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Computers &amp; Education xxx (2005) xxx–xxx

**COMPUTERS &  
EDUCATION**[www.elsevier.com/locate/compedu](http://www.elsevier.com/locate/compedu)

## When to jump in: The role of the instructor in online discussion forums

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Received 19 March 2004; received in revised form 19 October 2004; accepted 7 June 2005

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### Abstract

As asynchronous discussion forums become more prevalent in online and flexible-delivery modes of teaching, understanding the role that instructors play in student learning in these forums becomes an important issue. Whether the instructor chooses to lead discussions or to keep a low profile can affect student participation in surprising ways. In this study, we investigate how instructor participation rates, the timing of instructor postings (during or at the end of a forum) and nature of their postings (questions, answers or a mix of the two) relate to student participation and perception.

Using archives containing over 40,000 postings to nearly 400 discussion forums, together with over 500 university evaluation survey responses collected over six consecutive semesters, we analysed student and instructor postings to discussion forums, student responses to university evaluation surveys, and instructor and student responses to surveys carried out as part of this project. We collected both quantitative and qualitative responses on how instructors believe they behave in discussion forums and compared these with statistical analysis of the forums, and then looked at how the instructors' behaviour correlated with students' participation and perceptions.

We found that the way that instructors post to forums may influence students' forum discussions and participation in unexpected ways. We show that instructors' perceptions of how they teach online do not necessarily agree with our observations, and that intuitive measures such as the rate of student participation

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and the length of discussion threads are not necessarily good ways to judge the ‘health’ of discussion forums or the quality of learning taking place.

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*Keywords:* Computer-mediated communication; Teaching/learning strategies; Adult learning; Distance education and telelearning

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## 1. Introduction

The use of online asynchronous discussion forums as part of online and flexible-delivery modes of teaching is becoming much more prevalent, facilitated by the increased use of commercial online course delivery systems by educational institutions (Katz, 2003; Morgan, 2003; Northover, 2002; Warger, 2003). Teaching via online asynchronous discussion forums presents a new challenge to instructors used to the immediate visual and audio feedback of face-to-face classes (Collins & Berge, 1997; Markel, 2001; Schrum & Berge, 1997; Schrum & Hong, 2002). In fully online delivery in particular where the only means of contact is via forum postings and emails, making contact with the quiet, non-participating students ‘down the back of the class’ presents a special challenge. Normally outgoing instructors may find it hard to teach in a medium where body language and verbal clues count for nothing, and personality can only be expressed via the written word. In contrast, less outgoing instructors may welcome the opportunity to take time to craft their responses to students’ postings, and find that they can take on roles that they would not normally assume in face-to-face teaching (Levitch & Milheim, 2003; Paloff & Pratt, 1999).

For all online instructors, a particular challenge lies in working out how much and in what way to intervene in students’ discussions in order to aid learning, without actually taking over in the process. The instructor’s role in asynchronous discussion forums can vary from being the ‘sage on the stage’, to the ‘guide on the side’ or even ‘the ghost in the wings’ (Mazzolini & Maddison, 2003). Discussion in the literature generally suggests that it is important that instructors play an active, visible part in forum discussions (Berge, 1995; Salmon, 2000; Salmon & Giles, 1997). For example, Paloff and Pratt (1999) state that, “Additionally, it is important for the instructor to make thoughtful comments on student posts, designed again to stimulate further discussion. As part of this function, the instructor acts as a cheerleader, attempting to motivate students to go deeper and further with the material than they might in a face-to-face classroom”. Frequent instructor participation is often assumed to encourage student participation, for example in Kearsley (2000), “One factor that strongly affects the amount of student interaction and participation is the level of instructor involvement. If the instructor regularly posts messages in the discussion forum or provides comments to students via email, this increases student involvement and participation in a course. So a cardinal rule of good online teaching is that the instructor must participate a lot to get students to do likewise”. It is also recognised that instructor participation may be overdone: “However, the instructor needs to maintain a balance between too little and too much participation. Because the learning community is a critical feature of the online course, the instructor need not respond to every student post but instead should determine the appropriate time to jump in, make a comment, ask another question, or redirect the discussion. Too much participation by the instructor can have the effect of reducing the amount of interaction among

the students and create an unnecessary degree of reliance on the teacher” (Paloff & Pratt, 2001; also see Levitch & Milheim, 2003).

The above quote (Paloff & Pratt, 2001) highlights the central issues investigated in this study – when and how should the online instructor “jump in” to asynchronous discussions? The study we report here used a statistically large sample of forum postings to investigate whether student participation rates, lengths of discussion threads, and student perceptions concerning their learning in online discussion forums are influenced by

- the frequency at which their instructors participate in forum discussions,
- the timing of instructors’ postings – during or at the end of discussions, and
- the nature of instructors’ postings – as answers to student questions, new questions, both answers and follow up questions, or other comments.

We also comment on qualitative responses from instructors and students on these aspects of forum participation.

Note that in this paper, we sometimes speculate on cause and effect, but by itself this study does not and cannot reasonably attempt to establish causal relationships between these variables. As an example, in this study we find a negative correlation between the frequency of instructors’ postings and students’ postings to asynchronous discussion forums. Now it may be that students will not feel the need to post very often because their instructors are posting frequently and answering outstanding questions in the process. Alternatively it may be that instructors feel the need to post frequently to fill the silences, in situations where their students choose not to post very often for other undetermined reasons. We don’t attempt to determine cause and effect in this study, but we do reach some potentially significant and useful conclusions for coordinators of online programs.

In this study, we have investigated asynchronous forums that are used for tutorial-type teaching purposes and form part of the assessment mix in *Swinburne Astronomy Online* (SAO). SAO is a fully online, postgraduate suite of Masters/Graduate Diploma/Graduate Certificate astronomy courses offered by Swinburne University of Technology, Australia, and the authors are the designer and original coordinator of SAO (MM) and the current coordinator of SAO (SM). In an initial study (Mazzolini & Maddison, 2003) we used SAO discussion forum archives and university evaluation survey responses collected over three semesters to conclude that the way that instructors post to forums can influence students’ forum discussions and student perceptions, though not always in expected ways. We found that, on average, instructors who played a prominent part in forum discussions or who were active in making significant numbers of initial postings did not appear to stimulate more discussion, and may possibly have even limited the amount of discussion (with the more advanced students) and the length of discussion threads (with all students). However, SAO students did respond favourably to the perceived enthusiasm and expertise of instructors who post relatively frequently, even if, in the process, their own contributions to the discussions tend to decrease. Although the rate of student participation and the length of their discussion threads may be common intuitive ways used by instructors to judge the ‘health’ of their discussion forums, our initial research showed that it is far from clear that they are useful measures to judge the quality of the learning taking place there. These were interesting results, but somewhat limited by the size of our survey sample. In the study reported in this paper, we extended our analysis across 3 academic years (6 consecutive semesters). In addition, we added a

more qualitative dimension to our study by surveying students and current and past SAO instructors, and we also analysed the timing and nature of instructors' postings to forums.

