

Developing Online Team Skills

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ABSTRACT

This paper discusses the development and delivery of a new course at the UK Open University (OU). The course makes a virtue of the fact that OU students study in a predominantly distance learning environment, by providing a structure within which team working activities are carried out with no face-to-face contact whatsoever. Issues that were considered in designing this course and decisions about tutoring and assessing the students' team working experience are discussed. Preliminary results from the first delivery of the course, including analysis of archived team conferences, are presented. Directions for future development and enhancement are indicated.

Categories and Subject Descriptors

H.5.3 [Information Interfaces and Presentation]: Group and Organization Interfaces - *Asynchronous interaction, Collaborative computing*. K.3.1 [Computers and Education]: Computer Uses in Education - *Collaborative learning, Distance learning*. K.3.2 [Computers and Education]: Computer and Information Science Education - *Curriculum, Information systems education*. K.4.3 [Computers and Society]: Organizational Impacts - *Computer supported collaborative work*. K.7.4 [The Computing Profession]: Professional Ethics - *Codes of good practice*.

General Terms

Management, Measurement, Documentation, Performance, Experimentation, Human Factors.

Keywords

Distance learning, team working, virtual teams, asynchronicity, process versus product, reflection, online tutoring.

1. INTRODUCTION

There are frequent complaints from business leaders that the new graduates that they employ are lacking in a number of key skills, such as communication and team working. Traditionally it has been argued that such skills are best learned in the workplace rather than the college. Increasingly, however, in subject areas such as Computing there has been pressure from professional accreditation bodies such as the ACM (Association for Computing Machinery) [1] and the BCS (British Computer Society) [3] to ensure that substantial team working activities are included in undergraduate programs of study.

Figure 1, which is taken from the 2006 edition of the annual Job Outlook report from the National Association of Colleges and Employers, highlights the importance which employers place on graduates having Communication and Teamworking skills.

Employers rate the importance of candidate qualities/skills	
Skill	Rating
Communication Skills	4.7
Honesty/integrity	4.7
Teamwork skills (works well with others)	4.6
Strong work ethic	4.5
Analytical skills	4.4
Flexibility/adaptability	4.4
Interpersonal skills (relates well to others)	4.4
Motivation/initiative	4.4
Computer skills	4.3
Detail-oriented	4.1
Organizational skills	4.1
Leadership skills	4.0
Self-confidence	4.0
Well-mannered/polite	3.9
Friendly/outgoing personality	3.8
Tactfulness	3.8
Creativity	3.6
GPA (3.0 or better)	3.5
Entrepreneurial skills/risk-taker	3.2
Sense of humor	3.2
(5-point scale, where 1=not at all important and 5=extremely important)	

Figure 1. NACE Survey 2006

The question of how we, as educators, can best meet employer demands for problem-solving, interpersonal communication and conflict-handling skills in their future employees is addressed by Howell [9]. He suggests that we can meet these needs through projects which involve groups of students who work and solve problems together, preferably involving an element of design, since this not only encourages problem-solving thinking but also fosters group interaction, investigation, creating, planning, testing, evaluation and improvement. He also emphasizes the point that students will respond more positively to such activities when they are based on problems that arise in the real world.

In the context of business in general, and software engineering in particular, recent developments in technology and in

business practice mean that "Virtual team working is already commonplace and is rapidly becoming essential as organizations work in an increasingly collaborative way" [5].

In order to address these concerns, the Department of Computing at the OU has recently introduced a team working module into its degree program. OU students work predominantly in a distance learning environment, and are accustomed to interacting with their course materials, their tutors, and their fellow students, using a variety of means of online communication. It was therefore decided at an early stage in the design of the course that we would attempt to make working and cooperating *at a distance* an important dimension of the teamworking experience provided by our new course, M253: Team working in distributed environments.

The course that we have developed runs over a six month period, and is one of the compulsory second level modules that contribute to the OU's Bachelor degree in Computing. Students are allocated to teams of 5 or 6, distributed randomly across the UK, and each course tutor is responsible for up to 4 such teams.

This paper discusses the structure of the course, its assessment, and some results from a preliminary analysis of the data gathered from the first presentation which started in February 2005. A more detailed discussion of the course itself, and of the issues that it is attempting to address, can be found in an earlier paper [12].

