



UNIVERSITY
OF WOLLONGONG
AUSTRALIA

University of Wollongong
Research Online

Deputy Vice-Chancellor (Academic) - Papers

Deputy Vice-Chancellor (Academic)

2003

Collaborative Design Projects: Evaluating Students' Online Discussions

S. R. Lambert

University of Wollongong, slambert@uow.edu.au

Publication Details

This conference paper was originally published as Lambert, SR, Collaborative Design Projects: Evaluating Students' Online Discussions, *Integrate, Interact, Impact: Proceedings of the 20th Annual Conference of the Australasian Society for Computers in Learning in Tertiary Education (ASCILITE)*, Adelaide, Australia, 7–10 December 2003, 293-303. Copyright Lambert 2003. Original conference paper and copyright statement are available [here](#)

Research Online is the open access institutional repository for the University of Wollongong. For further information contact the UOW Library: research-pubs@uow.edu.au

Collaborative Design Projects: Evaluating Students' Online Discussions

Abstract

This paper reports on the author's work to evaluate student online discussion, a learning tool used in a face-to-face graphic design subject centred around a collaborative design project. A modified teaching and learning model with new online resources was trialled with approx 45 undergraduate design students in session 1 of 2003. The 4 students in each project team were allocated a specific role based on contemporary design studio practice. An online discussion space was set up for each project team. A number of evaluation techniques were used including a content analysis of online discussion postings on which this paper focuses. Results show that, within the context of a collaborative task supported by clear team roles, the discussion space effectively scaffolded engagement, team development, communication, feedback and problem solving. While useful trends have been noted, the evaluation model used was not sufficient to explain variations to trends. The evaluation methodology needs to be modified for blended teaching model to include analysis of both face-to-face and online activity.

Keywords

Evaluation, online collaboration, online discussion, design students, undergraduate, team-work, group-work, blended teaching model, experiential learning

Disciplines

Arts and Humanities | Curriculum and Instruction | Instructional Media Design | Other Education | Social and Behavioral Sciences

Publication Details

This conference paper was originally published as Lambert, SR, Collaborative Design Projects: Evaluating Students' Online Discussions, Integrate, Interact, Impact: Proceedings of the 20th Annual Conference of the Australasian Society for Computers in Learning in Tertiary Education (ASCILITE), Adelaide, Australia, 7–10 December 2003, 293-303. Copyright Lambert 2003. Original conference paper and copyright statement are available [here](#)

INTERACT INTEGRATE IMPACT

Proceedings of the 20th Annual Conference
of the Australasian Society for Computers in
Learning in Tertiary Education (ASCILITE)

Adelaide, Australia
7–10 December 2003

Editors

Geoffrey Crisp, Di Thiele, Ingrid Scholten, Sandra Barker, Judi Baron

Citations of works should have the following format:

Author, A. & Writer B. (2003). Paper title: What it's called. In G.Crisp, D.Thiele, I.Scholten, S.Barker and J.Baron (Eds), *Interact, Integrate, Impact: Proceedings of the 20th Annual Conference of the Australasian Society for Computers in Learning in Tertiary Education*. Adelaide, 7-10 December 2003.

ISBN CDROM 0-9751702-1-X WEB 0-9751702-2-8



Published by ASCILITE www.ascilite.org.au

COLLABORATIVE DESIGN PROJECTS: EVALUATING STUDENTS' ONLINE DISCUSSIONS

Sarah Lambert

Centre for Educational Development and Interactive Resources (CEDIR)
University of Wollongong, AUSTRALIA
Sarah_lambert@uow.edu.au

Abstract

This paper reports on the author's work to evaluate student online discussion, a learning tool used in a face-to-face graphic design subject centred around a collaborative design project. A modified teaching and learning model with new online resources was trialled with approx 45 undergraduate design students in session 1 of 2003. The 4 students in each project team were allocated a specific role based on contemporary design studio practice. An online discussion space was set up for each project team.

A number of evaluation techniques were used including a content analysis of online discussion postings on which this paper focuses. Results show that, within the context of a collaborative task supported by clear team roles, the discussion space effectively scaffolded engagement, team development, communication, feedback and problem solving.

While useful trends have been noted, the evaluation model used was not sufficient to explain variations to trends. The evaluation methodology needs to be modified for blended teaching model to include analysis of both face-to-face and online activity.

