
Title	Connecting learners: Singapore's multipoint desktop videoconferencing practicum project
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Source	<i>MERA-ERA Joint Conference, Malacca, Malaysia, 1-3 December 1999</i>

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CONNECTING LEARNERS: SINGAPORE'S MULTIPOINT DESKTOP VIDEOCONFERENCING PRACTICUM PROJECT

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Abstract: This paper reports progress on research into the pedagogic roles that multipoint desktop videoconferencing (MDVC) can play in the new practicum arrangements at the National Institute of Education, Singapore. The background and rationale to this project were presented at the 1998 ERA and MERA Conferences. During the last year there have been a number of significant developments. In particular, the NIE researchers have formed a partnership with school clusters N1 and N2. A network of collaborators has been established. Additionally, a number of trials have been undertaken, enabling the project to be officially launched in the presence of the Director General of Education at NIE on 6 May. More recently, the project has involved practicum students and staff from the two school clusters and basic quantitative and qualitative data has been collected from participants. Schools in Cluster N1 are involved in the 'Mentor Project', which is investigating the staff development role of MDVC for School Coordinating Mentors. Schools in Cluster N2 are participating in a parallel enquiry into the use of MDVC as a remote conference facilitator of practicum related information shared by NIE student teachers and supervisors. This paper discusses the background and aims of the project and reviews progress to date. The paper will also report the technical and pedagogic aspects of the research, drawing on evidence from student logs and interviews from participants.

Introduction

The potential of multipoint desktop video conferencing for adding value to teaching practice conferencing is the main focus of the research project that we describe in this paper. Adding value to the experiences that student teachers have during the seven or eight weeks that they are posted to schools means something other than doing what is currently done in a more cost effective or convenient way, important as such considerations might be. It means opening up to students and their supervisors possibilities that are currently unavailable to them, and thereby re-defining, in important respects, conventional notions of the practicum. At the 1998 ERA and MERA Conferences we described the early stages of the research project. Since then a great deal has happened, most notably being full funding by the Singapore Ministry of Education. In this paper we firstly describe the key developments that have taken place. We then present results of interviews and log journals from student teachers who have used MDVC on teaching practice. Finally, we present an outline of a conceptual framework that seeks to locate MDVC within a context of social change towards the globalised, knowledge-based society.

Background

The Teaching Practice Discourse and Computer Communications Technology Project builds on the findings of a funded National Institute of Education (NIE) research project completed in 1994 (Sharpe, et al., 1994). This research project studied the quantity and quality of supervisory discourse (Zeichner, 1988) between teaching practice students and NIE supervisors and school-based Co-operating Teachers (CTs). It found that there was a preponderance of low-level factual discourse and that conferences were relatively short. The researchers concluded that ways and

means needed to be found to increase both the quantity and quality of discourse. In particular, there was a need to explore ways of increasing the level of justificatory and critical discourse and the frequency of joint meetings between student CTs, NIE supervisors and student teachers. In late 1997, when the first desktop internet telephone software became readily available, the researchers began to see in this technology a possible solution to the problems they had identified.

A number of other parallel developments were also important in moving the idea forward. Firstly, during 1998 NIE began to restructure its practicum on a "partnership" model (Benton, 1990), whereby schools would be given more responsibility for supervising student teachers on teaching practice. Secondly, the Singapore Ministry of Education (MOE) began grouping schools into school clusters under the overall direction of school superintendents. Thirdly, the building began of the new, relocated NIE campus at the Nanyang Technological University (NTU). These developments coincided with a substantial expansion of NIE's intake and extra demands on its staff. The researchers saw that each of these developments had far-reaching implications for the practicum and the part that video-conferencing could play within it (Sharpe, et al., 1999).