## 2. Study context

In 2003 there were approximately 260 enrolled students in SAO resident in over 30 countries. SAO students are generally articulate, enthusiastic, adult students (average age mid 40s), but mostly lacking any prior experience of learning online. SAO involves a hybrid online delivery strategy, combining high bandwidth course content on CD-ROMs with access to online, asynchronous communication and web resources. Asynchronous discussion forums are used in SAO for tutorial-type teaching purposes and form part of the assessment mix, which is typically made up of computer-managed testing, essays, and project work as well as contributions to the forums (Mazzolini, 2000, 2002). In other studies, we have investigated whether gender affects the level of participation in SAO discussion forums (Mazzolini & Maddison, 2002) and also discussed effects of the growing size of the program (Mazzolini & Maddison, 2003a), and issues associated with international participation in SAO (Mazzolini & Maddison, 2004).

In SAO units, students are divided into groups containing approximately 30 students per instructor, each group with its own set of discussion forums. A new forum is opened up every two weeks during the teaching semester, where students are required to post at least one question or 'extension comment' about current course material and also answer at least one question posed by someone else. In the forum discussions, students clarify their own understanding of key concepts and further develop their science communication skills by answering each other's questions, often in considerable depth. At the end of the teaching semester, SAO students are asked to nominate which three of their discussion forum postings are to be assessed. The discussion forum component of the final grade (up to 30%) is made up of marks awarded for the nominated forum contributions, plus a smaller 'participation mark' component intended to reward regular participation.

SAO instructors are professional astronomers. Each semester approximately 50% of the instructors are based outside Swinburne, teaching into the online program from observatories and research institutes around the world. Online teaching is generally the only practical way that SAO astronomers can gain experience as instructors while fulfilling their professional commitments, as even the Swinburne based instructors frequently need to travel to observatories and conferences during teaching times. For some young SAO instructors the online program has been their first teaching experience, and so far all have been new to online education when they started with the program. The 'guide on the side' philosophy of the SAO program helps new instructors find their feet, but the lack of face-to-face interaction with students can initially make it difficult for them to gauge 'what works' when teaching through discussion forums, and so the SAO coordinating team have to pay special attention to mentoring new instructors and monitoring their teaching.

As forum discussions are a key feature of SAO, the SAO program offers an excellent opportunity to make comparative studies of student and instructor participation in discussion forums. Although the astronomy course material being discussed in forums varies according to unit, all forums are conducted under the same overall guidelines and with the same assessment criteria. Feedback from studies such as this one has proven invaluable in guiding new instructors on

how best to make their online teaching effective and also on how to ensure that the online learning experience is rewarding and engaging for their students.

### 3. Study outline

In order to investigate when and how online instructors should ‘jump in’ to asynchronous discussions, in this study we analysed forum postings and university evaluation survey results and also carried out our own surveys of SAO students and instructors.

The analysis of forum postings involved studying student participation rates as functions of instructor participation rates and of the timing and nature of instructor postings. Following on from our initial research (Mazzolini & Maddison, 2003), we report here on a more comprehensive analysis of student and instructor posting rates and discussion thread lengths covering SAO discussion forums from Semester 1, 2000 to Semester 2, 2002 inclusive. These involved a total of 375 forums containing over 40,000 postings in all, where each forum can contain up to approximately 200 student and instructor postings (see Table 1 for detail).

In the survey component of this study, we studied student responses to (anonymous) university evaluation surveys over the same six semesters, together with student and instructor responses to surveys specifically carried out as part of this project. Student response rates to university evaluation surveys are ~35% on average, and our analysis is based on approximately 500 survey responses collected over six semesters. Our own direct survey of 230 enrolled SAO students in one particular semester (Semester 2, 2002) had a similar level of success, with 85 responses representing a 37% response rate. Of the 23 instructors who taught into SAO over the six semester period, two are the authors of this study, and one could no longer be contacted. Of the 20 remaining instructors, 17 responded to the instructor survey (85% response rate).

### 4. Results

In this section, we discuss each of the three main components of our study in detail. In each case, the overall aim was to investigate how student participation and perceptions are affected by how and when their instructors post to discussion forums.

Table 1

Statistics for each of the 6 semesters of the study, showing the total numbers of enrolled SAO students, the number of units they enrolled in plus the number on offer, the number of discussion forums offered (some units had more than one forum, due to larger enrolment numbers), and the total number of instructors involved in those discussion forums

	Number of students	Number of unit enrolments	Number of units offered	Number of discussion forums	Number of instructors
S1, 2000	135	175	5	8	8
S2, 2000	155	200	6	8	8
S1, 2001	180	270	7	10	10
S2, 2001	200	280	7	11	11
S1, 2002	230	330	8	11	11
S2, 2002	215	280	8	11	10

#### 4.1. Results of student participation and perceptions as a function of instructor participation rates

In order to extend our earlier investigation of how student participation and perceptions related to SAO instructors' participation in the discussion forums (Mazzolini & Maddison, 2003), we analysed six consecutive semesters of discussion forum and university evaluation survey data to see whether the trends we reported in the 2003 paper would be confirmed with a larger statistical sample and over a longer timeline. The university evaluation survey responses were analysed to see if students were more likely to rate aspects of their educational experience highly if their instructors regularly contributed to the discussion forums. As part of the instructors' survey, instructors were asked their opinion on whether frequent instructor postings tended to correspond to higher or lower (or unaffected) student posting rates, and those responses are also discussed here.

##### 4.1.1. Frequent instructor intervention – effects on student participation

In our analysis of discussion forum postings, we first measured the overall number of student postings in forums as compared to the number of postings by instructors. We then investigated whether the proportion of instructor postings and the number of times that each instructor initiated new postings (rather than just contributed to threads initiated by students) significantly influenced overall student posting rates and lengths of discussion threads.

Casual observation had suggested to us that instructors who posted frequently would encourage greater participation rates by students in SAO, but in our earlier study over three semesters (Mazzolini & Maddison, 2003) we found this not to be the case. Instead, in that study we found that

- the percentage of instructor postings within a forum showed a significant negative correlation with the length of discussion threads ( $N = 29$ ,  $R = -0.67$ ,  $p < 0.01$ ) but we did not find a significant correlation with the student posting rate; and
- the percentage of discussion threads started by instructors showed significant negative correlations with both the length of discussion threads ( $N = 29$ ,  $R = -0.58$ ,  $p < 0.01$ ) and the student posting rate ( $N = 29$ ,  $R = -0.41$ ,  $p < 0.05$ ).

