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Using collaborative learning to develop transferable skills

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Abstract: *A multi-dimensional, team-based assignment was given to a class of 68 Environmental Systems students at Flinders University, South Australia. A collaborative learning approach was designed to facilitate the students' development of transferable skills appropriate for potential future employment in the environmental management sector. At the outset a number of students verbalised their dislike for group work. On completion of the assignment, a review process found that 90% of the class felt that they had performed 'well' or 'very well', and reflected that they had learnt new skills from peers or had a deeper understanding of teamwork processes. Students predominately viewed their experience in a positive way with comments such as 'we had fun and got along well'. The success of this cooperative learning exercise can be attributed to a number of factors. First, the assignment was multi-dimensional, the successful completion of which required a range of research, communication, practical, computer, and creative skills (i.e. the task was more suited to group work than individual work); secondly, in the embryonic stage of the assignment a framework was established that assisted with the identification of individuals' strengths and interests; and finally, the use of a group 'charter' served to assist goal setting for the assignment.*

Keywords: *Collaborative learning; transferable skills; skill diversity.*

Students need to learn teamwork strategies for their future employment (Assiter, 1995; McGrath, 2000; Vik, 2001). For this reason, second year environmental students at Flinders University were assigned an authentic, collaborative learning-based project. This paper explores the student perceptions of the collaborative learning process, and student reflections on transferable skills gained as a result of using this methodology.

An objective of the topic was for students to develop transferable skills appropriate for the environmental management sector. This objective is supported by research that suggests collaborative learning exercises can develop transferable skills required in future careers (Houghton & Kalivas, 2000; Napier & Gershenfeld, 1999).

Asking students to work collaboratively in teams was not a decision taken lightly. Research suggests that collaborative learning encourages students to take responsibility and become

active seekers of knowledge, rather than passive recipients (Johnson, Johnson, & Smith, 1998; Ledlow, 2001; McCormack, 1995; Napier & Gershenfeld, 1999). Ideally, students learn to depend on one another rather than exclusively on the authority of the teacher (Bruffee, 1993; McCormack, 1995). Students frequently, however, report a dislike for “group work” (Bacon, Stewart, & Silver, 1999; Dyrud, 2001). A major source of group conflict occurs when more responsible team members complete the work and others share the credit. This phenomenon has been termed “social loafing” (Guerin, 1999) or “freeloading” (Brooks & Ammons, 2003; Garrett, 1998; Heathfield, 1999). Other forms of group conflict result from lack of class time for team activities or a lack of adequate training in team skills such as communication, and management strategies (Dyrud, 2001; McGrath, 2000; Vik, 2001). Consequently, a conscious effort was made to design a collaborative learning activity that focused not only on the academic content of the topic, but also attended to the social and inter-personal components of teamwork.

The assessable component of the topic was a challenging, multi-faceted project, authentic to those in future workplaces. In keeping with characteristics of collaborative learning, students were given a high degree of control over their learning (Bruffee, 1993; Cooper, 2000; Ocker & Yaverbaum, 2001). Students were required to form teams, structure their activities to complete a range of tasks, designate roles, provide knowledge input and resources, conduct assessment and ultimately identify what they had learnt. Teachers acted as facilitators. The individual students’ skills and experience, brought into each team, created a natural division of labour, which in turn created interdependence. Through social interdependence and support (Steiner, Stromwall, Brzuzy, & Gerdes, 1999) students could work together to produce one learning product, make best use of existing skills and experience, and learn from each other.

This paper describes student attitudes toward this collaborative learning activity and how their experience might contribute to the development of skills required for future employment. The research instruments and examination questions upon which this paper is based are described and analysed in the following discussion.

The context

Environmental Systems is a second year topic, and while the class comprised predominantly second year students, postgraduate and undergraduate students in their third year of study were also enrolled from a number of different programmes of study. The diversity of the class in terms of professional and educational backgrounds is illustrated in Table 1. This table is an overview and does not reflect additional diverse personal and social attributes.

The assignment

The project assigned required students to undertake several different tasks. The preliminary activity was to explore a current water management issue in a specified local catchment close to the University. One of the most challenging tasks faced by each team was devising an appropriate research question related to the issue of their choice. To ensure that this was completed, part of the assessment was based on the statement of aims of the research, and an outline of the methods teams would use to support their enquiry. The class was encouraged to apply the practical skills of water quality analysis they had been taught earlier in the topic. On the basis of the findings of their own research, the next step was for each team to produce a high quality, informative brochure. They were instructed to write the brochure in a style that

was appropriate for a broad community readership. The final task of the assignment was for each team to present a seminar to the class based on their project.

