Physics Innovations Centre for Excellence in Teaching and Learning

**Compilation of final reports on Open University
Physics Innovations CETL projects**

e-Tutorials and Learner Support

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Introduction

This book brings together the reports, posters, questionnaires, etc., related to πCETL projects in the areas of e-tuition and learner support.

The supported open learning provided by the Open University has always included personal support for students from a regionally-based tutor, now known as an Associate Lecturer (AL). As well as marking and commenting on their students' assignments and providing telephone advice and support as required, ALs also give a number of regionally-based tutorials. However, many students are unable to attend these face-to-face sessions – for example, they may be held at a time that is inconvenient for some students, or students may not be able to travel to the venue – and typical attendance might only be 30%. The rapid increase in ownership of computers and increased access to broadband connections have made e-tuition and support a viable option, and most of the projects described in this book have investigated various ways in which students can be provided with online tuition and support. This mode of communication is particularly suitable for the increasing number of international students.

Several different aspects have been explored. To begin with, we investigated ways of delivering tutorial support via asynchronous *FirstClass* forums. In 2006, the introduction of a new Level 3 electromagnetism course (course code SMT359) gave us the opportunity to try out a new tuition model that involved a mix of regional face-to-face tutorials, inter-regional day schools and online forum-based e-tutorials. Reports from Stuart Freake, Hara Papathanassiou and Ulrich Kolb describe this model, and the nature of the e-tutorial component, and discuss how it was evaluated (Papers 1 and 2). We include the survey forms that were used to elicit the views of students and ALs about the tuition model, together with some notes for students and ALs about e-tutorials, amended in the light of the survey results.

Two other investigations of asynchronous e-tutorials were conducted in 2007. Hara Papathanassiou and Ulrich Kolb conducted a trial of an e-tutorial in a Level 3 astrophysics course (S381), and the outcomes of that are reported here (Paper 3). Finally, although the two Level 2 astronomy and planetary science courses S282 and S283 have used e-tutorials for a number of years, a new way of using these tutorials was tried out by an AL, Roger O'Brien, in 2007. He used the tutorial to stimulate students to discuss past exam questions. This was very successful, and Roger's informal report describes this project (Paper 4).

The asynchronous nature of communication in *FirstClass* forums has the advantage of providing flexibility for participants to access the e-tutorials at times that are convenient for them, but it severely limits the interactivity that can take place. In 2008 a number of Open University course teams started to experiment with use of the *Elluminate Live* system, which allows synchronous communication between an AL and a group of students, each in their own home. This system allows the sharing of sound, still images, videos and whiteboard writing, with two-way communication via typing, sound or the use of emoticons. It is therefore well-adapted for reproducing many of the features of a conventional small-group physics or maths tutorial. Hara Papathanassiou discusses her trial of this system with students from two Level 3 physics and astronomy courses (S381 and SMT359) (Paper 5) and John Bolton describes feedback from a student survey of *Elluminate* tutorials in SM358 (Paper 6).

A very different type of student support is described in Andrew Norton's report (Paper 7). This project gave students the opportunity to make real-time astronomical observations via a conventional telescope directly controlled by a tutor who was in two-way contact with students via a weblink. The students were able to see real-time video of the telescope controls

together with the telescopic images. This simulated the experience of acquiring data from an observatory, helping them to appreciate the nature of astronomical images and measurements and to prepare for an astronomy residential school course. Although not described in this book, we note here that the πCETL has developed a robotic telescope, PIRATE, which can be controlled directly by groups of students via a web link. This has largely superseded the observations mediated by a tutor described here. Because PIRATE has the status of an independent learning resource, which can be used without tutor mediation, this work is described in another book in this series: *Electronic Resources for Teaching and Learning*.

Recently developed technologies provide new ways of communicating information. In the past, we have produced DVD videos of problems being solved in real-time, and mailed these to students along with other course materials. These videos have been highly-rated by students but are relatively expensive to produce because a film crew is involved. Nowadays, screencast software can produce similar products much more cheaply.

The report by Gillian Stansfield and Stuart Freake (Paper 8) discusses the production and use of video screencasts in a Level 3 physics course (SMT359, *Electromagnetism*). Screencasts were produced of solutions to assignment questions and exam questions, and of presentations for use in e-tutorials. The screencasts were widely used and very popular with students, and show great potential for extensive use in many subject areas. As part of this project, a guide to production of screencasts was developed and this has been included in this book. Also included are the online survey form used to evaluate students' views about this new form of support. Finally, a poster gives a brief overview of the project and illustrates the type of poster used at CETL conferences and elsewhere.

Course choice advice is an important aspect of learner support, especially at the Open University where no courses have enforced prerequisites. Although we give clear advice about coherent pathways, many students graduate with open degrees spanning a number of different disciplines. This is a particular issue for Level 3 physics and astronomy courses, which attract students with a wide range of different backgrounds. The report by John Bolton (Paper 9) discusses an investigation of the effect of prior courses, and the grades obtained in them, on student performance in the Level 3 physics course SM358, *The Quantum World*. The analysis was carried out using a computer program, CHASE, that was designed for this task. The program can be extended to other courses, and could help to provide better course choice advice across the University.

Although the Open University provides its students with a plethora of information from a variety of sources, a physics and astronomy student might find it quite difficult to locate the information relevant to their needs; they don't have access to the equivalent of the departmental notice boards and sources of information that students have in a conventional university. The Physics and Astronomy student website has been created to overcome this difficulty by providing access to a wide range of information relevant to their studies and interests. We also hope that the website will help to foster a feeling of belonging to a community of people interested in physics and astronomy, filling a need that might otherwise be lacking for students studying at a distance. Dave Edward's report (Paper 10) describes the website that he has developed and provides some data about use of the site.

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Tutorial support for a Level 3 Electromagnetism course
- using a blended approach

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Abstract

The tutorial support for a Level 3 electromagnetism course was divided between face-to-face regional tutorials, face-to-face inter-regional day schools and asynchronous e-tutorials provided using the *FirstClass* conferencing system. Participation in the three modes of support was recorded and both the associate lecturers who provide the tutorial support and a sample of the students studying the course were surveyed to investigate their perceptions of the value of the support provided. Results indicate that there was an increase in overall use of tutorial support, and that students generally preferred face-to-face support to on-line support. Participation in the e-tutorials was low – only about 30% of students logged in to the e-tutorials, and less than 10% of students posted one or more messages. Nevertheless, for the hard-core of regular users, which included a number of students who were unable to access face-to-face tutorials because of a disability or difficulty in travelling to the venues, the e-tutorials provided a welcome form of support.

1   Introduction

Most Open University courses offer students optional face-to-face tuition in the form of regional tutorials. For a Level 3 science course, such as SMT359 *Electromagnetism*, each tutor – also referred to as an associate lecturer (AL) – might provide four 2-hour tutorials to their group of 20-25 students over the eight-month presentation period of the course. These tutorials are held in major population centres, and with 15-20 ALs covering the whole of the UK, the tutorial venues are necessarily widely separated. Many students choose not to attend because of the difficulty or expense of travelling to the tutorials, because the scheduling of the tutorials clashes with other commitments, because they cannot spare the time, or because of disability, and some students feel that they do not need this optional tutorial support. Consequently, attendance at regional tutorials is typically 30% or less. For some science courses, the regional tutorials are supplemented by inter-regional day schools, held at three or four locations in the UK, where there is more face-to-face tuition time (typically 4 hours) but the distance that many students must travel to attend is greater. Generally a day school has a higher attendance than a regional tutorial, but the proportion of the registered students attending day schools is less than that attending regional tutorials.

Now that Open University students are expected to have access to a computer with internet access, online tutorials – or e-tutorials – could provide an additional method for tutorial support that is accessible to all students, irrespective of geographical location or disability. This method of support could be particularly important when the Open University make its courses available worldwide. Also, if the e-tutorials involve asynchronous communication, they could overcome many of the problems associated with inconvenient scheduling of face-to-face tutorials.

One particular issue that has to be addressed in order to provide effective tutorial support for Level 3 physics courses is the communication of complicated equations and diagrams by both ALs and students. This is relatively straightforward to do in a regional tutorial or day school by writing on a board, overhead projector or paper, augmented where necessary with verbal descriptions. It is more difficult to communicate equations effectively in e-tutorials, particularly for students who lack skills in using equation editors or maths typesetting software. This is an issue that is being addressed in the development of the OU VLE and by the MathsOnline Project.

2   The project

The introduction in 2006 of a new Level 3 physics course, SMT359 *Electromagnetism*, provided the opportunity to try a new tuition model. This model involved splitting the standard allocation of tutorial contact time (8 hours per AL) between three types of tutorial support.

Regional tutorials   Most of the 15 ALs provided an introductory 2-hour tutorial for their group of students in March, soon after the start of the course, and a 2-hour revision tutorial in August/September, near the end of the course. In four regions there was a tutorial midway through the course. Two tutors gave no regional tutorial because their students were widely scattered – in one case, throughout continental Europe.

Day schools   Two 4-hour day schools, at the beginning of April and at the beginning of July, were given in Edinburgh, Manchester, Bristol and London. Students could attend any of the day schools, but the expectation was that if they opted to attend they would go to the most accessible schools.

E-tutorials   Eight asynchronous e-tutorials were scheduled at approximately equal intervals through the course. Each of these was run by a single AL using the *FirstClass* conferencing system (Open Text Corporation, www.firstclass.com), and was open to all of the students for posting messages for a period of about a week, generally from a Saturday morning until the following Saturday. After this period, the conference messages were accessible to students in a read-only mode. Running an e-tutorial was considered to be equivalent to four hours of face-to-face contact time for the AL.

Each of the 381 registered students could therefore participate in two 2-hour regional tutorials (with the exceptions mentioned above), two 4-hour day schools and eight e-tutorials. If e-tutorials are assumed to involve a notional one hour of student time – a gross underestimate in some cases – then the total 'contact' time available to *Electromagnetism* students was 2 x 2 hours + 2 x 4 hours + 8 x 1 hours = 20 hours. This greatly exceeds the contact time for the standard regional tutorial model, which provides 4 x 2 hours = 8 hours. However, the AL contact time (8 hours) is the same for both the *Electromagnetism* model and the standard regional tutorial model of four 2-hour tutorials, since each *Electromagnetism* AL (with the exceptions noted above) gave two 2-hour regional tutorials and *either* a 4-hour day school *or* an e-tutorial that was notionally allocated 4 hours contact time. Thus the *Electromagnetism* model potentially provides much more tutorial support for the same input from ALs.

Students had two other sources of tutorial support while studying the course. The course DVD included two 1-hour videos of face-to-face tutorials in which an AL and a student discussed how to answer typical assignment questions. The aim of these videos was to support students as they tackled the first assignment. Another source of tutorial support was available to those students (about 1/3 of the cohort) who were also enrolled on the electromagnetism residential school course, SMXR359; during a week in July, students on the residential course were able to attend tutorials that covered many important topics in electromagnetism.

3   Evaluation

This was the first use of e-tutorials with a Level 3 physics course at the OU, and it was therefore important to discover the views of both students and ALs about the usefulness of the blended approach to tutorial support. This was done by collecting data from a variety of sources.

Associate lecturer survey   A questionnaire was emailed to the ALs after the course examination. This asked for information about the tutorials they had presented – scheduling, attendance, the amount

of their time involved – and about their views on the strengths and weaknesses of the three modes of tutorial support. It also asked how they thought the tutorial contact time should be split between the three modes in future presentations of the course.

Student survey   A paper questionnaire was mailed to students after the course examination but before they had been notified of their results. The questions asked about participation in each of the three types of tutorial, reasons for non-participation, what they liked most and what they liked least, and how helpful and how interesting the tutorials were. Students were also asked what division of tutorial resource between the three modes of support they would recommend for future presentations of the course. In addition, they were asked about the video tutorials and about the support offered by the electromagnetism residential school course, SMXR359. The data from the student survey was merged with demographic data and student performance data from the OU student database.

Archived messages in e-tutorial conferences   As well as indicating the nature of the interaction in the tutorials, the records also show which students actively participated by posting messages and which students read messages and downloaded attachments. The messages include some that provide student feedback on the e-tutorials, and ALs also provided a reflective summary of their e-tutorial.

4   Results

4.1   Associate lecturer survey

Only one of the 15 ALs did not respond to the emailed questionnaire. Most of them had given two 2-hour regional tutorials, an introductory tutorial in March and a revision tutorial in September. The ALs appointed in Scotland and in the North East Region (which is responsible for students in continental Europe) did not offer regional tutorials because of the widespread geographic location of their students, and provided some telephone or email support in place of this. Mean attendance at the introductory tutorials was 10, and at the revision tutorials was 8; the overall attendance was 223 students at 25 tutorials, an average attendance of 9 students, with a range from 2 to 20 students. Taking account of the fact that five of the tutorials were 1.5 hours rather than 2 hours, the total student contact time was 427 hours for an AL input of 47.5 contact hours, or 9 student hours per AL contact hour.

Seven of the eight ALs who ran day schools responded to the survey. The total attendance at their seven day schools was 103 students, an average attendance of 15, with five attendances in the 10-17 range, and outlying attendances of 34 for a London day school and 3 for a day school that clashed with England's last match in the football World Cup. So these day schools provided 15 student hours of tuition per AL contact hour, which is about 50% higher than the ratio for regional tutorials, though day school tuition was concentrated on about half the number of students that were involved with regional tutorials. ALs presenting day schools spent an average of 13 hours preparing for the event, with a range of 6 to 32 hours, so including the 4-hours contact time this means an average of 17 hours academic input per day school. In addition, they spent an average of 6 hours on travel to and from the event (range 1.5 to 16 hours).

All of the eight ALs who presented e-tutorials responded to the survey. They were not asked to quantify student participation, since this information was accessible from the archived records of the e-tutorials. ALs presenting e-tutorials spent an average of 10 hours on preparation (range 2 to 17 hours), and an average of 8 hours on-line during the e-tutorial (range 3 to 30 hours). Thus the average academic time per e-tutorial was 18 hours (range 6 to 45 hours), which is similar to that for day schools.

The questionnaire asked ALs to note what they thought were the main strengths and weaknesses of each of the three modes of tutorial support, and their responses are summarized in Table 1.

Table 1 Strengths and weaknesses of different modes of tutorial support identified by 14 ALs.