Keywords

Evaluation, online collaboration, online discussion, design students, undergraduate, team-work, group-work, blended teaching model, experiential learning

Introduction

In November 2002 the author assisted Marius Foley from the Faculty of Creative Arts in writing an Educational Strategies Development Fund (ESDF) application to develop and trial collaborative tools and processes for teaching undergraduate design students at the University of Wollongong. The requested funds were to pay for teaching relief for the lecturer (Foley) and to cover the costs of the Learning Designer (the author.) Confirmation of the application's success was received in December 2002 enabling both to commit 3-4 hours per week to the project above face-to-face class time in 2003.

Developing the ESDF project has allowed a collaborative teaching model to be modified and renewed to fit current teaching and professional contexts. The project built on work done by Foley since 2001 to focus students on team-based work practices over 13 weekly on campus teaching sessions. However in response to evaluating previous classes, in 2003 more scaffolding supports were developed for the students including online tools and resources, and assessments were modified to reflect this (Lambert & Foley, 2003). The aim of these interventions was to: increase student satisfaction and engagement with group work; facilitate student group work especially work done out of class time; and to provide equity in marking of group work by making it more transparent. A teaching website powered by WebCT ("WebCT site") was deployed for the first time in which a discussion space was a key component.

The usefulness of the teaching model and support resources were evaluated using a number of different techniques. This paper focuses on the evaluation of the online discussion space. The hypothesis was that the online discussion space was useful for creating, communicating and collaborating, and encouraged the students to engage with the project collaboratively out of class time.

Collaboration in the context of design and design education

Despite the well documented problems with group-work (Lea, Rogers, & Postmes, 2002) and collaborative learning groups (Salomon & Globerson, 1987), collaboration remains central to both professional design practice (Schrage, 1995) and the teaching of design (Gleeson, 1996.)

“Groups accomplish tasks that can not be done by individual alone; they bring multiple perspectives to bear on a single problem; they capture the dynamic of real world complexity; they provide a vehicle for decision making and taking; and they impose an efficient means of organization control over individual behaviours.” (Baskin, 2001, p. 265)

As Baskin has noted, collaboration has potential benefits across both *practical* and *creative* domains. In practical terms large tasks can be accomplished in less time than if one person was responsible for it. In creative terms the quality of the finished product is improved due to the potential for creative synergy in solving the client’s design problem. Creative synergy occurs when the best ideas from many perspectives feed off each other to create an enhanced product - the outcome represents more than the sum of the parts. As Schrage has noted in the context of the design industry, “...the new reality is that it will take the collaborative efforts of people with different skills to create innovative solutions and innovative products” (Schrage, 1995).

However, every designer can tell a tale or two of a design job gone horribly wrong due to problems with the team: quality/quantity of work, clash of personalities, power struggles, and poor communication. When designers find a good team they often stick with them, joining to form companies or less formal networks - these days often with only a virtual/online shopfront - to pool talent and work together on client projects (Johnstone, 2002).

Reviving collaborative learning with online learning supports

In recent times the benefits of collaborative learning have been shown to extend to the online environment (Hron & Friedrich, 2003) and according to Baskin is undergoing somewhat of a revival.

“Unsinkable ships, Volkswagens and collaborative group work have much in common. They have each undergone a recent revival of sorts; in each case the new version bears a strong Wittgensteinian resemblance to its more classic predecessor; and in each case the end user is able to enjoy the nostalgic experience of having once again rediscovered the wheel.” (Baskin, 2001, p. 265)

As the medium documents group processes, the literature also shows that the online discussion forum can overcome the lack of transparency, which can blight collaborative learning groups (Baskin, 2001.) A teacher reading through the discussion threads can easily spot the student not pulling their weight, and those contributing frequently and well.

Also, it has been noted that in online discussions students will have “more time to reflect on course content and make in-depth cognitive and social contributions to the class that would be nearly impossible in a regular college classroom. In addition, such conferences can ready students for in-class activities and events.” (Hara, Bonk & Angeli, 2000, p. 24)

There are some similarities to this project (referred to as ‘the ESDF project’) with the work done by researchers who are looking at largely online collaboration where part or all the student cohort are studying off campus (Hron & Friedrich, 2003; McLoughlin, 2002). The ESDF project discussed here

also treads similar territory to the work of Hara and Bonk (2002) in that the teaching context is a blend of regular face-to-face teaching supported by online tools and resources, particularly an online discussion space. This is sometimes referred to as a “blended teaching model.”

Task and system design

At the heart of the task design for the ESDF project is the idea of roles - clearly defined and documented task roles. As with previous classes, students were put into teams of 4 based on a range of their abilities, using a survey of their career intentions. High and low performing students were mixed together (based on previous results.) They were also allocated defined roles that mirrored those of a conventional graphic design studio-art director, designer, production or traffic controller and client liaison. The teams then worked on actual design jobs, sourced from a number of not-for-profit groups.

It was hoped that allocating each of the 4 team members a role and defining/documenting those roles would provide adequate scaffolding to enable the students to actively engage in the collaborative process, and to get over the inertia and group formation problems noted by many researchers (Tuckman & Jensen, 1977; Maples, 1988; Gersich, 1989.)

While the students were assessed as a group, the assessment procedures set up with an opportunity for an individual design response (worth 30% of the overall mark) that would lead into the team work, and that they could justify their own contribution to the team in a group report (worth 20%). (Lambert and Foley, 2003.)The online discussion space was crucial to documenting individual effort and group process.

In another similar study involving students collaboratively developing a piece of computer software (McLoughlin, 2002) a different system design was used to structure or scaffold student communication, a similar concept to “rules-based communications” (Hron & Friedrich, 2003.) Discussion threads such as “stating progress”, “developing a testing strategy” and “allocating responsibility” were set up for the students to use. While these complement the task design, the evaluation showed that the “Bulletin Board did not scaffold successful collaborative learning for all groups... and did not demonstrate effective communication processes” (McLoughlin, 2002.)

Bonk’s “starter/wrapper” model represents different task and system design, allocating a role usually performed by the teacher (ie starting and wrapping up the online discussion) to a different student each week (Hara et al, 2000.) This model is often used when the pedagogical aim of knowledge formation (assessing and integrating or rejecting new information) is central to the task design of collaboratively producing a research report on a given topic. The “starter/wrapper” model represents an interesting shift of the power relationship between teacher and student, where the leader/follower model is maintained but the students take turns to be the leader.

With the roles-based task design used for the ESDF project, the voice of the teacher or leader is absent from the discussion space except for 1 or 2 administrative posts. The space is owned by the student team, which allows for the formation of a distinct team identity, which has in turn been linked with motivating members to apply effort for the benefit of the group rather than putting individual concerns first (Hara et al, 2000; Lea, Rogers & Postmes, 2002). As Lea et al have noted, “individuals who categorize themselves as part of the group are likely to engage in *socially* self-enhancing behaviour, such as making mutually supportive coordinated contributions They are also more likely to compensate for other group members’ shortcomings by helping out or doing extra work. In collective tasks they engage in social labouring (striving to improve the fortunes of the group as a whole.) Clearly these kinds of behaviours are highly desirable.” (Lea et al, 2003, p. 55)

Teams and groups are not the same thing

For the purposes of this paper I define a group as any loose collective of individuals, where as a team is a group of individuals who as a result of prioritizing a common goal above individual goals (after Lea) make mutually supportive coordinated contributions and engage in social labouring to benefit the

group as a whole. The term collaboration is often used in the context of creative industries regarding the development of software, websites, logo or packaging design, building plans and so on (Schrage, 1995.) For the purposes of this paper I use the term collaboration to refer to a particularly complex and lengthy team-based task with a primary tangible outcome that is more than a written report. In our study the students' primary tangible outcome are websites or brochures (involving imagery and texts) for a real client. Group and individual reports are secondary outcomes. Therefore, for this paper I do not use the term collaboration interchangeably with team-work or co-operative learning.

Evaluation plan

The trial of the ESDF project with 45 3rd year undergraduate students was undertaken February - July 2003 and included both formal and informal evaluation. Informal elements included: weekly monitoring of the online discussion space by both teacher and author; teacher's observation of student progress during face-to-face class time; and feedback from teacher and clients about the students' completed work.

As per the University's Office Of Research Ethics Committee, student permission was sought by the author for: an online survey of student experience deployed at end of session; and content analysis of the student online discussion postings.

Informal evaluation: outcomes

As the following quote illustrates, a number of conclusions were reached from the observed behaviour of students in the classroom and online combined with an assessment of the final project undertaken by teacher and client.

“There was an immediate uptake of the new technology ie online discussion forum across the class, ... which suggested that the students were willing to engage with the technology and could appreciate it as a common, collaborative space. It was evident by regular visits to the discussion space that the sharing of ideas and images, and feedback on the shared items was happening, albeit at differing rates, in all the project groups. It was seen as place where they could easily communicate, transfer files and track the progress of their teamwork...One of the most important pedagogical outcomes from the trial was that the student's work and their input into the site was consistent over the 13 weeks. This reduced the last minute frenzy that normally characterises student work and focussed the student's attention on the design process, not just the final outcome. Interestingly the design outcomes were also of a high professional standard, evidenced by the feedback from clients” (Lambert and Foley, 2003.)

Formal evaluation of discussion postings: methodology

There were 4 phases to the analysis of discussion postings.

Phase 1: Read the logs and get a feel for the data, look at number of postings, draft evaluation criteria

Phase 2: Evaluate pattern of communications, look at new vs reply messages and use of attachments

Phase 3: Qualitative analysis of content, breakdown the aim of postings

Phase 4: Review logs for evidence of linkages to face-to-face activities

Phase 1

Student permission was granted to analyse postings from 6 out of 14 groups (N=518 or 61.8% of all postings.) The research period was from after the mid-session break - from week 8 to week 13. Where not all group members gave their permission the data for the whole group was excluded from the analysis.

Firstly, as Table 1 shows, the number of postings was counted, averaged over 6 weeks, and related not to project outcome but to team standard - the label 2H for example means 2nd high performing team. The team standard rating was based on the lecturer's assessment of the group report submitted at the end of the student project. The group report outlined individual roles and contributions, and team process. The

team standard rating followed Lea et al's criteria: "...the aim is not just to produce a good group product (by whatever means) but to ensure that *every* member of the group contributes effectively and is involved in producing the group outcome." (Lea et al, 2002). Note that the use of the labels M and H was done at the data analysis stage as a way to try and locate trends in the medium and high performing teams. Some other teams who did not do so well in terms of team performance declined to be included in the study.

Permission granted, included in data	Total postings (N)	Av. weekly postings	Team standard
Group 1H	121	5.0	High
Group 2H	46	1.5	High
Group 3H	26	1.4	High
Group 1M	196	8.2	Medium
Group 2M	27	1.1	Medium
Group 3M	102	4.2	Medium
Postings included in data	518		
Postings excluded from data	320		
Total postings	838		

Table 1: Results of Phase 1, number of discussion postings per group, team standard

The only trend visible from this comparison is that too few (1.1) or too many (8.2) postings per week may separate medium from high team performance. The highest performing teams ranged from 1.4-5.0 messages per team member per week. These results begged the question, is 8.2 messages per team member per week too high for the task size? Is it an indication of task or team problems?

Phases 2

To investigate team communication patterns, quantitative data was extended to counting the number of new versus reply messages and the use of attachments by each team.

The pattern of communication amongst these medium-high performing teams was expected to include: numerous replies to each new posting and predominant use of attachment with new messages. This would support the hypothesis that the student's used the online discussion space for sharing and responding to information including images.

Phase 3

The purpose of communication amongst these medium-high performing teams was expected to include some evidence of higher order learning such as collaborative problem solving and analytical or reflective feedback. A certain amount of socialisation was expected, as "By showing appreciation and encouragement to other members in the team, [high performing teams] created emotional spaces that were expansive and opened possibilities for action and creativity" (Losada, 1999.) Therefore it was also necessary to read, analyse and code each message according to its primary purpose.

An iterative process was used to design coding criteria. Testing of draft criteria against the log of discussion messages helped to develop the criteria finally used. From reading the messages it was clear that while most students were task focussed, the groups had distinctive usage patterns. Rather than lose this information by aggregating all the data, the group data was kept together and look at the patterns of communications for each group. The postings were coded according to the criteria listed in Table 2.