2. THE COURSE MATERIALS

Our approach has been to create a generic team project framework, into which specific real world scenarios can be dropped for each presentation of the course. The nature of these scenarios is such that no specialist knowledge of the application area is necessary for an individual to be able to take part in the project. Indeed, part of the initial task is for team members to investigate the scenario and to share their findings. The scenario only sets the context in a very general sense; everything is very loosely specified, leaving a lot of things to be decided by team members as a result of their own investigations and experience. The tasks set for the teams are all restricted to activities in the requirements phase of the software lifecycle, which means the course is not restricted to students from Computing degrees.

The course materials that students receive include a printed Course Guide and an extensive set of online Resource Sheets covering both theoretical and practical aspects of working in (virtual) teams, working on analysis of system requirements, and documentation issues such as keeping personal logs and writing reports. These Resource Sheets are provided as guides to the sort of techniques and notations that might help students with the tasks they have to undertake, rather than mandatory instructions on how they should proceed. The Guide contains background course information, plus detailed explanations of which Resource Sheets students should read, and what activities they should undertake week by week, again presented as guidelines rather than mandatory instructions. We want teams to make their own decisions about such matters, within the framework of the deadlines which we have set for intermediate and final assignments, as part of their collaborative activity.

3. THE COURSE STRUCTURE

The basic structure of the course is shown in Figure 2. There are four distinct phases of project activity in which the team members have to interact with each other, each phase culminating in a Milestone (for example M1 on the figure) at which both team and individual deliverables have to be

submitted to the tutor. The initial phase is formative and un-assessed but is critical to team formation, involving feedback from the tutor and reflection from the students. The summative assessment for the course is based on the deliverables from the three subsequent phases.



Figure 2. Overall schedule for the course.

The introductory phase is in the nature of an ice-breaker, in which students get to find out something about each other, in terms of their personal details, interests and experience, what they hope to get out of the course, and what particular skills they think that they can contribute to the team's activities. We want to reduce the effects of social as well as geographic distance on collaboration between our virtual team members as early as possible in their project [4].

There is much discussion in the literature about the problems of team formation, and about the benefits of face-to-face meetings to establish the team socially before any task-based work is undertaken. We did not have the resources to bring our distance learning students together for face-to-face meetings, and since there is evidence from studies such as those by Whitton [15] that task-based ice-breakers are as effective in establishing team cohesion as socially-oriented activities and are actually preferred by students, we made the main activity for this initial phase a simple task-based team exercise.

Students were tasked, as individuals, with choosing a website (for a specified application chosen by us as the Course Team) and evaluating this website according to criteria determined by the team members themselves as a result of some initial online discussion. They then had to share their choice and its evaluation with the rest of the team and, as a team, come up with a prioritized list of all the chosen websites, together with reasons for the ordering, agreed by the team. This material is submitted to their tutor for comment.

The advantage of this approach is that it gives students a safe - since un-assessed - space in which to start on the process of working together. They find out something about each others' personalities, preferences and priorities and begin to form personal relationships. At the same time they have an opportunity, as a team, to begin establishing some ground rules for such matters as the nature and frequency of communication necessary to complete such tasks, and the need for mechanisms to allow them to arrive at agreed team decisions. A positive side-effect is that, in addition to the experience they have gained about the difficulties of working as a virtual team, what they have learned from the activity of analyzing the websites in this phase can be applied to one of the design tasks that they have to undertake later in the course.

The rest of the course is made up of three distinct phases of project activity based on the scenario which we have provided. For the first presentation the scenario was based on a small enterprise involved in the business of letting holiday properties, which has asked for advice on how to computerize its activities and provide an online system for its clients. The three phases are structured around Activity Sheets, with both team and

individual deliverables required for assessment by the tutor at each milestone. These Activity Sheets are only released at the beginning of the phase to which they apply, in an attempt to focus teams' attention on the current task.