In the current study, we analysed six semesters of data, extending the sample size to 375 individual discussion forums (each of 2 weeks duration), and recalculated the correlations that had been noted over three semesters. We found that

- the percentage of discussion threads started by instructors still showed significant negative correlations with both the length of discussion threads ( $N = 375$ ,  $R = -0.27$ ,  $p < 0.001$ ) and the student posting rate ( $N = 375$ ,  $R = -0.33$ ,  $p < 0.001$ ), and
- the percentage of instructor postings within a forum still showed a significant negative correlation with the length of discussion threads ( $N = 375$ ,  $R = -0.41$ ,  $p < 0.001$ ), and now the increased sensitivity provided by the much larger sample size also allowed us to establish a significant negative correlation with the student posting rate ( $N = 375$ ,  $R = -0.32$ ,  $p < 0.001$ ).

With respect to the first result, we would have expected that by making the effort to initiate new postings, instructors would have encouraged their students to post more often. In our initial



study, we also found a negative correlation between the percentage of new postings initiated by instructors and the student posting rate, but our results in that study were only significant for the more advanced SAO units. (SAO students can study units in any order, prerequisite requirements permitting, but the student cohort in the three ‘introductory level’ units is typically composed of 70% beginner students. Very few beginner students enroll in any of the other 12 ‘advanced level’ SAO units in their first semester.) In this study, using data from twice as many semesters, we have now been able to identify a significant effect in both cases ( $R = -0.37$ ,  $p < 0.001$  for advanced units,  $R = -0.18$ ,  $p < 0.001$  for introductory units). We find that for both advanced and introductory units, the more initial postings made by instructors, the lower the student posting rate on average.

In summary, on average we found that the more the instructors posted, the less frequently students posted and the shorter were the discussion threads. We also found that forums where instructors were active in making new postings contained fewer student postings and shorter discussion threads. If we judge how prominent a part SAO instructors played in discussion forums in terms of the total percentage of postings they made and the number of new postings they initiated, then we can now make the stronger statement that the *more* prominent the role the instructors played in the forum discussions, the *fewer* student postings occurred on average. Our studies therefore suggest that SAO forums where instructors played a prominent role corresponded to lower rates of student participation, and instructors who attempted to increase the amount of discussion in forums by initiating new postings did not succeed.

#### 4.1.2. Frequent instructor intervention – university evaluation survey responses

In our earlier study (Mazzolini & Maddison, 2003) we analysed (anonymous) student responses to university evaluation surveys and found significant correlations suggesting that SAO students tend to perceive instructors who post often as being more enthusiastic and displaying greater expertise, as compared to instructors who post infrequently.

To determine whether the trends identified in that initial study would be confirmed when using a larger statistical sample from six consecutive semesters, we again analysed student responses to the following university evaluation survey statements:

- “The online instructors were enthusiastic”.
- “The online instructors demonstrated expertise in the course matter”.
- “I found the newsgroups useful”. (Note that SAO employs newsgroup technology to deliver its discussion forums.)
- “Overall I was satisfied with the educational experience provided”.

As responses were recorded on an ordinal scale measurement (a 1–5 Likert Scale), analysis of correlations between survey results and the average percentage of instructor postings using the Pearson correlation coefficient would not be appropriate. Instead, we used one-way analysis of variance (one-way ANOVA) tests.

We found that 6 semesters of data confirmed the trends noted over 3 semesters. Specifically, the percentage of instructor postings within a forum showed

- a significant although very small effect size when correlated with students' estimation of the enthusiasm shown by their instructors ( $F(4,457) = 12.1, p < 0.001, \eta^2 = 0.08$ );
- a significant although again very small effect size when correlated with students' estimation of the expertise of their instructors ( $F(4,542) = 9.18, p < 0.001, \eta^2 = 0.06$ ), but
- no significant correlation with students' estimation of the usefulness of their forums or their overall satisfaction with their educational experience.

In the earlier (Mazzolini & Maddison, 2003) study, we found that instructors who posted very infrequently may have had a slightly negative influence on student satisfaction with their SAO educational experience overall, but that this conclusion may have been biased by results from one discussion forum where the instructor was particularly (and unacceptably) inactive. In this current and larger study, the biasing effect of that one outlier result disappeared and we found that most SAO students tend to rate their satisfaction with their overall educational experience highly, whether their instructors posted frequently or not.

The statement about the usefulness of discussion forums had only been included in the survey for the last three semesters studied. We did not find any significant correlation between perceived usefulness of forums and the rate at which instructors post, and so it appears that SAO students found forums useful whether or not their instructors contributed at a significant rate. This would tie in well with the student-centred nature of the discussions, in that students were encouraged to post their own queries and answer each other's questions. However, the sample size for the analysis was small and so no firm conclusions could be drawn.

In summary, we found that on average, a small but significant correlation suggesting that students perceived instructors who posted often as being more enthusiastic and as displaying greater expertise than instructors who posted infrequently – which is hardly surprising. However, when it came to overall satisfaction with the SAO experience, SAO students generally made up a very satisfied cohort independent of how often their instructors participated in forum discussions.

#### 4.1.3. *Frequent instructor intervention – students' and instructors' views*

Although in the previous section we found that the frequency with which instructors posted to forums had a small but significant correlation with students' responses concerning instructor expertise and enthusiasm in the university evaluation surveys, this is indirect evidence only. In Semester 2, 2002, as part of a general SAO survey asking students directly about their experiences with the discussion forums, we asked the students to give us “any comments on what styles of instructor participation you find most useful for teaching and learning, and why”.

Of the 85 students who replied to the survey, 57 responded to this particular question with 47% of those responses mentioning that the students concerned appreciated frequent instructor postings. No students indicated that they would like to see instructors post less often, though a very small number (4 students) indicated that instructors should hold off answering students' questions for a few days, or even till the second week of each forum, to give other students a chance to provide answers first. Comments included:

“I personally appreciate instructors that participate in the discussions. This keeps the transmission of erroneous information down to a minimum. I respect my fellow students,



but who's to say that they are always right? The worst class I took was one in which the instructors were missing from action in the newsgroups.”

“I prefer an instructor who posts frequently during a given two week period but not so that they answer the questions during the two weeks. The ‘final word’ should be left to the end of the two weeks. [Posts] during the two weeks should be more to guide the discussion, [possibly] even leading us into common ‘blind allies’ as a challenge to the discussion. The discussion should then be cleared up at the end of the two weeks.”

We also surveyed SAO instructors to find out how they viewed aspects of their participation in discussion forums. Fig. 1 shows instructors’ responses when questioned on the effect that frequent instructor postings had on student discussions in forums. Three instructors indicated that they could not say which of the alternatives posed was correct. Of the other 14 instructors, all but one indicated that they believed that frequent postings by instructors either did not affect, or even increased, the level of student discussion. This is in contrast to our statistical analysis in Section 4.1.1 where we found that, on average, frequent posting by instructors corresponded to lower student posting rates.