	Strengths	**Weaknesses**
Regional tutorials	• peer support, student interaction; promote self help and friends • face to face contact with AL; encourage student to contact AL by other means; AL gets to know own students; motivation • smaller travel distance than day schools; small group means all can participate • help student see wood from trees; provide help with difficult parts of course	• not enough of them! • low numbers attending • low population density means increased travel distance; duration short compared with travel time • no support materials provided • weaker students may be put off in case they are put on the spot
Day schools	• interaction between students • interaction between AL and students sorts out difficulties; help to see wood from trees • some students willing to travel further than for regional tutorials • full day allows varied activities; plenty of time for discussion; less rushed than tutorials • provide overview; place material in context; revision • AL can gauge what is needed and interact	• many unwilling to travel longer distances; attendance difficult for distant students; many R11 students can't attend • students don't know what they might be getting into • lot to cover so difficult for slower students • not enough time, so problem solving rushed • numbers can be too large, so difficult to work with individuals or small groups, and some students don't contribute or ask about their problems
E-tutorials	• very good for active participants • long duration gives more time to think about physics, longer to work on problems, more time to consider response • students learn from each other • accessible – all can participate, dip in when they want • richer delivery possible • remain available for reference; useful as revision tool • one AL can reach large number of students	• feedback and development of ideas takes longer than face to face tuition • focus on stronger students; slower students can't contribute before quick students post; platform for know-it-alls, students who most need help stay away • difficult to catch up with threads if miss a few days • low participation • long duration may be off-putting • inappropriate for teaching; concentrate on problem solving • difficult to communicate equations and diagrams; danger of encouraging lax maths notation • collaboration difficult • not integrated into study schedule • open ended AL commitment

The overall split of AL contact time between the three tutorial modes was 50% for regional tutorials, 25% for day schools and 25% for e-tutorials. The ALs were asked how they thought the overall contact time should be split in future presentations of the course, and also how they would like their

own personal contact time to be split. Results are shown in Table 2, and indicate that ALs think that a greater proportion of resource should be allocated to regional tutorials and a smaller proportion to e-tutorials. When the responses of the ALs who had given day schools and those who had given e-tutorials are analysed separately, it is apparent that each group is more favourably disposed towards the type of tutorial support it had been involved with. Five of the seven day school ALs were happy with their 2006 allocation of 50% regional tutorial and 50% day school, one would like 50% of their contact time to be allocated to e-tutorials and one wanted all of their time allocated to regional tutorials. Of the eight e-tutorial ALs, only one – who had a significant number of students in continental Western Europe – indicated that they would like their e-tutorial teaching to increase. Two e-tutorial ALs indicated that they would like no e-tuition allocation, four indicated a substantial decrease in their e-tutorial allocation and one did not respond.

Table 2 Future split of tutorial resource recommended by 14 *Electromagnetism* ALs.

		Regional tutorials	Day schools	E-tutorials
Split in 2006		50%	25%	25%
Future overall split	-- all ALs	56%	24%	20%
…………………....	-- day school ALs	53%	27%	20%
……………………	-- e-tutorial ALs	63%	19%	18%
Future personal split	-- all ALs	55%	28%	16%
……………………	-- day school ALs	54%	39%	7%
……………………	-- e-tutorial ALs	64%	14%	23%

The ALs were asked how helpful the video tutorials had been to students and eight of them gave a rating on a four point scale (*very helpful* = 4, *fairly helpful* = 3, *not very helpful* = 2, *not at all helpful* = 1); the mean rating was 3.3. They were also asked to rate the helpfulness of attending the electromagnetism residential school for supporting study of *Electromagnetism*; nine ALs (including seven who had acted as tutors at the residential school) gave a mean helpfulness rating of 3.7.

4.2   Student survey

A paper questionnaire was mailed to 150 of the registered students in November, after the examination, and 65 responses (43%) were received. Answers to many of the questions were optically read and input into a spreadsheet by the OU Survey Research Department. Answers in the form of written responses were transcribed in summary form into a spreadsheet.

The sample selected for the survey did not include students who had notified the University of withdrawal from the course – 21% of the initially registered students. Survey responders represented 17% of the initially registered students, and in an un-biased sample 17% of each subgroup of initially registered students would appear among the responders. Subgroups whose representation was low (less than 12%) were:

- students receiving assistance from the financial assistance fund (FAF) (2%);

- students who failed the course with no option to resit (7%);

- students under 40 (8%) and in their 50s (12%);

- students with educational qualifications equivalent to less than two A-levels (9%);

- female students (11%);

- students also registered for the electromagnetism residential school course (11%).

- students who had linked the course to the BSc Physical Science award (12%);

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Subgroups with high representation (greater than 22%) were:

- students in their 40s (23%) and those over 60 (42%);

- students who had linked the course to the BA/BSc Maths (23%) or BSc Natural Sciences awards (30%);

- students with a postgraduate qualification (25%);

- students with disabilities (29%);

- students who passed the course (27%) and particularly those with distinctions (29%);

- students eligible for a resit (32%).

The lower representation of women and recipients of FAF among responders is correlated with higher withdrawal rates for these groups. However, the only significant differences (chi-squared test, $P < 0.05$) between the sample population and the complete cohort are the number of FAF students ($P = 0.0038$), the age distribution ($P = 0.0002$), the distribution of result statuses for *Electromagnetism* ($P = 0.036$) and the number studying the electromagnetism residential school course ($P = 0.043$. The differences can be attributed to an unknown combination of the random variations expected from the sample selection, a systematic bias in the sample selection caused by the requirement to avoid sending the questionnaire to students who had already received two other course questionnaires from the OU (which could explain the low representation of students studying the electromagnetism residential school course), and differences in the response rate of different subgroups of students (e.g. response rates to the OU end-of-course surveys in 2006 were more than 20% greater for the over-50s than for the under-40s, and 8% greater for students with disabilities than for those without disabilities).

Table 3 summarizes the participation by the 65 students in the different types of tutorial support. In the case of e-tutorials, 'participation' means that a student indicated that they had at least read messages in the *FirstClass* conference. Fourteen students indicated that they had participated in all eight e-tutorials, and ten students indicated that they had posted messages in one or more e-tutorials, with an average of 4.6 e-tutorials in which they posted messages. Some discrepancies have been noted between students' questionnaire responses about their participation in the e-tutorials and the archived messages; this is not surprising since the questionnaires were completed in November or December, many months after students had participated in the e-tutorials.

The average tuition hours per student was 6.2 (assuming e-tutorial participation counts as 1 hour tuition). This is much higher that for the standard regional tutorial model for Level 3 courses, where a typical 30% attendance rate for the eight contact hours would result in about 2.4 tuition hours per students.

Table 3 Participation by 65 students in the three tutorial modes.

	Regional tutorials	Day schools	E-tutorials	All types of tutorial
Percentage of students participating in at least one 'tutorial'	43	23	54	66
Average number of 'tutorials' in which students participated	1.0	0.4	2.7	4.1
Average contact time per student/hours	1.9	1.5	2.7	6.2
Percentage of students *not* participating in any 'tutorials'	57	77	46	34

Students who had not participated in each of the types of tutorial were asked to indicate whether any of a number of listed factors were major reasons, or additional reasons, for their non-participation. Results are summarized in Table 4. 'Couldn't spare the time' and 'more important to study course material' were frequent responses for all three types of support, and 'inconvenient location', 'unable to travel' and 'inconvenient time' were often a factor for both forms of face-to-face tuition. 'Don't like communicating with computer' and 'don't want to spend more time using computer' were often given as reasons for not participating in e-tutorials.

Table 4 Percentages of non-participating students who indicated that various factors were either major or additional reasons for their non-participation in the three types of tutorial support. (n/a means *not applicable*, or *not asked*.)

	Regional tutorials		Day schools		E-tutorials	
Number giving reasons for not participating	37		50		47	
Reasons for non-participation	major / %	addit. / %	major / %	addit. / %	major / %	addit. / %
Inconvenient time	16	14	22	16	n/a	n/a
Inconvenient location	38	11	40	14	n/a	n/a
Unable to travel to tutorial / day school	19	5	20	8	n/a	n/a
Too costly to travel to day school	n/a	n/a	16	6	n/a	n/a
Couldn't spare time	38	14	32	18	36	17
Didn't feel needed help	3	24	2	16	4	17
More important to study course material	16	16	20	18	30	21
Don't find this tutorial support helpful	5	11	4	12	11	15
Other reasons	22	8	16	4	21	2
No access to a networked computer	n/a	n/a	n/a	n/a	6	0
Don't like communicating with computer	n/a	n/a	n/a	n/a	19	11
Don't want to spend more time using computer	n/a	n/a	n/a	n/a	21	15

Students were asked to rate on a four-point scale both the helpfulness and the interest of each type of tutorial in which they participated. The average ratings are shown in Table 5, and indicate that the e-tutorials were considered to be less helpful and less interesting than the face-to-face tutorial support.

Table 5 Average ratings for helpfulness and interest of the three types of tutorial support. Students selected from the options *very helpful/interesting* = 4, *fairly helpful/interesting* = 3, *not very helpful/interesting* = 2 and *not at all helpful/interesting* = 1.

	Regional tutorials	Day schools	E-tutorials
Number giving rating	28	15	24
How helpful?	3.0	3.0	2.5
How interesting?	3.1	3.1	2.6

For each of the three types of support, students were asked to note what they liked most about it and what they liked least. Not all of the students who had participated in a particular mode wrote in what they liked most and liked least, but the most frequent comments are summarized in Table 6.

Table 6 What students liked most and liked least about the three modes of tutorial support. The numbers in column 1 indicate (number of comments / number of students participating in that type of tutorial).

	Liked most	Liked least	Suggested improvements
Regional tutorials (24 / 28)	• face to face contact with tutor • meeting other students • ability to ask questions, clarify difficult concepts	• too short • need more of them • travel time • tutor shortcomings	• have more of them • make them longer than two hours
Day schools (11 / 15)	• consolidation • working through problems	• travel time • lack of preparation by tutor	• have more of them • make them longer
E-tutorials (21 / 35)	• provided more exercises and answers • interaction with students • tutor presentation • easy access, no travelling • helped with problem solving and assignments	• confusing structure • difficult to follow • time consuming • equation input not easy, no common standard • need to be up to date with study to benefit • dominated by a few students	• scrap them • improve structure – use summaries, sub-conferences • provide software to enable input of maths to messages

Students were asked to indicate their preferred split of AL time between the three types of tutorial support. About 2/3 of the sample responded to this question, and Figure 1 shows the frequency distributions of their responses, which spanned the range from 100% regional tutorials to 100% e-tutorials.

The average of all responses indicates a student preference for a split of:

regional tutorial 63%;   day schools 21%;   e-tutorials 16%,

compared with the 50%, 25%, 25% split that the students had experienced and the 56%, 24%, 20% split suggested by ALs (Table 2).
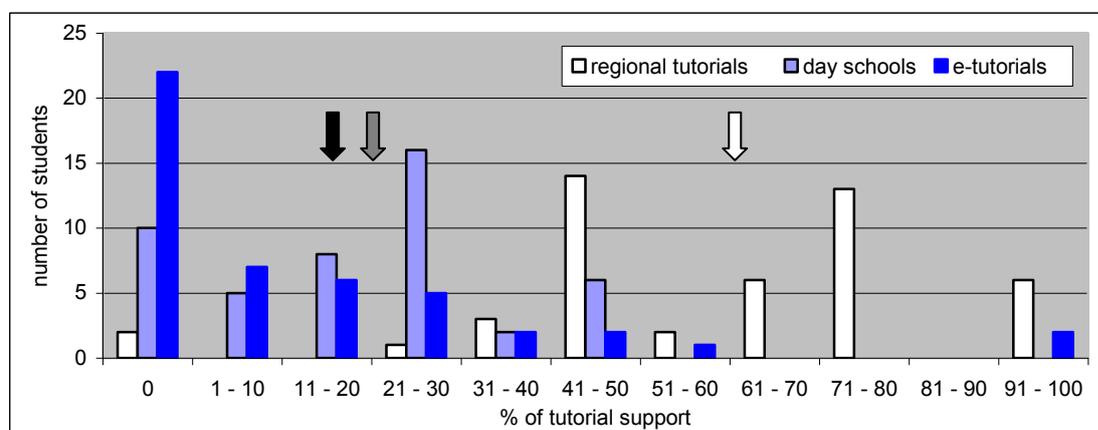

Figure 1   Preferred percentage split of tutorial resource between regional tutorials, e-tutorials and day schools based on responses from 47 students. The arrows indicate the averages of the students' responses for the three types of tutorial support.

The demographics of the students who had participated in each of the three types of tutorial support were compared with those for all of the responders to the survey. The numbers of students involved are small – of the 65 responders, 28 participated in regional tutorials, 15 in day schools and 35 in e-tutorials – so differences between the demographics of the three groups are not generally statistically significant. The only difference that is significant (chi-squared test, $P < 0.05$) is that students who are studying the electromagnetism residential school course are more likely to attend regional tutorials and day schools. This is not surprising; students who are willing to spend a week in a face-to-face learning situation are more likely to avail themselves of other, shorter opportunities for face-to-face tuition.

Video tutorials

Most of the students watched both of the video tutorials that provided support with tackling their first assignment: 82% of the sample watched the first video and 77% watched the second. Average student ratings for the helpfulness of the videos and for a number of other potential benefits, are shown in Table 7. Students were also asked whether they thought additional video tutorials would have been useful, and 54% of the sample thought that they would.

Table 7   Students' perceptions of the video tutorials. Students selected from the options *very ...* = 4, *fairly ...* = 3, *not very ...* = 2 and *not at all ...* = 1.

	Average rating
How helpful did you find the video tutorials?	3.4
Did they give you confidence to tackle assignment?	3.0
Did they indicate how to tackle questions?	3.2
Did they indicate how to check solutions?	3.1

Residential school course

Only 17% of the sample (14 students) attended the electromagnetism residential school course (SMXR359). This is a significantly smaller percentage than for the entire course population, of which 33% registered for the residential school course. As noted above, the small proportion is probably due to the sample avoiding students who had received two other course surveys, and many students studying both *Electromagnetism* and the residential school course would have fallen into that category.

Students were asked to select from a list their major reasons, and additional reasons, for not studying the electromagnetism residential school course concurrently with *Electromagnetism*, and the percentages giving each reason are shown in Table 8. 'Unable to take a week off work', 'personal circumstances' and 'insufficient spare time to study an additional course' were the three most common reasons given.

Table 8 Major reasons and additional reasons for not studying the electromagnetism residential school course (SMXR359) concurrently with *Electromagnetism*. Numbers are the percentages of the 51 students in the sample not studying SMXR359 who selected each reason.

Reason for not studying SMXR359	Major reason	Additional reason
Unable to take a week off work	31	4
Residential school dates clashed with holiday	6	2
Personal circumstances	29	10
Unable to afford the course fee	14	18
Insufficient time to study an additional course	27	27
Don't like attending residential schools	6	10
Not interested in doing lab work	2	4
Other reason	20	2

The 14 students who attended rated the residential school highly for helpfulness in supporting their study of *Electromagnetism*, as shown in Table 9.

Table 9 Average ratings for helpfulness with *Electromagnetism* of various aspects of the electromagnetism residential school. Students selected from the options *very helpful* = 4, *fairly helpful* = 3, *not very helpful* = 2 and *not at all helpful* = 1.