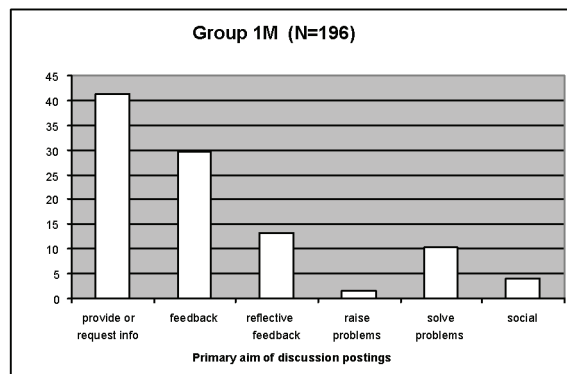
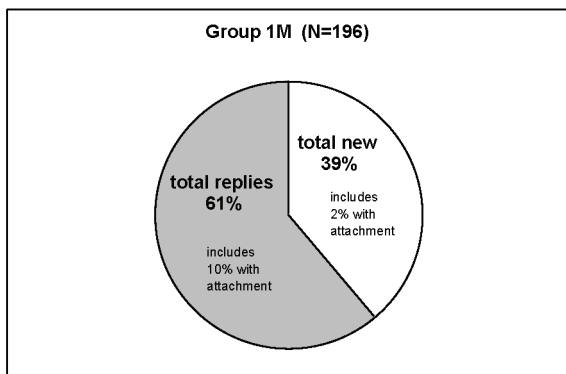
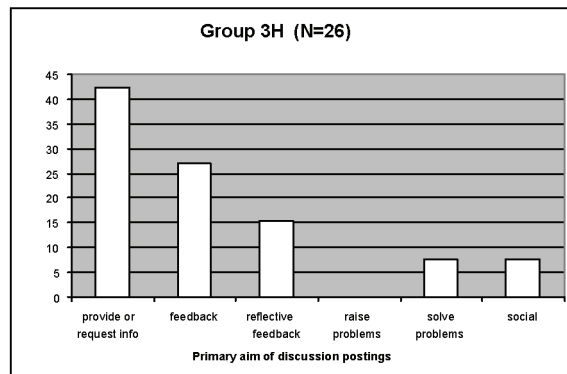
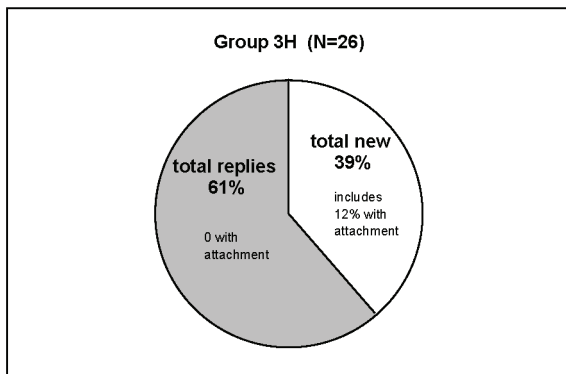
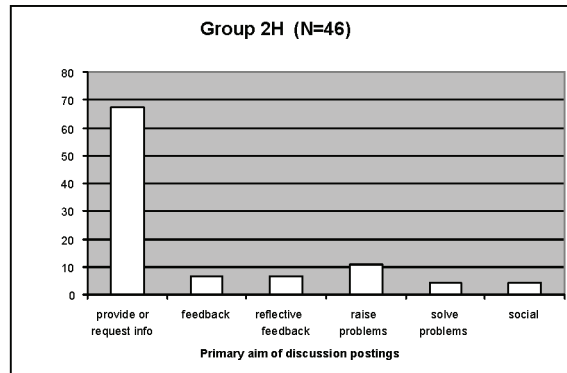
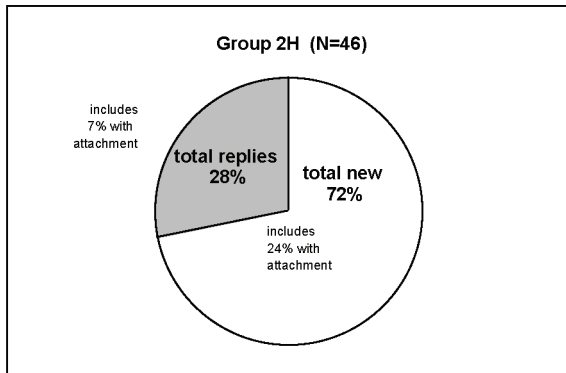
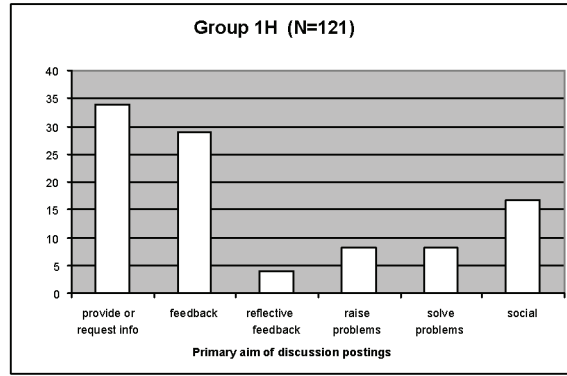
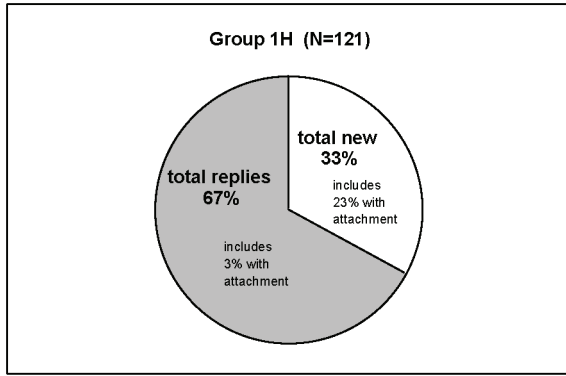
Code	Primary aim of posting	Example
1	provide or request information/ material	Tadaa! Here's some info on the new link (see attachment.) What do you think about....?
2	general feedback	I'll make those changes on the sitemap
3	reflective/analytical feedback (eg feedback plus own ideas)	I'm kinda liking the first one, with the 3D attempt. I don't think ... is as cool, cos the style is a bit childish... anyone else??
4	raise problems	Serious problem with the multi-session CD...
5	raise/provide problem solutions	Remembered a friend with a mac, should be OK
6	socialisation, group culture	Nice one bruva!! Good luck for the talk!

