An investigation into students' use of a computer-based social learning space: lessons for facilitating collaborative approaches to learning

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Abstract

Provision of computers in universities for self-study is taken for granted and is seen as a "must have" educational resource, yet it is very expensive to fund. Students report that they use the Internet as their first stop in approaching research tasks. Learning theorists posit the important role of social interaction in contributing to learning. The use of collaborative methodologies such as group work also illustrate the importance, and perceived beneficial role of, learning with others. However, in general, student access to computers for self-study in UK Higher Education is provided through large rooms furnished with serried ranks of computers, which do not allow or encourage computer-based collaborative working. This study addresses this mismatch between approaches to learning and the way universities make computers available to learners. The University of Wolverhampton provides a social learning space with 24 computers on four fishbone-shaped tables, in a room without any restrictions on talking, eating, or drinking. It was provided so as to encourage learners to work collaboratively and to be able to integrate the use of a computer whilst doing so. This paper reports the initial findings of a study into its use, through questionnaires, observational data, and interviews. Has the provision of a computer-based collaborative learning space positively affected approaches to computer-based self-study? The results of this study inform how best Higher Education institutions might provide computer access to learners so as to encourage collaborative working and positively affect student approaches to their learning.

Introduction

The provision of student access to computers in UK Higher Education (HE) is unquestioningly seen as an essential educational resource for self-study as well as for teacher-

led learning. Such access is made available to students in all universities. The cost to institutions of providing students with such access is high, and in the author's institution this means provision of some 2000 student computers, which with a three yearly replacement cycle, costs circa £500 000 annually. Given these high costs and the ubiquitous use of computers by students for self-directed learning, it is axiomatic that their provision should be in maximum alignment with the educational process and with current theories on the most productive approaches to student learning. This paper investigates the relationship between an open-access computer room and student approaches to self-study.

Computer rooms in Higher Education

The University of Wolverhampton modules (and most modules in UK universities, allowing for some variation according to subject) are typically organised with around 3 hours face-to-face teacher-directed learning and 7 hours independent, autonomous or self-directed learning. Open-access computer facilities are seen to be supporting independent learning. In addition, national initiatives such as progress files (Quality Assurance Agency, 2001), lifelong learning (http://www.lifelonglearning.dfee.gov.uk/), and ideas from educational theorists such as Candy (1991) and Boud (1988) embody the value placed on the creation of effective independent learners. Candy (1991) proposes that the skill of effective self-directed study arises "...as a product of the interaction between the person and the environment." Even in 1998 a study found that 91% of students had accessed campus-based computers (Ray & Day, 1998) and more recently, the Pew Internet (2001) think tank found that "nearly three-quarters (73%) of college students say they use the Internet more than the library." As a large amount of self-study time is now conducted with a computer for word processing of assignments and Internet research, plus a host of more specialist uses, it follows that the environment in which learners work with these computers needs to be designed to facilitate the most productive approaches to learning. Little attention in the UK HE sector has been given to the best way to encourage the most valuable approaches to student learning when they engage with computer-based self-study. Research into self-study has had less attention than that into face-to-face teaching, and the more ubiquitous use of PCs by learners, largely facilitated by the Internet, is only a recent phenomenon.

What are the different approaches to learning?

Educational researchers (eg, Biggs, 1999; Ramsden, 1992) have identified qualitatively different student approaches to learning that can be used to characterise the context-dependent ways in which students engage with learning tasks and their learning environment. Surface approaches to learning are characterised by focusing on facts, memorising of selected items, and by minimal engagement with any understanding of the wider meaning of issues or concepts and the connections between them. Deep approaches to learning, already based on a detailed grasp of a body of knowledge, pursue an active understanding of underlying concepts, the relationships between these, and an awareness of, with the desire to, be able to apply them. Students may be encouraged through the design of, and intervention in, many aspects of their learning environment to adopt either approach to learning. Social constructivist principles of

education see that encouraging collaboration and interaction with peers, and thus exposure to alternative perspectives through an opportunity to negotiate meanings might be one way of fostering deep learning. The processes of reflection, self-evaluation, and initiation of new learning are also likely to be invoked in collaborative learning situations. As a methodology to encourage deep learning, group work has a well-established rationale (Biggs, 1999, pp. 87–90) and this is at the heart of methodologies such as problem-based learning (Biggs, 1999, pp. 208–210). It follows therefore, that if we wish to enable and encourage deep approaches to learning and effective modes of self-study whilst using computers, then the expensive computer room environment needs to be configured and streamlined so as to at least allow for, and at best to encourage, such approaches.