The work involved in each phase builds on what has already been achieved in earlier phases, but addresses a different aspect of the requirements for a system to meet the problem posed in the scenario under consideration. In the first phase teams have to establish the essential facilities that the system should provide. In the second phase they have to investigate the way in which these facilities will be provided and establish the data needs of the system. In the third phase they have to decide on the design of the nature and content of the web pages through which clients will interact with the proposed system. The nature of the tasks in each phase is similar, in terms of the need for setting rules for working together as a team, allocating roles and accepting responsibilities. In contrast with much of the literature on e-cooperation and e-collaboration, such as Salmon's work on e-tivities [14], this course is therefore of an iterative and incremental nature. The division into three phases provides significant opportunities for reflection and assessment at the end of each phase, which should be used as a starting point for attempting to improve performance in subsequent phases. Over the course of the three phases the complexity of the tasks and the necessary degree of interaction between team members increases, as does the complexity of the decision making and the complexity of the shared documentation that has to be produced. In particular in the second and third phases we have incorporated activities working in pairs, as indicated in Figure 3, which has proved invaluable in ensuring that no students can sit back and leave all the work to the rest of the team.

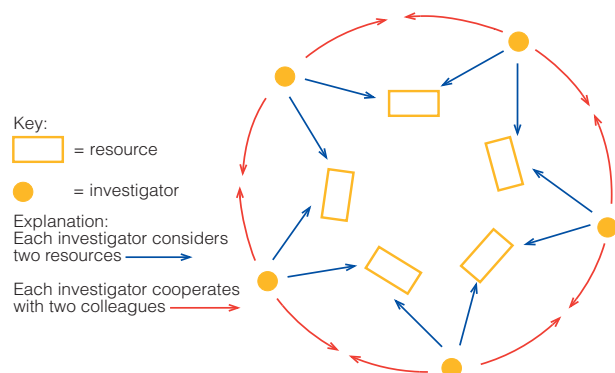


Figure 3. Pairwise Collaboration Diagram

4. THE COURSE ASSESSMENT

The deliverables at each milestone have a standard form which is illustrated in Figure 4. Each deliverable comprises both a partial product and reflections on the process by which that product was produced.

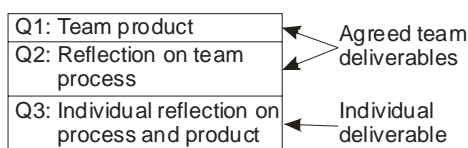


Figure 4. Assessment structure at Milestones 1, 2 and 3.

The partial product is an agreed, shared, document reporting on the technical results of the team's investigations and analyses.

The team reflection is centered around the rules that the team has developed and adopted, and the way in which these have been followed, and the roles and responsibilities that the team has decided on and allocated, and the way in which these have been performed. It is again a shared document that has to be endorsed by all team members. The individual reflection is centered on the relationships that the individual has experienced during the process, and their feelings about the way that the team has formed and performed. Both these reflective elements have to be based on evidence from team conferences, documentation of team decisions, and individual project logs. One of the key emphases of the course is that we are not only attempting to improve student learning *through* collaborative working in teams, but to improve student understanding *about* collaborative working in teams.

We have built into the course the concept that partial success (in the sense of a team failing to produce a good solution to the problem posed in the scenario) should not be regarded as failure, provided lessons are learned that will improve future virtual team working performance. This approach is one which is supported by the excellent book on computer science projects [7]. A key recommendation is to "consider awarding academic credit for successful accomplishment of tasks rather than assessing the products of those tasks" (op. cit. p. 218).

5. THE TUTOR ROLE

The role of the tutor in an online environment is a crucial consideration. Given that our primary concern is that teams develop their own solutions to the problems that they face, we have adopted a mentor rather than manager model, in which course tutors operate in a substantially hands-off mode. Their responsibilities include:

1. Monitoring the team conferences and keeping an eye on the activity that is taking place and whether the team is managing to stay substantially on course and on schedule.
2. Moderating the team conferences in the sense that they need to ensure that the team is behaving appropriately, and make suggestions to either the team or the individual members, where there is evidence that interactions within the team are getting out of hand.
3. Marking the team and individual work submitted at each milestone, and providing feedback that might assist the team and individuals' reflections on progress to date and help to improve their performance in subsequent phases.

What tutors must *resist* is any temptation to Manage a team's organization, or to Meddle in a team's activities. This contrasts with the more actively interventionist role envisaged by much of the literature on online tutoring (see, for example [6, 14]) but reflects the facilitating role discussed by Gustafson and Gibbs, and their implication that much of the more traditional 'teaching' role is embedded in the course structure [8]. The overall task of the tutor is to provide Support, Assessment, Feedback and Explanation, a SAFE working environment in which learning can take place.

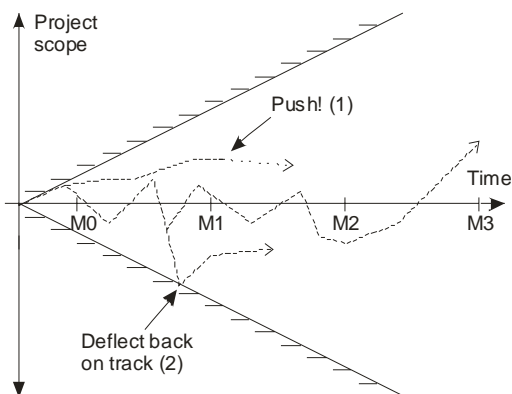


Figure 5. Sample project trajectories showing points at which tutors intervened.

The three major exceptions where tutor intervention is encouraged are where a team is (1) substantially off-time schedule or (2) off-task, as indicated in Figure 5, or where an individual is substantially off-team in terms of their behavior.

One of the reasons why we need to keep the level of tutor intervention down is that we need to ensure that they have a manageable workload. Generally, experience of online tutoring would suggest that it is even more demanding than operating in a traditional face-to-face context (see, for example [8]).

6. TEAM LEADERSHIP

Much of the literature assumes the need for *management* of virtual teams and also talks about *leadership* (see, for example [11, 13]), with management being more of an external issue, whereas leadership is predominantly an issue internal to the team. In our context, management is more to do with the initial setting up of the teams and the setting of the overall team objectives, in terms of task(s) to be undertaken, time scales within which the various specified deliverables are to be produced, and possibly provision of suitable resources. In a sense we, as a Course Team, are the managers, and our course materials provide the framework within which the project is undertaken. We want leadership to be something that emerges from the way in which the team then configures itself - within this framework - in order to achieve the objectives which they have been set, given the time constraints and the available resources.

A number of leadership issues are discussed in [10] including the potential *ego* problem, and the constant need to remember that everyone in the team must be regarded as having an equally important part to play, or as we emphasize to our students, "There is no I in TEAM". The view of virtual teams that we want to foster is essentially democratic, self-organising, and egoless rather than hierarchical in nature, which we believe is more likely to reflect the nature of virtual teams than that of more traditional, co-located, teams [9].

7. PATTERNS OF COMMUNICATION

The primary medium for communication used on the course is the existing FirstClass environment available to all our OU students. It is predominantly an asynchronous text-based messaging system, although it does also provide a synchronous online chat facility. Some student teams chose to supplement this with other technologies such as Wikis and VOIP.

One of the advantages of the FirstClass environment is that all messages are recorded, which allows tutors to follow their

teams' progress in real time. We have been able to archive the conferences for all 27 teams taking part in the first presentation of the course, which provides a valuable post-course database, from which we will be able to investigate the behavior of the teams, in terms of their formation and development, and the actions and interactions of the team members.

Figure 6 shows the overall weekly volume of messages for a typical team over the course of the project. Visible peaks of activity can be observed immediately prior to the submission of shared deliverables at each milestone. The gap in weeks 9 and 10 arose from an initial decision not to progress with work for phase 2 until feedback had been received from tutors for the phase 1 assessment. This resulted in an unacceptable loss of momentum for the teams, which we have addressed for subsequent presentations.

The total number of student messages for this team over the 24 week period was 480, an average of 20 per week, but with 50 or more messages in peak weeks. Other teams ranged in message volume from as low as 275 to as high as 1285 messages.

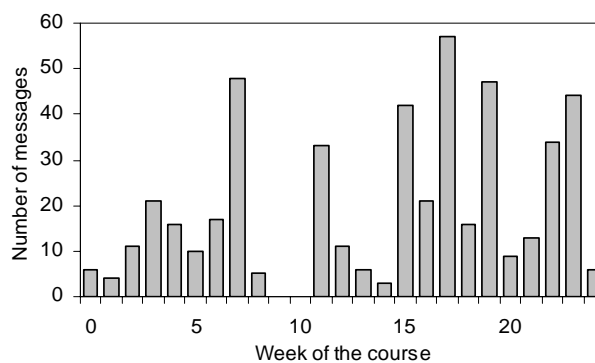


Figure 6. Messages posted per week by one team.

Figure 7 shows the levels of individual contributions (each student color coded) to the same team conference over each phase, and indicates the intensity with which students engage in collaborative activity throughout the course.

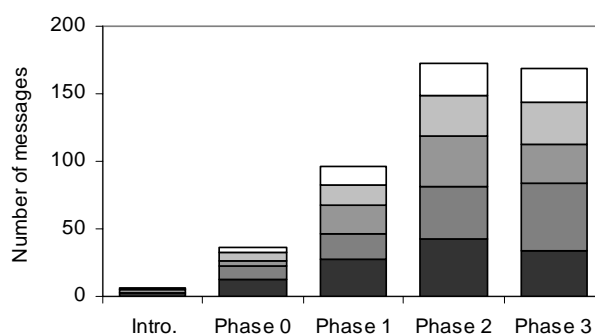


Figure 7. Messages posted per phase, grouped by student.

Both graphs provide some idea of the volume of messages that have to be processed by both the team members and the tutor. Table 1 indicates the relative frequency with which students found it necessary to access their team conference in order to keep up with this volume of communication.

Table 1 Frequency of student access to team conferences

More than once a day	18.6%
Daily	58.1%
A few times a week	23.3%
Weekly or less	0.0%

8. FUTURE DEVELOPMENTS

We expect to be able to report, in future publications, on a number of interesting aspects of the course. In particular we intend to carry out more qualitative analyses of the purpose and content of the messages (as, for example, in [8]) and to investigate issues like the establishment and maintenance of trust within teams, the dynamics of team decision making, the effects of gender, and the most suitable team role models for effective virtual team work.

We know that, in the OU's standard FirstClass conferencing facility, we do not have an ideal environment for the kinds of communication activities that our teams need to engage in. The lack of a good asynchronous discussion forum, the lack of a good mechanism for the production of collaborative documents, the lack of adequate *presence* or *awareness* mechanisms for synchronous communication activities, and the lack of good mechanisms for supporting time-constrained decision-making processes are examples of this. We expect to address some of these issues as the OU develops its own Moodle-based VLE. As a result of our investigations into existing environments, and our experiences of running the course, and following the philosophy of a recent paper by Briggs [2] that '*the most useful focus for collaboration technology researchers would be the technology-supported work-process, rather than just the technology*', we hope to be able to develop an ideal electronic environment to support our students' virtual team activities.

9. POSTSCRIPT

We are currently approaching the end of the second presentation of the course, on which we have 11 tutors handling 42 student teams between them. In the first presentation end-of-course survey 58% of respondents asserted that they were fairly confident, and 26% very confident, they will be able to apply the team working skills that they have developed on the course. Together with the fact that nearly all the tutors from the first presentation asked to work on the second presentation, because they found it such a satisfying teaching experience, we take these figures as an endorsement of the pedagogic principles underpinning the design and development of the course.

Finally, we include some comments from messages sent by students to their team conferences after completion and submission of their final assignments:

'Composing my answer to Q3 (for the final assignment) has shown just how much I have gained from this course – my flippant remark at the very beginning about doing this course only for the 10 credits seems very shallow, now that I have completed it. It was hard work.'

'The reflective practice (and evidence of) that is required by this course has not been covered by any of my OU studies up to this point, so M253 has been a timely addition to my studies.'

'It's been an enjoyable experience overall, working with you, and I've picked up some good skills, especially in project

planning and report writing. It's been very intense at times, something I wasn't expecting working electronically, but we have always delivered.'

'I have learned so much about teamwork and about myself that I wish I could do the course again knowing all I know now.'

10. ACKNOWLEDGEMENTS

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