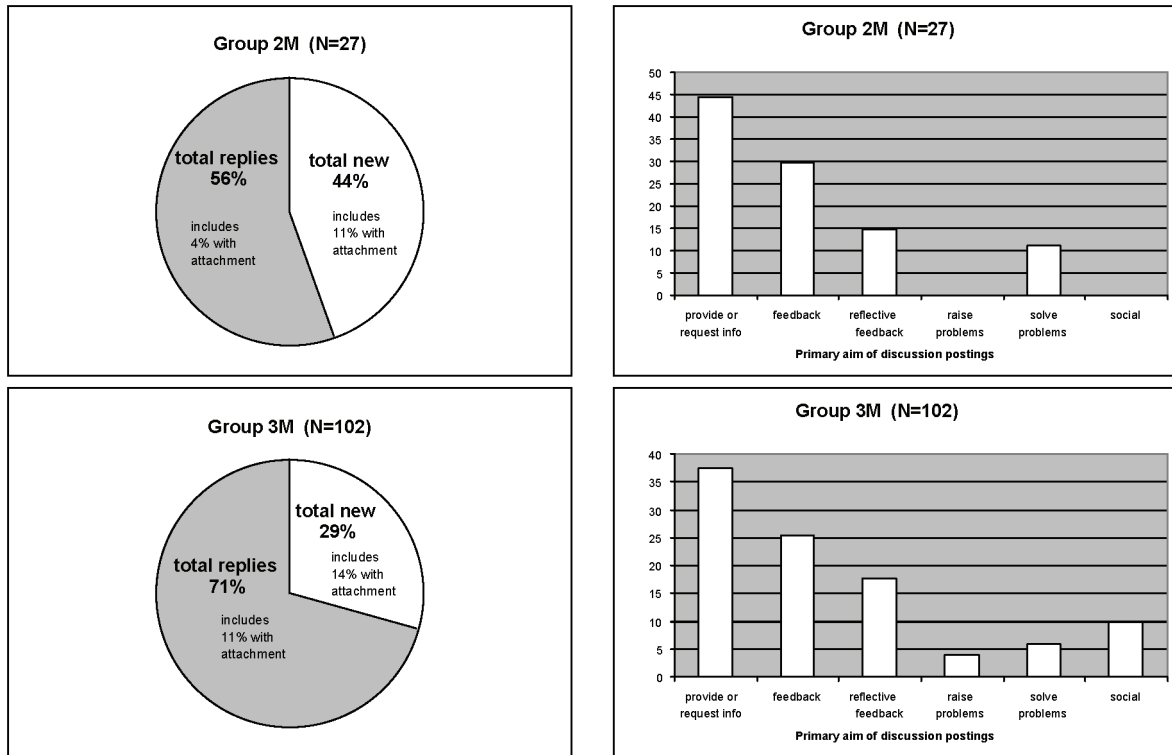
Table 2: How the postings were coded

The content analysis approach of coding postings using criteria which look at the message's primary purpose moves beyond simple quantitative means of investigation and seeks to investigate the quality of the learning that takes place in the student's online communications (Henri, 1992; McLoughlin 2002). In this case, it was necessary for the author to write new criteria for data coding that was suitable to the structured, project-driven online collaboration undertaken by the students and therefore to the discussion postings to be coded .

On the surface the criteria used look to be a departure from Henri's pioneering model, but in fact each criteria represents a 'bundle' or 'cluster' of learning attributes eg reflective feedback covers cognitive, metacognitive, interactive dimensions of Henri's model (1992.) This method has the advantage of being easy and quick to apply by a educational rather than linguistic specialist, overcoming 2 criticisms often cited for the lack of content analysis (Hara et al, 2000.) Like McLoughlin (2002) and Hara (2000) the new/reply/attachment and aim of postings criteria were coded using a one pass through the data technique to save time. On reflection, coding only the primary purpose of the posting rather than splitting the message up into many different components also saved time but the rationale for this approach was based on the brief and to the point nature of the messages themselves.

Diagrams showing results are on the following page.