Mismatch between collaborative approaches to learning and the design and operation of computer rooms

The current norms for computer provision in UK HE with regard to the layout of computer rooms and the ways in which students are allowed to work in them, do not fit neatly with some of the conditions seen to promote deep approaches to learning. The vast majority of universities' open-access computer laboratories are organised as serried ranks of side-by-side computers. These are often large, cavernous facilities. They also have library-style restrictions on talking, eating, and drinking. The many and varied ways in which the physical learning environment impacts on, and can be designed advantageously for, promotion of learning has been addressed by Van Note Chism and Bickford (2002) at a conceptual level. Their book, prompted by the observation of a "...lack of extensive dialogue on the importance of learning spaces in higher education environments" (Van Note Chism & Bickford, 2002, p. 3) investigates a wide range of factors including furniture, room sizes, and room shapes, and is derived from a variety of disciplines, for example, environmental psychology and design architecture. There has been some work which indicates that students would prefer to use computers in a collaborative mode for their learning. A small study by Waddick (1997) of face-to-face teaching using computers found that the way in which computer-based study was organised affected student perceptions of their learning. They identified strong preferences for a group and social arrangement around the computers. The use of clustered computers in self-access centres has also long been advocated as the most productive in the field of language learning (eg, Hardisty & Windeatt, 1989, p. 6). Banning and Cannard (1986) see that "among the many methods employed to foster student development, the use of the physical environment if [*sic*] perhaps the least understood and the most neglected." This study aims to address an aspect of this research gap by investigating students' perceptions about, and use of, a computer environment which was designed to allow for, and more importantly support and encourage, collaborative approaches to computer-based self-study.

Research question, context, and hypotheses

The University of Wolverhampton has provided a social learning space with 24 fixed computers arranged on four circular tables and also wireless connections for those students with laptops (see Figure 1). In addition, the room had a coffee bar and had no

Figure 1: The social learning space

restrictions on talking, eating, and drinking. This paper reports on an investigation into the use being made of this facility. The research aimed to ascertain if, by providing self-access computers in this type of environment, students were supported in using collaborative approaches to their self-directed studies. Was there thus a greater degree of alignment between deep approaches to learning and self-study time spent around these university computers? The five linked hypotheses were:

1. Students would be using the room for both university study and social reasons.
2. Students would use the room for collaborative study.
3. The environment would facilitate collaborative study.
4. The environment would not affect students' concentration.
5. The environment would affect students' choice to study in this room.

Although this study investigated the use of PC-based collaborative approaches to study in the social learning space, collaborative approaches to learning, both in classes and in self-study time, are an approach to learning actively encouraged throughout the university by teaching staff.

Methodology
Four sets of data were collected for this study: (1) observations of how the room was used in terms of the amount of computer use, the types of uses being made of the computers, and the type of interactions observed around the computers; (2) a questionnaire focusing on students' attitudes towards aspects of self-study with computers; (3)

structured interviews with students using this learning space; and (4) rough and ready observations of the mode of use of the competing "serried ranks" computer room.

Observations

The ways in which students used this learning space in their computer-based self-study were observed for at total of 36 hours over a period of 1 month during weeks 5 to 9 of a 12-week semester. The social learning space is open from 9 a.m. to 9 p.m. and the observations spanned this time period. There is no directive in any of the university labs which stipulates that the use of the computers must be for study and there is no restriction on (legal) Internet usage. The types of main use being made of each of the 24 fixed computers and any wireless connections made were recorded in 10-minute snapshots. Types of main use were determined as one of the following: (1) mainly for individual study; (2) only for individual social use; (3) mainly for collaborative study; (4) only for group social use; or (5) computer not being used. The type of use was ascertained by the observer looking at the main on-screen activity of the user and, where multiple applications were open, checking with the students what their main activity was. The observer was around the same age as the students and was not an academic member of staff as this might have made the students wary of describing non-work related tasks. Those students who were asked about their activity were told about the study, its anonymous nature, and how they would be able to access the results.

Questionnaire

To ascertain students' attitudes to self-study using computers and their use of this learning space, a questionnaire was given out to students using the room. Questionnaires were anonymous and participants encouraged through entry to a draw for a £15 book token. The questionnaire used 22 statements to which students were asked to respond on a 5-point Likert scale from *Strongly agree* to *Strongly disagree*. This self-report questionnaire included two opposing measures for each attitudinal trait, for example, "I use the PCs to work together with other students" and "When I work in this room on the PCs, I usually work by myself." The statements aimed to elicit data on five aspects of the use of this environment. These were: (1) did the students work alone or with others; (2) what types of uses did the students make of the room; (3) did the environment facilitate collaborative study; (4) did the environment affect the students' concentration; and (5) why did the students choose to study in this room? It also included three open-ended questions asking for the subjects' responses as to their likes, dislikes, and suggested changes for the room.

Interviews

A set of 11 questions was assembled to be used as a guide for face-to-face structured interviews with students who used the room. The questions were designed to corroborate or refute the same areas of students' use and perceptions of this learning environment as explored in the self-report questionnaires, as well as being an opportunity to reveal any issues not previously considered by the researcher. Fifteen interviews were carried out and the students' answers were noted by the interviewer. These were analysed and the main themes were categorised.

Observation of the modes of use of an alternative large self-study computer room
Rough and ready observations were made on 10 different occasions of the modes of
student use of an alternative self-study computer facility, which had 200 computers.
The computers in this lab however did have access to the full range of learning resources
such as CD-ROMs which were not available in the social learning space. This lab is based
in the university's main Learning Centre, has computers in serried ranks, and enforces
a policy of no talking, eating, or drinking. As collaborative work was prohibited anyway
in this lab, the data collected during the observations sought only to ascertain whether
or not, despite these restrictions, collaboration was taking place here. The IT support
staff for this lab, based in an adjacent room, further confirmed that they enforced the
policy of no talking, eating, or drinking. These 10 observations followed directly after a
period of observation in the social learning space, during which the observer only
recorded the numbers of PCs being used collaboratively. During these 10 visits, only one
instance of collaborative work was observed, and this was for social reasons.

Results
Table 1 shows the summary of the 36 hours of observation of the use of the social
learning space.

These results show affirmation for the second and fourth hypotheses. Nearly 70% of
total use was for study and of this 17.52% of students were observed working collabo-
ratively. However, when the collaborative study focused use of the social learning
space (17.52%) is taken as a percentage of the total study focused uses (69.21%),
then more than 25% of the study-orientated use of the social learning space was col-
laborative. The social learning space was being used quite extensively for collaborative
study.

Two other interesting features emerged from the observations. First, the extent of
computer-based multitasking became very apparent. Students would flit between
several open applications, some work-based (eg, word processing) and some social

Table 1: *How the computers in the social learning space were used and for what purpose*

Type of uses observed being made of the computers	Numbers (%) of recorded uses per 10-minute block per computer (24)
Alone—mainly for study	2092 (51.64%)
Collaboratively—mainly for study	710 (17.52%)
Total number of uses observed for study	2804 (69.21%)
Alone—only for social reasons	1161 (27.54%)
Collaboratively—only for social reasons	86 (2.11%)
Total number of uses observed for social reasons	1247 (30.78%)
Total number of uses of computers	4051
Not in use	795

