Using a shared workspace and wireless laptops to improve collaborative project learning in an engineering design class

David J. Nicol [a,*], Iain A. MacLeod [b]

[a] *Centre for Academic Practice, University of Strathclyde, Scotland, UK*
[b] *Department of Civil Engineering, University of Strathclyde, Scotland, UK*

Abstract

Two different technologies, groupware (a shared workspace) and shared wireless laptop computers, were implemented in a project design class in a civil engineering course. The research interest was in the way these technologies supported resource sharing within and across project groups and in the forms of group collaboration that resulted. The initiative was evaluated using both qualitative (e.g. pyramid discussion) and quantitative methods (e.g. survey, logs of usage). The results showed that these technologies helped improve group sharing of resources and supported different kinds of group collaboration. The shared workspace provided a location-independent central repository of resources around which group activities were coordinated whereas the laptops provided a focal point for the face-to-face discussion of these resources. The paper discusses the importance of embedding supportive technologies and the different forms of learner collaboration mediated by each technology.
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1. Introduction

Across most disciplines in higher education there has been a growing interest in collaborative learning using group projects. Group projects normally involve students working together over a

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* Corresponding author. Tel.: +44-141-548-4060; fax: +44-141-553-2053.
   E-mail address: d.j.nicol@strath.ac.uk (D.J. Nicol).

period of time in order to complete a complex and open-ended task. This requires that members of the group plan, negotiate and co-ordinate their activities and share information and resources. Research has shown that such collaborative activities can be beneficial to individual learning (Cohen, 1994; deCorte, 1988; Johnson, Johnson, & Smith, 1998; Quin, Johnson, & Johnson, 1995; Slavin, 1994) although it has also been shown that these benefits are dependent on both the quality of the learner interaction and on the attitudes of students to group collaboration (Underwood, 2003; Walker, 2001).

In recent years, computer-based systems have been harnessed to support collaborative learning in higher education. In 1996, Koschmann identified 'computer supported collaborative learning' (CSCL) as an emerging paradigm in learning research (Koschmann, 1996). CSCL is based on the premise that computer tools alter the social arrangements amongst learners and result in new kinds of peer interaction and joint activities (Dillenbourg, 1999). Research on CSCL focuses on how computer applications might be used to scaffold knowledge building and knowledge sharing amongst members of a group (Crook, 1994; Roschelle & Teasley, 1995).

There is also research interest in the different ways that computer technologies might mediate and support collaborative learning. For example, Crook (1994) has proposed four types of collaborative interactions in which computers play a part: interactions *at* computers, *around* computers, *related to* computers and *through* computers. Each of these interaction patterns can be shown to mediate different group learning processes. More recently, Oliver and McLouglin (2001) have shown how different web tools can be used to support different group kinds of group activities including online debates, the sharing of problems and solutions and task-related communication. Other researchers have investigated how the same tool might support different types of collaborative activity. Of particular relevance here is a study by Sikkel, Gommer, and van der Veen (2002) that evaluated seven higher education courses where students used online groupware technology for a variety of different collaborative purposes (e.g. archiving resources, collaborative authoring, online discussions). They concluded that the main strength of groupware was as 'a repository for the objects of collaborative work'. Research suggests that shared access to such task-relevant resources is a key factor in successful group working (Shaikh & Macauley, 2001).

The study reported in this paper extends this body of research by investigating how the application of two different computer technologies – groupware and shared laptops with wireless access – might be used to support resource sharing and group collaboration in a Civil Engineering project design class in higher education. The paper begins with an explanation of why the department decided to introduce these supportive technologies into the project design class.

2. Concerns about group project learning

2.1. Background to the project class

In the third year of the undergraduate degree course in Civil Engineering at the University of Strathclyde all students are required to take a core class entitled ' Civil Engineering Projects 3'. This design project class lasts for one semester (12 weeks) and involves group collaboration in relation to a 'realistic' industrial project. The project brief is the re-development and planning of