vChina: A project on Learning in Video-Conferencing Environment in Distance Education

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Abstract

The use of information technology forms an integral part of primary and secondary education in many different parts of the world. In the past decade, as the price of software and hardware has become more affordable, there is an increasing interest in applying various communication technologies to support collaborative learning. The introduction of Video-Conferencing Learning Environment (VCLE) is a good example of applying communication technologies to support interactive distance education. This article reports on the experience of developing video-conferencing based education between some schools in Hong Kong and some schools in China. It also discusses some of its technical and pedagogical implications in implementing video-conferencing based education.

Introduction

Technologies influence the ways we teach. Classroom teaching is no longer the only way to transfer knowledge from teachers to students. Classroom instruction, due to the advent of distance education and advancement of communication technologies, is now changing from the on-site teacher lecturing to a learner-centered interactive class where students may be at thousands miles away (Baker, Harvell, & Yuan, 1997).

This undoubtedly results in the growing popularity of distance education in the past decade. Among the various forms of course delivery in distance education, Video-Conferencing Learning Environment (VCLE) is the one that is used extensively (Majid et al., 2006). Here we define “Video-Conferencing Learning Environment” as an audiographics environment that supports real-time interaction between teachers and learners, or among the learners themselves, through a telecommunications link. In this environment, two or more people are located in different places but they can see, hear each other and can manipulate the same information on their screen at the same time using an appropriate software package. As a result, a new level of collaborative and interactive learning environment is created through the use of current World-Wide-Web/network technology, where a range of instructional media such as image (and video), audio and computer applications can be shared by people in remote places in real time.

Prevailing distance-education technologies have a history of providing means to facilitate the delivery of classes or training at different locations (McBride & Gillan, 2000). There is much literature suggesting that technologies such as VCLE have
positively impacted the quality of teaching and learning, and the transmissions of teaching resources to students (Goggin, Finkenberg, & Morrow, 1997). In addition, many studies also showed that the use of VCLE can improve the capacity of communication and interaction between teachers and learners as well as among the learners themselves.

However, setting up a VCLE in the school context is not an easy task, especially when teachers have heavy teaching load, possess insufficient technical knowledge and experience. To address these issues, the Hong Kong School Net Ltd., in conjunction with the St. Bonaventure College and High School, have carried out a joint project called “vChina” since 2003, to assist and promote the use and development of VCLE in the schools of Hong Kong, with the financial help from the Quality Education Fund of Hong Kong.

**Launching of the vChina project**

Hong Kong established its first five-year plan of I.T. in education in 1998. This reform has brought in a variety of infrastructure such as school network, school communication and management system, e-mail system, etc, to the schools in Hong Kong. By the end of 2000, nearly 80% of schools had been provided with fibre-optics to access the Internet. Internet-based inter-schools activities, competitions and liaison with schools in China on various Internet-based projects have become active since then.

“vChina” is characterized as a classroom-focused video-conferencing distance education development project funded by the Quality Education Fund of Hong Kong. It builds on the previous experience that the authors have in holding various Inter-based inter-school activities, such as “Hong Kong and Inter-City Schools Real-time Debate on Net”. Currently undergoing its 5th years of development, its aims are to: (i) enhance the effectiveness of teaching and learning through the use of ICT, with special focus on the use of VCLE in distance education; (ii) open new learning perspectives for all participants involved; (iii) develop suitable teaching methods for distance education through the use of video-conferencing technology; (iv) identify novel ways to support the development of video-conferencing distance education for local primary and secondary schools; and (v) assist local schools to form partnerships with schools in different countries (with main focus in China) through the use of VCLE.

**The First phase of the project (2003-2006)**

In the beginning of the project, most of the teachers and students in Hong Kong were not familiar with the virtual environment created by the video-conferencing. Also, there was practically a lack of pedagogical model of distance education that could be adapted for use in primary and secondary schools context. In the first phase of our project, our concerns were twofold. Firstly, we concentrated on exploring the feasibility of using VCLE for distance education in the local schools context.