Table 1: Diversity of the class

Characteristics	Description	No. of Students
International Students	<i>Countries of origin:</i> Mongolia, Hong Kong, Papua New Guinea, India, Vietnam, USA, Germany, Indonesia, Brazil	10
Age Range	Number of students >25 years Range from 19 to 49 years	24
Degree Programmes	Master of Environmental Management	5
	Bachelor of Science	9
	Postgraduate Diploma in Environmental Management	3
	Bachelor of Environmental Management	30
	Bachelor of Arts	13
	Bachelor of Geospatial and Information Technology	1
	Bachelor of Education	3
	International Exchange/Study Abroad	3
Prior Qualifications	Bachelor of Science - Animal Husbandry	1
	Bachelor of Science - Geology	1
	Bachelor of Education	2
	Bachelor of Arts - World History	1
	Bachelor of Arts - Asian Studies	1
	Bachelor of Architecture	1
	Bachelor of Health Sciences	1
	Bachelor of Mechanical Engineering	1
	TAFE	2
Grade Point Range	(Highest possible = 7) Highest	5.66
	Lowest	1.15

Assessment for the topic was flexible in order to alleviate student concerns of the potential for “social loafers”. The assignment would have been difficult to complete independently, however, students were given the option of submitting an individual written component. This option was not taken by any of the students. A second flexible assessment method adopted, to avoid frustration caused by freeloaders, was an internal team assessment process. Individuals evaluated the contribution of their team members through a formal process. The marks allocated by each student were collated and comprised a proportion of the final grade.

The nature of the assignment was explained to the class of 68 students, who were then asked to self-select teams of a maximum of four people. Nineteen teams were formed. The majority of teams comprised four people (14 of the 19 comprised four people), but there were two teams of three and three teams of two. However, not all students readily formed teams. A few unattached students were asked to form teams from amongst themselves and two international students, who had sought tutoring assistance for the topic, were placed with established teams. There is much debate on the value of teacher allocation of students to groups to ensure a balanced distribution of skills among members (Blowers, 2003; Fiechtner & Davis, 1985), as

opposed to self-selection (Brooks & Ammons, 2003; Mello, 1993). The diverse pool of skills and experience within the student body in the Environmental Systems class countered possible unevenness of skill division between teams.

At the outset, when presented with the team assignment, many students informally indicated their dislike of working in teams. Some students also made reference to this initial dislike in responses to the examination question. For example:

My own personal advancement was threatened if the group performed badly. All four in the team had similar fears and suspicions of the others and we were able to overcome this by improving our communication skills and exerting a certain degree of frankness.

To limit group conflict, Jaques (2001) recommends that newly formed teams be offered some assistance to help them achieve cohesion and to set direction. Consequently, a framework was established for the Environmental Systems class to assist them with the identification of individuals' strengths and interests and to help them agree on a team goal. Several exercises were adopted, designed by University of Technology Sydney, to encourage students to think about what was involved in undertaking team work before and during the team project.

The preparatory exercise consisted of a *pro forma* that encouraged students within each team get to know each other (UTS, 2002a). The schedule of questions gathered information about each student's abilities, anticipation about teamwork, likes and dislikes, and how these could be used to the benefit of the assignment. A team "charter" (UTS, 2002b) was introduced to the teams during the preliminary stage of the assignment. The charter overtly recorded the strategy for team process and function (for example, the regularity, location, and length of meetings), and a vision and a target for achievement. Furthermore, it provided the team with some insurance by getting each team to construct a predetermined plan of action should a difficult or dysfunctional situation emerge. Each member of each team signed their charter and was encouraged to keep a personal copy for reference. Completion and submission of the charter formed part of the final mark for each team.

Data collection

A student review of this collaborative learning approach was undertaken using two short review questionnaires three quarters of the way through the topic. The questionnaires were developed by the University of Technology, Sydney, and accessed with permission from their website [http://www.iml.uts.edu.au/learn/teach/enhance/groupwork/resources/IML_groupwork_teamreview.pdf] (UTS, 2002c). The first questionnaire comprised fourteen questions. Ten questions used a Likert rating scale of **1** being *not performing well* to **5** *performing very well*; five open-ended questions gave opportunity for comment. Individuals were asked to rate their team independently on aspects such as working together in their group, commitment to the groups goals, effectiveness of meetings, communication, ability to meet deadlines, shared workload, motivation, their strengths and weaknesses, likes and dislikes, and their team's overall performance. Once the individual questionnaires had been completed, students were asked to rejoin their team and a second questionnaire comprising three open-ended questions was administered for completion within teams. The purpose of the exercise was for teams to reach consensus of key strengths, and areas needing improvement for a better collaborative effort, and to identify how that might be achieved (UTS, 2002c).