Table 2: Percentage responses (n = 40) to the self-report questionnaire

	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
	What do students use the room for?				
I never use these PCs for purposes other than my studies.	2.5	5	7.5	47.5	30
I use this room and the PCs for my university work.	30	47.5	5	5	0
	Do students work alone or with others?				
I use the PCs to work together with other students.	5	47.5	22.5	10	12.5
I never work alone on the PCs in this room.	0	7.5	12.5	35	40
	Does the environment facilitate collaborative study?				
This room design (table layouts, etc) allows me to work using a PC with my colleagues.	22.5	32.5	22.5	10	0
The organisation of this room does not encourage me to study with my colleagues.	0	7.5	20	40	22.5
If I have group assignments to complete I would work here rather than in the PC lab in the Harrison Learning Centre.	30	27.5	12.5	7.5	10
	Does the environment effect students' concentration?				
The sociable nature of this room hinders my university studies.	0	5	20	32.5	25
I am able to concentrate on my university work in this room.	22.5	42.5	17.5	12.5	2.5
	Why have students chosen to study in this room?				
I chose to work in this room because I am able to talk, eat, and drink.	47.5	35	7.5	5	2.5
I would use this room more frequently for university work if there were more PC-based academic resources available on the PCs.	27.5	32.5	25	7.5	0

orientated (eg, Messenger™), hence the qualifier "mainly" in front of the two study categories. This was apparent to the observer, although not quantitatively recorded, that whilst recording the data and in interviews, many learners confirmed multitasking as a preferred mode of working whilst studying on the PC. Second, the extent of social use of the PCs became apparent, some 30.78% of all computer use.

Table 2 shows the percentage of responses to half of the 22 statements included in the self-report questionnaire. For economy of space, the opposite statements for each of these 11 statements in Table 1 have been omitted as they mirrored these results.

The questionnaire results confirm all five hypotheses:

1. The social learning space is used for both study and social purposes, although the 7.5% who strongly agreed, or agreed that they never used the room for anything other than work, conflicts with the observation figure of 31%.
2. The use of the social learning space for collaborative study is confirmed (ie, 52.5% strongly agreed, or agreed they studied together).
3. The environment is seen to be a key factor in assisting collaborative study (ie, 62.5% strongly agreed, or agreed that the room's organisation helped working with peers).
4. There did not appear to be a detrimental effect in allowing talking, eating, and drinking on students' perceptions of their ability to focus on their work (ie, only 15% strongly disagreed, or disagreed that concentration was affected by the environment).
5. The nature of the environment was a key aspect of students' choice to study in this room (ie, 82.5% strongly agreed, or agreed that this affected their choice of study location).

The interviews again confirmed each of the five hypotheses and also the accuracy of the data collected from observations and the self-report questionnaires. The only unaligned set of data is again the use of the computers for work or social reasons. The environment is a guiding factor in the choice of place to study and its layout facilitates study. It is used for collaborative work. Concentration is not affected by allowing discussion around the PCs. Additional factors of note were the desire for extended wireless connections and printers.

The last set of data collected was a "rough and ready" observation of students who were working in the other large, traditional computer room housing 200+ PCs. This was arranged in serried ranks, had full access to university library resources, and had enforced restrictions on talking, eating and drinking. In comparison to the social learning space, there was very little collaboration for example, between groups of students working together.

The data show strong support for all hypotheses but mention needs to be made of some limitations of the research. The observations covered a period of 4 weeks whereas recording a semester's use might show variations in the social versus work use in line with assessment schedules. The students used for the three data collection sets were familiar with and were already using this social learning space. A different picture might have emerged if random students had been sampled, although teasing out why those who were using the social learning space did so was the main research focus. No measures were taken of the nature of the student interactions taking place as, although there was study-focused collaboration, it may have been operating at a surface level.

Discussion and implications
Wolff (2001, p. 36) in her investigation of the ways in which environments for learning can assist collaboration says, "What was missing from the literature was adequate research to describe the desired features of the physical learning environment that

Table 3: Results of the interviews (n = 15)

Questions used to guide the interviews	Key features from interviews	
Why did you choose to work in here?	Environment	12
	Laptop connection	3
What are the most important differences for your study between this PC facility and HLC?	Environment	13
	Laptop connection	3
	Printers	1
	Speed of PCs	1
How long do you spend studying in this room?	1 h	0
	1–2 h	5
	2–3 h	6
	3 h+	4
What are you using the PCs here for?	Work	11
	Social	15
When you use this room for University work do you ever work together with colleagues?	Yes	13
	No	2
Does this PC facility affect the length of time you spend in study?	Yes	7
	No	8
When working as part of a group using a PC, where do you go as a first choice and why?	This room	10
	Other	5
Are the amount and type of resources a factor in your choice of where you do your PC based study?	Yes	13
	No	2
Do you find this room distracts you from your studies in any way?	Yes	0
	No	15
Are there any features of this room which support or encourage your studies?	Layout	9
	Atmosphere	8
	Toilets	6
	Food/drink	6
Do you have any suggestions regarding the way PCs are made available for students at the university?	More similar rooms	9
	Printers	2
	Wireless LAN in room	3
	Better PC support	3
	Queue system for PCs	1
	Internet access in halls	1