The solitary instructor who indicated that frequent postings by instructors tend to result in a reduced level of student discussion commented that

“I think there is indisputable evidence that posting by the instructor has a tendency to kill off many threads immediately (even when subsidiary questions are posed). That said, the pros of posting clear, supportive responses outweighs the cons of killing off the thread.”

This quote addresses a core concern of our research. The rate at which students post is often considered to be a measure of the ‘health’ of a discussion forum. If that were so, then on the basis of our study, instructors would be advised to post infrequently. However, it is quite likely that

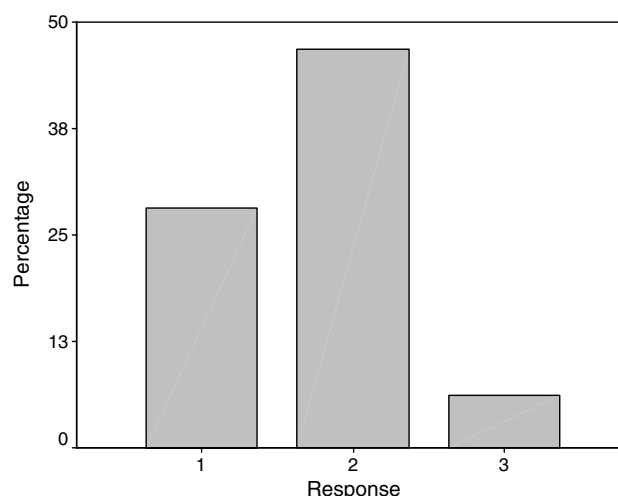


Fig. 1. Instructor survey responses to the question, “In your experience, if an instructor posts relatively often to the discussion forums, does the amount of student discussion on the forums tend to: (1) increase, (2) not be significantly affected, (3) decrease?”.

even if high rates of instructor participation do correlate with relatively low numbers of student postings, well thought out instructor postings may aid learning even if they decrease the level of overall discussion. Clearly any judgment of the effectiveness of a discussion forum that is based on posting rates only may be quite misleading.

#### *4.2. Results of student participation and perceptions as a function of the timing of instructors' postings*

##### *4.2.1. The timing of instructors' postings – effects on student participation*

In this part of the study, we analysed discussion forum postings to see if the *timing* of instructors' postings – specifically, whether instructors tended to post mainly during or at the end of each 2 week forum – showed any significant correlation with student posting rates or discussion thread lengths. This is of interest to us because this difference in timing is also a signature of a difference in style: in SAO, instructor postings at the end of a forum are almost always intended to 'wrap up' discussion threads. In contrast, although some instructor postings made during forums answer student questions too, many are intended to continue and even initiate discussion threads.

After inspecting forum postings to see at what stage instructors typically make final 'wrap up' postings, we classified instructor postings before the last 2 days of the official period for each forum as 'in forum' postings, and instructor postings made in or after the last two days of the official period for each forum as 'final' postings. An analysis of the percentage of instructor postings showed that, on average, instructors post approximately half their postings during each forum (mean = 55%, sd = 26%) and half as 'wrap up' postings at the end. This trend held for both introductory and advanced level classes, and was something of a surprise. It might have been expected that instructors of introductory level classes could have felt the need to do more of their postings during the forum discussions in order to aid their relatively inexperienced students, as compared to instructors of advanced level classes. We also observed that almost all instructors do post consistently during forum discussions at some level, as they are encouraged to do by the SAO coordination team – only a very small number of forums had essentially all the instructor postings at the end.

Our analysis of student posting rates showed no significant correlation with whether instructors chose to make the bulk of their postings during or at the end of each discussion period. Consider these results in combination with our earlier result (Section 4.1.1), where we concluded that instructors playing a prominent role did correspond to lower rates of student participation on average. It might have been reasonable to expect that instructors who posted mostly at the end of each forum would 'disturb' student discussions less, thereby having less inhibitory effect on student posting rates. However, this was not the case – even when instructors who typically posted frequently waited to do so till the end of forums, the average number of student postings was lower than average, at least to the accuracy of this study. We can speculate that it may be that students will still tend to wait to hear what the instructor has to say at the end rather than continuing to debate an issue at length, once they have noticed that their instructor generally follows the practice of making comprehensive 'wrap up' postings at the end of each forum.

#### 4.2.2. *The timing of instructors' postings – university evaluation survey responses*

In Section 4.1.2, we found that students perceived instructors who posted frequently as being more enthusiastic and displaying greater expertise as compared to instructors who posted infrequently. We were interested to see if this result was affected by whether the instructors tended to post often during or at the end of forums.

When we compared the percentage of postings made by instructors in the periods during and at the end of each discussion forum with the results of university evaluation survey questions on enthusiasm and expertise (using Likert scales from 1 = strongly disagree to 5 = strongly agree), we found some interesting positive correlations. For both the enthusiasm and expertise questions, the ANOVA analysis indicates that there is a mild positive correlation with the percentage of instructor postings *during* forums ( $F(4,451) = 2.63$ ,  $p < 0.05$  for enthusiasm,  $F(4,546) = 3.03$ ,  $p < 0.05$  for expertise), and a strong positive correlation with the percentage of instructor postings at the *end* of forums ( $F(4,451) = 14.5$ ,  $p < 0.001$  for enthusiasm,  $F(4,546) = 11.6$ ,  $p < 0.001$  for expertise).

In summary, as well as concluding that SAO instructors who tended to post often scored more highly on survey questions concerning instructor enthusiasm and expertise, we found that the effect was much more pronounced for instructors who posted mostly at the ends of the forums. Clearly these survey results indicate that SAO students appreciate it when instructors make significant numbers of 'wrap up' postings at the end of each discussion forum. Although the frequency with which instructors post *during* forums did not significantly affect survey results on instructor enthusiasm, it should be noted that the few extreme cases where instructors hardly posted at all during forums did result in low scores on this survey question.

#### 4.2.3. *The timing of instructors' postings – students' and instructors' views*

In Section 4.1.3, we discussed responses to the Semester 2, 2002 SAO survey where students were asked to provide "Any comments on what styles of instructor participation you find most useful for teaching and learning, and why". Of the 57 students who responded to this particular question, 20 students indicated that they particularly appreciated it when instructors posted during the 2-week forums, two students commented that it was best when instructors posted mainly in the second week of each forum (especially when it comes to answering student questions), and only three students made comments which could be interpreted as indicating some preference for instructor postings to occur mainly at the end of forums. Comments included:

"My personal experience is that I don't find a decrease in student discussion whenever instructors make their postings, but rather there is an increase in student traffic. Of course, this greatly depends on the topic in question and the appropriate time of intervention of the instructor. In the six units that I covered with SAO, I found that instructor styles varied and I find it best when the instructor regularly contributes in small doses. In this way, there is less of a need for the instructor to summarise the work at the end of the two week period since everything is in check from the very start."

"I think the regular participation of the instructor during each two week period is the most useful. This allows an incorrect interpretation to be addressed sooner rather than at the end of the topic (e.g. the Internet is a fantastic resource, but there are websites propagating

incorrect astrophysical theories that students may run with, not knowing of their illegitimacy). Regular instructor participation also allows time for further thought-provoking discussions, either initiated by the instructor as a follow-up question(s) . . . or prompted by the students in response to the instructor's posting."

"Instructors should jump in quickly when they see the discussion in the thread is wrong or getting well off track; otherwise hold back for the first week and let the students have at it. Coming in too early with comments tends to shut down the discussion."

Clearly there is a contrast between the perceptions of these 57 students and the trends we noticed in Section 4.2.2 using university evaluation survey results. When asked explicitly, these students indicated that they preferred it when instructors post mostly during forums, but the university evaluation survey results indicated that instructors who posted more often at the end of forums were rated more highly on enthusiasm and expertise.

Fig. 2 shows instructors' responses when asked to comment on whether they tended to post most often during or at the end of each 2-week discussion forum. Although instructors were asked to choose between the two alternatives, two responded that they did both equally. Of the other 15 instructors, a slight majority stated that they tended to post most often during rather than at the end of each discussion forum, but the difference was not statistically significant. These responses compare quite well to our statistical analysis of forum postings as discussed in Section 4.2.1, where we found that instructors posted roughly equally during and at the end of forums on average.

One of the most experienced instructors made the following additional comment, which is a good summary of the teaching approach that instructors had been encouraged to use by the SAO coordination team:

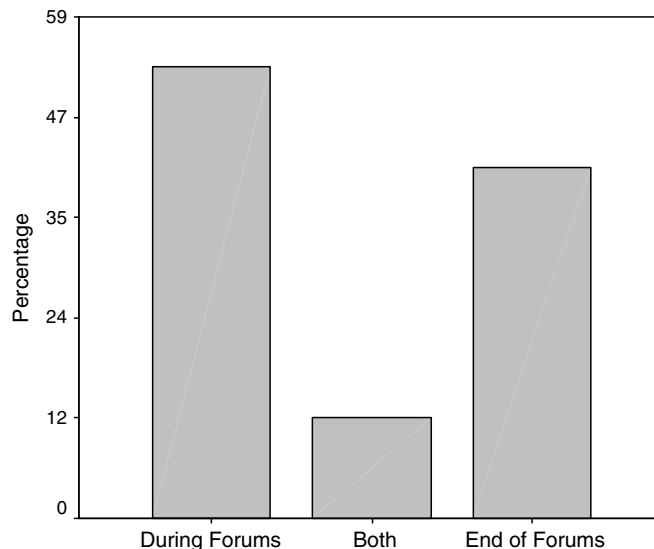


Fig. 2. Instructor survey responses to the question, "When taking part as an instructor on SAO discussion forums, do you tend to post (1) most often during each 2-week discussion forum, or (2) most often at the end of each 2-week discussion forum?"

“I see two roles for the instructor:

- (a) During the 2-week period, to monitor the discussion, correct any significant misconceptions, trigger discussion, and steer the discussion in an appropriate direction. All this is best achieved with a fairly light touch. The aim is to stimulate a good discussion, get students to answer each other’s questions as far as possible, but correct any answers which may be misleading.
- (b) At the end of the 2-week period, answer any remaining unanswered questions, or finish off and tidy up any extended discussions.”

Instructors who tended to post mainly at the end of a discussion forum suggested that discussions that are progressing well are best left largely alone:

“My ... students seem mature enough that they don’t require me to proffer up many questions of my own, and I prefer to see students have their own go at answering other’s questions. I will jump in straight away if I see something glaringly wrong, but otherwise prefer to do a “tidy up” within a few days of each newsgroup closing, on questions which have not otherwise been satisfactorily answered by the students themselves.”

And from another instructor:

“I mostly answer students’ questions, only at the end of the fortnight. I figure if you answer the student’s question early in the piece then you effectively close that thread and don’t allow the other students (who may be a little slower in forming their response) to join in. Most students I think take the instructor’s word as gospel.”

However, some of the other instructors suggested that mostly posting at the end of discussion forums may not be effective:

“I find that it is most useful to post my contributions (both questions and answers) during each 2-week forum. That way I know my contributions will be looked at. I find that it is hard to get students to look back at previous 2-week periods in any detail. Most students always want to move onto the next topic and some struggle to keep up with even that.”

#### *4.3. Results of student participation and perceptions as a function of the nature of instructors’ postings*

##### *4.3.1. The nature of instructors’ postings – effects on student participation*

Since the commencement of SAO, the coordination team has encouraged instructors to use a broadly ‘Socratic approach’ when participating in online discussion forums. (For a discussion on using Socratic questioning to teach critical thinking through online forums, see [MacKnight, 2000](#).) Here, the underlying model is a constructivist one, which assumes that student knowledge and preconceptions can be drawn out through student–student and instructor–student asking and answering of questions in asynchronous discussions, and that misconceptions can be made explicit and resolved through online dialogue in ways not available in purely paper-based distance education. (For discussions of constructivist approaches to online education, see [Anderson, 2002](#);

Berge, 2001; Gold, 2001; Markel, 2001; Schrum & Hong, 2002). One early SAO participant who is also a university lecturer in his own discipline commented, “The . . . group are a terrific bunch, even though class is virtual. And the discussions and questions are imaginative and demand thinking caps. It’s more like the classic Greek form of tuition, with the course tutors and students sitting round a forum discussing the subject. It’s live tuition. Once again, better than a real class-bound course . . . ”

Certainly the discussions in SAO forums do predominantly involve posting questions and answers, but it has not been clear just how much the instructors have contributed in terms of asking initial and follow-up questions, and whether this is even necessary. It may even be conjectured that forums of articulate, enthusiastic adult students that have been set up in this way will maintain a momentum of their own, almost independent of the way in which instructors participate.

To see whether postings by SAO instructors to discussion forums actually do tend to be made up of a mixture of answers, questions, and follow-up questions arising from answers, we analysed postings by SAO instructors to four discussion forums for each class over six semesters (Semester 1, 2000 to Semester 2, 2002). Overall, each of these classes took part in six 2-weekly discussion forums each semester in 2000 and 2001, and seven 2-weekly discussion forums each semester in 2002 after a slight change in semester length. The four forums per class used in this analysis were the second to fifth forums for each semester and were specifically chosen to exclude the initial and final forums which tended to include a large proportion of necessary ‘housekeeping’ postings by instructors. In total, 283 forums and 4801 instructor postings were included in this particular analysis, which involved classifying each instructor posting in these 283 forums as either a

- question,
- answer,
- combination of answer plus follow-up question, or
- other.

The ‘other’ category corresponds to administrative ‘housekeeping’ postings by instructors such as welcome messages to each forum, and housekeeping postings about assessment, etc.

The results of the analysis are shown in Fig. 3. As can be seen, the overwhelming majority (68%) of SAO instructor postings are in the form of answers to students’ questions. Instructors’ questions and answers coupled with follow-up questions together represented only 12% of total postings by instructors.

#### 4.3.2. *The nature of instructors’ postings – effects on university evaluation survey responses*

Does it really matter to the students whether their instructors post their own questions as well as answers to student queries? We used one-way ANOVA tests to re-analyse the responses to the university evaluation survey statements

- “The online instructors were enthusiastic.”
- “The online instructors demonstrated expertise in the course matter.”
- “Overall I was satisfied with the educational experience provided.”



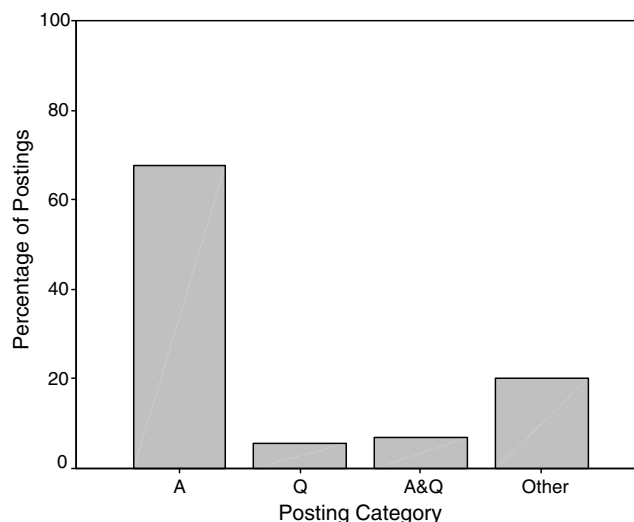


Fig. 3. Categorizing instructor postings (4801 in total) to 283 discussion forums held over 6 semesters, according to A = answers to students' questions, Q = new questions, A and Q = responses to students' questions which include subsidiary questions, and other.

in order to see if averages of student responses (on a 1–5 Likert Scale over six semesters) showed any significant correlation with whether their instructors posted mostly answers, questions, or a combination of answers with follow-up questions in order to extend a discussion thread.

We found no correlation between student responses to these survey questions and whether the instructors posted mainly questions, answers, or follow-up questions. Note that this statistical analysis is hampered by the very small number of SAO students who give negative responses to these university evaluation survey questions (5% of students at most). Students do however regard instructors as less enthusiastic (significance level  $p < 0.01$ ) if their instructors tend to register a high proportion of 'other' postings – i.e., postings that are neither questions nor answers. This result is relatively easy to interpret once one realises that instructors whose postings fall mainly in the 'other' category are usually the same instructors who make relatively few postings at all. Most of the postings made by relatively inactive instructors are 'house keeping' ones, with only a minority addressing student questions on course content.

#### 4.3.3. *The nature of instructors' postings – students' and instructors' views*

Among the 57 responses received to the request to give us “Any comments on what styles of instructor participation you find most useful for teaching and learning, and why” in the Semester 2, 2002 SAO survey of students, approximately one third mentioned that they appreciated it when instructors ask questions in forums, including 5 responses that explicitly mentioned follow-up or subsidiary questions. Comments included:

“I think the instructors should stay active in the newsgroups. They don't have to answer the questions (and for the most part shouldn't unless it is way beyond our ability), but they

can let us know if we are on the right track or ask further questions (if the discussion seems to languish). After the newsgroup is over they can then answer or correct answers as part of a cleanup. The instructor needs to have a motivating presence in the newsgroup.”

“I was surprised that the instructor was such a frequent participator but I found his comments very useful and the follow up questions challenging. It certainly didn’t keep postings succinct, there were some lively discussions resulting!, but it did stop the reinforcement of misconceptions.”

“I like the instructor to pose questions; where the questions can lead to another level of understanding of the subject under study. For instance; . . . The instructor asked a question about . . . I felt I actually learnt something worthwhile; from just one simple thread posed by the instructor. This occurred throughout the semester; and I came away from this [subject] really satisfied; when in fact I initially thought the subject may have been quite dry. From the four [subjects] I have taken to date; I would say this was one of the better ones.”

“I would have found it helpful to have the instructor post some core questions about the particular 2 week material. It would have been good for me to have some bit of formalised approach. The material was all very new to me and I had a difficult time coming up with questions. I did better answering other students questions; and found that most helpful in solidifying the particular 2 week session. Just my learning style and as I go on with SAO; I expect to get better at asking questions.”

“I like when an instructor adds questions to expand the discussion without finishing the prior one. It leaves it open for people to consider. It can be helpful when an instructor posts questions as often it is difficult to come up with a question that is appropriate to the topic.”

Fig. 4 shows a histogram of instructors’ responses when asked to comment on their teaching style in SAO forums. Instructors were least likely to say that they usually started new forums off with some sample questions, or that they preferred to make most of their postings at the end of each forum. Most instructors indicated that they responded to students’ questions but also asked follow-up questions, either to keep discussion threads going or to start off new discussion threads. This is in contrast to our statistical analysis of forum postings as shown in Fig. 3, where we found that the overwhelming majority of instructor postings were answers to student questions, that instructor postings that included questions constituted only 12% of the total, and that instructor postings that were mixtures of answers and follow-up questions made up only 7% of the total.

Several instructors commented on the effectiveness of a ‘Socratic approach’ involving answering questions with more questions, for example:

“I definitely like to ‘answer’ questions with questions, or at least give hints as to how the answer might be found by further research/thought. This often invokes a response – often a simple hint is all that’s needed to get them on the right track.”

However, as shown in Fig. 3, very few of the instructor postings in our sample actually were of that nature.

Fig. 5 shows instructors’ responses when asked to comment from their own experience on what SAO students most appreciated in terms of the nature and timing of instructor responses to postings. Two instructors indicated that they could not say what SAO students most appreciated. Of the 15 other instructors, most suggested that students most appreciated

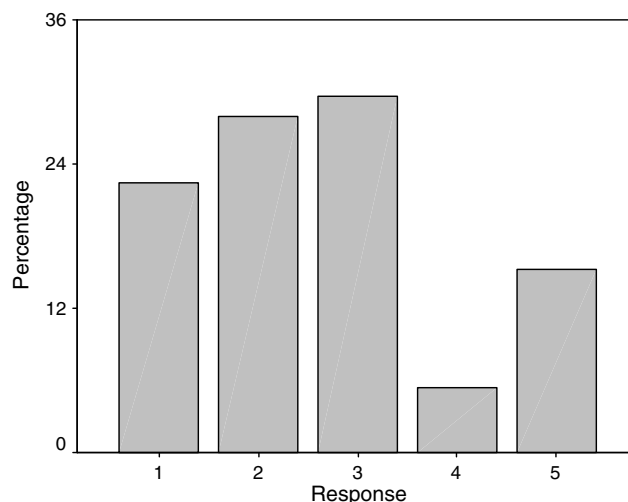


Fig. 4. Instructor survey responses to the question, “When taking part as an instructor on SAO discussion forums, indicate which ‘one or more’ of the following best describes your teaching style: (1) I mostly answer students’ questions, (2) I respond to students’ questions, but I also tend to start off new threads by asking new questions, (3) When I respond to a student’s question, I often ask subsidiary ones in order to continue the discussion thread, (4) I usually start a new 2-week discussion forum off with some sample questions, (5) I prefer to make most of my postings at the end of each 2-week discussion forum”.

