

# INCORPORATING DIGITAL TOOLS FOR INFORMAL PEER GROUP LEARNING

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**Abstract:** Peer group learning is being introduced in many educational systems as an effective way of developing social and cognitive aspects. We observed that there is a spontaneous informal peer group activity among university students which takes place mostly at outdoor locations. Since it is difficult to acquire conventional mediation tools and artifacts at an outdoor location, conducting group learning activities in such resource constrained environments is tedious. Nowadays, most students carry wireless connectivity enabled laptop computers which can successfully be used as a mediation artifact. Our objectives in this research is to develop an appropriate framework to help and motivate students to conduct peer group learning activities using their laptop computers. In this paper we provide a comparative study of existing potential collaborative and cooperative peer group learning tools, describe their features and emphasize the need for a specifically developed tool for informal peer group learning that can incorporate these features.

## 1 INTRODUCTION

Social interaction plays an important role in the development of cognition. Furthermore, individual learning and development is dependent on the institutions, environmental settings, and cultural tools and artifacts in one's social milieu (Bonk and Cunningham, 1998),(Kozulin et al., 2003). In higher/university education culture peer learning is being promoted for its benefits and effectiveness (Boud et al., 1999). We have observed that there is a cultural peer learning activity at University of Colombo in Sri Lanka where all peers are students and there is no teacher involvement at all. This learning activity takes place among small student groups informally. It is a multi way reciprocal teaching phenomenon where peers dynamically change their roles as teachers and students (Palincsar, 1986). It is a very interactive activity. In sociocultural theory it has been identified that, mediation tools and artifacts play an important role in learning (Bonk and Cunningham, 1998). This has been supported by the fact that white board/black board is being used successfully as a core artifact for supporting teaching and learning activities in many educational systems for

ages, and with the evolution of technology, in some settings, white board/black board has been replaced by more sophisticated audio/visual teaching aids.

Since, informal peer group learning is a spontaneous event, it is very common to see that students conduct peer group discussions in locations where they use to have their social gatherings; such as in students shared lounge, cafeteria, and even under trees. Even though it is possible to have a white board in a students shared lounge, it is not possible in all other potential locations where students used to gather. In such settings, it is impractical to have learning artifacts readily available for spontaneous informal peer group learning activities. As an alternative, students tend to use other mediation artifacts and tools such as papers, printed notes, tutorials. With the development of information and communication technology (ICT), currently there is an inclination among students for using laptop computers as a mediation artifact in peer group learning. Associating laptop computers as a mediation artifact has been considered as an effective way to improve learning (Gulek and Demirtas, 2005).

However, laptop computers themselves have limitations such as small localized screens than projec-

tors or white boards. Furthermore, when using several laptop computers to cope informal peer group learning, the problem of not having a common visual screen imposes constraints on sharing applications and presentations among the group participants. These affects the learning when it is used as a mediation artifact within a peer group activity. In addition to that, students can not expect to have a readily available network infrastructure to share any information at an outside location from institutional setting. Since, there is no appropriate mediation tool to fulfill these requirements, students face difficulties when conducting informal peer group learning activities using laptop computers.

To overcome this, one solution is to build an application framework which can support cooperation/collaboration and building applications from ground up with sharing in built. Ycab (Buszko, 2001) is an example for such frameworks. Currently a vast amount of ICT based applications and tools are being used in many educational systems. Most of these applications and tools are not built to support cooperative learning. Implementing all these applications to comply to a provided application framework would not be a feasible solution. A second solution is to use screen sharing. Using screen sharing techniques, all the applications can be used for cooperative work without any alterations to the application. This approach has been used in several other research activities on cooperative/collaborative group learning/working as well (Brian et al., 2002). In this paper we have carried out a comparative study of existing screen sharing peer group collaboration tools in section 3.

