

Research Article

Student Perceptions of Social Learning Space: Designing and Implementing a Co-operative Assessment Task in Pharmacology

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Abstract

We report findings from a case study of co-operative, group-based assessment in Pharmacology for second-year undergraduates at The University of Queensland, Australia. Students enrolled in the 2005 Bachelor of Science and 2006 Bachelor of Pharmacy degree programs, were early users of the university's new Collaborative Teaching and Learning Centre (CTLC), a specialised social learning space. A pre-existing, traditionally taught Computer Assisted Learning (CAL) module on the topic of Drug Dependence was common to the courses for Science and Pharmacy students. We describe how this module was redesigned as part of a 3-hour, co-operative assignment weighted as 5%. Details of the co-operative learning principles, the teaching strategy and the assessment design are documented. Most students achieved high academic results: Science (2005) mean \pm SD = 79.5 \pm 14.8%, n = 232; Pharmacy (2006) mean \pm SD = 83.3 \pm 13.6%, n = 186. From post-task opinion surveys and focus group interviews, both student cohorts perceived that CTLC facilities and the group work helped them learn about Drug Dependence. These data confirmed that most students felt they worked co-operatively to complete the assessment. Time and understanding the new task were the main reported stressors.

Keywords: computer assisted learning (CAL), group work, pharmacy, science

Introduction

Social learning space refers to the myriad of physical and virtual resources which support student-centred, interactive learning in formal and informal contexts (Oldenburg, 1991 cited in Williamson and Nodder, 2002). Research in higher education is increasingly investigating how teaching methods can be defined by the features of available spaces i.e. what are called "built pedagogies" (Oblinger, 2006). Traditional arrangements of rows and columns of seats and computers in dedicated Information Technology (IT) rooms do little to support student-centred learning in groups, as strongly recommended by educationists. Brett and Nagra (2005) cited data from student questionnaires, interviews and observations that multi-tasking and social interactions were facilitated in a social learning space with shared computers arranged on circular tables. These authors further supported the earlier recommendations of Lea *et al.* (2003) that students' perceptions should inform the selection of teaching methodologies and provision of learning opportunities in such social learning spaces.

As teachers of Pharmacology, we are interested in how students can better learn the technical content and processes of drug actions through social interactions with their peers and with staff. We share with our colleagues in all educational sectors an interest in how technology-rich learning spaces can be designed to more meaningfully connect learners through group-based teaching and assessment practices (Goodyear, 2005).

The use of computer assisted learning (CAL) modules for delivering undergraduate Pharmacology courses has grown over 60% since 1996 (Hughes, 2003). However, there is a need for more pedagogical research on how computer-based learning can be more effectively integrated with disciplinary content (Hughes, 2002). This requires studies that address both the types of learning spaces which promote social interaction and types of teaching and assessment that promote interactive learning. While recent data related to Pharmacology could not be found, a large-scale survey of pharmacology teachers in the UK cited the lack of appropriate resources (including inadequate physical space and access to IT-based support) as limiting the use of innovative teaching methods (Markham *et al.*, 1998). Assessment in small group settings is often used in the expectation that it supports greater dialogue, interpersonal exchanges, higher-order learning around more complex and authentic problems, as well as more efficient use of resources (Mello, 1993; Gibbs, 1995). Furthermore, assessment is more positively perceived when related to authentic tasks with long-term benefits, calls upon a range of skills and is not over demanding (Sambell *et al.*, 1997). From a metastudy of research published over 22 years, Struyven *et al.* (2005) described some of the complex associations between students' perceptions of assessment and their surface, deep or strategic approaches to learning described by Trigwell and Prosser (1991). They further reported that assessment in the form of extended writing generally prompted deeper learning more than in multiple choice questions.

Here, we report how a traditional pharmacology CAL module on the topic of Drug Dependence was redesigned and used as a summative assessment task around (1) purpose-built collaborative, computer laboratories, and (2) principles of co-operative learning and the teaching approach to make better use the technology-intensive learning space. We document the re-design of this assessment task in second-year Pharmacology, the student-centred built pedagogy, present student academic achievements and their perceptions of the collaborative work space. Students' perceptions were sampled about working in the collaborative computer laboratories; university group work in general; how their own group worked while completing the Drug Dependence module; and how they (as individuals) worked. This study focused on students enrolled in a semester 2, 2005 Bachelor of Science. However, substantial comparisons were also made with following semester (semester 1, 2006) Pharmacy students. This was completed to determine whether the co-operative assessment task was transferable across different cohorts using the same module.