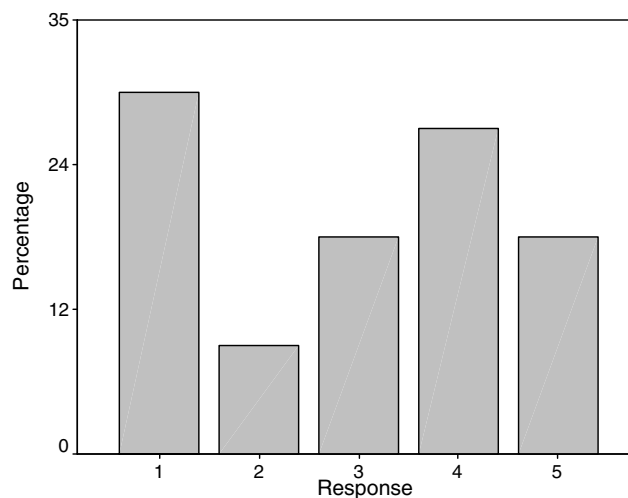


Fig. 5. Instructor survey responses to the question, “In your experience, do SAO students most appreciate it when instructors predominantly (1) respond to students’ questions during each 2-week discussion forum, (2) respond to students’ questions at the end of each 2-week discussion forum, (3) respond to students’ questions but also make a point of starting new discussion threads by asking new questions, (4) respond to students’ questions, but in the process ask subsidiary ones in order to continue the discussion thread, (5) other”.

it when instructors responded to their questions during forums, and one third of the instructors also indicated that students appreciated it when instructors asked new or subsidiary questions.

One instructor commented on a conflict between wanting to be seen to be responsive to students' questions, but not stifle discussion in the process:

“My feeling is that students would appreciate more ‘instant’ feedback, . . . On the one hand, I want them to have first go at answering questions and since students’ tend to contribute most at varying points during the fortnight, I don’t want to jump in too early. On the other hand, some students may view this as laziness on my part.”

Another instructor commented that it was hard to know whether students most appreciated instructors making postings during forums or at their conclusion, as students sometimes thanked instructors for postings made during the forums but were less likely to make the effort to do so once a forum was essentially over.

Finally, the instructors were asked to comment on what styles of instructor participation in SAO discussion forums they regarded as the most effective for teaching and learning and to give reasons for their response. They were also asked for any other comments. The responses by instructors seemed to be broadly in agreement with the ‘guide on the side’ philosophy of the SAO program, for example:

“I’m happy with the system of posting hints and questions to the newsgroup, rather than too many explicit answers. Many times someone gets the right answer on the newsgroup, after more or less discussion, and I simply chime in by confirming it in a short posting.”

and

“I have found the most effective style is one where the instructor’s participation is not markedly different from that of a student, except that the instructor tends to know more of the answers. So just like the students, I pose speculative questions, give partial answers which raise more questions, or point colleagues to an interesting WWW site.”

However, the issue of whether end of forum ‘wrap up’ postings by instructors are effective (see Section 4.2.3) was raised again:

“I have no strong sense of whether students actually go back to read the instructor wrap-ups on questions at the end of the 2-week session.”

## 5. Conclusions and outlook

The role of the instructor in online discussion forums is a key one in many forms of online education. However, without face-to-face feedback, it is not easy for instructors to gauge the ‘health’ of their discussion forums, especially when dealing with distance education students, and it can also be difficult for coordinators of online programs to judge when their instructors are doing a good job in supporting their students’ learning online.

In our investigations of forum interactions in Swinburne Astronomy Online (SAO), we found that the volume of student and instructor postings in forums did not necessarily indicate how well the forums were going – the more instructors posted, the fewer postings were made by students

and the shorter were their discussion threads on average, and instructors who attempted to increase the amount of discussion by initiating new postings did not succeed.

Forums with fewer student postings and shorter discussion threads than most are not necessarily deficient as learning environments. It may be that frequent instructor intervention makes discussions more efficient, with less time spent by students pursuing false trails and conducting inconclusive debates. However, the coordinators of online programs are likely to judge forums intuitively and assume that forums containing large numbers of student postings are best. As a consequence they are likely to encourage their instructors to ‘jump in’ often, by making frequent postings and starting new discussion threads in order to encourage students to post. Our research into SAO forum interactions would suggest that this strategy is likely to be ineffective. However, if coordinators aim to achieve positive responses for issues such as instructor enthusiasm and expertise on university evaluation surveys, then our experience suggests that coordinators should encourage their instructors to post often, even if the student posting rate does go down in the process. Obviously there is a balance to be achieved here.

When we surveyed the instructors on how they posted to forums, we found that roughly equal numbers reported that they mainly posted during forums as compared to at the end of forums. Instructor postings made during forums acted to ‘guide’ the forum discussions, whereas postings at the end of forums primarily had a ‘wrap up’ function, answering still open questions and generally closing off discussion threads. When we analysed instructor postings to forums, we found that, on average, instructors posted approximately half their postings during each forum and half at the end, which is compatible with the instructor survey. Instructors who tend to post most towards or at the end of forums scored particularly highly for enthusiasm and expertise on university evaluation surveys, but as these were the instructors who also tended to post the most overall, this was not surprising.

The majority of instructors surveyed indicated that they often asked follow-up ‘Socrates style’ questions in order to continue existing discussion threads or start new ones, and they also believed that students were likely to appreciate this strategy. However, when we analysed a large sample of instructor postings to forums over six semesters, we found that the overwhelming majority of instructor postings were answers to student questions, and in very few cases did instructors ask follow-up questions. Our analysis of correlations between styles of instructor postings and university evaluation survey responses suggested that whether the instructors tended to post questions, answers or a mixture of both, had very little effect on students’ responses to the surveys, except that students did seem to regard instructors who answered lots of questions as more enthusiastic, and they did not appreciate it when instructors mainly posted ‘house keeping’ type postings rather than engaging actively in the online discussions.

Finally, all but one of the instructors surveyed also suggested that frequent instructor intervention in forum discussions would either increase or at least not significantly affect the volume of student discussion, whereas our analysis suggested that this was not generally the case. Clearly effects like these are not intuitively apparent, and so the results of research like this can be very useful in training online instructors.