## 2 BACKGROUND

We have conducted a survey among students to identify the use of laptop computers and to estimate the popularity of informal peer group learning. Four representative groups were considered according to the student participation for informal peer group learning. The results of the survey presented in Figures 1 reveal that informal peer group learning is very popular among both junior and senior students. We can also observe that the number of students who have not participated in any informal peer group activity within their last year of study are less significant compared to the total student population. Furthermore, it can also be observed that the popularity of the event does not deteriorate with the maturity of students, i.e. informal peer group learning has a positive effect or benefit on students learning process. Therefore, students

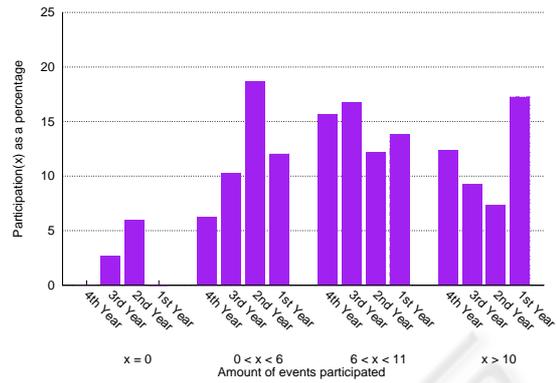


Figure 1: Participation for informal peer group learning by students.

continuously involve in informal peer group learning throughout their entire undergraduate studies.

With recent technological advancements, portable wireless devices such as laptop computers are getting cheaper in price and there is a rapid increase in the number of students possessing laptop computers in higher education institutions in Sri Lanka. From the survey results depicted in Figure 2 we can clearly observe that the number of junior students possessing a laptop computer is higher than the senior students possessing a laptop computer. This clearly witnesses the inclination in using laptop computers and the growth in the number of undergraduate students using laptop computers.

To use laptop computers as a mediation artifact for peer group learning, they must be interconnected with each other by some mean. However, the interest to connect to the network through provided wireless network (802.11x wireless network) at the university using the laptop computers has been revealed to be considerably low (Figure 2). It should also be mentioned that, by observing answers to open ended questions provided with the survey and by interview-

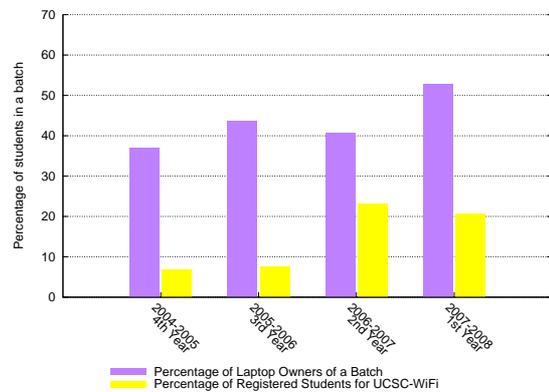


Figure 2: Comparison of Laptop Owners and Registered Students for the wireless network.

ing several students, we came to the conclusion that the main reason behind not registering to the wireless network is the lower data transfer rate experienced by their registered colleagues. This is due to access point saturation during peak hours. In addition to that, wireless network has become unreachable at most outside locations. Therefore, students prefer to use their own wireless connectivity such as HSDPA even within the university premises.

### 3 SCREEN SHARING TOOLS AND TECHNOLOGIES

Cisco WebEx (www, 2009j) and Adobe Acrobat Connect Pro (www, 2008) have a fully web based approach which supports desktop sharing and individual application sharing<sup>1</sup>. In order to use these tools users must login to a central server hence the Internet connectivity. In addition, these tools provide facilities such as shared white boards, chat, and video conferencing with voice based communication. A competitive, with limited facilities, open source tool for these two proprietary applications is Open Meetings (www, 2009f). Since the server can be obtained and installed in a local machine, Internet connection is not mandatory.

Screen sharing applications such as Glance (www, 2009b), Lotus Sametime Unyte (www, 2009c), Yuuguu (www, 2009k) and ShowMy PC (www, 2009g) also provide a web based viewer. However, the host machines of the cooperative activity must install a software application. There are several feature differences between above mentioned fully web based solutions and these applications.

Microsoft Shared View (www, 2009d) is a screen sharing solution for cooperative activities from Microsoft Corporation. In contrast to Yuuguu, Microsoft Shared View does not provide a web interface for viewers. Furthermore, even though it claims to support individual application sharing, child windows of a shared application are not shared. Cross-Loop (www, 2009a) is a similar application and is not capable of sharing individual applications.