Development of the Project

At the 1998 ERA and MERA Conferences we described the steps that had been taken in reaching a decision to use CU-SeeMe software in conjunction with the new Singapore ONE broad-band network. Since then a number of significant events have taken place. The first were the first school trials which began in January and February 1999. With start-up funds provided by the NIE, student teachers on TP at Xishan Primary School and Jiemin Primary School, both in School Cluster N2 in the north of the island, began using MDVC to link up with researchers at NIE. Following encouraging results, the researchers then entered into a partnership with School Clusters N1 and N2 whose superintendents and school principals had shown a keen interest in the new technology. This partnership was crucial in the development of the research, especially because of the technical and human resources it made available. N1 Cluster schools, it was decided, would take part in an ongoing "Mentor Project" and N2 Cluster schools in a "Pre-Service Project".

Aims of the Mentor and Student Teacher Projects

The Mentor Project

The mentor project uses MDVC to link together the School Coordinating Mentors (SCMs) at the eight secondary schools and one junior college that make up School Cluster N1. The SCMs are senior school staff who, under the new partnership model, have overall responsibility for the management of the practicum at their schools. The intention is that because this role is new, the SCMs will benefit from a regular sharing of ideas with each other and with the NIE staff (a member of the research team) in overall charge of mentor training.

Figure 1: MDVC Conference with Cluster N1 SCMs

MDVC provides the SCMs of N1 Cluster schools with an opportunity to:

- share information on school-based mentoring programmes, for example the provision made for NIE trainees, beginning teachers and older teachers;
- discuss issues and problems, especially those related to setting up the mentor programmes and the gaining of support from principals and colleagues;
- the sharing and discussion of real-life case-studies;
- the personal needs, frustrations and rewards of mentoring.

The Pre-Service Project

The Pre-Service project involves linking together students posted to N2 Cluster primary schools for teaching practice both with each other and with members of the research team. To date all nine of the Cluster schools have taken part in the project which has involved students from two Post Graduate Diploma in Education (PGDE) cohorts and one Diploma in Education (Dip Ed) cohort with students posted to Cluster N2 schools for TP. Students have typically been divided into conference groups, comprising up to six members drawn from different schools and NIE.

Figure 2: MDVC Conference with Cluster N2 PGDE (Pri) Student Teachers

MDVC has been used to:

- enable the students to hold private discussions on any matters relating to their teaching practice;
- enable students to discuss teaching practice matters with members of the research team, who in some cases have been their NIE supervisor;
- draw up the basic pedagogic protocols for using MDVC as a vehicle for practicum conferencing;
- to collect basic quantitative and qualitative data relating to the technical and pedagogic aspects of conferencing.

Organisational and Technical Aspects of the MDVC Project

By far the most important, and yet elusive, part of this project was to solve the numerous problems associated with the organisational and technical protocols of achieving MDVC in practice. As mentioned earlier, our MDVC solution adopted a cost-effective communications and Information Technology (C&IT) platform that made use of White Pine's[®] CU-SeeMe[®] software over the new wideband Singapore-ONE (S-1) ATM network. We made use of the sole Internet Service Provider (ISP) gateway into S-1, which is Singapore Telecom's Magix[®] service – see figure 1. In order to pioneer this project it was necessary to liaise and receive the support of all the following IT-related organisations in Singapore listed in Table 1.

Figure 3: Access to Singapore ONE via the Magix ADSL gateway – by courtesy of Magix© a subsidiary of Singapore Telecommunications Pte. Ltd

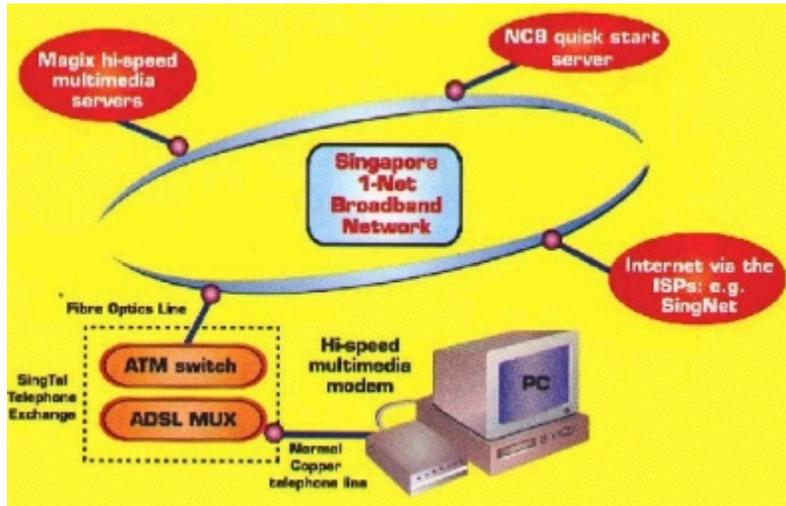


Table 1: MDVC C&IT Support Agencies

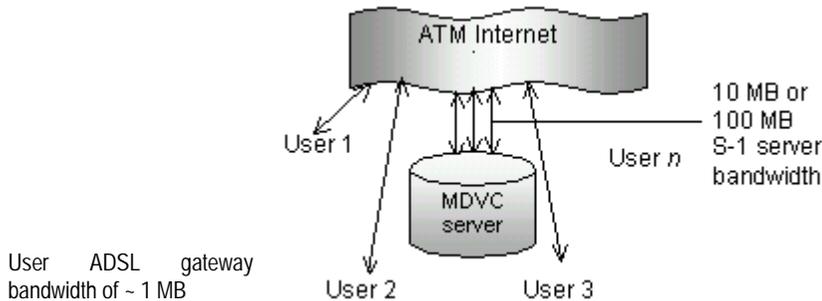
Support Agency	Specific C&IT Services Provided
Information Management Resources	Sole distributors of the CU-SeeMe→ MDVC software in Singapore.
Singapore's National Computer Board (NCB)	Sponsorship of our MDVC server gateway access into the S-1 network and temporary use of their own server to initially evaluate our MDVC system.
Singapore Telecommunications Private Limited (SingTel)	To obtain support and sponsorship of our project and make use of the resources and facilities associated with SingTel's Magix® service.
Kent Ridge Digital Lab's (KRDL)	C&IT consultancy regarding the MDVC server and workstation IT technical performance and requirements specifications.
Educational Technology Division of the MOE	To provide over-arching support for implementing the necessary IT equipment and support services in the MDVC N1 and N2 Cluster schools.

In addition to liaising with the above IT organizations, there was a need for close coordination with all the schools located in Clusters N1 and N2, which meant close working with the two Cluster superintendents and the school principals.

From all this coordination we negotiated agreements to support and sponsor our MDVC project initiative in the N1 and N2 Cluster schools. In practice this meant linking up dedicated workstations in the schools to the S-1 network. Fortunately, under the Singapore MOE's IT MasterPlan, all the project schools had been provided with Asynchronous Digital Subscriber Line (ADSL) gateway access into S-1. We ensured that every school had the necessary software and peripherals to operate an MDVC workstation. However, in order for MDVC to operate properly, a central network server, which is often referred to as a "reflector", is also required. This MDVC server acts as a nerve centre and controls and connects all the various users together. For example, an ISDN multipoint videoconferencing system might have 10 users each using 2 ISDN channels. In total the ISDN reflector must have 20 ISDN channels connected together. Considering the hire charges for each ISDN line one can see why an ISDN MDVC solution might be too expensive to implement within the school system. However, an ATM wideband Internet system offers cheaper user access into a system already designed to distribute video-on-demand (VOD) multimedia services and with sufficient bandwidth capable of hosting a multi-channel MDVC server. Singapore's NCB provided

a support grant through its offshoot commercial agency 1-NET to connect our School's MDVC server into the S-1 network. We were then able to achieve the necessary MDVC C&IT infrastructure as shown in figure 3 below.

Figure 3: Multipoint desktop videoconferencing over a Wideband Internet



In addition to setting up the above infrastructure at both NIE and the Cluster schools we had to invest many hours in trialing and testing the system before we could get it to work properly. During the period from around February to July 1999 we established the MDVC technical protocols (Coombs, 1997) that optimized the quality and performance of each individual workstation. These technical protocols focused upon choosing the correct system settings for fine-tuning the audio and video operational requirements for using the CU-SeeMe[®] MDVC software platform. We also established during this time the necessity for having full time technical support staff available at all times to help troubleshoot the regular problems that arose. The Technical Assistants (TAs) that were already available in every school were specifically asked to look after the MDVC workstations and to troubleshoot any problems experienced by the users, i.e. the teacher trainees on practicum in N2 Cluster schools and the SCMs in the N1 Cluster schools. Because we were involved with many schools across each Cluster we found the need to appoint Cluster IT coordinators to manage the technical aspects of the MDVC project across all the TAs. Likewise, we discovered the need for an IT full-time technician to be attached to our project at NIE, so as to support the lecturers working on this project. It was from the evidences of these early valuable experiences that we were able to propose and qualify the appointment of a full-time IT project officer as part of our wider research grant application to the MOE under the aegis of the newly introduced Educational Research Fund (EdRF).

Another important resource developed for this research project has been the MDVC Website, which can be found in the URL address listed at the end of this paper. The MDVC Website provides a rich menu of useful support resources for all the participants including:

- Student notices;
- MDVC participant lists and instructions;
- Overview of the research project with downloadable files;
- Academic resources to support the MDVC action research programme in the schools; and,
- Web-based video-clips of the practicum student's lessons (this is projected for the future).

Feedback from Student Teachers Using the MDVC System

Data has been collected to date from two cohorts of Post Graduate Diploma in Education (PDGE Primary) and one cohort of Diploma in Education (Dip Ed) student teachers posted to schools in

Cluster N2 who have used the system. Because equipment was not installed in the schools until two weeks before the end of their teaching practice, the first PGDE cohort had little time to use the system. However, one group, which had agreed to participate in a demonstration at the official project launch on 8 May 1999, were able to conduct a number of lengthy conferences with one of the NIE researchers. A debriefing session was conducted with them, extracts of which are reported below. The second PGDE(Pri) cohort was posted to N2 Cluster schools for their teaching practice during July/August 1999. They formed conference groups comprising up to six members drawn from different N2 Cluster schools and were asked to hold one conference a week, to decide themselves on the topics they would discuss, and to fill out an “MDVC Session Report”. Fourteen “MDVC Session Reports” were received from this group. The last group to use the system were Dip Ed Year 2 students posted to N2 Cluster schools for their final Teaching Practice in during August to October 1999. Five student teachers from four N2 Cluster schools completed MDVC session reports and took part in a post TP debriefing session.

Qualitative Feedback

The debriefing session was an open-ended discussion between six of the PGDE (Pri.) student teachers who were involved in preparations for the project launch demonstration and one of the researchers. It covered five main areas: the technical strengths and weaknesses of MDVC; the arranging of conferences; the pedagogic strengths and weaknesses of MDVC as a practicum tool; and the differences between MDVC and face-to-face conferences. The first area is discussed later, using data from the second PGDE cohort.

How easy was it to arrange conferences?

The students felt that although it should have been easier to arrange MDVC conferences, given that it was only necessary to arrange a time and not a place as well (a very perceptive comment), in practice this was not the case. The main problem encountered was that all the student teachers had different timetables and were only free as a group either at break time or at the beginning and end of the school session. Though the project Website allowed for the posting of conference times, typically they had found it easier to rely on conventional communications, such as e-mail, pagers or the telephone, to mutually arrange conferences at their convenience. Sometimes it was necessary to switch lessons with the cooperating teacher.

Identify the pedagogic strengths and weaknesses of using MDVC

Generally, the students pointed to the strengths rather than the weaknesses of MDVC operating as a pedagogic tool and electronic social interaction (ESI) forum. A number of strengths were identified, particularly the opportunity to:

- meet with supervisors more often due to savings on travelling time;
- share classroom management issues, which are a “big concern to begin with”;
- share experiences and strategies with other students in other schools, this being particularly important where only one or two students had been posted to a school and did not have other students to talk to; (i.e. the ESI Protocol of overcoming “peer isolationism”).
- “breaks down the walls”; “not compartmentalised in a school”; “each school has its own culture and way of doing things – good to learn how others are doing it”.
- “share burdens” with other student teachers – “to know that you’re not alone out there and that others are having the same problems” – to “have your day brightened up”;

- “feel comfortable among peers”; “feel warmer, not left on an island”. (i.e. safety of the ESI forum for expressing thoughts and feelings).

Only one weakness was identified, but the students emphasized that it was a major one:

- the lack of privacy due to the school computers being located in public areas, such as the staff room – “dare not to say anything nasty”

Also, the students commented on the potential of the technology for sharing such things as lesson plans and pupils’ art work.

What are the main differences between using MDVC and regular face-to-face conferences?

The main difference in favour of MDVC were thought to be that it:

- reduces the “physical barriers” of a face-to-face conference; ‘helps to break down status barriers’; “creates a more level playing field”;
- makes it easier “to bring up issues because you feel a safety in distance”; the relationship in video conferencing is ‘indirect’ and “if we say anything wrong there is no immediate accountability as it is assumed to be an open discussion’
- provides more time for thought than in a face-to-face conference;
- helps to relieve stress by being able to check with other student teachers whether you are doing the right thing; this is particularly important if the CT is not approachable.

The main differences in favour of face-to-face meetings were thought to be that they:

- conveyed emotions better, though MDVC did allow participants to see facial expressions which partially compensated;
- were safer, because you know exactly who is sitting in the room – the concern with MDVC is “who is sitting there”. (i.e. the perception of someone present “off-screen”).

Whatever the merits of MDVC, however, the students felt that it should not be allowed to totally replace school visits by supervisors. One student remarked that a camera can “look at a classroom but you need to be present to feel it too”.

Quantitative Feedback

We have received sixteen session Student teachers from the second PGDE (Pri.) cohort have to date submitted fourteen MDVC Session Reports. The reports are from individual group members of four groups and cover eight conferences. Typically, the conferences lasted around 45 minutes to an hour and, unlike with the first cohort, members of the research group did not log on to them. One of the sessions was “point-to-point, with the others on average involving four participants each. Although the participants were logged onto the same conference, technically their experience varied considerably, due mainly to differences in the school equipment they were using, their own level of competence and variable access to support from the schools’ technical assistants.

Students were asked to answer questions on the frame rate and whether the system had “frozen”, and questions on the quality of the audio.

An average of 14 frames per second was recorded by the students, ranging from a low of 3 to a high of 40. Approximately half, however, reported some frame “freezing”. With regard to sound quality, almost three quarters of participants reported that they could hear all the participants in the group,

though most encountered some degree of audio "chopping". In only one case, however, was audio chopped all of the time, with eleven students reporting chopping some of the time and four students none of the time. The majority of the students (13) encountered no echo. We overcame this problem of echo by using uni-directional, cardioid desktop microphones, which were screened away from the multimedia speakers that were located in the background. We were able to use the MDVC system with several parties *via* an open desktop rather than be confined by the solitary conventional arrangement of employing a single-user headset microphone only. When asked to provide an overall assessment of the MDVC equipment, seven students considered it to be 'good', a further eight considered it to be 'acceptable' and only one thought it was 'poor'.

Although it would be unwise to draw any general conclusions from such a small sample, we believe that these results are consistent with our overall experience of MDVC to date. Technically, we would concur with the overall assessment of the student teachers that the quality of the sound and video is somewhere between good and acceptable. However, it is clear that problems do occur with the system from time to time and most certainly it is audio problems that are the most frustrating when they occur. Conference participants can tolerate low frame rates but poor audio disables the communication discourse process and can result in a great deal of time being spent by participants asking whether they can hear each other. The best conferences occur where the participants have learnt how to use the system and where technical assistance is on-hand to troubleshoot. Technically, then, the early experience that we have had with the MDVC system is encouraging.

The technical adequacy of the equipment is, of course, only a prerequisite. What is equally or more important is whether student teachers are able to fit its use into already over-crowded teaching schedules and can see a positive value in its use (Gawith, 1998). The initial feedback that we have reported in this paper suggests that our earlier hope of MDVC being used for spontaneous conferences might not be practicable. The student teachers report that pre-arranged conferences held either before or after school teaching schedules, represent the best solution to overcoming the problems of arranging conferences. It could be, however, that spontaneous conferences – dealing with concerns quickly as they arise – might be best suited for smaller groups of two or three student teachers. Finding time for conferencing in an already packed TP was clearly a problem and for this reason the student teachers felt that conferences must be worthwhile i.e. be helpful to them in their TP.

Pedagogically, students pointed to the advantages of meeting supervisors more frequently. Though this is an obvious advantage, it does beg the question of the kinds of economies that MDVC is likely to bring about. On the one hand, it is possible that savings will be found in reducing supervisors' time and travelling costs. On the other hand, especially until technical reliability improves, this will most certainly be offset by increased costs relating to the maintenance of the organizational and technical infrastructure needed to support MDVC (Selinger, 1997). If our students are to be believed, however, the initial costs might be well worthwhile. In the current educational context in Singapore, where communication and reflectivity in the form of critical and creative thinking are being emphasized, the observation that MDVC helps to bring down communication barriers and makes it easier to identify and bring up issues, share burdens and experiences is highly significant. Interestingly, there was a definite feeling amongst this group that the participants had got to know each other, and the NIE lecturer, much better than they would have done in an ordinary face-to-face situation. This could be because MDVC offers a more informal medium compared to the formally arranged face-to-face supervisor visits. There was some amusement after teaching practice when the participants met each other face-to-face for the first time, particularly about the height of the participants: "You look so much taller on the computer". Perhaps they had felt so much taller, too.

One major problem, however, is the lack of privacy that currently exists for conferencing and this is something that will have to be addressed urgently. It forms part of a much wider IT-communications concern, of course. The issue is one of privacy and the main concern is that “lurkers” are about. In a clinical supervision mode, the trainees must “trust” their peers and supervisors. Our early experience suggests that MDVC may actually enhance trust, perhaps, by a process of decontextualising conferencing by providing an alternative social frame. (Goffman, 1974). Although they are pressed for space, it seems likely that schools will have to consider providing private rooms for MDVC conferencing. This will do much to engender a climate of trust and thereby reassure participants who are already aware that they are conferencing in password-protected chatrooms on the schools’ private server.

Adding Value to the Practicum

One participant from the second batch commented that she would prefer to have a conference with her friends at the local Starbucks café! This, of course, is a wonderful idea prompted in her case by a number of technical problems she had been encountering. However, she was so busy on TP that she never got round to this and this is perhaps the key point. Her rather dry comment is, however, surprisingly helpful because it begins to draw attention to the main pedagogic promises of MDVC as a teaching and learning aid. This suggests the ultimate goal of providing a virtual learning environment (Winn & Jackson, 1999) that is socially conducive and acceptable to all the client users, much like Rogers’ (1971) therapeutic and pedagogic concept of establishing total positive regard.

In his discussion of “modernity”, Giddens (1993) points to three social conditions that are necessary and constituent of the modern, globalised, information society: the separation of time and space; the “disembedding” of social institutions; and the process of “reflexivity”. Modern IT and communications build on social processes that have been forming over the period of industrialization and which have been accelerating over the last ten to twenty years, especially with the arrival of the desktop computer and the Internet. Like other IT-communication devices, MDVC must be understood both technically and socially. Socially, it is crucially about the social manipulation of space and time. MDVC allows participants to be in six or more different places at the same time. It allows student teachers to hear and share views, experiences and materials across a number of different schools instantaneously. This has never been possible before and represents the pedagogic benefits of establishing MDVC as a virtual learning environment. MDVC is also a “disembedding” process. Just as it is now possible to disembed social institutions as diverse as banks, bookshops and fast-food chains from particular physical locations, so too it is possible to disembed teaching practice from the confines of the single school. Student teachers need no longer to be “locked” in to and socially and physically isolated within a particular school: MDVC provides a way of unlocking the doors. Finally, just as big business and governments rely less on tradition and custom and constantly re-examine their practices reflexively, with both eyes set on the future, so the modern teacher can no longer rely on the expertise to be found in one single school. MDVC opens up a wider dialogue and range of experiences to the trainee teacher than has ever been possible in the past. It goes some way also towards meeting the criticism directed at school-based teacher education models that they rely too much on “sitting next to Nellie” (Gilroy, 1992).

MDVC, then, is not just simply a technology. It should not, in our view, be seen only as an alternative and more cost-effective way of doing what is already done in a different way. Its value-added potential lies in the possibility of providing new and alternative experiences that have not been available in conventional forms of teaching practice. One example that excites us in this respect is the making of video-clips of classroom teaching by the student teachers and the sharing of

them using the pedagogic virtual learning environment of MDVC and the Web. If this can be done, and we believe that it ultimately can, it will mark a major step forward in the practicum. For the first time, student teachers will be able to record, share and discuss video-clips of their own lessons virtually in a real-time critical appraisal platform. Of course there are other advantage as well. We are looking forwards, for example, to the sharing of whiteboards, Internet pages, lesson plans and other materials using MDVC as a real-time virtual learning platform with IT multi-task capability.

Conclusion

Due largely to the support received from NIE, School Clusters N1 and N2, MOE and commercial organizations in Singapore, it has been possible to put in place a working MDVC system. In this paper we have described its main features and presented some initial findings on usage. In planning for the next stage of the project, beginning January 2000, we have taken into account the lessons we have learnt so far. For example, in order to meet the problem of scheduling of meetings, arrangements have been made to block off time for MDVC on the student teachers' and researchers' teaching timetables. Another change, to meet the need for focussed discussion, is the provision of a conferencing programme with topics such as lesson planning and classroom management. Provision is also being made for regular specialist conferences, chaired by NIE lecturers, on topics such as the teaching of lower primary mathematics. Additionally, new research instruments and designs have been drawn up.

We have argued that our motivation, as educators, lies less in the technology itself and more in its pedagogic potential. If we are correct, MDVC could genuinely add value to practicum experiences at NIE and thereby help improve the quality of the teaching profession (Sharpe & Gopinathan, 1993, Sharpe, et al. 1998 & 1999). Though we have limited our discussion to the practicum, there are numerous other educational and business applications. This is not surprising. In a globalised world the main mechanism and product of economic and social life is knowledge and communication. It is inconceivable that MDVC will not become a routine feature of life in the new millenium. Our particular interest is in whether and how it will make a significant difference, in reshaping the educational world.

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Useful Website addresses that are related to our project

- http://www.soe.ntu.edu.sg:8000/practicum/po_index.htm (MDVC research Website – password protected)
- <http://www.ncet.org.uk/info-sheets/videoconf.html#what> (NCET, UK)
- <http://cu-seeme.cornell.edu> (shareware)
- <http://www.wpine.com/> (commercial)

Acknowledgements

Cluster Schools N1 and N2 and Cluster IT Coordinators

MDVC Project: Cluster IT Coordinators

- Mr Suhardi B Saaban, Vice Principal, Xishan Primary School
- Mr Charles Tong, Head, IT, Xinmin Secondary School

Participating Primary Schools – Cluster N2

- Ahmad Ibrahim, Chongfu, Huamin, Jiemin, North View, Peixin, Peiying, Xishan, Yishun.

Participating Secondary Schools/JC – Cluster N1

- Bartley, Bowen, Deyi, Holy Innocents', Sembawang, Seng Kang, Serangoon Garden, Xinmin, Nanyang JC