Figures 1-12: Phase 2 and 3 results, pattern and purpose of discussion postings

Phase 2: Quantitative results

In all groups new messages were more likely than replies to have attachments eg graphics or perhaps a Word document. All groups except 2H had more replies compared to new messages. 4 out of these, including 2 of the 3 high performing teams had close to 2 replies for each new message. In contrast to this, Group 2H had 2-3 new messages for each reply (complete reverse of trend.)

Phase 3: Qualitative results

Looking at the Figures 1-12, we can see that the primary aim of discussion postings was for providing or requesting information. For Group 2H it was overwhelmingly so, all other dimensions (feedback, problem solving, socialisation etc) were negligible, 5-11% of the total. All groups except 2H had a balance between those messages providing/requesting information and giving feedback, especially if you add the general and reflective feedback percentages together. Generally, group 2H's results stood out as different to the rest.

Groups 3H, 2M and 3M had the highest proportion of reflective feedback. Problem solving was a common feature, mostly between 5% - 10% of all postings. Socialisation was a feature of all groups except group 2M. Group 1H had significantly higher proportion of socialisation messages. Groups 1M, 2M and 3H had an imbalance between raising and solving messages. Overall, the discussion space effectively scaffolded engagement, team development, effective communication, general and reflective feedback and problem solving. However, all of the highest performing teams did not necessarily have the highest number of messages posted or new/reply message ratios nor the highest percentages of reflective feedback, problem solving, or socialisation messages.

Questions arise regarding the reasons for this and for the noted imbalances in communications patterns, such as 2H's results. Considering that all groups analysed performed well (medium-high) as teams and the final project results were all of a high standard, the variations may point not to lacks or problems with online collaboration, but at least in part to the linkages between work undertaken face-to-face and online. Maybe Group 2H decided to use the online environment to provide material and saved their reflection,

feedback and problem solving for the weekly face-to-face meetings. Perhaps Group 2M did a lot of social bonding in the weekly face-to-face meetings, looked at progress and raised problems which were then worked on and solved during the week, and reported on in the online environment. These issues are tackled in Phase 4 of the evaluation.

Snapshot of medium-high performing teams

Following is a snapshot of what a medium-high performing collaborative team might look like based on trends already discussed:

1. 30%-40% of discussion postings were new topics
2. 60% - 70% of discussion postings were replies to the new topics
3. A balance between providing/requesting information and feedback
4. 5% -15% of the feedback was analytical or reflective
5. 5%-10% of messages involved socialisation or maintenance of group culture
6. An average of 1.4 - 5.0 messages posted by each team member each week

However, some variations in usage of the online discussion space for messages relating to feedback, problem raising and solving and socialisation are apparent. This is assumed to be related to the kinds of activities undertaken in the face-to-face classes. While it is impossible to know exactly what the groups got up to in the face-to-face environment, some information can be gleaned from the online discussion space in which students sometimes refer to what occurs in face-to-face meetings.

Phase 4

The discussion logs were read again and indicative samples were copied to create 4 pages of excerpts for close analysis. The findings are tabulated below in Table 3.

Group	Features of the discussion evident in the logs
1H	long threads, short messages, colloquial language, combination of forward planning and group socialisation, buoyant positive tone, jokes
2H	Fewer longer threads, many short statements, some terse/stressful language. Refers to making decisions in face-to-face meetings
3H	Shorthand, cliquy vernacular language, stress handled affably, positive tone
1M	Highest number of messages, high proportion of long messages, more formal language. Some evidence of individuals identifying and solving problems in isolation. Some evidence of stress, overload and exhaustion due to large project, unresponsive client. Some sarcasm, belief that other members not pulling weight.
2M	More formal language, reflective but cautious exchanges. Dominantly text only message (without graphic attachments.)
3M	Useful feedback from members on most inquiries and problems. Positive and friendly tone without cliquy vernacular language.

Table 3: Results from Phase 4, features of the discussion evident in the logs

As Table 3 indicates, some groups used formal language, others so colloquial it was hard to fathom what was going on (this is the SMS generation, and language adapts and changes so quickly!) Stress was evidenced in most groups at different times, sometimes handled affably while in other cases the situation seemed to sour communications.

That group 1M's messages were sometimes prone to negativity could be at least partially justified by excessive workload rather than particularly troubled collaboration. It seems that for a group of 4, 196 online messages over 6 weeks is too much (ie over 8 messages per team member per week.)

2M had no direct socialisation messages, and the effect of this could be seen in the formal language used in the online discussion space.

3H maintained a particularly positive tone and shared a common vernacular language. It is interesting to note that they also had a relatively high proportion of socialisation type messages and a good balance between providing information and feedback.