How helpful in supporting study of *Electromagnetism* were…	Average rating
… the lab work at the residential school?	3.3
… the tutorials at the residential school?	3.4
… informal discussions with students and tutors at residential school?	3.4
… the residential school overall?	3.4

4.3.1 Archived messages in e-tutorial conferences

The messages posted in all eight e-tutorial conferences were archived for analysis of which students accessed each e-tutorial, the nature of the activities, and the interaction and contributions that they generated. In total, 1088 messages were posted in the e-tutorials, with a maximum of 279 messages for the third e-tutorial and a minimum of 71 for the final e-tutorial. About 26% of the messages were posted by ALs, that is, a ratio of approximately 3 student messages per AL message. Only 38 students (10% of the registered students) posted one or more messages during the year, with 30 students posting to the first e-tutorial and an average of 10 students posting to each of the last four e-tutorials. One third of these students only posted messages in the first e-tutorial and thereafter posted no further messages. At the other extreme, 10 students posted messages in five or more e-tutorials, with the most prolific student posting 155 messages spread over all eight e-tutorials. These data are shown in Figures 2 – 4.
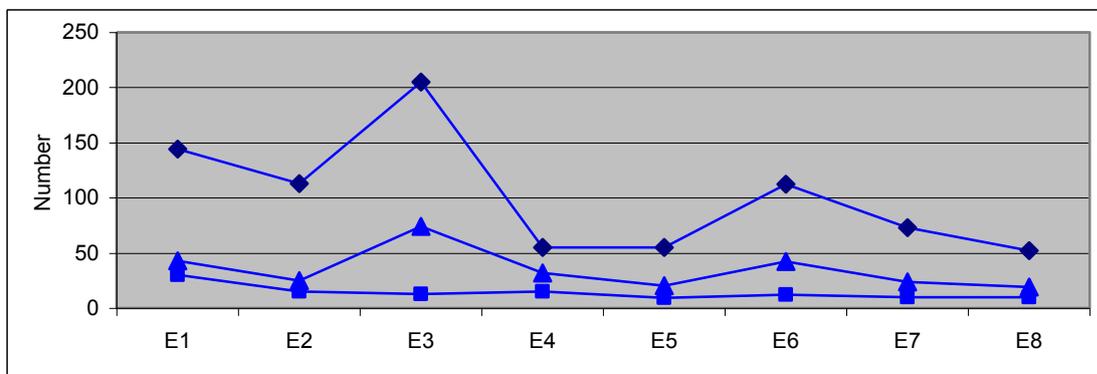

Figure 2 Number of student messages (top), number of AL messages (middle) and number of students who posted messages (bottom) for each of the eight e-tutorials.
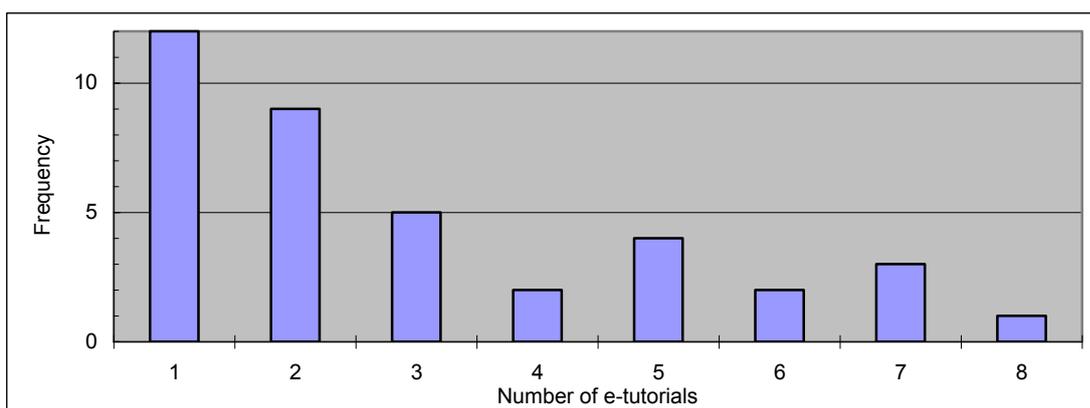

Figure 3 Number of e-tutorials in which the 38 'active' students posted messages.
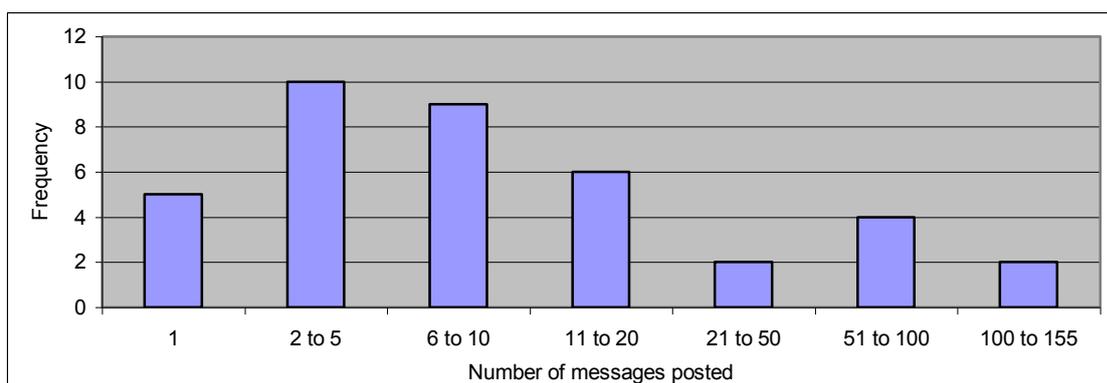
Figure 4   Number of messages that each of the 38 'active' students posted during the course.

For each message posted in *FirstClass*, the Message History facility will display the names of people who have read that message. This allows the identification of students who are following the e-tutorial but not actively participating by posting messages or who are simply downloading problems and solutions for use as an additional learning resource. Identifying readers of all messages would be a laborious process, but to get a measure of the number of students accessing an e-tutorial, including the silent participants, we have taken the average of the number of students reading the AL's first message (where the AL introduces themself and indicates what form the e-tutorial will take) and the number reading the message with the first problem or activity for the e-tutorial. The ratio of readers to message posters varied between about 2.5 and 5.5. Figure 5 shows how the number of students accessing each e-tutorial decreased over the year, and compares this with the attendance at the regional tutorials and at the day schools. Factors contributing to this decrease are the decrease in the number of students studying the course because of formal or informal withdrawal, some students trying the first few e-tutorials and then deciding that this form of support was not worthwhile, and the increasing demands on students' time from other aspects of the course
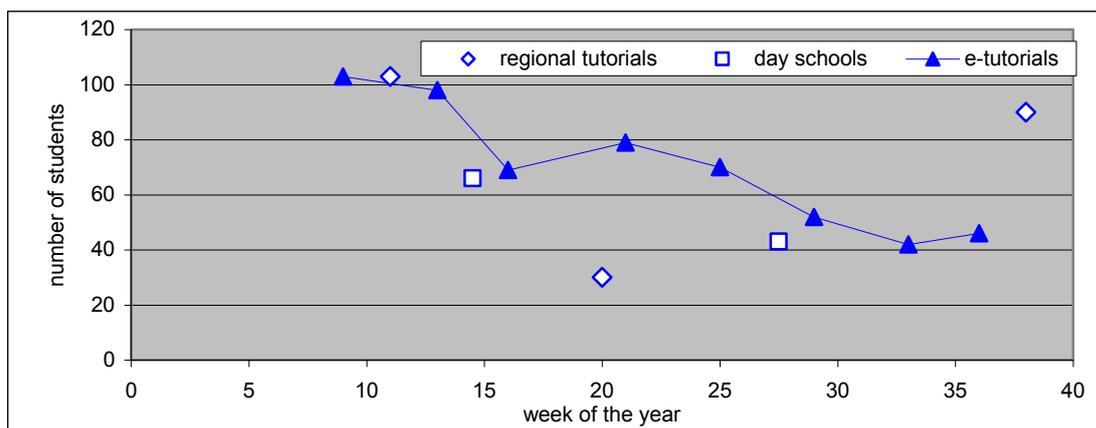

Figure 5   E-tutorial 'attendance', measured by the average of the number of students reading the first AL message and the number reading the first 'problem' message, for each of the eight e-tutorials, compared with the attendance at regional tutorials and at day schools. The numbers for regional tutorials in weeks 12, 20 and 38 are for 10, 4 and 11 tutorials respectively.

Also of interest is the proportion of students reading the initial AL message who also read the closing messages, and this proportion, which we will refer to as the retention, is shown in Figure 6. The retention was less than 50% for the first three e-tutorials, so over half of the students who looked at early messages decided that it was not worth sticking with the e-tutorial until the end. Retention was

higher for later e-tutorials – up to 80% for some – reflecting the fact that many of the students who did not find the earlier e-tutorials sufficiently worthwhile did not access the later e-tutorials. Also shown in Figure 6 is the number of messages posted by the AL in each e-tutorial, and it is clear that there is no positive correlation between this and the retention; if anything, the correlation is negative (Pearson coefficient -0.6).
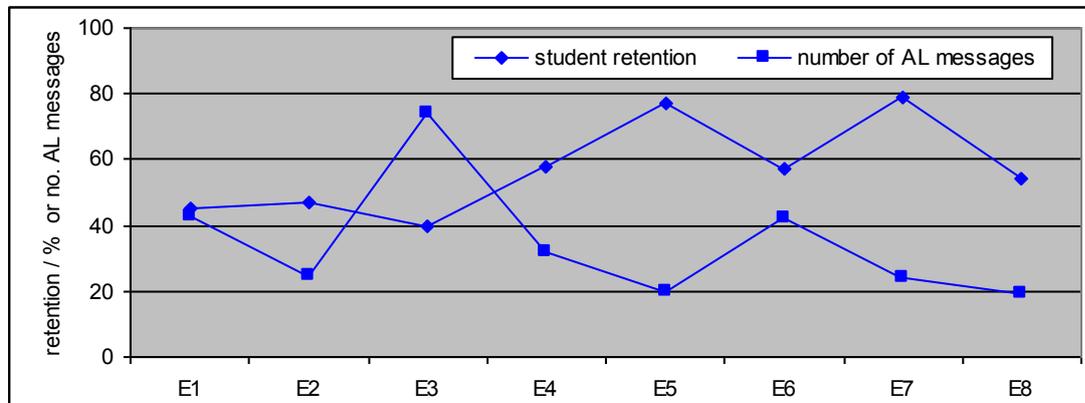

Figure 6 E-tutorial retention – the percentage of students reading the AL's first messages who also read the closing message – and the number of messages posted by the AL for each of the eight e-tutorials.

Students' demographic information and performance information was merged with the data about the participation by the 38 students who posted messages to the e-tutorials in order to compare the characteristics of these students with the course population as a whole. There were several categories for which there were significant differences (chi-squared test,
$P < 0.05$). Compared with the 10% of the total course population who posted messages, 21% of students with disabilities posted messages ($P = 0.042$), 13% of the over-40s and 6% of the under-40s posted messages ($P=0.014$), and 14% of students passing the course posted messages ($P = 0.014$). Figures 7 and 8 reinforce the message that the students who posted messages were older and obtained better course results than the complete student cohort.
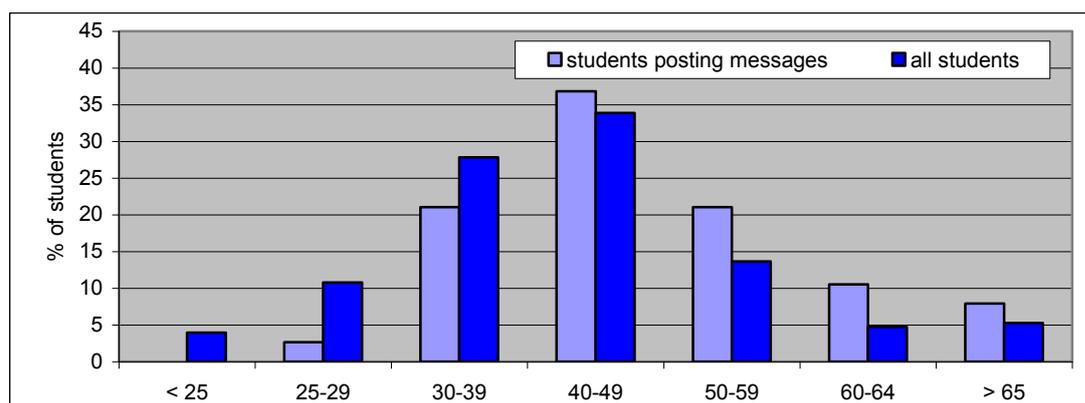
Figure 7 Age distribution for students who posted messages within the e-tutorials and for the course population as a whole.

Also the percentages of different subgroups of students who posted messages were higher for women (11%), for those with postgraduate qualifications (15%), and for those who had passed the prerequisite maths course (11%), and lower for students who were receiving financial assistance (6%), those who had linked the course to the Physical Science (8%) or the unnamed BSc (7%) awards, and

for those who had passed the prerequisite physics course (9%). However, none of these differences were statistically significant at the 5% level.
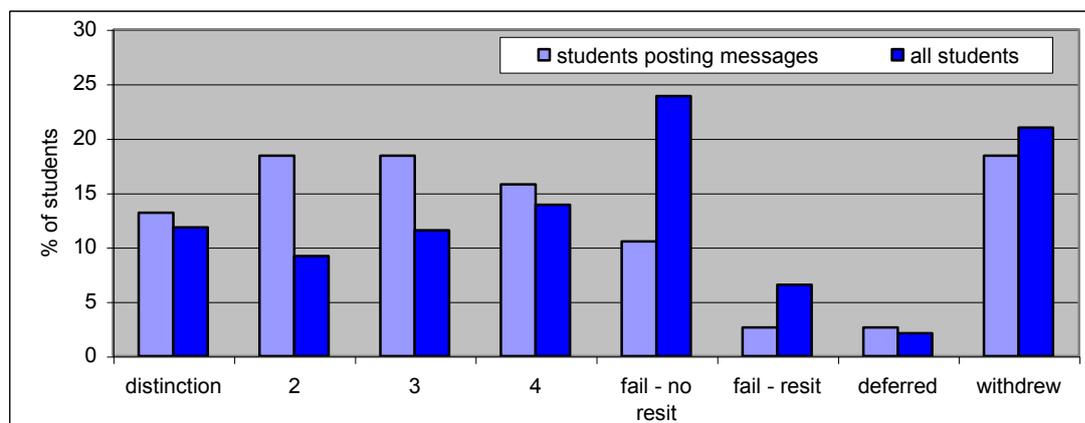

Figure 8   Comparison of the course results for students who posted messages within the e-tutorials and for the course population as a whole.