The perceived value of participating in a collaborative learning activity and the development of transferable skills were further monitored through two questions in the final examination. The first examination question required students to list the skills they gained through the assignment. In a second question students were required to consider how they would approach potential future team tasks in an employment situation to achieve maximum productivity and efficiency, and minimum frustration (Pearce, Clarke & Gannaway, in prep). Student perception gathered in this manner might be considered the “correct” answer to the examination question. Student response was, however, remarkably candid and supported the data gathered via the questionnaires.

Data analysis

Table 2 shows that of the 68 students enrolled in the topic, 54 individual and 19 group questionnaires were returned. Not all groups or individuals answered all questions. Quantitative and qualitative responses from the two questionnaires and the examination were analysed. The results are presented in the next section. Numbers of comments or responses provided by students for a particular question are indicated in Table 2. Table 2 shows that the maximum number of comments from open-ended comments from the group questionnaire was 57. Closed questions within the individual questionnaires were answered by 54 students. Some students provided multiple ideas within the open-ended questions of the individual questionnaire - these ideas were treated separately and sorted by themes. The number of comments from the open-ended individual questionnaires is therefore greater than the number of returned questionnaires, for example, four open-ended questions generated 65 ideas. Sixty-one students completed the examination questions.

Table 2: Nature and number of responses obtained through the two questionnaires

Type of Questionnaire	Nature of Questions	No. of Responses (n)
Group	Open ended responses: Groups ranked their top 3 strengths and top 3 weaknesses: 19 groups x 3 = 57 comments	19 questionnaires returned, with 57 separate comments (i.e. n=57)
Individual	Closed Likert scale responses	54
	Open ended responses: Individuals provided multiple responses	65 comments (i.e. n=65)
Examination	Two open ended questions	61

Results and discussion

The individual questionnaire resulted in 46% of the respondents giving a rating of *performing well* and 44% giving a rating of *performing very well*, i.e. the majority of students (90 %, n=47 of 54) reported that they thought their team was performing either *very well* or *well*.

When individual students were asked what they liked best about their team, the most common response was that they *got along well* and *worked well together* (35%; n=23 of 65 comments). Some responses indicated the exercise was enjoyable:

- “The ability to have fun - particularly doing the fieldwork”
- “Had fun doing the assignment”
- “Had great fun together”

Conversely, for a couple of teams who had enjoyed the assignment, and the opportunity for social interaction that the project presented, *being friends* and *being too nice to each other* was seen as a hindrance to productivity.

The criteria: *commitment to the team's goals* was selected by 48% (n=26 of 54) of students as the major strength of their team and by a further 37% (n=20 of 54) as a moderate strength. Of all the criteria listed, this aspect received the second highest ranking from students rating their team's performance. *Commitment to the team's goals* was nominated by 25% of individual students as something they liked best about their team (n=16 of 65 comments).

The responses on the team based questionnaire closely agreed with the individual questionnaire results. Key reasons provided in the questionnaires by students to why their team worked well included:

1. having a commitment to a goal (n=16 of 57; 28%)
2. sharing similar goals' (n=13 of 57; 23%)
3. sharing ideas, skills and resources (n=10 of 57; 17.5%).

The value of the initial framework created via the charter is predominantly the reason for successful teams, particularly *commitment to the goal*, and *sharing similar goals*. This was reiterated in the student responses to the examination question in comments such as:

At the beginning, I was a little worried about if we could work in a harmony because of our different backgrounds. However, the first two meetings corrected my thoughts and made me confident to work with other team members. It is important that the team charter and target sheet that we had to fill in during the lecture gave everyone in the team a clear and common target of the project. They provided a great opportunity for us to understand each other and made everybody know his/her own strengths and responsibility in the team through the step by step questionnaire.

Prior to the formation of teams, students were not specifically asked to identify their individual capacities for the task that lay before them. Implementing the charter provided the opportunity for students to explore the resources within the team.

Development of transferable skills

While there is argument for teacher allocation on the basis of abilities to ensure successful teamwork (Bacon, Stewart & Silver, 1999; Blowers, 2003), the authors of this study found a situation where self-selected teams successfully developed a group product while making productive use of team skills. It is acknowledged that this was partly due to the diversity of skills within the class. The study found that the majority of students perceived their teams to be successful, either through the quality of the end product, the team dynamics in developing that product, or the skills learnt in the process and the ability to draw on each other's skills.

