in creating presence and increasing student engagement.

P1 also emphasises the importance of each school creating its own permanent physical space for languages. LT1 is therefore able to regularly provide resources to be printed and displayed in those spaces which are drawn upon during her lessons and which serve as prompts for the students.

A final point of engagement to note is LT1's introduction of students and teacher to the concept of videoconferencing-based lessons through the establishment of a code of conduct for the classes. Just as the language teachers have had a steep learning curve when utilising the technology, the students have also had to adjust to the blended learning environment. The code of conduct ensures that lessons can run smoothly, logically and fairly, while minimising the impact of student misbehaviour or behaviour that unintentionally disrupts the technological setting. One illustration is the response to the small time delay of two seconds when communicating with students at the videoconferenced schools and when receiving a response from them. To minimise asynchronous audio overlaps, students must raise their hand to answer a question and the classroom teacher chooses a student to respond. Students are also asked to mute their microphones when they are not conversing with the teacher, in order to reduce the transference of ambient chatter and disruptive sounds to other locations.

In contrast, the physical space provided to LT3 in N2 does not afford him the same opportunities. Because LT3 moves from school to school, on each visit he must set up his space for each location to accommodate the teaching of the physical class as well as the two videoconferencing-based classes. As a consequence of him visiting and hence being in charge of the physical lesson only every third week, there is not a strong sense of place for languages in each school, none of which have established a dedicated space for language education.

The act of teaching to the three classes simultaneously, through a combination of face to face and online teaching, has presented difficult challenges. LT3 has to ensure that his face-to-face students are sitting close enough together so that they can all be seen through the video screens at the other schools. Furthermore, he has to position and re-position himself somewhat awkwardly so that he does not have his back to his own students or to the Polycom unit and thus the other classes, at least for large segments of class time. At the same time, he must also be able to physically move to work the technology:

> And another problem is… all the students are sitting in front of the screen, and I get a problem to get in front of the camera. So that's the problem I have, to get, let the students sit behind the desk, is like, is not enough to be covered by the camera. So the only way is to sit in front of the desk… but then I find myself, like I have to squeeze in the middle. Yeah, that's a big problem. A bit tricky, because on the one hand I need

> to be mobile, on the other hand I need to be in the camera as well, and to make sure that all the other students are also in the camera. That is quite a challenge (LT3).

This constant need to move and engage with the three different groups of students inhibits LT3's ability to utilise paralinguistic clues, which would otherwise assist not only in encouraging students, but also in the management of classroom behaviour. Under these physical constraints, the same time delay that affects N1, of one to two seconds, creates more difficulties for N2. LT3's face to face students respond more quickly than students at the other two schools, whose responses come in at different times. This difference in synchronization creates a cacophony of sound which can be confusing for students. A lack of clear protocols around class behaviour also exacerbates disruptive behaviour that can be heard across all settings.

6 Concluding comments

We have described two cases of locally created primary school networks in regional and rural areas in Australia using videoconferencing to deliver language programs, motivated both by the scarcity of language teachers, and the need to share a single teacher across multiple schools and great distances. Two very different models of videoconferenced language teaching have emerged, (a) only distance learning via a centrally located teacher, and (b) simultaneous distance and in class teaching. Different outcomes and behaviours have been shaped by a broad and critical coalition of infrastructure support, prior knowledge, as well as an interplay between emerging programmatic practices and the 'material properties' of the technology, including its functions, limits, and deployment in physical space.

In response to our research questions, we can report that both N1 and N2 have devised carefully orchestrated approaches that integrate technology into language learning, although to varying extents, and with different responses to some of the variables at play. While N1's model rested on a fluid and mutually adaptive view of both technology and timetabling, N2's model rested on a fixed view of videoconferencing fitting into a set timetable. These decisions, central to the two models, were shaped by prior experience with technology in education, leading to the programmatic characteristics of each approach. The deployment of physical space and techniques for creating presence and engagement in the lessons reflected the opportunities afforded by the programmatic choices. What our study suggests is that even with a clear plan for applying technology to teaching, success depends on the way these processes allow or hinder mutual adaption between teaching practice and technology.

Additionally, our study of the two networks confirms the broad consensus of researchers that systems of technology in use are 'socially constructed' (Leonardi and Barley, 2010) and that the complex interplay of technological and educational factors underpinning the programs both shape and are shaped by the interpersonal.

Overall the two teaching patterns of the two Australian networks explore here appear closest in nature to the two videoconferencing models used in the European MustLearnIT project (cf. Luoto 2007 and Pritchard et al 2010). However, a direct comparison of results is difficult, given critical differences in contexts, for example, local versus supralocal organization and management, as well as in research foci. While our study represents a snapshot of two individual networks of primary schools, it has wider application to our understanding more

generally of how technology, in this case videoconferencing, is normalised in language teaching (Garrett 2009). It demonstrates that even with the same conceptual foundations and aims, divergent models of practice can emerge, neither a ‘best practice’ but both as sustainable adaptations to localised factors, something not previously explored in the literature. However, a closer look at practices which emerge in the deployment of the programs, such as the use of physical space, use of presets and other techniques to create presence, indicate an important direction for future research into the effective progression of videoconferencing and language education at all levels, not just in primary schools.

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