5   Discussion and conclusions

The rationale behind providing three different modes of tutorial support for the *Electromagnetism* course was to make support more accessible to a greater number of students than with a standard regional-tutorial-only model, but with no increase in support costs. Most students had the option of participating in 2 x 2-hour regional tutorials, 2 x 4-hour day schools and 8 (x 1-hour, say) e-tutorials, which was a total of 20 hours of tutorial support. This is 2.5 times more than for 4 x 2-hour regional tutorials, but required the same AL contact time. The data from the AL survey and from the archived e-tutorials indicate that the mean participation time per student registered for the course was 3.8 hours (1.2 hours regional tutorials, 1.1 hours day schools and 1.5 hours e-tutorials), and data from the student survey indicates a mean participation time for those responding of 6.2 hours (1.9 hours regional tutorials, 1.5 hours day schools and 2.7 hours e-tutorials). The large differences between these two sets of figures may be partly due to the exclusion from the sample of students who withdrew from the course and to a greater response rate to the survey from students who completed the course. However, since typical attendances at regional tutorials for Level 3 physics courses are 30%, which equates to a mean contact time of 2.4 hours, we can be confident that the mixture of modes did indeed achieve the aim of increasing access to tutorial support.

The greater average contact time does not necessarily mean that a greater proportion of students participated in some form of tutorial – it could be that the same students made use of all three types of support. Data from the student survey indicates that 22 of the 65 responders did not participate in any form of tutorial support and 11 students participated in all three types of tutorial support. Of the remaining 32 students, 13 participated in e-tutorials only (that is, no face to face support), 6 attended regional tutorials only and none attended day schools only, while 2 attended regional tutorials and day schools, 9 regional tutorials and e-tutorials and 2 day schools and e-tutorials. So 46% of students participated in face to face support and an additional 20% of students made use of e-tutorials only, which indicates that the provision of e-tutorials resulted in a substantially larger proportion of students making use of some form of tutorial support. It is also worth noting that, of the students who made use of only e-tutorials, a quarter had a disability, 30% subsequently completed the course but failed (indicating that they needed tutorial support), and about half participated in seven or eight e-tutorials.

The video tutorials were used by a majority of students and rated highly for their usefulness. This form of support has been used previously with mathematics courses, and following its success in the *Electromagnetism* course, similar tutorials were produced for the 2007 presentation of *The Quantum*

World. The students who attended the electromagnetism residential course rated it very highly for the support that it provided for their study of the *Electromagnetism* course. Unfortunately, only a third of the *Electromagnetism* students benefit from this additional support, and in future presentations the students need to be made aware of the support that the residential school provides and strongly encouraged to attend.

Although provision of e-tutorials increased access to tutorial support and involved a larger proportion of students, feedback from students and ALs indicated that many of them thought that e-tutorials were less useful than face-to-face tuition. In the student survey, the helpfulness and interest of the e-tutorials were rated lower than that of the regional tutorials and day schools (Table 5), and both students and ALs recommended that the balance of tutorial support in future course presentations should be changed by reducing the number of e-tutorials and increasing the number of regional tutorials (Table 2, Figure 1). However, this was the first experience of e-tutorials for the *Electromagnetism* course team, for the eight ALs who ran them and for many of the students who studied the course, and before reducing the use of e-tutorials we should explore ways for making them more effective. Various suggestions have been made by students and ALs, and these are discussed below.

Link some e-tutorials explicitly to assignments   Many students focus their study on activities that they perceive to be related to the assignments. The video tutorials were watched by a large majority of students for this reason. None of the e-tutorials was explicitly linked to the next assignment, though most of them tackled problems and topics that were relevant to it. Basing an e-tutorial on activities that develop skills and understanding that are assessed in the next assignment would be helpful to students, and advertising to students that the aim of the e-tutorial was to do this should increase participation.

Provide an introductory e-tutorial on mathematics   The *Electromagnetism* course is heavily dependent on mathematics skills developed in a Level 2 prerequisite course, and it is important for students to be able to handle the mathematics with confidence at the start of the course. An introductory e-tutorial that focussed on mathematics skills, perhaps aimed particularly at the less-confident students, could serve a useful function.

Provide a revision e-tutorial   Most ALs provide a regional tutorial in the revision period at the end of the course, but only a minority of students attend. An e-tutorial that included discussion of revision activities, the exam and exam technique could prove popular with students.

Make use of sub-conferences to structure the e-tutorial discussion   In most of the e-tutorials all of the messages were posted in a single area, so that a student logging in for the first time a few days after the e-tutorial opened would be faced with a long list of unread messages on a variety of topics. Many students found this baffling and off-putting. If the AL were to set up a number of sub-conferences for different topics or activities, with clear guidance about how they were to be used, then students would be able to dip into whichever sub-conferences were of interest, and each sub-conference would be more-manageable and less daunting. Other suggestions for making the e-tutorials more user-friendly include all ALs using the same easily recognisable message icon so that their messages stand out from student messages, more use of summaries to pull together the messages in a thread, and ensuring that the message subject lines are clear and appropriate.

Try different durations for the e-tutorials   The *Electromagnetism* e-tutorials generally started on a Saturday morning and were open until the following Saturday. This required a large commitment from the AL, and some suggested that a shorter period would be better, for example, Friday evening until the following Tuesday. This would reduce the opportunity for some students to participate actively by posting messages, but concentrating activity into a shorter period might make participation less daunting for some.

Provide more course team generated materials   Running an e-tutorial can involve large amounts of an AL's time, a proportion of which is associated with producing materials and activities beforehand. Some of this preparation could be done by the course team, so that the AL could spend more time interacting with students while the e-tutorial is live.

Provide more support for maths and diagram input   Many of the students commented on the difficulty of inputting equations to *FirstClass* messages. A variety of approaches were used by students and ALs for mathematics input, including scanning hand-written equations and attaching an image file or pdf file, using linear keyboard entry with Greek symbols and maths symbols that are not produced by the standard keyboard rendered as words, using Equation Editor or a similar palette-based system, or using Latex converted to a pdf file. None of these combine speed, ease of use and clarity in an e-tutorial context. One of the aims of the MathsOnline project and the VLE development is to overcome this hurdle, so hopefully these difficulties will diminish in the future.

Allow students to use pseudonyms or to post anonymously   Some students have suggested that they or others have not posted messages in e-tutorials because they were concerned that their contributions would be considered stupid or inappropriate. Allowing students to post without revealing their names might encourage more participation. However, a better approach might be to emphasise at the start of the course that all contributions are valuable, and that if one student does not understand something then the chances are that there are many others in the same boat.

E-tutorial etiquette   It would be helpful to produce a brief guide to e-tutorial etiquette. This would be aimed at encouraging participation and avoiding the e-tutorial being dominated by a few very active students. Similarly, guidelines for ALs on how to run an e-tutorial would be useful.

6   Future work

Some of the suggestions for changes to e-tutorials discussed above have been incorporated into the e-tutorials for the 2007 presentation of SM358 *The Quantum World*, a Level 3 physics course which uses a similar model for tutorial support to the *Electromagnetism* course. Clearly we still have a lot to learn about how to provide effective e-tutorials, but since e-presentation is becoming more important in distance learning, it is important to optimize the value of e-tutorials to students, and devise appropriate structures, activities and approaches for different situations. This report has focussed on student participation in the three types of tutorial support for *Electromagnetism*, and on student and ALs views about these types of support. It has not discussed the activities and interactions that take place in tutorials, and in particular it has not discussed which are effective in e-tutorials at encouraging participation and learning. Future investigations could explore this using archived records of the e-tutorials for *Electromagnetism*, and for *The Quantum World* and for a second level course, S282 *Astronomy,* which has made use of e-tutorials for four years. By using a blended approach to tutorial support we aim to make tutorials accessible to all students. Over the next few years we will learn more about what makes e-tutorials effective, and this is likely to lead to increased student participation in this form of support. It will also make support available worldwide as the University reaches out to a global audience. However, there is a proportion of students who do not need tutorial support or whose time is more effectively spent studying the course materials or on other learning activities, and there are students who prefer face to face support to e-tutorials. So the aim should not be to get all students to participate in e-tutorials. Indeed if all students participated the increased number of messages posted would mean that the current model for e-tutorials would not be viable.

Student survey concerning tutorial provision

SMT359 Tuition Survey 2006

Please use a ball point pen to complete the questionnaire. Do not use fountain or felt pens as the ink may be visible on the other side of the page. The questionnaire will be read with the help of a scanner so please fill it in as described. Please put an 'X' in the appropriate box keeping within the boundary of the box. For example: ☒ . Do not spend too long on each item. If you make a mistake and cross the wrong box, please block out your answer and then cross the correct box.

For example: ■ ☐ ☐ ☒ ☐

SECTION A: REGIONAL TUTORIALS

1 **How many regional tutorials for SMT359 did you attend…**

(Please cross one box only in each row)

	0	1	2	3	> 3
in your own region? ………………………………………………	☐	☐	☐	☐	☐
in other regions? ………………………………………………	☐	☐	☐	☐	☐

2 **If you did not attend any of the regional tutorials, please indicate the reasons for not attending:**

(Please cross one box only in each row)

	Major reason	Additional reason	Not a reason
Inconvenient times	☐	☐	☐
Inconvenient locations………………………………………..	☐	☐	☐
Unable to travel to tutorials………………………………….....	☐	☐	☐
Couldn't spare the time……..	☐	☐	☐
Didn't feel I needed help with the course…………………..	☐	☐	☐
More important to spend time studying the course materials….	☐	☐	☐
Don't usually find tutorials very helpful…………………....	☐	☐	☐
Other reason/s *(Please specify below)*…………………………..	☐	☐	☐

3a **If you did attend one or more regional tutorials, please answer the following questions:**

(Please cross one box only in each row)

	Not at all	Not very	Fairly	Very
How helpful did you find the tutorials?	☐	☐	☐	☒
How interesting did you find the tutorials?	☐	☐	☐	☐

3b **What did you like *most* about the tutorials?**

3c **What did you like *least* about the tutorials?**

21

4   **Please note any suggestions that you have for improvements to the timing, location, format and content of the tutorials.**

> (empty box)

SECTION B: E-TUTORIALS

Eight e-tutorials were provided during the year:

E1 - Dave Dolman, February	**E5** - Andy Mill, June
E2 - Julius Orwa, March	**E6** - Gillian Stansfield, July
E3 - Fred Currell, April	**E7** - Richard Potton, August
E4 - Stan Zochowski, May	**E8** - Hara Papathanassiou, September

5   **Please indicate the extent to which you participated in each of these e-tutorials. ***

(Please cross all that apply in each column)

	E1	E2	E3	E4	E5	E6	E7	E8
Did not access this e-tutorial………….…………	☐	☐	☐	☐	☐	☐	☐	☐
Posted 3 or more messages……………….……	☐	☐	☐	☐	☐	☐	☐	☐
Posted one or two messages……………..……..	☐	☐	☐	☐	☐	☐	☐	☐
Read messages but did not post messages...…	☐	☐	☐	☐	☐	☐	☐	☐
Tried most questions…………………………..…	☐	☐	☐	☐	☐	☐	☐	☐
Tried a few questions……………………..……..	☐	☐	☐	☐	☐	☐	☐	☐
Downloaded questions for future use………..…	☐	☐	☐	☐	☐	☐	☐	☐

* If you can't remember exactly which e-tutorials you participated in, try to give your best estimate of how your participation varied through the course. We don't want you to go back to the messages in the eight conferences!

6   **If you did not participate in any of the e-tutorials, please indicate the reasons for not participating:**

(Please cross one box only in each row)

	Major reason	Additional reason	Not a reason
Don't have access to a networked computer………………………	☐	☐	☐
Don't like communicating via computer...………………………....	☐	☐	☐
Didn't want to spend more time using a computer………….........	☐	☐	☐
Couldn't spare the time……...……………………………………….	☐	☐	☐
Didn't feel I needed help with the course………………………….	☐	☐	☐
More important to spend time studying the course materials…….	☐	☐	☐
Don't usually find tutorials very helpful………………………….....	☐	☐	☐
Other reason/s *(Please specify below)*……………………………	☐	☐	☐

> (empty box)

7a   **If you did participate in one or more e-tutorials, please answer the following questions:**

(Please cross one box only in each row)

	Not at all	Not very	Fairly	Very
How helpful did you find the e-tutorials?	☐	☐	☐	☐
How interesting did you find the e-tutorials?	☐	☐	☐	☐

7b   What did you like *most* about the e-tutorials?

7c   What did you like *least* about the e-tutorials?

8   Please note any suggestions that you have for changes to the way that e-tutorials are run in future presentations of SMT359 (and of the new quantum mechanics course).

SECTION C: DAY SCHOOLS

9   **Please indicate which day schools you attended.** *(Please cross <u>all</u> that apply)*

April 1 London………...	☐	July 1 London………….	☐
April 1 Edinburgh…….	☐	July 1 Edinburgh……...	☐
April 8 Manchester......	☐	July 8 Manchester……	☐
April 8 Bristol…………	☐	July 8 Bristol…………...	☐

10   <u>**If you did not attend any of the day schools**</u>**, please indicate the reasons for not attending:**

(Please cross <u>one</u> box only in <u>each</u> row)	Major reason	Additional reason	Not a reason
Inconvenient times	☐	☐	☐
Inconvenient locations……………………………………..	☐	☐	☐
Unable to travel to day school locations..…………………	☐	☐	☐
Too costly to travel to day school…………………………	☐	☐	☐
Couldn't spare the time……..	☐	☐	☐
Didn't feel I needed help with the course…………………..	☐	☐	☐
More important to spend time studying the course materials …	☐	☐	☐
Don't usually find day schools very helpful ………………..	☐	☐	☐
Other reason/s *(Please specify below)*……………………….	☐	☐	☐

11a   **If you did attend one or more day schools, please answer the following questions:**

(Please cross one box only in each row)	Not at all	Not very	Fairly	Very
How helpful did you find the day schools?	☐	☐	☐	☐
How interesting did you find the day schools?	☐	☐	☐	☐

11b   **What did you like *most* about the day schools?**

[   ]

11c   **What did you like *least* about the day schools?**

[   ]

12   **Please note any suggestions that you have for improvements to the timing, location, format and content of the day schools.**

[   ]

SECTION D: OVERALL TUTORIAL PROVISION

This year the total amount of tutors' time for the tutorial programme was divided in the following way:

   Regional tutorials: 50%   E-tutorials: 25%   Day schools: 25%

13   **Please indicate in the boxes below the division of tutors' time that you think would best meet *your* needs.** (Enter 35% as ⬚0⬚ ⬚3⬚ ⬚5⬚ %, and 100% as ⬚1⬚ ⬚0⬚ ⬚0⬚ %, and make sure that the three values add up to 100%.   For example, if you think that no tutor time should be used for regional tutorials, and that the available time should be split equally between e-tutorials and day schools then enter ⬚0⬚ ⬚0⬚ ⬚0⬚ , ⬚0⬚ ⬚5⬚ ⬚0⬚ and ⬚0⬚ ⬚5⬚ ⬚0⬚ in the three rows.)

Regional tutorials …... ☐☐☐ %

E-tutorials …………... ☐☐☐ %

Day schools ………….. ☐☐☐ %

14   **Please note any additional comments about the tutorial provision for the course this year, and/or about the provision in future years.**

[   ]

SECTION E: VIDEO 'TUTORIALS'

Two video 'tutorials' were provided on the course DVDs, and these were designed to provide advice and support about answering TMA questions, particularly for the two parts of TMA 01.