As mentioned early, group 2H's communication patterns and purpose varied markedly from the rest. The online space was used for providing information and to a lesser extent, for raising problems. However, rather than presuming that this indicated troubled collaboration, the analysis of the online discussion postings carried out in Phase 4 identified direct references to feedback and problem solving that occurred in face-to-face meetings.

Face-to-face activities (for groups 2H and 2M) and high levels of reflective and general feedback (group 2M) seem to have inoculated them against disaster, their process and final projects were still of a good standard.

Conclusion

Within the context of a collaborative task supported by clear team roles, the discussion space effectively scaffolded engagement, team development, communication, feedback and problem solving. However, variations to the 'snapshot' of med-high performing teams need clarification and could be linked to factors external to this study. Activities undertaken by students in class and other face-to-face meetings and size/complexity of client project are potential sources of variation to trends in team performance.

As such, while trends have been noted the evaluation model used was not sufficient to conclusively explain variations to trends. In a blended teaching model, it would seem naïve to think that one can evaluate an online discussion tool in isolation. Current evaluation methodologies need to be modified for blended teaching models to include analysis of both face-to-face and online activity. It may be that additional evaluation criteria are added to the set already discussed in this paper.

Our findings echo that of Hara et al, who recently noted that "Given these observations, scholars concerned with instruction in higher education might focus on ways to create ideal learning spaces incorporating both class and computer activities." (Hara, 2002, p18.)

References

- Baskin, C. (2001). The Titanic, Volkswagens and collaborative group work: Remaking old favourites with new learning technologies. *Australian Journal of Educational Technology*, 17(3), 265-278.
- Gersich, C. (1989). Marking time: Predictable transitions in task groups. *Academy of Management Journal*, 32, 274-309
- Gleeson, E.J (1996). Common Ground: An Experiment in the Teaching of Generic Skills for Design Students, *Proceedings of the 3rd National Conference, Product Design Education, University of Lancashire*
- Hara, N., & Bonk, C.J., & Angeli, C. (2000). Content analyses of on-line discussion in an applied educational psychology course, *Instructional Science* 28 (2), 115-152
- Henri F. (1992). Computer Conferencing and Content Analysis. *Collaborative Learning Through Computer Conferencing*, 90, 117-136
- Hron, A. & Friedrich, H.F. (2003). A review of web-based collaborative learning: factors beyond technology. *Journal of Computer Assisted Learning* 19 (1), 70-79.
- Johnstone, A. (2002). Collaboration: Getting it together on the web. *Desktop* 170, 66-67
- Lambert, S & Foley, M. (2003). Trialling Collaborative Tools and Processes for teaching graphic design at the University of Wollongong. *Create.Ed conference proceedings* (upcoming.)
- Lea, M. & Rogers, P. & Postmes, T. (2002) SIDE-VIEW: Evaluation of a system to develop team players and improve productivity in Internet collaborative learning groups. *British Journal of Educational Technology* 33 (1), 53-63.

- Losada, M. (1999). The complex dynamics of high performance teams. *Mathematical and Computer Modelling*, 30(9-10), 179-192.
- Maples, M (1988). Group development: Extending Tuckman's theory. *Journal for Specialists in Group Work*, Fall, pp. 17-23.
- McLoughlin, C. (2002). Computer supported teamwork: An integrative approach to evaluating cooperative learning in an online environment. *Australian Journal of Educational Technology*, 18(2), 227-254.
- Salomon, G & Globerson, T (1987) When teams do not function the way they ought to. *International Journal of Educational Research* 13, 89-100
- Schrage, M. (1995). *No More Teams! Mastering the Dynamics of Creative Collaboration*, Currency Doubleday, New York, New York
- Tuckman, B. & Jensen, M. (1977). Stages of small-group development revisited. *Group and Organization Studies*, 2, 419-427.

Acknowledgements

This work is part of a 12 month project funded by the Educational Strategies Development Fund (ESDF) at the University of Wollongong. I'd like to thank my partner in the ESDF project and the lecturer of the students involved in this trial, Marius Foley of Faculty of Creative Arts, University of Wollongong. Preliminary results and background to the trial were published in the conference proceedings for RMIT's Create.Ed conference, October 2002.

Copyright © 2003 Sarah Lambert.

The author(s) assign to ASCILITE and educational non-profit institutions a non-exclusive licence to use this document for personal use and in courses of instruction provided that the article is used in full and this copyright statement is reproduced. The author(s) also grant a non-exclusive licence to ASCILITE to publish this document in full on the World Wide Web (prime sites and mirrors) and in printed form within the ASCILITE 2003 conference proceedings. Any other usage is prohibited without the express permission of the author(s).