TightVNC (www, 2009h) is an open source desktop remote control solution. TightVNC can also be used for desktop sharing by adding client hosts to the TightVNC server. Since, TightVNC server is installed in a local machine no Internet connection is required. Easy Broadcast VNC (www, 2009i) is an extensive

<sup>1</sup>Individual application sharing is the feature that only a particular application running on the desktop can be shared among others without having to share whole desktop.

work done to ease the desktop broadcasting for a defined list of hosts.

NetSupport School (www, 2009e) is a LAN based comprehensive application for controlling and managing a classroom. It is equipped with features to broadcast activities between the teacher and students.

### 4 DISCUSSION

Most screen sharing applications focus on supporting people who stay far from each other. Therefore, applications are deployed at a central location which require a working network connection to access it through the Internet or the Intranet. Even if the wireless network is available, poor download speeds affect the motion of screens. Though, students can use their HSDPA connections which are paid per Mega Byte to communicate, few students have HSDPA connections due to high costs. Moreover, projection delays at viewers display due to accessing a remote server make mentors instructions asynchronous with the projection.

Even though students used to have their informal peer group learning activities in outdoor locations, members of each group gather themselves at one physical location. Therefore, an isolated wireless ad hoc network can be created to achieve connectivity between available laptop computers. Furthermore, interpersonal communication can be achieved by using face-to-face vocal communication. In this setting it would be the most effective way of interpersonal communication. Hence, communication bandwidth and processing power which are used for voice communication can also be saved.

Most screen sharing tools are based on a client-server architecture and therefore the users are required to connect to a server. However, there can be limitations such as number of concurrent connections, outbound network bandwidth. Therefore, broadcasting screen information to peers can be an effective way of achieving sharing. Moreover, implementing a screen broadcast can be effective than managing client-server connections among the peers of an ad hoc network.

Most applications share whole desktop screen. However, sharing individual applications have several advantages over sharing whole desktop. First, students can keep confidential information intact. Second, students do not have to hand over the total system control to other parties when control handing over is required. Third, resource consumption can be reduced; for example, when calculating difference between current screen buffer and original screen buffer,

bigger screens result in longer calculation times.

Motivation is an important factor for learning. None of the available tools encourage user to do collaborative/cooperative work. Students can be encouraged to do informal peer group learning using notifications. For example, students can be notified of the reachability of a colleague and prompt for a cooperative session initiation. In addition to that, students even can be notified of existing informal peer group sessions. Hereby, notification interrupts can be used in an effective way to guide students.

## 5 RELATED WORK

Mighty Mouse is a multi screen collaboration tool which has been built to support peer group collaborative activities using laptop computers (Brian et al., 2002). It uses a common screen that is visible to all the participants and participants can use the mouse pointer to move to the screens of other participants, i.e. by moving mouse through left of screen moves a person to the screen left to the current screen and moving it through right screen edge put him on the right screen. However, additional video switching hardware are needed to use the tool with a projector.

NetSupport School is a software tool that is especially built to support computer aided formal learning on a LAN (www, 2009e). This tool provides facilities to restrict and control users over the usage of applications, network etc. Although it is equipped with some of the features that are required to support considered informal peer group learning scenario, it does not have built in support to work in isolated environments from communication infrastructures.

## 6 CONCLUSIONS

Informal peer group learning is a popular way of learning among students at University of Colombo. Survey results indicate that there is no deterioration effect on the popularity of informal peer group learning with maturity of students. Laptop computers are becoming a popular tool among students and they tend to use laptop computers as a mediation artifact in support of learning. However, there is no tool to support informal peer group learners in resource constrained environments. Existing solutions mostly address the problems with remote learning. Therefore providing a tool which can fulfill the needs in a spontaneous informal peer group learning activity would help students to improve the effectiveness of learning

through informal peer group learning. The effectiveness of the tool itself can be improved by considering the properties of the specific environment of application.

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