15   **Did you view either of these video tutorials?**

(Please cross one box only in each row)	No	Yes
Assignment preparation tutorial I ………………………………...	☐	☐
Assignment preparation tutorial II ………………………….……	☐	☐

16 **If you did not view either of the video tutorials, please indicate the reasons for not viewing:**

(Please cross one box only in each row)	Major reason	Additional reason	Not a reason
Didn't have access to computer or DVD player to view the videos..	☐	☐	☐
More important to spend time studying main course materials..	☐	☐	☐
Didn't need additional support with TMA questions ……........	☐	☐	☐
Find it difficult to learn from video materials ……………..……	☐	☐	☐
Other reason/s *(Please specify below)*…………………………..	☐	☐	☐

17a **If you did view one or both video tutorials, how helpful did you find these tutorials?**

	Not at all	Not very	Some	Very
(Please cross one box only)…………………….……	☐	☐	☐	☐

17b **Did the video tutorials…**
(Please cross one box only in each row)

	Not at all	Not very	Fairly well	Very well
give you confidence to tackle the first assignment?	☐	☐	☐	☐
indicate how to tackle the assignment questions? …………….…	☐	☐	☐	☐
indicate how you could check solutions? …………………………	☐	☐	☐	☐

17c **Do you think that it would have been useful to have had additional video tutorials to support later TMAs?**

	No	Yes
(Please cross one box only)………………………………………	☐	☐

17d **If you answered yes to the previous question, indicate for which TMAs or TMA questions additional video tutorials would have been particularly helpful.**

SECTION F: RESIDENTIAL SCHOOL COURSE SMXR359

18 **Did you study the residential school course SMXR359 this year?**

	No	Yes
(Please cross one box only)……………………………………………….…..	☐	☐

19 **If you did not study the residential school course this year, please indicate the reasons.**

(Please cross one box only in each row)	Major reason	Additional reason	Not a reason
Unable to take a week away from work	☐	☐	☐

25

Residential school dates clashed with holidays.....…............…….	☐	☐	☐
Personal circumstances make residential school attendance difficult ……………………………………………………………	☐	☐	☐
Unable to afford the course fee …....………………………..........	☐	☐	☐
Insufficient spare time to study an additional course	☐	☐	☐
Don't like attending residential schools ...………………………..	☐	☐	☐
Not interested in doing laboratory work ………………………….	☐	☐	☐
Other reason/s *(Please specify below)*……………………………..	☐	☐	☐

20a **If you did attend the residential school this year**, please indicate how helpful the following aspects were for supporting your study of SMT359?

(Please cross one box only in each row)

	Not at all helpful	Not very helpful	Fairly helpful	Very helpful
the laboratory work………………………………………………	☐	☐	☐	☐
the tutorial programme…………………………………………….	☐	☐	☐	☐
informal discussion with other students and tutors……………..	☐	☐	☐	☐
other aspects *(Please specify below)* …………………..………	☐	☐	☐	☐

20b **Overall, how would you rate the helpfulness of the residential school for supporting your study of SMT359?**

(Please cross one box only)……………………..………………..

Not at all helpful	Not very helpful	Fairly helpful	Very helpful
☐	☐	☐	☐

SECTION G: FURTHER CONTACT

21 **Would you be happy to participate in a follow up survey?**

(Please cross one box only)…………………………………………………...

No	Yes
☐	☐

SECTION H: GENERAL COMMENTS SECTION

We would be very grateful to receive any further comments you may have about your experience of studying this course. These help us to understand more about your experience and ways in which we might improve the courses and services we offer to students. It is also very useful for us to be able to illustrate the findings in internal reports and external publications with quotes from your comments. We must stress that these would never be attributed to an individual student and your comments will remain completely anonymous like your responses to the earlier questions. If however you feel you would rather we did not use your comments in this way please cross the box before continuing. ☐

Please add any further comments you may have about your experience of studying this course. We are particularly keen to hear your views on the ways we might improve our courses.

Thank you for completing this questionnaire. Please return it using the enclosed pre-paid envelope to: The Survey Office, IET, The Open University, FREEPOST ANG 5175, Milton Keynes, MK7 6YR, UK

SMT359 Electromagnetism

AL survey concerning tutorial provision

Please either edit this file to indicate your responses, save the changes and return the file to me as an email attachment, or print out a paper version, write in your responses and return by regular mail. Thank you.

Name: …………………………………………….

A   **Regional tutorials:**

1   How many regional tutorials did you give?   0   1   2   3   4

2   When did you give them (e.g. late Feb, Aug 28), what was their duration, and approximately how many students attended?

	When	Duration/hr	No. students attending
Tutorial 1	…….……………..	……………	……………..
Tutorial 2	…….……………..	……………	……………..
Tutorial 3	…….……………..	…………..…	……………..
Tutorial 4	…….……………..	……………..	……………..

2   Please indicate in a couple of lines the content/format of the tutorials:

Tutorial 1

Tutorial 2

Tutorial 3

Tutorial 4

3   What do consider the main strengths/advantages of regional tutorials in this course?

4   What do consider the main weaknesses/drawbacks of regional tutorials in this course?

5   Was some or all of your regional tutorial time used for telephone support?   Yes / No

If yes, please specify how much.

B   **Day schools**

If you gave a day school,

6   How many students attended? ………………

7   Please indicate in a few lines the content/format of the day school.

8   Please indicate approximately how much time you spent

        preparing for the day school,   ……..…… hours

        travelling to and from the day school.   ………….. hours

Whether or not you gave a day school,

9   What do consider the main strengths/advantages of day schools in this course?

10   What do consider the main weaknesses/drawbacks of day schools in this course?

11   Please note any comments that you have about changes to the scheduling and locations of the day schools and/or the way that the day schools are run.

C   E-tutorials

If you gave an e-tutorial

12   Please indicate approximately how much time you spent

        off-line planning and preparing materials   …………. hours
        on-line responding to students and posting messages   …………. hours

Whether or not you gave an e-tutorial

13   What do consider the main strengths/advantages of e-tutorials in this course?

14   What do consider the main weaknesses/drawbacks of e-tutorials in this?

15   Please note any comments that you have about changes to the scheduling of the e-tutorials and/or the way that the individual tutorials are run.

D   Overall
This year the tutorial contact time of 8 hours per associate lecturer was divided so that each AL was allocated 4 hours for regional tutorials (which may have been supplemented by additional hours from regional resources) plus either 4 hours for a day school or 4 hours for an e-tutorial. This meant that with 16 AL contracts it was possible to schedule 8 day schools (at the beginning of April and beginning of July in Edinburgh, Manchester, Bristol and London) and 8 e-tutorials at approximately monthly intervals between late February and early September, in addition to two tutorials in each region. Thus the contact time was split

        50% regional tutorials,   25% day schools,   25% e-tutorials.

16   Please indicate the percentages of the *aggregate contact time for all ALs* that you think should be allocated to the three types of tutorial:

        regional tutorials ……..%   day schools ……..%   e-tutorial ……..%
        (total = 100%)

17   Indicate the percentages of *your* contact time that you would prefer to be allocated to the three types of tutorial:

        regional tutorials ……..%   day schools ……..%   e-tutorial ……..%
        (total = 100%)

E   Video tutorials

18   In your opinion, how helpful to students were the video tutorials on DVD that aimed to prepare them for the two parts of the first assignment?

Very helpful / Some help / Not very helpful / Not at all helpful / Don't know

19   Please note any evidence that you have to support your view.

F   Residential school course SMXR359

20   Did you act as a tutor at the residential school for SMXR359?   Yes / No

21   In your opinion, how helpful were the residential school activities in supporting students' study of SMT359?

Very helpful / Some help / Not very helpful / Not at all helpful / Don't know

22   Please note any comments you have about the support that the residential school provides for SMT359.

G   PC Notes Taker

We provided you with PC Notes Taker in the hope that it would help with electronic communication of symbols, equations and diagrams to students, and we would welcome your views on this.

23   Did you install PC Notes Taker on your computer?   Yes / No

If no, please indicate why not.

24   Did you have any problems with its installation and use?   Yes / No

If yes, please indicate nature of problem.

25   To what extent did you use PC Notes Taker for

e-tutorials?

email communication with students?

providing feedback to students on TMAs?

other SMT359 uses or other OU uses?

non-OU purposes?

26   How helpful was PC Notes Taker to you in your role as an SMT359 AL?

Very helpful / Some help / Not very helpful / Not at all helpful

27   Would you recommend that PC Notes Taker is provided for ALs on other Level 3 physics and astronomy courses?   Yes / No

28   Would you recommend that PC Notes Taker is provided for students on SMT359?
                    Yes / No

We will have a full discussion of the results of this survey at the debriefing meeting in December. Please list below other topics that you think should be discussed at the meeting. Thank you for completing this questionnaire. Please email edited file to Stuart Freake, Department of Physics and Astronomy, The Open University, Walton Hall, Milton Keynes, MK7 6AA

Notes for students attending SMT359 e-tutorials in 2008

Each of the five SMT359 e-tutorials will provide opportunities for internet communication between students and a tutor over a period of about four days. During this time, the tutor may raise issues for discussion, present some problems for you to work on, respond to queries and post solutions to problems. You will be able to make an input to discussion with other students, respond to points that they raise, tackle the problems posed by the tutor and discuss solutions. The aim is that the e-tutorials should provide opportunities for communication between students, not just communication between a student and a tutor.

The support provided by the e-tutorials is additional to the other tutorial support that is available from regional tutorials and day schools, and is quite different from face-to-face support. The e-tutorials will expose you to different teaching styles and to the expertise of a number of the ALs who are teaching the course. Other advantages are that there is no travel time or expense involved in participating in e-tutorials, and you can access them at times that are convenient to you during the four days or so that they are running.

Here are a number of points to bear in mind about the e-tutorials for SMT359.

Using FirstClass   The e-tutorials will each run within a FirstClass forum, and if you are unfamiliar with the FirstClass conferencing system you can find more information at http://www.open.ac.uk/computingguide/ouonline/fcouonline.html, and http://www.open.ac.uk/pc4study/communicating/online-forums.php. You can access FirstClass forums either with your web browser using the links on the course website or StudentHome, or using the FirstClass client software. The client software provides a more flexible interface, and we recommend this option if possible. However, it requires you to install the client software on your computer, either from the OnLine Applications CDROM or by downloading the application from http://www.open.ac.uk/lts/software/firstclass.html . If you are accessing First Class from a computer on which you cannot install your own software, then you will need to use the web browser option.

Schedule your involvement in the e-tutorials   The dates of the e-tutorials are posted in the 'DaySchools and e-tutorials' area of the course website. In order to benefit from an e-tutorial, plan to spend about two hours participating during the period it is running. This time will include both time that you are reading and replying to messages and time that you are working on problems. You might like to schedule this time explicitly in your study calendar.

Engagement   You should aim to work through the core activities that the tutor provides, and post your queries, requests for clarification and your responses to the forum. Read other students' contributions to discover their perspectives, and reply when appropriate. You will probably find that many of the questions and difficulties posted by other students are about things that had been puzzling you.

Posting messages to the e-tutorial forum   Here are a few points to keep in mind:

• Keep messages short, preferably less than a screen, since participants may have many messages to read. However, don't make your messages so terse that that they seem unfriendly or become difficult to understand.

• Avoid content that is not relevant to the e-tutorial – remember that other students will have to read what you have written to decide whether it is relevant.

• Use a friendly tone, and acknowledge and thank others for their help.

• Make sure your message is posted in the appropriate part of the forum. If your contribution relates to a previous message then open that message and click on Message / Reply (which will automatically generate a message with the same subject and will place your response in the same part of the forum). If you are starting a new subject, then open the window for the forum where you wish the message to appear and click on Message / New Message, and choose a short subject that will convey to others what the message is about.

• Avoid replying to several messages about different topics in a single message, or starting discussion of several unrelated new topics in a single message. This makes it difficult for people to follow the

discussions of the different topics. It is better to have a well-defined topic in each message that is identifiable from the subject line.

Inserting equations   FirstClass is not well-suited to communicating mathematics. We will post a separate document outlining some of the ways to overcome this difficulty.

Concern about named contributions   Your participation in an e-tutorial is not assessed in any way. You should feel free to contribute and especially to ask questions, however simple you think they might be! Remember, if something is not clear to you, the chances are that it is not clear to a significant proportion of your fellow students. If you are reluctant to post a message in your own name, you could send a personal email to the tutor who is running the tutorial so that they can bring your point to the forum.

Joining the e-tutorial late   If you join an e-tutorial some time after it started, you may be put off by a long list of messages that have already been posted. If you are pressed for time, a good strategy would be to read the introductory messages from the tutor first, and then have a look at the questions or activities that the tutor has provided, and pick out one or two of particular interest. Also, by inspecting the subjects of the messages that have been posted, you may be able to choose several of them that appear particularly relevant to your concerns. You can then select all messages under a given thread and skim read through the contributions.

Keep track of the time you're spending   e-tutorials can be addictive, so try to avoid spending more time on them than you have scheduled or you can spare.

Using e-tutorials for revision   All of the messages in the e-tutorial forums will be accessible until the end of the course. So if you are not able to participate in an e-tutorial while it is 'live', you can download problems, activities and solutions and read messages at a later date. You may find it useful to do this before tackling an assignment, or for revision purposes at the end of the course.

Using FirstClass

General information about FirstClass can be found at
http://www.open.ac.uk/computingguide/ouonline/fcouonline.html, and
http://www.open.ac.uk/pc4study/communicating/online-forums.php.

Below are some specific tips that you may find helpful during the e-tutorials.

For those using the client software:

• **Replying to messages**   If you want to send a message that is related to a previous message, then open that message, and click on either the Reply button (to send the message to the forum) or Reply Sender (to send only to the sender of the message you are replying to) or Reply with Quote (to send a message to the forum that includes a highlighted area of the original message. Alternatively select these options from the Message menu. All types of reply automatically insert a subject 'Re: original_message_name', so that messages relating to a particular subject – often referred to as a thread – are linked together.

• **View**   The way that the list of messages is displayed on your screen can be changed to suit your preferences. To change the view, select View / Change View Properties from the menus, and in the View Properties window select the Sorting tab. A choice of settings that gives a clear display is: Display format = List; Sort on = Last Modified; select Reverse sort; Group items on = Subject; select Collapse all groups. This gives you a single line for each subject, which can be expanded to show all of the messages, and the subjects are arranged with the most recent first.

• **Find**   If you want to find out whether there has been any discussion of a particular topic within a forum, you can search for the occurrence of relevant words. Select Edit / Find from the menus and type the word(s) you want to search for in the Find: box. Check appropriate boxes to specify which fields are searched, and if required restrict the search to messages created within a certain period. After you click on the Find button, a window will open to display a list of messages within which the words you specified appear.

• **Reading messages in a thread**   If you want to read other messages in a thread for which you have a message open, use the Previous in Thread or the Next in Thread buttons in the toolbar at the top of the message window.