Similar to other forms of distance education, in order to provide the highest level of quality of education and maximize students’ learning achievement, there are certain variables that need to be approached. The first and the most important variable to
consider is the learning environment – to evaluate and examine the differences between the traditional classroom and the classroom that is augmented or replaced for video-conferencing distance education (Restauri, King, & Nelson, 2001). During that period, the vChina technical team had evaluated the situations and found that in general; most schools in Hong Kong were not equipped with adequate facilities to use VCLE. Even though some schools had already installed certain video-conferencing equipment, they mainly used the equipment for campus TV. In those meeting/conferencing rooms, there was no Internet connection.

To tackle this problem, the vChina technical team, who was responsible for developing a “Distance Learning Classroom (DLC) (遠程教室)”, helped each participating school (both Hong Kong and China) to customize their equipment and facility needed for the video-conferencing distance education. Careful considerations were given to the position of video display, indoor lighting distribution, teacher’s table, seating arrangements for students, Internet installation, audio equipment, etc.

Even though the equipment used for group video-conferencing have changed over the years, the basic set-up for group video-conferencing at both ends remain the same: a codec, a PC for handling software and video streaming, three TV monitors (one for local view, one for remote view and one for other audigraphics display such as PowerPoint slide, graphics, video), one digital video camera (with remote control zooming and focusing), 1-2 microphones, and an electronic white board.

During the early stage of our development, the biggest problems that had occurred were unstable network traffic between the schools in Hong Kong and China, and the loss of lesson time due to the unfamiliar use of equipment. Most of the schools in China were not equipped with broadband Internet connection at that time. Fortunately, this problem has been solved by the rapid technology development of China. Now, in addition to Shanghai and Beijing, there is a new leased line between Hong Kong and Nanhai which has been in operation since May 2008. Besides, with the help of some of the partner organizations (mentioned below), several teacher training sessions were held to facilitate the use of video-conferencing equipments to the teachers in China.

Audibility problem did occur at the beginning of our project. The microphone could not receive the voice of the participants well. Disturbing background noise generated by a big group of participants talking at the same time coupled with the network traffic latency seriously affected the quality of audio being received. However, this problem was solved by reducing the number of participants at each location. The result was improved interactions between participants and better classroom management. Our experience showed that a group of 6-8 students at each location yields the best result a VCLE context.

The second concern that we had in the first phase of the project was to establish links between schools in Hong Kong and schools in China. Our collaboration with schools in China first started with a visit to the China Welfare Institute Children’s Palace (CWICP) in Shanghai (上海中國福利會少年宮) in 2004. During the visit, we explained the concepts of our project and sought assistance from the CWICP. Since
then, we have collaborated with the CWICP and Qibao Middle School (QMS) (上海市七寶中學) at Shanghai in various ways. The CWICP assisted us in establishing the schools network, promoted our project and acted as our project coordinator in Shanghai, while the QMS assisted us in providing technical support and teacher training to the teachers in Shanghai. In addition, the QMS established the first DLC in Shanghai with high speed Gigabit fibre network and advanced ICT equipment. This establishment played a significant role towards the success of our project in Shanghai as it not only introduced the concepts of VCLE to the schools in Shanghai, but also served as a model to them. This helped to attract many schools to join our project later. Besides, QMS also allowed other Shanghai schools with inadequate resources to use their DLC for holding Video-Conferencing activities with schools in Hong Kong. Since then, the number of Shanghai schools joining our projects grew rapidly.

School joining our project in Hong Kong was matched with at least one school in China through the “Online Sister Schools Alliance Program (網上姊妹學校結盟計劃)”, forming a network of “Video Sister School (VSS) (視像姊妹學校)”. Using the VSS network together with the technology provided, school could organize educational activities such as collaborative teaching (Putonghua lesson), on-line pen pal, problem-based learning with their counterparts in China. The vChina project team provided both administrative and technical support to all participating schools as required. It organized various sharing sessions and cultural exchange programmes for the students of the participating schools. In addition, all the VSS schools were encouraged to share their experience in using video-conferencing as a medium of delivery with other schools.