Two key research questions underpinned this case study:

- a) Can the CAL-based Drug Dependence module be re-designed for the Collaborative Teaching and Learning Centre to facilitate effective group learning in Science and Pharmacy undergraduate cohorts?
- b) What are the perceptions of Science and Pharmacy students around the CTLC and the new co-operative assessment task?

Methods

The Collaborative Teaching and Learning Centre

The Drug Dependence CAL has been traditionally delivered in the university's Interactive Learning Centre (<http://ilc.uq.edu.au/index.html>), a series of rooms with rows and columns of tables with integrated computers. From May 2005, the Collaborative Teaching and Learning Centre (CTLC) at the Brisbane campus of The University of Queensland became available as an advanced learning space for undergraduate teaching and learning. This special purpose building consists of open-design rooms with study pods (semi-isolated areas where smaller groups can work), flexible furniture arrangements and extensive networked computing and

audiovisual facilities. These are intended to provide an environment which supports interactive and social aspects of student learning in small groups. The challenge for the authors was therefore how to adapt the existing module on Drug Dependence to improve the quality of student learning through use of the CTLC facilities. This clearly aligned with the strategic objectives of the university to:

- deliver an enhanced and flexible approach to learning that meets curricula and pedagogical objectives by actively engaging students and providing the benefits of small group interactions
- ensure effective, structured evaluation of teaching and learning quality and outcomes, informed through feedback from students and scholars
- support ways to build effective learning communities that encourage independent learning and peer interactions, and
- enhance the teaching and learning environment, particularly in relation to provision of high quality infrastructure for flexible learning (Teaching and Learning Enhancement Plan, 2003-2007).

The students

This study included 232 students enrolled in the Bachelor of Science degree program (BSc) in semester 2, 2005, and 186 students enrolled in the Bachelor of Pharmacy (BPharm) in semester 1, 2006. Both cohorts were second-year undergraduates who were required to complete the same Drug Dependence module. The minimum academic standards for university entrance were considerably higher for Pharmacy students (top 2% in the state of Queensland). These students could be described as being high achieving, focused, strategic learners (Henning *et al.*, 1998). There was a greater range of academic abilities in the Science students (top 20%). In addition, Pharmacy students formed a discrete cohort sharing the same courses whereas Science students could select a much wider range of undergraduate courses reflecting their diverse and specialised fields of study.

The Drug Dependence Module and Assessment

The Drug Dependence module was a compulsory topic in the courses — Principles of Pharmacology & Toxicology (Science) and Human Physiology & Pharmacology 1 (Pharmacy).

In 2004, this module was taught and assessed traditionally. This included one 50-minute lecture on Drug Dependence was followed (after about two weeks) by one 3-hour CAL session (PharmaCALogy, [British Pharmacological Society](http://www.bps.ac.uk)) addressing the following learning objectives:

- c) to investigate the concepts of drug dependence and tolerance;
- d) to explore the properties of specific drugs of dependence; and
- e) to explore the methods that are used for assessing drug dependence in animal models.

Students were required to answer three questions before the CAL and answer formative assessment questions provided as part of the CAL. Students worked at their own pace in self-selected groups of 2 or 3 (within classes of about 50) being assisted by 2 to 3 postgraduate tutors plus one of the authors. Students were directed to the textbook - Rang, Dale and Ritter, 'Pharmacology', Churchill Livingstone: UK, 5th edition (2003) — for general concepts and selected materials for specific drugs. Understanding was assessed in the end-of-semester exam by four multiple-choice questions, with the topic weighted as 5% of the course.

As part of this study in 2005 and 2006, the major changes to the Drug Dependence module included: (1) one additional learning objective — *to work effectively as a team through*

Drug Dependence: Collaborative Learning

Criteria Sheet

Student Names

5% course assessment

Drug Names X / Y

	5	4	3	2-0
CONTENT	<ul style="list-style-type: none"> written summary of <i>Catalyst</i> video is accurate, brief but comprehensive technical concepts, drugs details & animal models are accurate and comprehensive 	<ul style="list-style-type: none"> written summary of <i>Catalyst</i> video is mostly accurate and detailed technical concepts, drugs details & animal models are mostly accurate and detailed 	<ul style="list-style-type: none"> written summary of <i>Catalyst</i> video presents key ideas accurately main technical concepts, drugs details & animal models are presented accurately 	<ul style="list-style-type: none"> written summary of <i>Catalyst</i> video is largely inaccurate and is not comprehensive technical concepts, drugs details & animal models are mostly inaccurate
FORMAT	<ul style="list-style-type: none"> thematic subheadings are from <i>Catalyst</i> video content is in correct section consistent throughout 	<ul style="list-style-type: none"> thematic subheadings are from <i>Catalyst</i> video most content is in correct section consistent throughout 	<ul style="list-style-type: none"> subheadings are not thematic key information is in correct section some consistencies 	<ul style="list-style-type: none"> subheadings are not thematic or from the video most content is not in correct section many inconsistencies
REFERENCING	<ul style="list-style-type: none"> all references are primary from peer-reviewed journals references are used appropriately, and citation style is correct and consistent 	<ul style="list-style-type: none"> most references are primary from peer-reviewed journals references are used appropriately, and citation style is mostly correct 	<ul style="list-style-type: none"> some references are primary from peer-reviewed journals references are cited 	<ul style="list-style-type: none"> references are not included
QUALITY OF WRITING	<ul style="list-style-type: none"> formal style of expression, grammar, punctuation, and spelling are accurate, clear, concise and consistent 	<ul style="list-style-type: none"> formal style of expression with some grammar, punctuation and spelling errors 	<ul style="list-style-type: none"> formal style of expression is inconsistent with some grammar, punctuation and spelling errors 	<ul style="list-style-type: none"> informal style of expression with significant and many errors

Marker's comment and Grade:

Figure 1 Standards-referenced criteria sheet used by tutors for marking the Technical Reports submitted by each team of students

Markers were tutors for the Drug Dependence sessions and were subsequently trained to mark consistently. Marking was checked by one of the authors (RWM). X and Y refer to one of the three stimulant drug names and one of the three depressant drug names allocated randomly to each group.

co-operative learning, resulting in the submission of a group-based Technical Report; (2) the lecture presented a brief overview of content (Drug Dependence, stimulant and depressant assessment); (3) students organized themselves into teams of three.

One depressant drug (either diazepam, heroin or ethanol) and one stimulant drug (either cocaine, nicotine or Ecstasy) were allocated randomly to each group at the start of the session. All the possible nine combinations were used; (4) Student teams worked wrote a short Technical Report (representing 5% weighting of the course) within the 3-hour timeslot of the laboratory class located in the CTLC. Submissions were electronic. All students received the same team mark and the topic was not subsequently assessed in the end-of-semester exam; (5) student submissions were marked by tutors using a standards-referenced criteria sheet aligned to the learning objectives (See Fig. 1) to provide specific and constructive feedback. The renewed organization of teaching and learning follows.

Supporting Co-operative Learning

The value of co-operative learning as a form of group learning has been extensively supported by many studies across different learning contexts but more in primary and secondary schools than universities (Johnson and Johnson, 1994). When working co-operatively, teams demonstrate five qualities: (1) positive interdependence: shared goal, resources and a unique role in task completion; (2) generally communicate and work physically facing one another; (3) work collaboratively; (4) independent accountability: distribute their workloads equitably; and (5) group processing: reflectively evaluate their group's goals and performance.

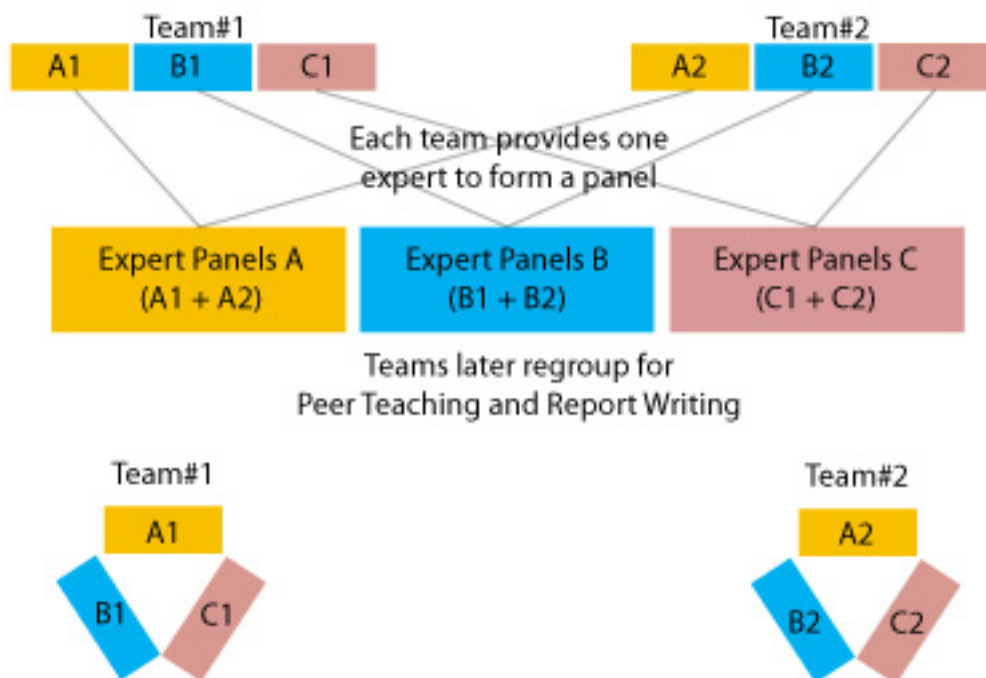


Figure 2 Organisation for team using Jigsaw teaching illustrating two groups

The letters represent three different students (A, B and C) from either team #1 or team #2. Each team assigns subtasks to research e.g. for team #1, A1 = stimulant drug, B1 = depressant drug, C1 = animal model). First, students begin in their original group, then break into their expert panels e.g. A1 + A2 = the expert panel for stimulants, B1 + B2 = the expert panel for depressants, C1 + C2 = expert panel for animal models. After completing their research, students reform their original group and teach each other what they have learnt (peer teaching). Finally, students write a Technical Report for submission as a summative assessment.

The so called, “Jigsaw” co-operative teaching approach of Slavin (1990) was adopted for writing the Technical Report. This refers to any team group activity in which each member is given a separate but complementary subtask. Only when all members effectively contribute, will the overall group task be completed, as when individual pieces complete a jigsaw puzzle. For our purposes, students formed teams of three within which one person acted as a specialist (or team expert) for the stimulant drug allocated to their group; a second member acted as an expert for one allocated depressant drug; while the third member acted as an expert of animal models (used to explore both the stimulant and the depressant drug allocated to their group). All three individual technical contributions were thus required to complete each team’s report. Three iterations were timetabled for these large classes, thus with about one-third of each student cohort were assigned per session. For each session, one-third of students were allocated to stimulants, one-third to depressants, and one-third to animal models. All students thus formed one of these three expert panels. Figure 2 illustrates the organisation using only two teams.

The sequence of teaching steps were:

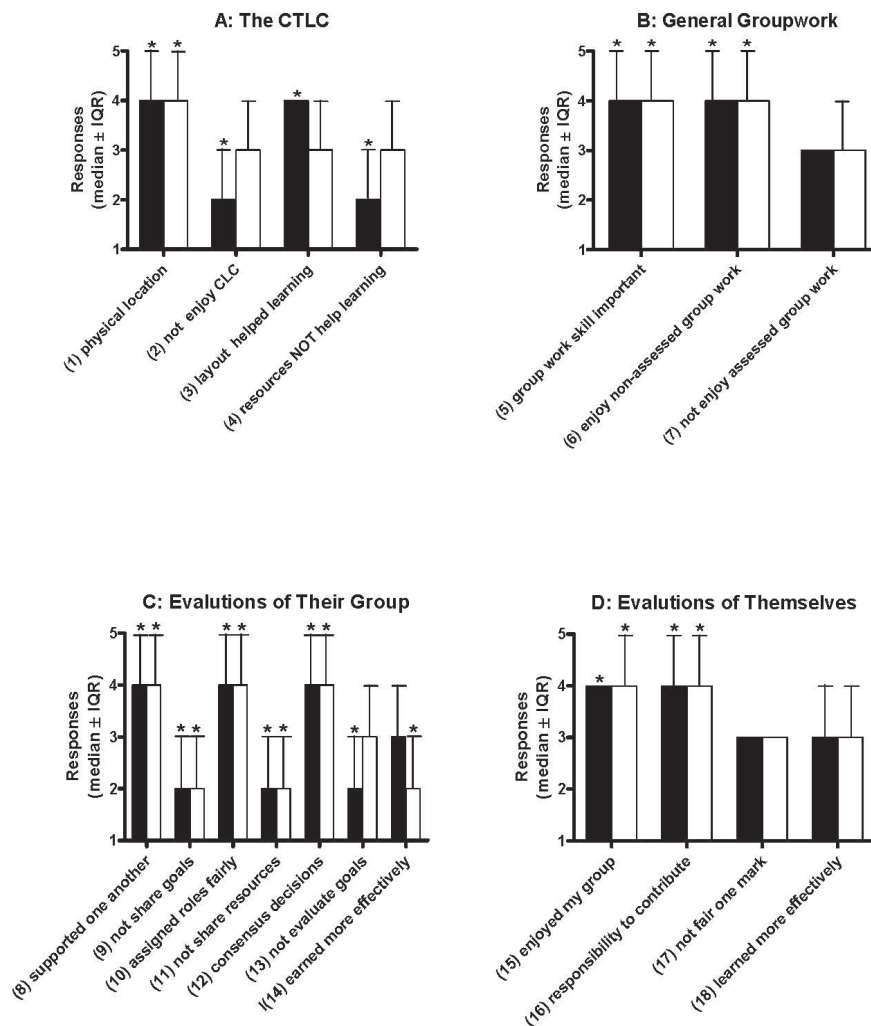
- f) Overview of task (10 minutes). This included (1) random allocation of two drug names (one stimulant and one depressant) to each team of three students (2) final clarification of the task including allocating pod spaces within the CTLC – one space for all those students exploring stimulants, another for those exploring depressants and a third for those exploring animal models, and (3) recommended durations which teams might allocate to each phase of their work.
- g) The trigger and initial planning of the Technical Report (15 minutes). An audiovisual trigger on *Drug Addiction* was presented. This was from the Australian Broadcasting Commission’s ‘Catalyst’ program which presents science to the general public. The following scenario was presented to students:

The ‘Catalyst’ producers have approached you as pharmacologists to assist them in developing the text of a new version of the Drug Addiction program for a technical audience. They want to keep the same broad structure as in the existing program but want to add technical details.
- h) Overall team plan and deciding subtasks (10 minutes). Each team was asked to prepare a text summary of the issues in the ‘Catalyst’ segment in order to provide the broad framework for learning. Team then which members completed the subtasks.
- i) Inquiry Learning in experts panels (60 minutes). Teams then disbanded into expert panels – either stimulant drugs, depressant drugs or animal models. Investigate your particular category of drugs (stimulants or depressants) or animal models, with the students from the other groups (but same panel). The CAL module for drug dependence was rich information resource about animal models. Here, student-experts selected from the CAL, a range of models appropriate to testing the actions of their allotted drugs.
- j) Peer teaching (30 minutes). Students then regrouped into their original teams to taught each other the main points they found about from their “expert” investigations.
- k) Writing the Technical Report (60 minutes). Finally, teams produced a report. This was written as a detailed summary of text points for the technical program arising from the ‘Catalyst’ segment. Details were bullet point summaries presented under major headings from the video trigger (maximum 2 pages).
- l) Student Surveys and Interviews

Students’ academic achievement and opinions were recorded. Two sources of quantitative and qualitative data were analysed in order to identify the range of student perceptions around using the CTLC and how they worked to complete the co-operative assessment task. These

included: opinion surveys with closed and open items, from both Science and Pharmacy cohorts; and focus group interviews from Science students.