• **History**   To see who has read a particular message, right click on that message in the list of messages and select History, or if the message is open select Message / History from the menus in the message window.

• **Summarise**   If you wish to read a group of messages off line or to print them, first highlight all of the messages by clicking on the first of them and then Shift-click on the last (or if the messages are not sequential in the list, Ctrl-click on the messages you want to select). Then select Message / Summarise Selected from the menus. The selected messages appear sequentially in a new window, and can be saved to your computer or printed in the normal way.

• **Attachments**   To add an attachment to your message, e.g. a word processor file or a picture, select File / Attach from the menus at the top of the message window, locate the file you wish to attach, highlight its name and click on the Open button. To view an attachment in a message that you have opened, simply double click on the attachment's name. To save an attachment on your computer, click on the name of the attachment to highlight it, then right-click on the name of the attachment and select Save Attachment... from the pop up list. The Save as window will open; navigate to the area where you want to download the attachment, and click on the Save button. The downloaded file can then be virus checked and opened.

For those using a web browser to access FirstClass

• **Replying to messages**   If you want to send a message that is related to a previous message, then open that message, and click on either the Reply button (to send the message to the forum) or Reply Sender (to send only to the sender of the message you are replying to). All types of reply automatically insert a subject 'Re: original_message_name', so that messages relating to a particular subject – often referred to as a thread – are linked together, which is very helpful when trying to follow discussion of different topics in a forum. The message window for replies opens with the original message pasted into it, and you should delete the parts of this message that are not relevant to your reply.

• **Order of messages**   The list of message displayed on your screen can be ordered by Subject, Name (of sender) or date Last Modified. Simply click on a column heading to order the items according to that column; clicking a second time on a column reverses the order. Ordering by date Last Modified, with the most recent items first, is usually most appropriate.

• **Reading messages in a thread**   If you want to read other messages in a thread for which you have a message open, click on Previous in Thread or Next in Thread on the left of the window.

• **History**   To see who has read a particular message, open the message and click on History on the left of the window.

• **Attachments**   To add an attachment to your message, e.g. a word processor file or a picture, click on the Browse button (next to the Attachments box), locate the file you wish to attach, highlight its name and click on the Open button, and then click on the Attach button. To view an attachment in a message that you have opened, simply double click on the attachment's name. To save an attachment on your computer, right-click on the link to the attachment, and select Save Target As ... from the pop up list. The Save as window will open; navigate to the area where you want to download the attachment, and click on the Save button. The downloaded file can then be virus checked and opened.

Notes for ALs running SMT359 e-tutorials in 2008

These notes and guidelines are based on experience of e-tutorials during the 2006 presentation of SMT359. E-tutorials can take a variety of formats, and each AL is likely to have their own preferences for the way that they run an e-tutorial, so these notes are not meant to be prescriptive. You should feel free to try new approaches, and should share your successes (and failures!) with colleagues so that we can learn how to make better use of this method of student support. There is a FirstClass forum for SMT359 ALs (where the Tutor Notes and Student Notes are posted) and this would be a good place to exchange ideas about the e-tutorials.

Note that some guidance for students about the SMT359 e-tutorials has been posted in the SMT359 08 e-tutorials forum, so students should see this before they access the individual e-tutorials.

Reminder for students   About a week before each e-tutorial, the Course Team will post a reminder for students in the news area of the course website. If you would like to provide a few sentences about the e-tutorial that you are running to encourage students to participate, then please send this information to Michael Watkins (m.watkins@open.ac.uk) at least a week before the start date. The Course Team has suggested 'topics' for each of the e-tutorials, and these topics have been advertised to students. However, you should feel free to interpret these topics flexibly and to broaden discussion and activities as appropriate.

Time required   Your preparation time for an e-tutorial might be roughly the same as for a four-hour day school. In addition, aim to spend about four hours moderating the e-tutorial while it is 'live'. You will need to restrict the content of the e-tutorial to something manageable by both the students and yourself.

Forum permissions   Each tutor has been given the role of "Controller" for the relevant e-tutorial, and can post messages at any time. You may like to post a preliminary message some while before the e-tutorial, with information about yourself and the e-tutorial, and it would certainly be good to have information there at least a week before the start date. As Controller you can change the permissions for the forum. The permissions are currently set to "SMT359=Student=Read", which means that students can read any messages that you post in the forum, but they cannot post messages. On the Friday the e-tutorial is scheduled to start, all you need to do to enable students to post messages is to change "SMT359=Student=Read" to "SMT359=Student=Write". To do this, double click on the icon for your e-tutorial to open the forum window, select Collaborate / Permissions from the menus, and in the box under Belongs to: replace "read" with "write". (You may like to try this out before the start date!) If you have any difficulty with this, please contact Lts-Service-Delivery@open.ac.uk . At the end of the e-tutorial, you will need to change the student permission from "write" back to "read".

Starting the e-tutorial   Post an opening message in the e-tutorial forum in which you welcome students, and give them an idea of what you intend the e-tutorial to cover and how it will be organized.

Organizing the content of the e-tutorial   Plan student activities, exercises and learning material that an appropriately prepared student should be able to complete in a couple of hours. It may be helpful to set up a number of sub forums within the e-tutorial forum, each for a different topic or for a different subset of problems, and to reserve the entry level of the e-tutorial forum for essential postings about the structure and timing of the e-tutorial. If you give appropriate titles to the sub forums and you provide guidance in a message in the main forum of the e-tutorial about the scope and timescale for contributions to the different sub forums, then students will be able to decide which areas they wish to participate in. To set up the sub forums, you will need to send an email to LTS-Service-Delivery@open.ac.uk a week before the start date, specifying the number (1 – 5) and start date of your e-tutorial, and the titles of the sub forums that you would like to be created within it. You can also specify the icons you would like used for each sub forum, if you wish.

Distinguishing your own postings   It is helpful for both students and tutor if the tutor's postings are clearly distinguished by a distinctive icon. There are advantages to using the same 'tutor' icon in all of the e-tutorials, and the bold **T** that is available is probably the most appropriate. You can set up this icon as follows: within FirstClass click on Edit / Preferences and then select the Messaging tab. Then click on the Mailbox Rules button and select File / New / New Send Rule. In the If: box select 'Always', and in the Then: box select 'Set icon'. Click on the icon box (next to Then: field) and select the bold **T** icon from the range of icons displayed. Then select Save. You can reset your mail icon to something else after the e-tutorial ends if you wish.

Levels of difficulty of problems   Consider creating problems/questions/tasks that have different levels of difficulty (e.g. easy, standard, slightly stretching). Make this explicit to the students, and provide some advice for them about which to attempt. Help students to prioritize their efforts by clearly indicating which parts of the e-tutorial develop particular key skills, which parts are for enrichment, etc.

Lurkers   There will generally be far more students reading messages and downloading problems than are actively participating by posting messages. Try to create a welcoming atmosphere that will encourage these lurkers to participate, while avoiding making them uncomfortable by pushing them too hard to make contributions.

Reluctant contributors   Offer students the option to e-mail you personally with any question, comment or contribution that they are reluctant to post directly to the forum. This could be an effective way of allowing anonymous contributions.

Posting of answers by students   Students may be discouraged from tackling a problem if other students post their answer very soon after the problem is posted. You could ask students not to post answers until after a specified time, for example, 24 - 48 hours after the problem is posted. However, encourage students to ask for hints or help if they are stuck and to provide hints or help for other students when they can do so.

Number of postings   Students may think they are wasting their time if they open several messages with no essential content. It may be better to respond to a number of student messages about the same problem or topic in a single message, rather than producing separate individual responses.

Closing a topic   Round off the discussion of each problem or topic by summarizing students' contributions, interspersing your own pedagogical comments and hints, as appropriate. Students appreciate the tutor posting a set of solutions to problems to problems set in the e-tutorial. Though providing answers may encourage some students to simply download the problems and solutions for use outside the e-tutorial, on balance it is probably worth making them available at the end of the e-tutorial so that problems and solutions can be used for consolidation and revision later in the course.

If you have any comments about these notes, or suggestions for additional points that it would be useful to add, then please send them to Stuart Freake (s.m.freake@open.ac.uk).

E-tutorials in SMT359:
an analysis of appeal to students and impact on performance

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Abstract

Electromagnetism (SMT359) is a new Level 3 physics course first presented in 2006. The tuition support consists of a mix of regionally-based face-to-face tutorials, inter-regional day schools and e-tutorials. Attendance for these was not mandatory and neither was it assessed. We examine the relative appeal of the different tuition methods. We also quantify attendance for the eight e-tutorials and try to establish their popularity and their impact on student performance. In the process we also sketch the profile of the e-tutorial participants to inform future targeting of e-tutorial attendees.

1 Introduction

SMT359 is a core Level 3 physics course, with its first presentation in 2006. The course is heavy in mathematical content, and maths competency is a requirement for all forms of tuition. A mixture of tutorial support was offered, with 75% face-to-face tuition (some as regionally-based tutorials and some as inter-regional day schools) and 25% e-tutorials uniformly distributed throughout the year. E-tutorials were offered as asynchronous conference sessions delivered using *FirstClass*, lasting for a week, and covering two to three chapters of the course material. The sessions were advertised in the same way as face-to-face tutorials by the regional offices and on the course website. Students have to access *FirstClass* for an e-tutorial just as they have to get to the venue of the face-to-face tutorials. There is no assessment or any other incentive for participation in the tutorials. Therefore, both e-tutorials and face-to-face tutorials form part of the support/enrichment material (as are the extra exercises posted on the course website).

Although e-tutorials are a well-established component of other Level 2 physics and astronomy courses (e.g., *Astronomy* (S282) and *Planetary Science and the Search for Life* (S283)), SMT359 was the first Level 3 physics course to incorporate them into its tuition model. Evaluation of their reception and perceived value is important for the Science Faculty, especially in view of the intention to make Science courses available to a broader international audience. The rich mathematical and diagrammatic content makes this course a prime vehicle for identifying and addressing technical issues that will be important for other Science courses.

In this work, we begin by establishing factors that affect course performance on SMT359. This should help us to tune future tuition, so that we can give the most effective type of support for individual students. We compare the participation rates of students in e-tutorials in comparison to face-to-face tutorials. We then establish the profile of the typical e-tutorial participant and evaluate of any impact of e-tutorial attendance on course performance. Finally we make some observations about e-tutorials and outline the future stages of this work.

2 Analysis and results

SMT359 had 381 students registered at the start of its presentation, most of whom were continuing students (i.e., this was not their first OU course). The data analyzed was provided by the University and was anonymous and in compliance with the Data Protection Act. We define the success rate (*SR*) in the course as the percentage of students who had earned credit at the end of the 2006 presentation (2% of the initially registered students obtained deferrals to the spring examination). We examine the success rates for different subgroups and assign confidence levels on the basis of a binomial distribution for the success rate.

The confidence levels reflect the difference in sample sizes and are evaluated as follows. In a statistical context, the course results of individual students can be regarded as independent trials in a random process with two possible outcomes: pass (P) or fail (F). Then the probability of *p* passes in a sequence of *n* independent trials (i.e. *n* students attempting the course) has a binomial distribution. The success rate *r* is given by the mean: $r = p$ and the variance is $\sigma^2 = p(1 - p)/n$. We therefore quote all success rates as

$$r \pm \Delta r = p \pm [p(1 - p)/n]^{1/2} . \qquad (1)$$

As an example, the success rate for the whole group is $(46 \pm 3)\%$, since the percentage of students passing the course was $p = 46\%$ and the number of initially registered students was $n = 381$. Confidence levels were similarly assigned to quantities describing attendance, etc., since these also have a Yes or No outcome and are therefore described by binomial distributions.

2.1 Factors affecting course performance

To provide the context for student performance we investigated the dependence of the success *rate in the course* on demographics and educational background. This should help to focus future tuition efforts on problem groups and build on the strengths of the more successful groups.

We have examined the influence of all available parameters on the success rate of students on the course. The results for gender, location and age are shown in Figure 1. Overall, male students marginally outperform females and EU students outperform those based in the UK and in Ireland. However, the results are not statistically significant in either case. For students based in the UK, there are some regional disparities, with students in the NW performing significantly worse while the Scottish perform better than any other group. Among age groups, students in their late 20s and those in their 50s perform better. One could speculatively attribute the success of the first group to professional motivation and that of the second to longer time devoted to study. Students in their 30s and 40s perform worse than any other group which could be due to heavier professional and family commitments.