The range of skills represented within different teams was recognised and appreciated by individual students: individuals stated (10 of 65 comments; 15%) that the sharing of skills and resources was something they liked best about their team.

- "All individuals in our team managed to put together our individual strengths to capitalise in the areas we thought we were the most proficient"
- "A diversity of team members ... from different countries, backgrounds or gender ... mean members have different strengths and weaknesses to provide a team with more

abilities. Therefore the strength of each member can be drawn upon to result in a better project”

These responses indicate that collaborative teams are capable of delineating tasks, and in fact, if given sufficient opportunity at the outset to discuss expectations and approaches to team effort, individual capacity tends to be recognised and tasks allocated accordingly.

In the examination students also identified that they developed a range of new skills through the team assignment. Some of these were acquired from a team member proficient in a particular area (e.g. computing) and some by independent effort in order to contribute to the final product. Comments illustrating this are shown below.

- “I gained a variety of different skills through working on the team assignment”
- “I learnt some different skills that will help me in future team assignments”
- “The team assignment was a good learning experience that taught me more than just practical skills but also working together with other people skills”

Students also had the advantage of acknowledging that they already possessed certain skills, for example, of the students who took a leadership role in the teams, many had not previously recognised or articulated this previously as a personal attribute. The reflective review process of the examination questions encouraged students to think about the processes of their own learning and not simply the content of the topic. Students were required to identify the skills that they had developed. According to the 61 student responses, particular skills gained from this assignment include those outlined in Table 3.

Table 3: Skills gained from the collaborative assignment

Skills Area	Specific Skills as identified by students (Number of students)
Research	<ul style="list-style-type: none"> • Ability to construct a research question, with the key elements being a water focus and of relevance to the local community (n=54) • Ability to conduct a review of current and appropriate literature on the chosen topic from diverse sources (n=3)
Interpersonal	<ul style="list-style-type: none"> • Subdivision and allocation of tasks within the team (n=61) • Communication and negotiation skills with peers (n=61) • Leadership (n=14) • Teamwork skills (n=33) • Communication skills with people in authority (e.g. Board members) (n=4)
Professional	<ul style="list-style-type: none"> • Organisational and time management skills – the students had diverse lecture and work timetables, and a limited period in which to complete the assignment (n=61) • Public speaking – convey the message in a 15 minute period (n=15) • Ability to answer questions from the audience (n=1) • Ability to articulate their own learning process (examination) (n=1)
Practical	<ul style="list-style-type: none"> • Field observation and environmental water sampling skills (n=13) • Map reading skills (n=7) • Write in a way that the community could understand an environmental issue (n=32) • Convey the message (on an environmental issue) in a succinct manner – 4 pages in total including all figures (n=7)
Computing	<ul style="list-style-type: none"> • Use a digital camera, download pictures onto a computer, insert pictures into documents (n=3) • More effectively use of web based database search engines (n=10) • Design the layout of information in the form of a visually stimulating/attractive brochure (incorporating graphics) (n=15) • Computer software skills (e.g. Ability to compile a PowerPoint presentation) (n=19)

On reflection, for future teaching

The charter, while useful for goal setting and identification of personal attributes suitable for group work, fell short of structuring teams' progress throughout the assignment. For example, students commented that their groups lacked professional skills such as time management (n=12 of 19; 63%) and project planning and management (n=9 of 19; 47%). The review process consequently has the additional value of informing teachers of curriculum design changes required for future assignments. In future, an additional activity could be built into the assignment that requires teams to prepare a structured time line of milestones for their project.

Conclusion

The collaborative learning approach in this study clearly encouraged interdependent and active learning, independent of a designated authority or "teacher" role. In order to alleviate individual student concerns regarding teamwork and to facilitate the functioning of teams, support was built into the topic by providing a framework and devoting workshop time for student goal identification and later for reflection on the process. An analysis of student perception via individual and team questionnaires indicated that students were aware that collaborative learning was effective in increasing their skills base. Students felt they produced a good quality product. Individually, many students indicated that their repertoire of skills had been broadened as they learnt from others in their team. Furthermore, many students' own individual strengths and skills had been enhanced during the process. The conditions of the teamwork had allowed such abilities to be revealed, and through this many students had gained self-confidence.

The success of this activity is a result of several factors: the multi-dimensional nature of the activity; a class with diverse backgrounds and skills; and the initial "framework" that led students to identify the range of abilities and interests within each team. The charter enabled the students to identify their own personal strengths and thus contribute strongly to that aspect of the assignment. The charter was instrumental in establishing commitment to tasks from the outset of the assignment, and it provided groups with a safety net. Each of these factors contributed to an assignment that has proved to be effective in developing transferable skills.

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