Surveys



Following submission of their reports, students were surveyed about whether they had previously used the CTLC and how they thought they worked in the CTLC to complete their assessment (Fig. 3).

Figure 3 Student responses (median \pm IQR) to items of the opinion survey

A. Comparing the CTLC with other work spaces at this university: 1) In general, the physical location where you complete group work is important to you. 2) You did NOT enjoy working in the CTLC today. 3) The physical layout of the CTLC helped you learn effectively. 4) The availability of the CTLC resources did NOT help you learn efficiently.

B. General Group Work: 1) Being able to work in a group to complete university course work is an important skill. 2) You enjoy working in groups at university to complete non-assessable coursework. 3) You do NOT enjoy working in groups at university to complete assessable coursework.

C. Completing the Drug Dependence module. Your group: 1) supported one another to complete the work. 2) did NOT share common goals. 3) was able to assign roles fairly. 4) did NOT share resources. 5) was usually able to reach consensus in decision making. 6) did NOT often evaluate how effectively it was achieving goals. 7) learned about Pharmacology more effectively than by other methods.

D. Completing the Drug Dependence module. As an individual, I: 1) enjoyed working in my group. 2) felt a responsibility to contribute to my group. 3) felt that it was NOT fair to allocate one mark for my group. 4) learned about Pharmacology more effectively than by other methods.

Filled columns (■) represent Science students; Open columns (□) represent Pharmacy students

* represents $P < 0.05$ based on the difference in median values from the scale midpoint of 3, using the Wilcoxon signed-rank non-parametric test. The absence of error bars indicates data sets with minimal interquartile range.

The four survey themes included perceptions about: working in the CTLC; group work in general; how their group worked while completing the Drug Dependence module; and how they (as individuals) worked. On closed survey items, respondents were asked to circle one number on a Likert rating scale from 1 to 5 where: 1 = very strongly disagree; 2 = strongly disagree; 3 = neither agree nor disagree; 4 = strongly agree; 5 = very strongly agree. In order to encourage thoughtful responses, closed items included a mix of questions worded affirmatively or negatively. Descriptive statistics of each item of the nonparametric data included median \pm interquartile range (IQR). The Wilcoxon signed-rank test was used to estimate whether survey data medians were different from the midpoint (hypothetical median = 3) of the 5-point scale. Significance was represented by two-tailed p -values calculated using GraphPad Prism Version 4. The internal consistency of all survey items was measured using Cronbach α coefficient using SPSS Version 16.0. and α -values of 0.8 or higher indicated that survey items reliably measures related themes or constructs on which survey questions are based. The survey also contained the following questions: (1) what three things were particularly good about the CTLC for this activity? (2) what were the three main challenges to using the CTLC for this activity? Open-ended responses to these questions were inductively coded into consensus themes according to the method of Bennett (2003). Prior to completing the survey, students were informed about the purposes of the survey and advised that their participation was voluntary and anonymous.

Focus Group Interviews

Three semi-structured interviews were conducted from six volunteers in Science to gain richer details of their opinions. Students were requested to elaborate on: what three things were particularly good about the CTLC for this activity?; what were the three main challenges to using the CTLC for this activity? Answers were recorded, transcribed, then analysed in terms of content. Each reference to content (a response element) was then deductively coded against the five tenets of co-operative learning, so that the number of responses per tenet could be reported. Coders used the following types of information to represent each tenet: positive interdependence (sharing of goals, resources and products of work); face-to-face communication (reaching group consensus around issues); collaboration (the social skills of social skills of listening, asking and answering of questions, giving and receiving explanations and helping one another); independent accountability (equitable sharing of group responsibilities demanded by the assessment); group processing (reflectively evaluating their group's progress). One author (ID) and one Research Assistant independently coded these data tallying the number of relevant comments from each interviewee under each of the five tenets. In order to demonstrate consistency of interpretations, an interrelater reliability coefficient was calculated.