The educational level of the students at the start of the course and their award intentions were examined too (see Figure 2). As expected, successful completion of the course correlates with previous educational level, with students with less than two A levels performing less well. Further, students who are pursuing a physics or a maths degree perform better than average, while those in an engineering programme perform less well. Thus previous educational level and study for a related degree are correlated with better performance.
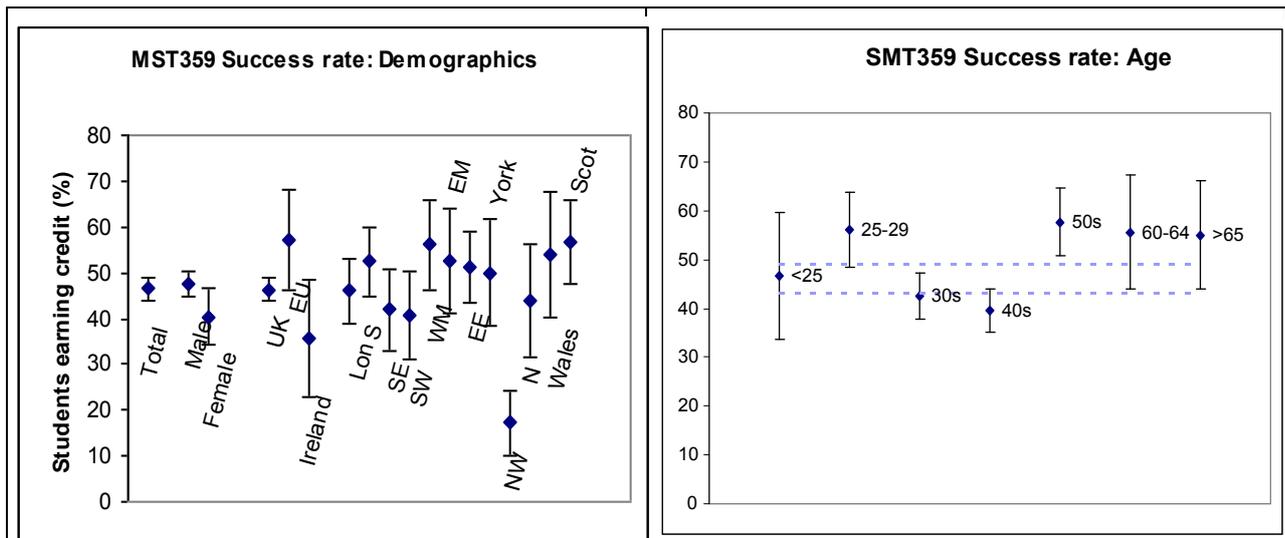
Figure 1 Dependence of successful course completion on gender, location and age. The percentages of registered students who passed the course as a function of gender and geographic location are shown in the left panel. Here, Lon = London, WM = West Midlands, EM = East Midlands, EE = Eastern England, York = Yorkshire. The percentages of students who passed the course as a function of age is shown in the right panel. The success rate for the whole group is indicated by dashed lines.
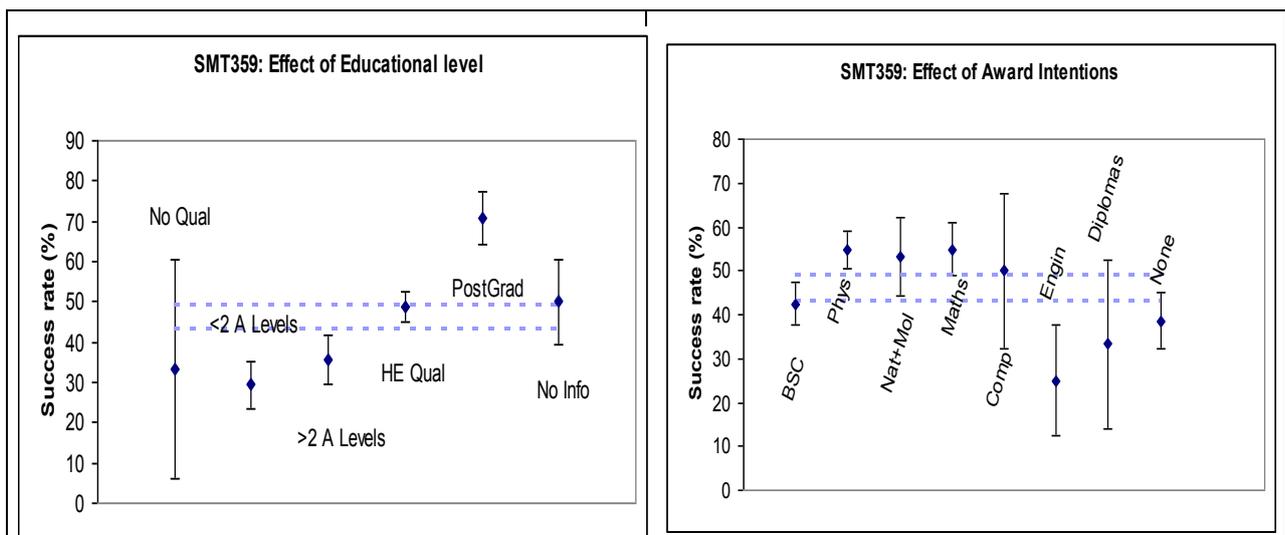
Figure 2 Dependence of successful course completion on previous educational level (left panel) and award intention (right panel). The success rate for the whole group is indicated by dashed lines.

Finally, we examine the relationship between the success rate and the courses studied previously (Figure 3). The recommended prerequisites (which are not enforced) for SMT359 are the maths course MST209 (or its predecessor MST207), and the general introductory physics course S207. Students are expected to have started with Level 1 maths or science (S103) courses. Also shown in Figure 3 are other groups of courses that feature in the list of the courses taken by SMT359 students, particularly Level 2 and Level 3 astronomy courses and Level 3 science courses. We also studied the effect on performance of having taken a particular course in the year preceding the present study.

As can be seen from Figure 3, students who have passed the prerequisite maths course (MST209) have a better chance of successfully completing SMT359, while passing the physics prerequisite (S207) does not appear to affect the success rate for SMT359. Having

passed another Level 3 astronomy or science course correlates strongly with the success rate for SMT359, as does passing the Level 2 residential school course (SXR207). The success rate for SMT359 is highest for students who study SMXR359 in the same year – results for this group are included in the left panel. Conversely, students who have passed the Level 1 maths course perform less well. Having taken any of these courses in the previous year does not alter the correlations.
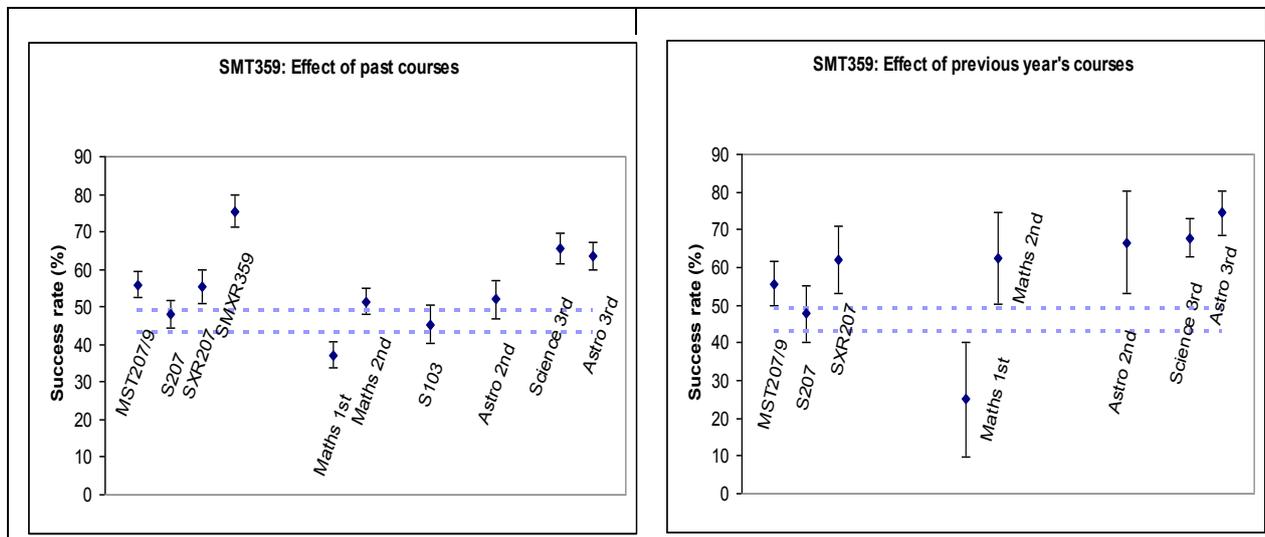
Figure 3 Dependence of successful completion of SMT359 on prior study of prerequisite and other relevant courses. The left panel shows success rates as a function of various courses that students have passed in earlier years and the right panel is for courses passed in the year preceding their SMT359 study. The success rate for the whole group is indicated by dashed lines.

In order to probe the effect of the prerequisite courses, we present the relationship between marks awarded for SMT359 and marks awarded for the prerequisite courses (see Figure 4). There is clearly some correlation, but the wide scatter of marks may be taken to indicate that the prerequisite marks are not necessarily good predictors of performance on SMT359.
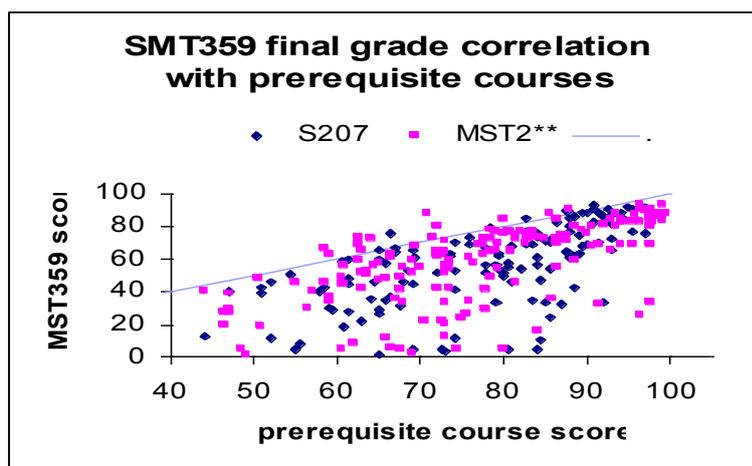
Figure 4 SMT359 score versus score on each of the prerequisite courses. The line shows equality. The mark for SMT359 is generally lower than for either of the prerequisites.

2.2 Comparison of attendance for the different forms of tuition support

For the analysis of the attendance for e-tutorials (as far as this can be established from the *History* record for key messages in the *FirstClass* forum), the numbers of students who read the following messages were counted: the opening AL message, all question messages from the AL (usually containing an attachment), AL messages containing answers to questions that were set (usually containing an attachment), two messages from students that either contained an attachment or the title was suggestive of an answer, and some comment messages posted by the AL with an appropriate title. Attendance for an e-tutorial is defined as the maximum number of students who have read a message. This may be the introductory message or the first question message, but is occasionally another posting by the AL with an attractive subject title.

Attendance for e-tutorials was compared to attendance for day schools. Both involved the same nominal AL 'contact time' and responses to an AL survey showed that overall those ALs conducting day schools and those conducting e-tutorials spent roughly the same amount of time on them. More specifically, those giving day schools spent (17.3 ± 9.2) hours in preparation and delivery and (6.3 ± 4.8) hours on travel. Those delivering e-tutorials spent (16.4 ± 2.1) hours in preparation and on-line time. Therefore the average time spent on essential tasks is about the same, while the ALs responsible for day schools spent additional time on travel.

In comparing the attendance for day schools and e-tutorials, the number of students with access to day schools is considered to be the total active population registered in the regions bordering the location of the venue. For e-tutorials, it is the whole student population. For all activities held before the beginning of July the active numbers are taken as the number registered at the start of the course. For later activities the active numbers were assumed to be the number who had not withdrawn by the end of the course. Regional information on withdrawals was not available, so for simplicity we assumed that the withdrawal rate was geographically uniform, equal to 20%. The boundary of July 1 is a best guess, as the time at which a particular student withdrew cannot be determined from our data. In any case the attendance rates are only indicative.

Two day schools were held at each of four sites, London, Edinburgh, Manchester, Bristol, the first in April and the second in July. For the purpose of calculating the attendance rates, we assume that the London school was in principle accessible to students from Regions 1, 2, 13 and 6; that in Bristol to regions 4 and 10; that in Manchester to Regions 5, 7, and 8 and finally that in Edinburgh to students in Region 11.

As can be deduced from Table 1, the attendance rate of the first day school is $(22 \pm 2)\%$ while that of the second is $(18 \pm 2.5)\%$. For comparison, the attendance rates for regional face-to-face tutorials are given in Table 2.

The attendance rates for the three types of tuition are compared in Figure 5. The rates are calculated on the basis of the student population the sessions were, in principle, accessible to. E-tutorials are assumed to be accessible to all students. The day schools were assumed accessible to 78% of the students, while the first and last regional tutorials were accessible to 77% of the students. The May/June regional tutorials were offered to only 27% of the students. Figure 5 shows that attendance rates for day schools are as good as for e-tutorials, while regional face-to-face tutorials are attended by almost a third of the students who had access to them. A small number of students will have attended face-to-face tutorials in more than one region. Attendance rates decrease with time as one would expect. It is interesting to note that the first e-tutorial is as well attended as the first face-to-face tutorial. This suggests that every effort should be made to ensure that the first e-tutorial is as positive an experience

as possible since this will encourage students to attend subsequent sessions. The attendance rate for e-tutorials decreases after the first e-tutorial but flattens off after the second e-tutorial.

Table 1   Attendance statistics for day schools. The second column shows the OU regions whose students are assumed to have access to the school. N_{total} is the number of students in the regions at the start of the course, N_1 is the number of students attending the first (April) day school and N_2 is the number of students attending the second day school. The fifth column shows the number of students assumed to be registered at the time of the second day school (see text for assumptions).

Location	Regions in reach	N_{total}	N_1	$0.8N_{total}$	N_2
London	1,2,13,6	164	34	131	17
Bristol	4,10	38	10	30	10
Manchester	5,7,8	66	11	53	11
Edinburgh	11	30	11	24	5
Totals		298	66	238	43

Table 2   Attendance for regional tutorials. In most regions two tutorials were offered, one in March and one in September. Some regions offered an additional tutorial around May/June. N_{total} is the number of students the tutorials were in principle accessible to, while N_A is the number of students attending.

Time	N_{total}	N_A
March	295	103
May/June	102	30
Sep	236	75
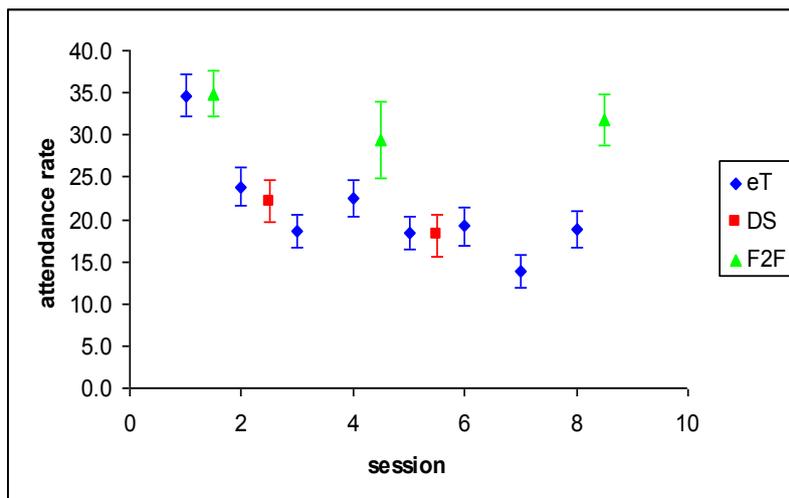
Figure 5   Attendance rates for e-tutorials (eT), day schools (DS) and regional face-to-face tutorials (F2F). The position along the horizontal axis indicates their relative timing during the course.

We investigated the relationship between the number of students attending without contributing – the 'lurkers' – and those making at least one posting, and we explored the relationship between student participation and the number of messages posted by the AL. As Figure 6 shows, for every student contributing to the e-tutorial, there are between three and seven lurkers. This suggests that the e-tutorial reaches a very large number of students who could potentially become active to some extent. Figure 6 shows that on average there are two to four student messages for each AL posting, with little variation between e-tutorials.
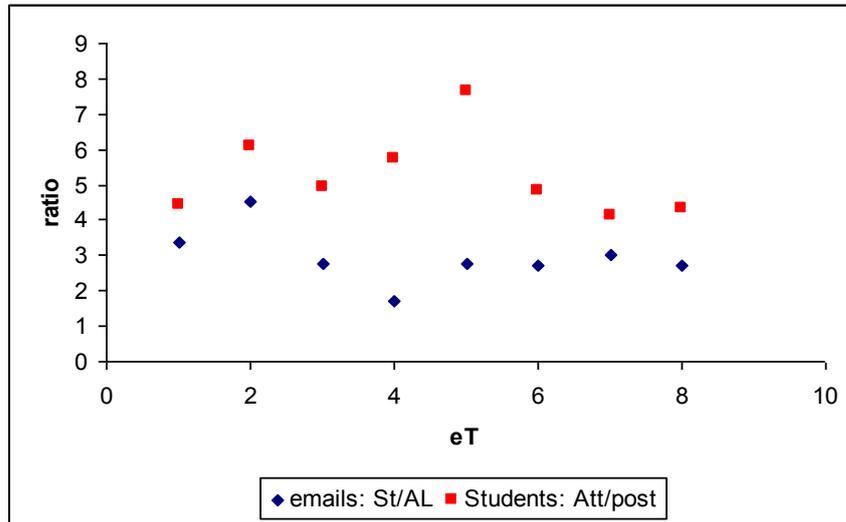
Figure 6   The ratio of number of messages posted by students to the number posted by the AL and the ratio of number of students attending to the number posting messages for each of the eight e-tutorials.

The number of AL postings does not affect significantly the retention rate (defined as the number of students reading the closing AL message as a fraction of the e-tutorial attendance), as shown in Figure 7. The total number of postings depends on the organization of the e-tutorial, the nature of the activities and the timing. Hence it is possibly not as reliable a measure of perceived value as the retention rate. For example, the first e-tutorial inevitably has to deal with a large number of technical problems and queries that may increase the number of postings. Content analysis of the e-tutorials, along with student feedback, is needed to establish the perceived value.
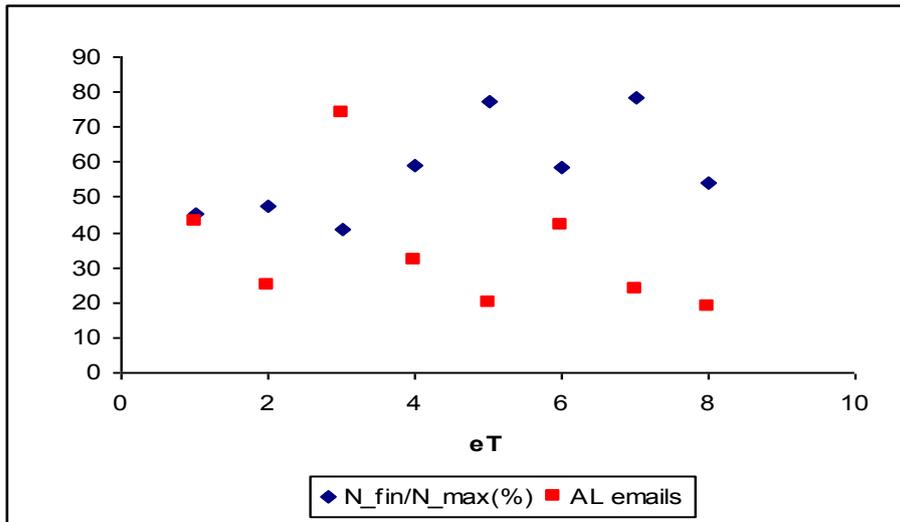
Figure 7 The retention rates N_{fin}/N_{max} (see text for definition) for the eight e-tutorials, shown as percentages. Also shown are the numbers of messages posted by the AL. If any correlation between AL postings and retention rate can be discerned, it is not positive.

Finally, we investigated the number of students reading different types of postings within an e-tutorial, in order to identify any features that promote the popularity of e-tutorials. Figure 8 shows the average number of students who read: tutor postings with questions (<TQ>); tutor postings with answers (<TA>); tutor postings with an attractive subject but no attachment (T comment); the closing message from the tutor (T close, usually requesting feedback); and fellow students' postings containing an answer. The data points represent averages; the bars indicate the corresponding standard deviations.
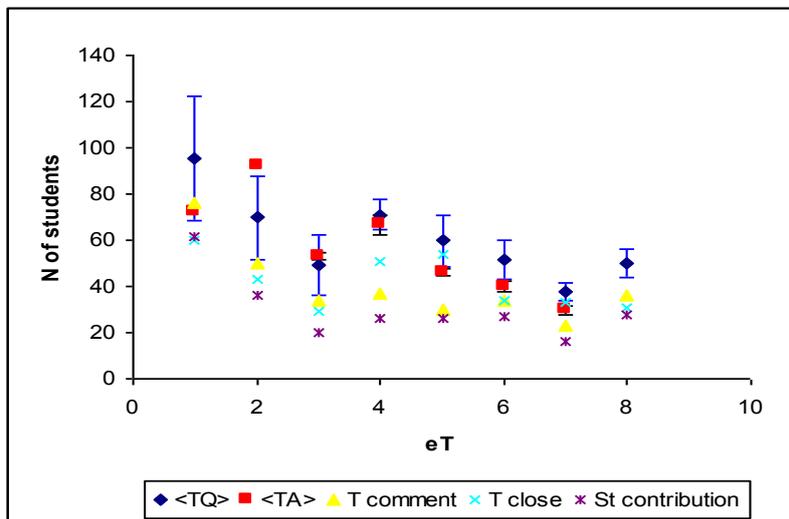
Figure 8 Numbers of students reading different types of message. Averages are shown for numbers reading tutor postings with questions (<TQ>), tutor posting with answers (<TA>), a posting containing a tutor comment (T comment), the closing message from the tutor (T close) and two significant student contributions.

Tutor question postings attract the highest readership, followed closely by postings containing the tutor's answers. A comment made by the tutor is not as widely read. Interestingly, the smallest readership is for other students' contributions (usually answers).

This analysis cannot address the degree of engagement of a student who attends but does not contribute. Naturally, a fraction of those reading a message will not bother to read anything else. For this reason we present averages for substantial AL postings. Similarly, a number of those students downloading attachments will not make any use of them.

2.3 Profile of active participants in e-tutorials

Only 38 of the 381 students initially registered on the course made a posting in an e-tutorial. We have used these 38 students to investigate the characteristics of the typical e-tutorial participant. This may help with the effective targeting of e-tutorial participants. Figure 9 shows the age distribution of participants and non-participants in the e-tutorials. Participants tend to be older, and, perhaps significantly, there were none or very few from the younger groups.

Figure 10 shows the regional demographics, previous educational levels and award intentions for the participants compared with the SMT359 student population. There are marginally higher participation rates for females than for males, while students from the East, North and Ireland showed significantly lower participation rates. Participation tends to be greater for students with higher previous educational level, and students linked to maths awards were more inclined to contribute. Thus the e-tutorial participant tends to be older, is more likely to be female, from London, the south and to a lesser extent from Scotland and Continental Europe, has a higher previous qualification and is linked to a maths award.
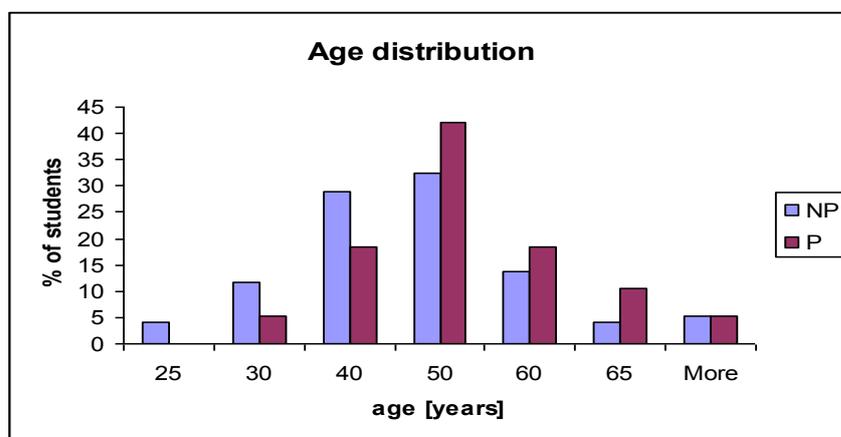
Figure 9   Age distribution of participants (P) and non-participants (NP) in the e-tutorials.
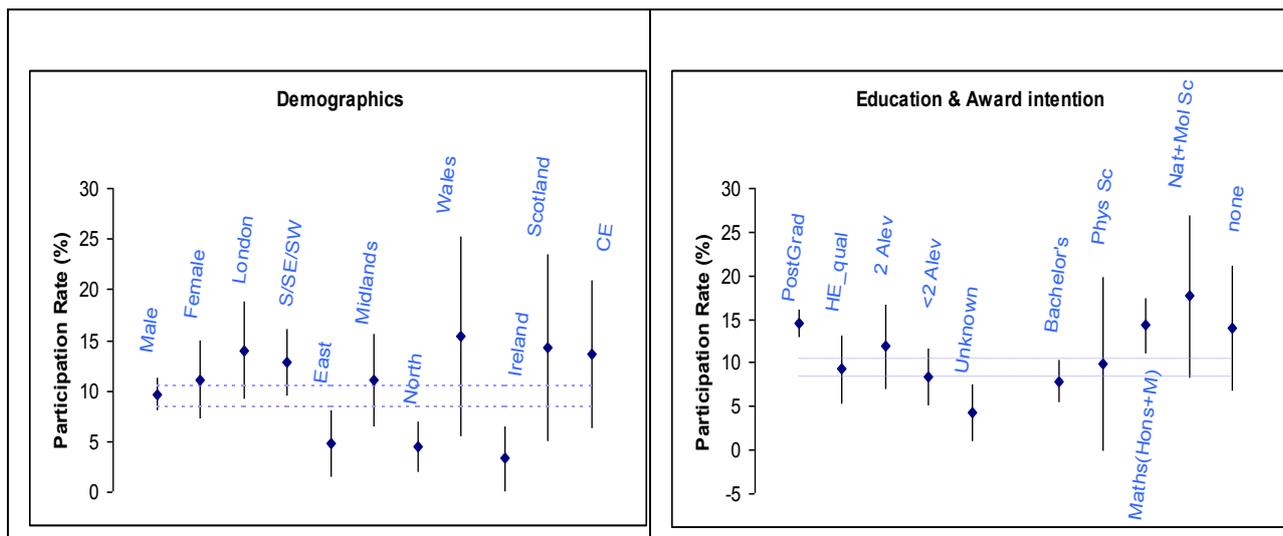
Figure 10 Regional demographics, previous educational level and award intention for e-tutorial participants. Participation rate for the whole group is indicated by dashed lines.

Preliminary analysis suggests there are a significant number of 'diligent lurkers' – students who keep checking out the e-tutorials, accessing AL postings and downloading attachments without ever making a posting.

Impact of e-tutorial participation on course performance

We have tried to identify any correlation between e-tutorial participation and course performance. For this, we present the distribution of the final course score for the e-tutorial participants and for non-participants (Figure 11). Participants performed better but this probably reflects their higher degree of commitment, larger time investment and higher confidence (probably due to more adequate preparation to a large extent). Participants are a self-selected group and the result is consistent with that.

The fact that only one student participated in all eight e-tutorials, and the frequency of participation was a decaying function of the number of e-tutorials, provides an opportunity to eliminate this selection effect. We have evaluated the difference between the TMA score for each active participant in an e-tutorial preceding a TMA and the average of the TMA scores for which this student did not participate in previous e-tutorials. The right panel of Figure 11 shows this as a function of the total number of messages the student posted in that e-tutorial. The number of messages posted serves only as a label and provides no insight to any type of correlation. Despite the small numbers, the fact that most of the differences are positive indicates that an active participant in an e-tutorial performed better on the TMA that followed than on their other TMAs. Even though the e-tutorial may not have addressed specific TMA questions, participation in an e-tutorial indicates increased engagement and practice.

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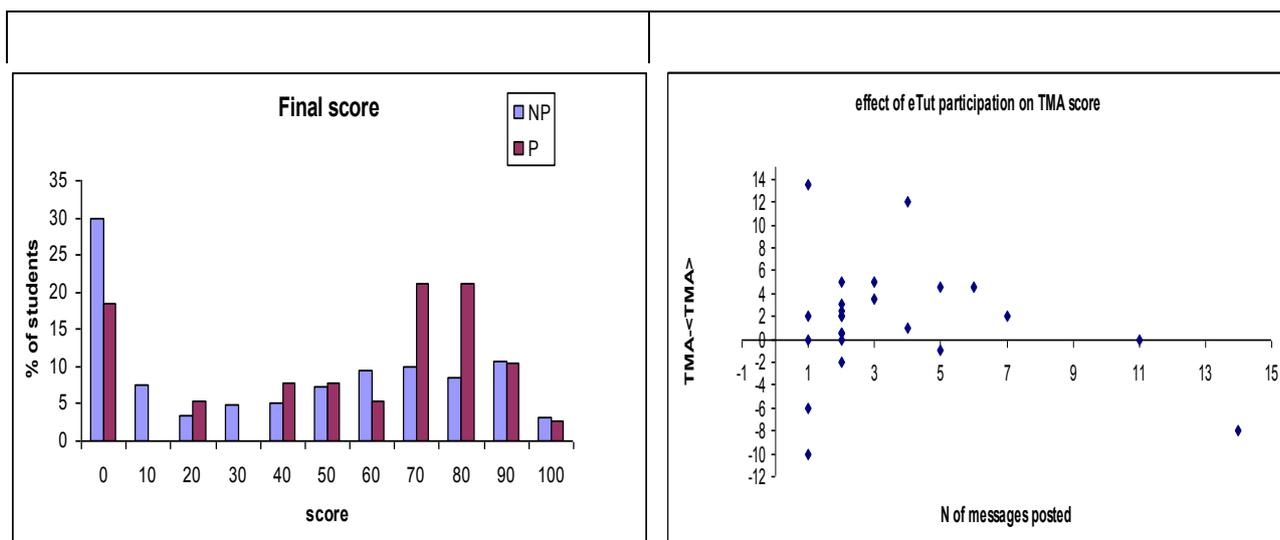
Figure 11   Impact of e-tutorial participation on performance. The left panel shows the distribution of the final course scores for participants (P) and non-participants (NP). The right panel shows how the score on a TMA following an e-tutorial differed from the average score for those TMAs where the student did not participate. This is presented as a function of the total number of postings the student made on this e-tutorial.

3   Summary and future work

In this report we have examined some aspects of the introduction of e-tuition to SMT359. We have investigated various factors that correlate with successful course completion. We hope that this can help the course team, regional offices and student advisors to allocate more effective support to the weaker groups and better address the needs of the stronger ones.

We have investigated the relative popularity of the different forms of tuition support and found that e-tutorials are as popular as day schools, but regional face-to-face tutorials are more popular. However, day schools and face-to-face tutorials are, at best, accessible to three quarters of the student population while e-tutorials are accessible to all students. This accessibility figure considers only geographic location and as such is an upper limit. Anecdotal evidence suggests a lower limit due to mobility restrictions, family and professional commitments.

Attendance for all forms of tuition support decreases with time during the course. The fact that attendance rate for the first e-tutorial was similar to the rate for the first regional face-to-face tutorial, which in absolute numbers means a lot more students, is very encouraging and should prompt everyone involved to put every effort into making this first e-tutorial a positive experience for students. This should increase attendance rates for subsequent e-tutorials, as well as for e-tutorials on future courses. Increasing the attendance rates beyond that of the first e-tutorial is likely to require making the tutorial support a more integral part of the course (e.g., by linking it to assessment).

E-tutorials require significant effort on the part of the AL to elicit any contribution at all: generally an AL posting provokes between two and four contributions. The number of AL postings though does not correlate with the retention during an e-tutorial. