

# Computer-mediated interaction in context

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This paper reports research into the impact of computer-mediated interaction on both students and tutors in the context of a course-specific case study. Quantitative data provided evidence of successful achievement of learning outcomes and high student completion rates. Tutors identified interaction as one in a number of successful features in the course design, about which they were very positive, in spite of the increased workload it entailed. Exploration of student data revealed both positive and some unintended negative effects associated with a highly interactive and activity-led approach to learning. These findings emphasise the importance of the context for interaction, in terms of the effective combination of both content and interpersonal interaction, the strong link with assessment and the content and design of activities. Tutors and students reported high levels of enjoyment and engagement as key features sustaining the success of a stimulating pedagogy.

Keywords: interaction, computer-mediated communication, activity design, distance education

## Introduction

Interaction is seen as essential in conceptual learning, because it enables the learner to build personal understanding, through a two-way, 'conversational' learning process (Laurillard, 2002). Bannan-Ritland refers to it as "a critical variable in learning" (2002, p. 161). The rationale for interaction relates to both cognitive and affective aspects of learning. Learners need to articulate their understanding and have personal feedback that enables them to adjust and to develop their understanding. They also need the opportunity to influence how learning proceeds, through being able to interact with their teachers. The key role of interaction from a social constructivist perspective therefore suggests that the design of learning environments should promote interaction, and that new information and communication technologies (ICT) should be developed particularly to provide more interactive learning experiences (ESRC, 2002).

Within distance education, interaction has been recognised as a diverse phenomenon, open to different categorisations. Hirumi (2002) places Moore's initial distinction between content and interpersonal interaction (Moore, 1989) within a more comprehensive framework which includes learner-self interaction, learner-human interaction, learner-non-human interaction and learner-instruction interaction. This framework offers a useful analytical tool for the analysis of planned interactions of many kinds. However, Bannan-Ritland (2002) asserts that interpersonal interaction has dominated the literature. Furthermore, two issues are prominent within this literature: the often low rates of contribution to conferences by learners, and the quality of dialogue and discussion, which may fall short of the levels of argument or knowledge construction desired (Salmon, 2000). Gorsky, Caspi and Tuvi-Arad (2004, p.1), for example, report that learners only chose to interact when they could not solve difficult problems on a compulsory chemistry course, as 'It was found that all students initially chose individual study characterized by intrapersonal dialogue'. Other researchers focus on analysis of the quality of discourse (Hakkinen & Jarvela, 2006), which may revolve round information exchange rather than more challenging forms of argument and knowledge construction. McAlister, Ravenscroft and Scanlon (2004) for example, review the use of interaction as a means for collaborative argumentation using online educational dialogues. They suggest that structuring interaction is essential, both at the macro level in terms of activity design, and at the micro level in terms of roles and procedures that ensure learners engage in reasoning, use evidence appropriately and develop argumentation skills. They also emphasise that learners' motivation cannot be assumed, particularly in distance education, where a context needs to be created that will "cultivate the social, motivational and empathic features that support meaningful and effective interaction" (McAlister et al., 2004, p. 195).

The achievement of effective interaction thus presents a considerable challenge to the course designer. Within distance education, interaction must also help retain students and support the achievement of learning outcomes. Research that provides evidence of the impact of specific designs for interaction is necessary if we are to build knowledge about how learners respond in real study situations. Research at the Open University, funded by the Andrew W. Mellon Foundation, explored the impact of computer-mediated interaction, and one of the case studies from the research is presented here to explore the intersection between interactive course design, learning outcomes and learner and tutor experience.