With the success of our project in Shanghai, we then started to collaborate with organizations in Beijing in 2005. The Beijing Education Network and Information Center (BENIC) (北京網絡和信息中心) and the Beijing 101 Middle School (B101MS) (北京101中學) became the synonyms of CWICP and QMS in Shanghai. The BENIC acted as our project coordinator and was responsible for establishing the school network in Beijing; while the B101MS provided professional advice, technical support and teacher training to the teachers in Beijing. Similar to the case in Shanghai, the B101MS established the first DLC (also equipped with Gigabit fibre network and advanced ICT equipment) in Beijing which served as a model to attract many schools to join our project.

Phrase one of our project ended in 2006. As a trial run, it was initially planned to recruit 20 schools from Hong Kong and 20 schools from China. However, due to the popularity of the project, a total of 50 schools were recruited finally.

The Second phase of the project (2006-2008)
Following the initial success of our project, we received further funding from the Quality Education Fund of Hong Kong, and phase two of the project “vChina Towards the World” was started. The scopes of the vChina project were then expanded. The objectives of the second phase of vChina were: (i) further promote the use of VCLE and recruit 150 local schools to join the project; (ii) liaise with schools and education department in different countries to develop a video-conferencing distance education network.
Currently, over 100 local schools and 120 schools from various countries/regions (Shanghai, Beijing, Ningbo, Foshan, Sabah, Singapore, New Zealand, Taiwan, etc) are now participating in our project (details of schools joining our project and other information can be found from our web site: http://www.vchina.hk/vchina_eng/e_index.html), involving over a hundred thousand primary and secondary school teachers and students from Hong Kong and China.

Despite the technical problems encountered at the beginning of our project, the feedback collected so far was generally positive. Students and teachers appreciated the opportunities of joining our project. On some occasions, students in some participating schools held activities on their own and various student discussion groups were formed. Currently, we are entering the final stage of the second phase of our project. We intend to conduct an in-depth analysis at the completion of the project, to analyse and evaluate its pedagogic value, the experience that we gained in setting up a DLC and the administrative support required (Synnes, Soderstrom, & Parnes, 2001; Winn & Jackson, 1999). The following section shows some of the preliminary results of our analysis.

**Some reflections**

Unlike other studies which were performed on a single subject basis and mostly concentrated on higher education sector (Saurino & Saurino, 2003; Steinweg, Davis, & Thomson, 2005), our project aims at helping schools at the primary and secondary education sectors to establish a VCLE platform for distance education with other schools across the time and spatial boundary. Our experience has shown that it is technically feasible to establish and apply VCLE to facilitate distance education in the primary and secondary schools context. Through the “Hong Kong and Inter-City Schools Real-time Debate on Net” that we mentioned earlier, it is also evidenced that multipoint Video-Conferencing with digital video streaming is also feasible with enough technical support. However, even though many face-to-face interactions, such as classroom teaching, regular meeting or inter-school competition, can be created through the use of this virtual environment, constraints still exist which limited the interactions among participants. In addition, up till now, we still cannot achieve one hundred percent reliability; it is hoping that the advancement of modern ICT can gradually improve this situation.

Besides, the establishment of VCLE in school setting and the relation establishment between schools have meant a lot of cooperation and coordination in both teaching and administration; especially during the period that inter-school activities were hold. It is recommended that the participating school should appoint a coordinator to coordinate the activities and liaison with other teachers on the administrative details, such as timetabling, student activities arrangement, etc; so that subject teachers can concentrate more on the curricular planning and development parts. As a general reminder, coordinators are advised not to hold activities during the China’s holidays such as Chinese Lunar New Year or during the examination period.
Pedagogical aspects of Interactive Video-Conferencing

Technology was considered effective when students and teachers indicated a high level of interaction, as though everyone were in the same room.  

(Saurino & Saurino, 2003)

Gilbert and Moore (1998) defines interaction as “a reciprocal exchange between the technology and the learner”, or the process that he referred to as “feedback”. The use of VCLE seems to render more advantages over other conventional distance education delivery methods mainly due to the fact that participants can interact with each other in real-time, which put a strong emphasis on the social aspect of learning (Rönkä, 2004). Participants can exchange/share their ideas and scaffold their knowledge with the remote participants through various kinds of activities such as discussion, role play or providing feedback to their fellow classmates.

It is important to note that various adjustments and communication problems may occur as participants are of different background (Rönkä, 2004). The most obvious example in our case is the use of spoken languages. Most of the participants in Hong Kong are of Cantonese speakers while participants in China are of all Mandarin speakers and only a few Hong Kong participants can speak fluent in Mandarin. They are of different cultural background and communicating using different languages. Our observations have shown that most participants felt strange when they first communicated with each other through the use of VCLE. Luckily the situation change well as time goes by. This may due to the fact that participants were started to know each other better and felt more comfortable when participating in various VCLE enabled activities.

Moreover, during the later stage of our development, it is interesting to say that many participants (especially those participants who are studying in high schools) do enjoy holding the activities on their own instead of participating in the structured activities organized by the teachers. As it gives them a sense of belonging and feels more relaxed since they can select on the topics that they want to discuss without any limitation.

Although Video-Conferencing is considered to be the most similar kinds of distance education to ordinary classroom teaching and learning, our observations show that it does have some differences. Unlike the tradition classroom teaching and learning environment where teachers can walk around the classroom and provide assistance to individual students, groups or the whole class while students are studying. The case is not the same in the VCLE. Teachers may have difficulties in taking care/monitoring the progress of remote students in VCLE. In most cases, they can only answer to inquires if students can specify the parts that they do not understand.

In addition, our observations also shown that most of the interactions appeared are of teacher-centred. That is, in most cases, teachers raise that questions and wait for students’ answer. It is rarely happen that knowledge is to be constructed through the feedback process among participants. As commented by Synnes et al (2001), the activity and communication between participants in VCLE are highly linked with the pedagogy used. If the pedagogies used are of mechanistic and behavioristic,
emphasising too much on the classroom management and learning situation, it may leads to teacher-centred practice and passive learners (Rönkä, 2004). The use of VCLE thus becomes traditional classroom teaching over the Internet instead of creating an interactive environment where participants can communicate and reflect on what they have learnt.

Here we echo Rönkä’s (2004) comment believing that teachers should use a constructive and collaborative approach when using VCLE for distance education. Teachers should provide constructive feedback to stimulate students’ interest and curiosity towards the topics and should facilitate/guide the students to reflect and further construct their knowledge in a more self-directed manner such that a sense of involvement is created inside the students’ mind. Moreover, doing this can also give students a feeling that their answers are being appreciated.

**Technical Issues**

**Networking**

One of the issues regarding video-conferencing tools is the quality of the network. Unstable network traffic will significantly deteriorate the quality and performance of the environment. It is practically impossible to make the environment work if a reliable network with sufficient bandwidth is not available. Fortunately, in our project (as mentioned above), this problem has been resolved due to the rapid network development of China. However, it is still worth to note that, in addition to the day-to-day school operations, (a sufficiently large) bandwidth will be consumed while the video-conferencing activities take place.

**Video-Conferencing Tools - Hardware or Software**

Another technical issue regarding video-conferencing is what video-conferencing tools should we use? Is it a hardware base or software base? One of the intended goals of our project is to develop a video-conferencing learning environment that is simple to use and does not demand high level of technological skills such that most teachers should be able to use and handle the equipments after a few hours of instructions. The process of selecting appropriate video-conferencing tools thus becomes a critical task towards the success of the project. It requires lots of technical knowledge and testing, and is too advanced for most teachers to manage, especially when we are talking to use IP multicast to connect various locations to a single point.

During the first phase of our project, several hardware devices (such as Polycom, VFone) have been tested. In general, the performance of the devices are stable and with good quality. The devices themselves is not difficult to setup and most teachers should be able to handle this after a training session. However, the downside here is that most of the devices require a fix IP address which may not be feasible in some schools setting, and have a high demand in network resources (bandwidth). Moreover, some devices only support point-to-point communication and cannot be used for multicasting.

By the end of the first phase, we started to consider the use of various video-conferencing software tools and several packages (such as Avcon, Adobe Connect Professional, i-conference, etc) have been tested. The most significant difference of using software approach to the dedicated hardware devices is that the
system is more flexible and can be configured using virtual IP address. All software tools have built-in multicast support that can be used to connect and distribute video streams to various locations at the same time. Also, most of the software tools tested are of low bandwidth consumption when compared to the hardware devices that we mentioned earlier. All this provide us better alternatives when network resources are of serious concern. However, the disadvantages here are that it has a very high computer configuration requirement which require the school to purchase a dedicated machine for that purpose. In addition, the software tools are normally complex to setup and difficult to maintain. Having a technical staff to take care the installation process and system maintenance is an essential need. Besides, it is also recommended that the technical staff to be on site to provide technical assistance to teachers when the video-conferencing activities take place.

Unfortunately, the turnover rate of technical staff at schools is relatively high when compare to that at other sectors. So, it is the schools’ responsibilities to make sure that the new staff have received proper training before started managing the system.

Environment issues
Even though we recommended schools to setting up a Distance Learning Classroom (DLC) for the video-conferencing activities, it is not a must. Some schools cannot do this due to the lack of resources, such as: lack of space or financial support. Schools in that sense normally carry out their video-conferencing activities using an ordinary classroom and setup the environment on an ad-hoc basis.

As mentioned earlier, there are several environment factors (such as lighting, position of display, audio) that affect the quality of education and students’ learning achievement when using VCLE for distance education. An ordinary classroom, for sure, cannot fulfill such requirement and we highly recommend the schools to set up a DLC, or a dedicated environment for video conferencing activities, in the school as much as they can.

Conclusion
The rapid development of communication technologies has opened new possibilities for distance education not only at tertiary level. Our project has assisted over 100 schools in Hong Kong and China in setting up their distance education environment and has established a school network of over 150 schools around Asia. We believe that our effort can help schools in broadening students’ horizons and open their eyes to other parts of the world. It is foreseen that more cross-border, inter-school cultural exchange activities will be hold through the use of these environment.

Through technologies have broken the time and space boundary and facilitated the transmission of course content to participants at different locations, it also created another layer of distance between participants. Ludlow (2001) noted that “Technology-mediated instructional activities sometimes replace interaction between an instructor and learners and among learners, with independent, isolated learning activities.” Setting up the environment for distance education is just a first step. Continues support for system setup and maintenance, and other pedagogical issues (such as pedagogical methods and teacher training) are all important.
Future research will include the collaboration with participating schools on an in-depth study of students’ behaviour under video-conferencing learning environment, special focus on will be put on studying the interaction between the teachers and students at different locations (remote and local) and among students at different locations.

References


Biodata

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Kam-Chung Leung is a veteran computer teacher in Hong Kong. He is the chairperson of the Education Bureau Centre of Excellence Video Conferencing Focus Working Group and is the project manager of the vChina project. In addition, Mr. Leung also serves as a steering committee member of the Hong Kong Distance Education Association. Mr. Leung is the founder of the Hong Kong Joint School Information Technology Association and has been actively promoting the use of I.T. in Education in Hong Kong during the past decades.