As part of this study we also surveyed SAO students directly to gain their opinions on aspects of instructors’ posting styles. Many students indicated that they appreciated frequent postings by instructors, especially when the instructors seeded the discussions with initial and follow-up questions. One respondent summarised the attributes of the ideal instructor: “The instructor that (1)

when responding to students questions also ask follow up related questions; just by introducing another close concept or a different angle of view or a possible different consequence under totally different initial conditions of the same topic; (2) at the end of each fortnight do not leave any unanswered question without reply; (3) at the end of each fortnight give his own opinion about any controversial topic that has been discussed among the students.”

Simple studies that use a statistically large sample of forum interactions can tell us a lot about what happens in online discussion forums. In contrast to the complications of studying interactions in face-to-face education, it is relatively easy to preserve and study online forum interactions without disrupting the teaching and learning environment. We intend to conduct further studies where we start to probe the nature of individual student postings as well as instructor postings in more depth, and are also currently studying how effective teaching through forums proves to be for sub groups of the overall SAO student population. We are also interested to see similar studies with other types of student cohorts (e.g. different age groups, on-campus as well as distance students) to see how relevant our conclusions are to other educational uses of discussion forums. In any case, the results of this and our other studies will be fed back into the SAO program to inform training and ongoing mentoring of its online instructors.

### Acknowledgements

The authors would like to thank the SAO team and the Swinburne Centre for Astrophysics and Supercomputing for their continued support in this research, as well as Swinburne Foresight, Planning and Review for providing their (anonymous) university evaluation survey data for us to analyse, with Ethics Committee permission.

### References

- Anderson, A.-C. (2002). Just Because it's Online Doesn't Mean it's Learner-Centred! ENC Focus, 9 (1), Available from <http://www.enc.org/features/focus/archive/pd/>.
- Berge, Z. (1995). Facilitating computer conferencing: recommendations from the field. *Educational Technology*, 35(1), 22–30.
- Berge, Z. (2001). Active, interactive, and reflective eLearning. *The Quarterly Review of Distance Education*, 3(2), 181–190.
- Collins, M., Berge, Z., (1997). Moderating Online Electronic Discussion Groups. Paper presented at the American Educational Research Association, Chicago, March 1997, Available from [http://www.emoderators.com/moderators/sur\\_aera97.html](http://www.emoderators.com/moderators/sur_aera97.html).
- Gold, S. (2001). A constructivist approach to online training for online teachers. *Journal of Asynchronous Learning Networks*, 5(1), 35–57.
- Katz, R. (2003). Balancing technology and tradition: the example of course management systems. *Educause Review*(July/August), 48–59.
- Kearsley, G. (2000). *Learning and teaching in cyberspace*. Belmont, CA: Wadsworth Publishing.
- Levitch, S., & Milheim, W. (2003). Transitioning instructor skills to the virtual classroom. *Educational Technology*, 42(2), 42–46.
- MacKnight, C. (2000). Teaching critical thinking through online discussions. *Educause Quarterly*, 4, 38–41.
- Markel, S. (2001). Technology and education online discussion forums: it's in the response. *Online Journal of Distance Learning Administration*, 4(2), Available from <http://www.westga.edu/~distance/ojdl/summer42/markel42.html>.



- Mazzolini, M. (2000). Assessment techniques in an online astronomy course. *Publications of the Astronomical Society of Australia*, 17, 141–144.
- Mazzolini, M. (2002). Newsgroup discussions as a learning and teaching tool in astronomy. *Publications of the Astronomical Society of Australia*, 19, 448–454.
- Mazzolini, M., & Maddison, S. (2002). Does gender influence discussion forum participation in online education? In A. Williamson, C. Gunn, A. Young, & T. Clear (Eds.), *Winds of change in the sea of learning: Proceedings of the 19th annual conference of the Australasian Society for computers in learning in tertiary education, ASCILITE 2002* (pp. 421–430). Auckland, New Zealand: UNITEC Institute of Technology.
- Mazzolini, M., & Maddison, S. (2003). Sage, guide or ghost? The effect of instructor intervention on student participation in online discussion forums. *Computers & Education*, 40, 237.
- Mazzolini, M., & Maddison, S. (2003a). Widening the circle – managing discussion forums in a growing online program. In G. Crisp, D. Thiele, I. Scholten, S. Barker, & J. Baron (Eds.), *Interact, integrate, impact: Proceedings of the 20th annual conference of the Australasian Society for computers in learning in tertiary education, ASCILITE 2003* (pp. 322–331). Adelaide, Australia: University of Adelaide.
- Mazzolini, M., & Maddison, S. (2004). Education without frontiers? International participation in an online astronomy program. In R. Atkinson, C. McBeath, D. Jonas-Dwyer, & R. Philips (Eds.), *Beyond the comfort zone: Proceedings of the 21st annual conference of the Australasian Society for computers in learning in tertiary education, ASCILITE 2004* (pp. 606–615). Perth, Australia: University of Western Australia.
- Morgan, G., (2003). Key Findings: Faculty Use of Course Management Systems. ECAR Key Findings, Available from [http://www.educause.edu/ir/library/pdf/ecar\\_so/ers/ers0302/ekf0302.pdf](http://www.educause.edu/ir/library/pdf/ecar_so/ers/ers0302/ekf0302.pdf).
- Northover, M. (2002). On-line discussion boards – friend or foe. In A. Williamson, C. Gunn, A. Young, & T. Clear (Eds.), *Winds of change in the sea of learning: Proceedings of the 19th annual conference of the Australasian Society for computers in learning in tertiary education, ASCILITE 2002* (pp. 477–484). Auckland, New Zealand: UNITEC Institute of Technology.
- Paloff, R. M., & Pratt, K. (1999). *Building learning communities in cyberspace – effective strategies for the online classroom*. San Francisco: Jossey-Bass.
- Paloff, R. M., & Pratt, K. (2001). *Lessons from the cyberspace classroom – the realities of online teaching*. San Francisco: Jossey-Bass.
- Salmon, G. (2000). *E-moderating: the key to teaching and learning online*. London: Kogan-Page.
- Salmon, G., Giles, K., (1997). Moderating Online. Presented to the Online Educa, Berlin, October 1997, Available from <http://www.emoderators.com/moderators/gilly/MOD.html>.
- Schrump, L., & Berge, Z. (1997). Creating student interaction within the educational experience – a challenge for online teachers. *Canadian Journal of Educational Communication*, 26(3), 133–144.
- Schrump, L., & Hong, S. (2002). Dimensions and strategies for online success: voices from experienced educators. *Journal of Asynchronous Learning Networks*, 6(1), 57–67.
- Warger, T. (2003). Technology: Calling All Course Management Systems. University Business, July 2003, Available from <http://www.universitybusiness.com/>.