## Research methods

Study of the research literature has identified the multidimensional nature of interaction, and the complexity of the context of use. Different types of interaction can be mediated by a range of different activities in courses, thus influencing the quality of the outcome and impacting on students' experiences of the study process. Accordingly, detailed study of particular cases of interaction was a key element in the research strategy. As Schofield (1993) argues, qualitative research is interested in generalisability not through statistical sampling in order to generalise to the larger population, but through a rich description of cases that enables comparability with other settings to be assessed and findings interpreted in terms of their relevance for different contexts and cases. This raises the question of selection of cases and we were able to use a principled approach for this, avoiding the tendency of some qualitative researchers to select cases "on the basis of convenience or ease of access" (Schofield, 1993, p. 209). Courses were selected on the basis of the extent to which they offered either interpersonal or content interaction, or both. They were also reviewed in relation to the degree to which such interaction was integrated into the course learning outcomes and their assessment. Integration has been identified as an important factor in whether or not students engage with the computer-mediated elements in their course (Kirkwood & Price, 2005) and this provides an important indicator of the pedagogical context in which interaction is used. Thirty-six courses were identified using the two dimensions of interaction and degree of integration, and this paper reports the detailed study of one course from this sample, titled *The Environmental Web*. The case study course includes extensive opportunities for interaction with both content and other learners, and integrates interaction very strongly into the learning outcomes and their assessment. While this course presents a unique context, it was selected because of features that enable it to be compared with other courses and a basis for interpreting the significance of the findings.

The research strategy also used quantitative data to enable comparisons to be made in relation to student retention and quality measures. A sample of students on the thirty-six courses completed the Course Experience Questionnaire (Ramsden, 1991) for example, and their evaluations of course quality were compared. Yin's approach to the design of case study research emphasises the need to develop theory (referring to propositions made on the basis of both empirical analysis and experience, as well as of the research literature) at the design stage of case study research (Yin, 2003). Accordingly, a number of 'theoretical' propositions were identified before data collection:

- Students' experience of computer-mediated interaction will have a positive impact on their learning;
- Take-up of opportunities for interaction will be influenced by their integration within the course design, notably its assessment;
- Students' perceptions of the quality of their course will be influenced by their experience of the interaction it provides.

Also following Yin, research questions were identified, on the basis of these theoretical assumptions and the aims of the broader research project, and these are as follows:

- How does the interaction experienced by students impact on them in terms of (a) their experience of study (enjoyment, interest, study time, workload, persistence etc); (b) their success in meeting assessment requirements; and (c) their interest in registering for further study on courses including interactive learning experiences?
- How does interactive study experience impact upon the perceptions, workload and experiences of tutors on the course?

Data on student retention and performance, quantitative data from a survey carried out on a random sample of students in 2004 and interviews with tutors and students were used to explore these questions.

### **A case study in interactive pedagogy**

The course *The Environmental Web* was selected as a case study because it offers a computer-mediated interactive study experience that is strongly integrated into the assessment and study process. The course recruits about 420 students annually, is mandatory within the Open University Environmental Science degree, is at third level and accounts for 60 points, and the equivalent of half a full-time year's study. It was selected based on evidence about key features of the teaching approach, outlined below.

#### **Structured and assessed use of computer-mediated communication (CMC)**

Students are required to participate in asynchronous tutor-group conferences from week 3 of the course and tutors ensure that all students log on from week 1. Study of the course is led by online activities which feed forward into online discussion designed to achieve a specific task. For example, the first group conference requires students (up to 30 in each tutor group) to role play a meeting of the Association of Small Island States (AOSIS), to agree on a series of demands to the United Nations, for actions in the area of policy and aid to address the impact of climate change on small islands. Before this collaborative activity, tutors allocate one of the small island states to each student in their group. Students work independently to collect data on 'their' island from external websites and submit it in tabular form to a conference set up by the tutor. Students also submit a review of the vulnerabilities and needs of their own island, plus suggestions for collective demands, prior to the discussion. The first assignment for the course then requires students to write a brief review of the discussion and their role in it. A list of the agreed demands is submitted together with an account of how the consensus was reached, or in some cases, failed to be reached. Twenty percent of the marks are allocated for this and a further 15% for use of data about their island that supports some aspect of the demands agreed. A later group discussion on biodiversity protection forms the basis for part of the text submitted for the second assignment, accounting for 30% of the marks. National and tutor group conferences continue to the end of the course on specific topics, though without being formally assessed.