Results and Evaluation

Academic achievement

Most students achieved highly on their Drug Dependence Technical Report: Science (2005) mean \pm SD = 79.5 \pm 14.8%, n = 232; Pharmacy (2006) mean \pm SD = 83.3 \pm 13.6%, n = 186. Student t -tests indicated no significant difference in the mean scores from two markers. Results from Science students were clearly higher than the scores from multiple choice questions the

previous year: Science (2004) mean \pm SD = 57.8 \pm 25.7%, n = 253. (Results from Pharmacy were not available.)

Student Perceptions

Closed Survey Items

The closed survey questions were answered by 136 (59%) of Science students and 137 (74%) of Pharmacy students. The Cronbach α coefficients were 0.972 and 0.970 for Science and Pharmacy, respectively. This very strongly indicated that survey items reliably measured the four survey themes. The median values were significantly different from the scale midpoint across most of the four survey themes. A range of opinions was evident but with clear patterns in students' perceptions more evident with Science than Pharmacy students. Almost all students from both Science and Pharmacy reported they had never previously used the CTLC.

Regarding the CTLC, most Science students reported that the physical work location and specifically, the CTLC (and including the resources) helped them learn effectively. While the Pharmacy students valued physical space, most were less committed about their enjoyment and value of the CTLC for learning (the Drug Dependence module). For both student cohorts, being able to work in a group at university was valued for non-assessable tasks but less so for assessable coursework. Nevertheless, when completing the module assessment, most students from both cohorts reported they worked by supporting one another, sharing goals and resources, fairly assigning roles and making consensual decisions. Science students felt they also evaluated goal achievement within their groups more so than Pharmacy students, although the latter felt their groups learned about Pharmacology more effectively than using other methods. Most students reported they enjoyed working in their group and reported a responsibility to contribute to group work. Most students did not express strong opinions about allocating individuals within a group the same mark, and that the group-based task was more effective than other methods for learning Pharmacology.

Open Survey Items

Fifty-nine percent of Science students (n = 136) further reported that working in their groups (43% of responses); the resources (23% of responses) and information they were able to access (11%) helped them most to complete their assessment. Fewer Pharmacy students included further comments on this section of the survey (30%, n = 55). However, being able to work together (35%); working to defined time constraints (26%); and access to resources (17%) were considered helpful.

The main reported challenges for Science students included time constraints to completing the assessment task (43%); understanding the task which was new to them (23%); and difficulties working in their groups (11%). For Pharmacy students, the main challenges were the time constraints (63%); researching and writing their reports (13%); and clarity of the task (9%). Coders of these open survey response reported an overall inter-rater reliability coefficient of 0.94. For both student cohorts, about 24% of answers could not be grouped by coders to define a single category.

Focus Group Interviews

For Science students only, their elaborated answers from the three focus group interviews were deductively coded against the five tenets of co-operative learning (Table 1). Coding of most of the 171 response elements represented group processing (42%), followed by positive interdependence (40%), independent accountability (39%), face-to-face interaction (29%) then collaboration (21%).

Table 1 Deductive coding of transcribed interview data from Science students expressing positive and negative opinions

Themes	Number of response elements (n = 171)	Percentage of responses	Sample from focus group interviews
Group processing	42	25	<p><i>So to look at articles ...when we're searching for them how to find stuff quickly and to like skim it quickly and the abstract and stuff to decide if we thought this one was any good.</i></p> <p><i>...in our group there was not a lot of talk it was very much well I've found this and then silence.</i></p>
Positive interdependence	40	23	<p><i>...and making sure that everyone is doing the right thing because like if you head off on the wrong tangent and then keep going for three hours you would end up with a completely wrong assignment.</i></p> <p><i>Everyone just kind of trusted everyone else to know what they were talking about I think.</i></p>
Independent accountability	39	23	<p><i>...while one person was typing their stuff in there we'd be working on something else.</i></p> <p><i>... so you've done your part and you still had to wait on the others to finish to get it all typed up and formatted properly, it just takes a lot of time and three hours is maybe not enough.</i></p>
Face-to-face interaction	29	17	<p><i>It's not you know always straight lines all the time. It sort of works you know like in the pods idea where it's more circular rather than you're all in straight lines. It's easier to talk to people and that sort of stuff.</i></p>
Collaboration	21	12	<p><i>We basically went through and volunteered, ...and that basically meant that we could go off and you were doing something that you wanted to do and not something that was thrust upon you.</i></p> <p><i>...and then if someone doesn't want to do well and then their group members are rude then they're not going to want to do well or put in the extra effort.</i></p>

Discussion

This study collected data around two questions:

Can the CAL-based Drug Dependence module be re-designed for the CTLC to facilitate effective group learning in Science and Pharmacy undergraduate cohorts?

CALs have been an excellent resource in undergraduate Pharmacology to expedite learning in large class settings where they can supplement or sometimes replace animal-based experiments. We have reported here how they remain a useful resource, capable of being modified to suit local educational design constraints. Importantly however, the effective use of CALs in this study was underpinned by principled teaching and learning practices. The Jigsaw pedagogy required high levels of effective interaction among students, while the criteria sheet provided transparent and valid criteria and standards for all students. Students who were experts in researching animal models were the main CAL users. They were able to share with “animal model experts” from other groups, their understanding of pharmacological experiments associated with depressant and stimulant classes of drugs. Subsequently, these students further contributed to teamwork by teaching their peers about the models and co-writing the Technical Report. Both the Science and Pharmacy cohorts achieved high academic results for their reports. These were higher than for the 2004 assessment of Drug Dependence based on multiple choice questions in the end-of-semester exam. Thus although the student year groups were different cohorts, an increase in the mean scores by more than 20% was clearly large.

What are the perceptions of Science and Pharmacy students around the CTLC and the new co-operative assessment task?

Survey responses from Science and Pharmacy cohorts and focus group interviews (Science students only) reflected their broad support for using the CTLC and the Jigsaw-based group work. Most students completed the surveys. Science more so than Pharmacy students, enjoyed the new CTLC facilities and reported that the facilities helped them to learn (Fig. 3A). Both cohorts valued group work and enjoyed working in their groups (Fig. 3D) but especially when the tasks were not summatively assessed (Fig. 3B). The reasons for these latter opinions were not further explored but many students perceive that allocating one mark to the whole group was unfair (Fig. 3D). Open survey responses from fewer students from both cohorts identified working in their group and the resources afforded by the CTLC were most important in completing group-based assessment.

From this profile of opinions, it can reasonably be inferred that students felt their groups were working co-operatively while completing the Drug Dependence assessment. Both cohorts reported behaviours consistent with effective group-based learning (Fig. 3C). Specifically, students indicated that they shared goals (positive interdependence), collaborated around the use of resources, made consensual decisions (working collaboratively), were able to assign roles fairly (independent accountability) and, to some extent, evaluated how effectively their group achieved their goals (group processing). The many episodes of face-to-face communication during completion of the task were clearly facilitated by the use of circular tables and open spaces to move freely from group to group or individual to individual.

The coding of transcripts from three focus group interviews provided ‘thicker descriptions’ from some Science students about their perceptions of the CTLC when completing the task. The large number of individual comments reflected a range of opinions. Most were favourable towards using the CTLC for the Drug Dependence group work. Reinforcing the survey findings,

the coded interview comments were highly consistent across two coders, and supported the inference that students felt they worked co-operatively (Table 1).

This consistent perception from most students about how they worked does in itself, not prove that they did interact at all times with high levels of co-operation. Both cohorts identified that there was too little time to complete the task and that they had difficulties in following the task requirements. It is not surprising that students used to traditional teaching and assessment modes, may be challenged by more student-centred approaches and tasks. This common experience has been formally reported in other studies (Taylor, 1986). However, teaching and learning innovations which use ICT to encourage learner autonomy are more prone to causing disorientation and stress in those students whose learning approaches are surface or strategic (Akerlind and Trevitt, 1999).

We have responded to these concerns of students by subsequently adapting the co-operative assessment task for the Drug Dependence module. The second phase of this study focussing on the 2006 Science cohort, describes how group learning was more effectively supported, and how peer teaching as a key feature of co-operative learning, was demonstrated to support learning about Drug Dependence.

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