support collaborative, project-based learning." In addressing this, the results from this study of computer-based learning provide some significant insights into the relationship between the learning environment and approaches to study. In this environment 25% of the study taking place was collaborative, concentration was not affected by allowing such collaboration, and the environmental factors which mitigated collaboration were features which were highly valued by students. It appears that the layout and the environment of this PC-based self-study facility were encouraging and supporting useful approaches to learning.

The main implication therefore is that considerations of what types of learning approaches we wish to develop and support need to be factored into our university computer-based learning spaces. These are an expensive item and thus such environ-

ments should be designed and run so as to support, encourage, and develop those ways of learning seen to be most productive, one of which is collaborative working. Specifically with regard to spaces provided for PC-based self-study, these need to be arranged in cluster format so as to allow groups of students to work together on one PC. The room also needs to encourage, rather than ban, human interaction.

The results also indicate something of the nature of the self-study in which students are engaging. It appears from the figure of 75% working individually that students are either choosing to work alone or being set self-study learning tasks which are individual. The nature of the mode of self-study being encouraged by staff would make an interesting further study. Collaborative work though it would seem, seen through the 25% plus of student collaborative engagement in the social learning space is being undertaken by some students and encouraged by some staff.

Another unexpected but interesting area of further research into student PC-based work patterns would be into the attitudes towards, and the effects of, multi-tasking on the PC. This was greatly in evidence in our observations and seemed to be a common way of working.

This study also reiterates the importance of what Lea, Stephenson, and Troy (2003) advocate, which is that in a learner-centred teaching institution we need to research our learners' attitudes and perceptions of their learning experience. The findings need to be used to inform decisions affecting the provision of student learning opportunities, whether about methodology, or as in this research, about the configuration of facilities. This study demonstrates that the type of environment in which learners would ideally prefer their access to computers to be housed is not in-line with the most common implementation of PC rooms.

The final implication of these results is linked to the development of PC technologies. At present wireless technology has reached affordable maturity and if collaborative approaches to learning are to be encouraged then fixed PCs allow less flexibility than do laptops with wireless connections to the Internet. In a completely wireless campus, learning with access to the Internet can happen at the place of student choosing, for example, coffee bars, corridors or outside, rather than inside a designated room. One of the unexpected outcomes of a wireless campus and laptops for all students scheme at Wake Forest in the USA, in addition to enabling collaborative learning processes to blossom (Brown, 2000), has been the conversion of such unlikely spaces as cars parked on campus into productive learning areas. In educational institutions such as Ninestiles (Microsoft, 2002) there have been large educational advances made through providing each student with their own laptop in a wireless environment. In the future, the ultimate way of fostering collaborative approaches to learning with PCs will be a wireless campus and provision of laptops for all students.

There are further, useful areas of research suggested by this study, which may extend its findings. In brief, the first would be an examination of the relationship between the

amount of collaborative use of the PCs and the students' work, in an attempt to investigate if, for example, any deeper approaches to study, any qualitatively superior work, and/or if this mode of study facilitated greater attainment of learning outcomes. A second would be a more detailed examination of the relationship between room-specific factors such as the position of PCs, drinking and eating factors, and the amount of collaborative study.

Conclusion

This study presented the findings of research into students' perceptions about, and their use of, a computer room designed to encourage collaboration in the learning process. They demonstrate one way in which collaborative working might be fostered through provision of a supporting environment. For a facility, which is so costly to sustain, this research shows that for maximum value a greater alignment needs to be sought between provision of learning environments and effective learning methods. These findings have implications for the development of wireless campuses, in tandem with all students possessing laptops, as a key innovation which should also create extended collaborative approaches to PC-based student learning.

Acknowledgements

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