#### **Web-based activities with feedback, lead the study process**

The course is organised in four blocks, each of which has approximately 10 online activities undertaken by students independently, accounting for approximately half the course study time. Students learn how to search environmental science websites, to evaluate the information they find, and to use it for analysis and problem solving. They also undertake field observation of specific types of birds, dragonflies and woodlice in their area, and submit their data to the course biodiversity database, which displays the data in geographically referenced form. This and many other activities are the basis for graded assignment tasks. Students also receive automated feedback as they work through the online activities.

#### **Computer models and tools play a central role**

Two climate models are included on CD-ROM and students use these to investigate the relationship between carbon-dioxide emissions and mean surface temperature increases. The impact on different countries of strategies for sharing the reduction of greenhouse gas emissions is also evaluated using a climate model. Students also carry out an independent project on a topic of their choice, submitting their reports as Web pages constructed using a supplied tool, The Web Wizard. This project report replaces the end of course examination.

These features of the course require students to interact both with their peers and with computer-mediated information, resources and tools. The course focus is described by the chair: 'Our overall aim is to provide you with the skills needed to develop your own environmental literacy and to take part in informed environmental debate and action, rather than to expand your environmental knowledge as such.' (Open University, 2006). A pedagogy of active involvement and participation alongside other practitioners in the environmental arena is delivered through a variety of forms of interaction, and the aim of the research was to explore student and tutor experiences and perceptions of this.

## Quantitative data

Student performance data for *The Environmental Web* are very positive. A high proportion of students complete the assessment requirements of the course, reviewing the data since the first year of the course in 2003. Table 1 shows that the course is around 10% better than the average for all level 3 courses in the Science faculty and marginally higher than the level 3 average in the Social Science Faculty in two out of three years. The only other Science courses to achieve higher rates of completion are all residential school courses.

**Table 1: Rates of completion compared with faculty averages from Science and Social Science**

| Course(s) base for calculation % of students * who complete | 2003 | 2004 | 2005 |
|---|------|------|------|
| <i>The Environmental Web</i>                                | 78.6 | 74.0 | 77.6 |
| Science Faculty Average for all Level 3 courses             | 69.2 | 68.5 | 66.5 |
| Social Science Faculty Average for all Level 3 courses      | 76.4 | 77.3 | 76.5 |

Note. \* Total numbers for % calculation are as in the returns to the UK Higher Education Funding Council.

A survey carried out in 2004 (response rate 47 %) provided data on 36 courses using computer-mediated interaction, including *The Environmental Web*. The survey used an adapted version of Ramsden's Course Experience Questionnaire (Ramsden, 1991), containing 36 questions generating seven scales: appropriate assessment, appropriate workload, clear goals and standards, emphasis on independence, good materials, good tutoring and generic skills. Student responses were highly positive in relation to appropriate assessment and generic skills, with highly ranked scores on items shown in table 2 (where 1 equals 'strongly disagree and 5 equals 'strongly agree').

**Table 2: Positive response on items from the Course Experience Questionnaire**

| Items from the CEQ   | Score, TEW* | Median score+ | Rank 1=best |
|--|-------------|---------------|-------------|
| Helped me develop problem solving skills                         | 3.8         | 3.6           | 6           |
| Helped my ability to work as a team member                       | 3.4         | 2.1           | 4           |
| Has sharpened my analytic skills                                 | 3.8         | 3.8           | 13          |
| To do well on this course all you need is a good memory          | 1.5         | 1.9           | 1           |
| More confident about tackling unfamiliar problems                | 3.6         | 3.3           | 8           |
| the course was more to do with testing memory than understanding | 1.4         | 1.9           | 2           |
| Helped me to develop the ability to plan my own work             | 3.6         | 3.6           | 11          |
| This course really tries to get the best out of all students     | 3.9         | 3.7           | 8           |

Note. \* The Environmental Web; + based on 36 courses surveyed.

Students' responses showed that the course successfully requires them to apply understanding in completing the assignments and to develop higher level skills, in particular problem solving and team work. However, there was strong agreement (above average) with the statements 'The workload on this course is 'too heavy' and 'there is a lot of pressure on you as a student' and disagreement with the statement 'students are generally given enough time to understand things they have to learn'. Students also did not agree with the statement that 'students have a great deal of choice over how to go about learning' (at 2.3 this was the lowest score of any course included in the survey). Finally responses also indicated that students did not find the aims and objectives and standards of work clear enough. Therefore these findings constitute a mixed picture. The course undeniably meets the most demanding test in terms of retention and successful completion of assessment requirements. However, qualitative research was undertaken to explore in more depth the nature of the impact of computer-mediated interaction on the course and also what might lie behind the mixed response from students.

## The students' perspective

Students who were surveyed in 2004 were asked to comment on the advantages and disadvantages for them of interactive ICT elements used in their course. Conferencing in particular offered both clear

benefits and, for some students, equally clear disadvantages. Benefits were identified as broadening one's views by reading a range of student opinions and experience, finding help with difficult areas of the course, sharing information and learning from more experienced peers.

The ability to assess different points of view greatly helped. I have on one occasion changed my opinion, when new facts were brought to light by another student. We all have access to, or have discovered different relevant material. We share this information.

Motivation to study when other people in same position (i.e. busy lives and too much study!). Sharing ideas and learning from other people with different skills. A sense of being part of a team.

For those of us who did participate regularly it was a good forum for expressing an opinion on important issues. It was interesting to obtain different perspectives than my own. Changed the way I looked at certain issues.

It has improved my confidence tremendously and been extremely motivating for me.

Allows discussion between students which is not always possible on other courses. You 'get to know' the other students especially those in your tutor group and can help each other out.

However, the disadvantages for some students were that conferencing brought extra deadlines and time pressures; it also added to the 'parallel processing' design of the course, where students have several activities to manage concurrently. This comment sums up the clash between study demands and lifestyle:

Enjoying the course in a masochistic way – finding it a very heavy workload but find the biggest drawback is not being able to tailor my studies to fit in with other 'life events' – so many deadlines/conferences etc to meet all the time adds quite a bit of pressure.

Students perceived contradictions between what the many interactions entailed, and 'the flexible ethos of OU study'. They had developed modes of study that they felt the course frustrated – 'having to do specific tasks at specified times can get in the way of trying to get ahead'. Another student commented that she would not recommend the course 'for people who like me have family and work, and do the majority of their study by reading through a text and making notes as they go'. She did not find the course 'either 'portable' or convenient'. For some students, stress was the result:

I am finding this the most stressful and time-consuming course I have yet done. There seems to be no point at which one can feel 'I have finished that section, good, take a breather and then set off on the next section. There are always at least three, sometimes five different activities to be done/ongoing at the same time.

In 2005, volunteers who had completed the course were requested to respond to an email proforma of seven open-ended questions about their experience. The aim was to explore some of the more negative responses identified in the questionnaire results outlined above. Ten students responded to the proforma and generally concurred with these comments on the time pressures and parallel processing of different activities and deadlines. These workload pressures also reached a peak during the summer, when many students have added pressure from trying to find time to take annual holiday. However, students were also asked more general questions about how *The Environmental Web* differs from other OU courses they had taken, and their responses provide evidence of highly integrated forms of interaction, with some unease about the interface interaction of extensive computer-based study:

I have never been so tied to a computer for any other course (Student 1).

It is one of only two courses I've done...where constant communication with tutor and other students is VITAL. The other courses I've done in more isolated circumstances...and I don't think I've suffered too much on those, but *The Environmental Web* would be impossible (Student 6).

At level 3 this course built a much better relationship with the tutor than previous level 3 courses I have taken. However it also requires you to have constant access to the Internet and so can be limiting (Student 10).

Three students commented on the increased contact with tutors, and this theme also developed when students were asked what they thought the strengths of the course were. Students commented on the skills they had learned, the high interest and currency of the course content, and the interaction with other students as well as the tutor:

The single greatest strength of the course was that it taught me how to search the web far more effectively than I was doing previously (Student 3).

The course felt very current both in content and in the way students were expected to learn I guess because man's impact on the environment is big news...and also use of the internet, eTMA, WebWizard and much online conferencing (Student 4).

The much greater level of interaction with other students and tutor. The requirement to do your own research for lots of things is a valuable learning experience (Student 6).

Praise for tutors demonstrated the vital role of electronic communication in enabling tutorial intervention, effective feedback and support. These students reported much more effective "teaching presence" (Rourke, Anderson & Garrison, 2001, p. 3) because of CMC by comparison with face-to-face and written communication:

(Tutor X) was a great tutor, friendly, supportive, encouraging... Emails were answered promptly... comments on (assignments) were relevant and helpful, also because typed – could read them – unlike any other tutor before (Student 2).

I did not miss the face to face tutorials. Tutor provided direction by conference posting and duplicated to personal mailboxes where important – I always felt my tutor would be there to help if needed (Student 4).

Tutors had identified the start of the course as critical to its success, and telephone interviews were undertaken with three students during April 2006, covering their experience to that point, including the AOSIS activity (see above). All logged on daily, and had found the workload at the beginning of the course high but manageable. One student said the workload was heavy and was asked why even so, she did not feel under pressure. Her response was to emphasise the enjoyment of the study process: "...I think it's the fact that it's not boring. I mean you don't have to do work from the book all the time and it just is this combination, this change from one type of activity to another."

All three were enjoying the course and had participated actively in the AOSIS conference role play. All were asked whether it had been possible to express differences of view or opinion, since previous research suggests students tend to avoid argumentation (McAlister et al., 2004). The role play mechanism appears to have had the positive effect of enabling students to express their views directly. The phased activity design meant that they had researched the vulnerabilities of their island before conferencing, and were aware of what might or might not be in their island's interests.

Interviewer: Did you find it possible to disagree?

Student: Oh very much so – people did disagree a lot and managed to put forward their points of view a lot, which I really liked, and backed it up with examples...most people's decisions were informed and you could see that.

This student confirms that students used evidence to support their views and the quality of engagement in the dialogue was a reflection of genuine engagement with the needs of their island. The group had to reach a consensus and took the initiative to use a spreadsheet to plot their views. This shows evidence of self-organisation in a context where the group were clear about their task and not dependent on tutor

facilitation. It was also possible to disagree with a majority view where that clashed with what was in the interests of the island that a student was representing:

About half way through we put everything on a spread sheet to see what kind of opinions were coming forward, and it was quite clear that three issues were coming forward from most people, so you...thought ...if you weren't in that consensus you would be in a minority and probably you'd have more sway if you felt able to join the majority...on most of the issues I could but there was one or two issues where I said no there's no way I'm going to compromise on that...I was Haiti, so I was very poor...there was a lot of wealthy islands, so some people didn't have the issues that Haiti did so there was some things that I just couldn't compromise on.

A second student identified the role play activity as key to being able to interact without knowing the group or having met them in advance. The task enabled students to “project themselves socially and emotionally” (Rourke et al., 2001, p. 3) and to make effective contributions from the beginning, without relying primarily on the skills of a facilitator:

Interviewer: So did you find it difficult to contribute...because you hadn't met these people first?

Student: No no not at all. Because in there we had an aim, we had a target so I didn't mind at all that I did not know the fellow students. We just exchanged views...

The third student worked in a group that agreed to work online on a selected date, to improve the process of reaching consensus – another sign of self-organisation. She also described a process of reasoned debate where views could be changed:

Student: ... We had a discussion about tourism...and that was one of the points that we'd agreed on the Sunday and then after some more of the comments the following week it was changed to not stopping tourism at all but going for eco-tourism and going for high taxes on air flights...so that opened up a separate debate in that area and that was one of the things that we altered the opinion on.

The phased design of the activity motivated students to engage with the evidence before interacting and the role play freed them from unease in putting forward and justifying their positions – they argued for ‘their’ island, not for themselves. The design of an effective context with phased stages and micro-level role structure supported online argumentation that engaged students and supported conceptual learning (McAlister et al, 2004). Students were also asked whether they would choose a similar course again, where there are no face to face tutorials but conferencing, as in this case. All three students were entirely comfortable with this mode of study and would not be put off from choosing such a course in future. However two still expressed a preference for face to face tutorials, in spite of feeling well supported by regular online interaction.

## **The tutor perspective**

Five tutors based in three regions (out of thirteen) were interviewed in January 2005. A semi-structured schedule was used, interviews were recorded and transcribed, with tutor agreement on the text. A grounded approach was used in the analysis (Strauss, 1987), with detailed study of each transcript and building of rich connections between the perceptions communicated in each interview. The strategy was not to assume that computer-mediated interaction was the most important feature of the course, but to explore tutor perceptions in order to find out how they perceived the important issues. Accordingly tutors were first asked what made the course distinctive, from their perspective. Four themes were agreed on by at least two tutors; the skills students learn, the up to date nature of the course, the amount of interaction and contact with students and the innovative nature of the design. Interaction therefore was part of a broader picture emphasising course content and use of the Web, as well as the delivery of more contact as a direct product of interaction. Quotations from tutors reveal how interconnected these themes are. The topical nature of the course, its being up to date and innovative, are apparently as important as the fact of an interactive mode of study:

I think very much the use of the Internet as, not so much a teaching tool, but as fundamental to the entire course. ..it's more than just use of the Internet as a medium of teaching, it's using it as the core of the course, teaching everything up to date and so on... It's use of the Internet to keep it up to date that is the key' (Tutor 4).

The fact that it deals with issues that are very topical... it's the uncertainty when you're trying to make the politicians or whoever make these critical decisions that affect everybody's lives...that's what stands out for me' (Tutor 3).

Both these tutors are primarily valuing the fact that the course deals with issues of the day, as they appear on the day – literally since students use external Web Sites throughout for study data and resources. Other tutors focused on the skills students learn and in particular, the ability to evaluate information gleaned from searching the Web:

This is one aspect that [*The Environmental Web*] teaches really well I feel...most of us teach other courses or teach in mainstream education, we're always pushing this point...with [*The Environmental Web*] right from the beginning one of the first activities they do is evaluating websites ...So there's actually a very structured set of criteria that they'll look at in terms of looking at what is a good website for whatever purpose they're using it for and what isn't and I think that's invaluable... (Tutor 1).

Two tutors also commented on the increased contact that they had with students by comparison with other OU courses, one tutor comparing it favourably with A level (the final UK school examination at 18 qualifying for university entry) and explaining that he preferred the kind of teaching it enabled:

It feels more like – how can I put it – more like genuine teaching... I have a lot more contact with students...compared with (another OU course) it's much more like the level of contact that you would expect at A level... I check my conferences more or less on a daily basis and there's usually something there... a more continuous form of contact. I can float things that I don't normally do... You don't normally float an idea, wait for a response from someone...the level of interaction is much higher...much more enjoyable. Certainly the students say that to me and I find it much more enjoyable (Tutor 3).

Another tutor referred to the study process using the interactive online activities, as more effective for learning, because of the continued feedback on progress: "What's distinctive about it is the way that you work through the material. You've always got questions and answers...the fact that you've got instant feedback when you work through the material" (Tutor 2). Tutors were also asked a second open-ended question, namely to identify whether particular aspects of the course teaching were key to its success. All tutors picked out aspects associated with interpersonal interaction, with three tutors commenting on the conferencing, the high rate of participation and continuity of student contact with peers as well as the tutor. Three tutors also highlighted the beginning of the course as key to its success. The first six weeks of the course focus on the AOSIS activities and culminate in a day school. Students are not given a choice, they must complete the activities and conference with peers if they want to submit the first assignment. Tutors say that this gets students involved right from the start and ensures that they engage with each other and the course. The data collection activities later in the course also sustain student interaction and, as importantly, engage their imagination, as this tutor indicates:

...the sort of study...where they count woodlice and things like that. They feel most of them very much part of a bigger whole, it's all very immediate, it's real research, it's actually useful for the scientific community and there are people all over the country feeding into this and that combines the immediacy of the style of the course with something which for many of them it captures their imagination, although they do complain a bit about sitting outside and not finding any dragonflies for example' (Tutor 4).

Tutors were asked whether students are effectively supported and all responded unhesitatingly that students are much better supported on *The Environmental Web* than other courses they tutored. The support comes as much from other students, they felt, as from tutors, with accessibility to online help

being available at most times of the day and evening. All tutors logged on daily and commented that the workload was more continuous – and somewhat higher – than on a course without successful computer-mediated interaction. None of the tutors was negative about this, one even saying that it was ‘addictive’.

I suppose the biggest thing is being there all the time. I know they say oh you only have to look three times a week and you have to wait and that, so you don't - you get hooked on it cos you look every night most of the time you are at home. So if you want to go away, it's quite tricky...Oh, it has impacted on me. I learned a lot more about ICT...I like it, its addictive... you keep going back there to see what's going on, its um a sort of February to October junkie input kind of thing you know (Tutor 5).

All tutors also commented that the course provides a form of indirect continuing professional development, in that they continue to improve their own teaching skills for this interactive mode of study, and they also keep up to date with their subject:

...I think what's surprised me is how much I've enjoyed it as a teaching medium and how much ... students are getting out of it as a learning medium. I really enjoy it. The interesting thing from my point of view is that with other courses I've tutored is that after you've done it just one or two years you get used to doing the same thing and you don't have to read the course materials because you know what's there...With this one I just feel that I'm learning all the time which is great...each time the course is presented I still feel I'm learning a lot about teaching in this way (Tutor 1).

## Discussion

The design of a course selected as a case study of integrated computer-mediated interaction provided a highly structured context which successfully engaged students and supported their achievement of key skills and assessment goals, notably problem solving, team work and tackling unfamiliar problems. Interaction did have a positive impact on learning, particularly associated with the strong integration of interactive activities with assessment tasks. Students reported the personal impact of interaction in terms of feeling both less isolated and more aware of a broad range of views, valuing these new opportunities to learn from different perspectives and more experienced peers. Student experience confirmed the success of the structured activities at the beginning of the course, and the effectiveness of online role play in supporting reasoned argument and constructive difference of opinion. This was achieved through the design of activity and did not depend primarily on the skills of a moderator or facilitator, which previous research has emphasised (Salmon, 2000). However, the integration of interaction into the assessment process meant that students had to engage in conferencing and also had to manage activities running in parallel. The number of deadlines increased and some students reported that the course was more than usually difficult to manage alongside their other responsibilities. Some students also focused on computer interface interaction and experienced being tied to the computer as a study restriction. Students' assessment of course quality was negatively affected by these unintended negative impacts of an effective pedagogical design. However, the course achieved higher rates of completion than comparable courses in two faculties and students rated it highly for appropriate assessment and generic skills learning outcomes.

The tutor perspective was extremely positive, and gave equal weight to effective skills teaching and use of the Web for updating, as well as the interactive features of the course. Interaction was valued primarily in terms of the high level of interpersonal contact it delivered, and for the active study process created by online activities. Students were also seen to be much better supported than on other OU courses, even though there were no regular face to face tutorials. These features were seen as key to the success of the teaching, particularly at the beginning of the course. Tutors found the course enjoyable, as did their students, and this appeared to mitigate the fact that conferencing in particular increased their workload and also made it more continuous. Tutors also felt that they continued to learn from the course, as a highly innovative form of teaching, alive to change as it occurs, in environmental science.

## Conclusion

Meeting the twin challenges of mobilising participation and high quality learning requires more than the design of interaction at the micro level of dialogue strategies and supports for argumentation and

conceptual conflict. The evidence from this case study affirms that these are important, and that a well-designed role play activity can generate effective learning dialogues, even without some of the more elaborate dialogue support interfaces (Cook, 2002). But it also shows that interpersonal interaction was successful in part because preceded and supported by content interaction. The two worked together synergistically, and were consolidated by being assessed. The wider context of the course as a whole also shaped students' reactions and willingness to engage. It was difficult to separate out the positive impact of interaction from other aspects of the course pedagogy such as the currency of the content, the immediacy of its style and the role students are given as environmental researchers in their own right. A context was created that motivated students and gave them intrinsic rewards for engagement, as well as extrinsic rewards through assessment. This suggests that simply adding interactive features to a course is unlikely to lead to such positive outcomes.

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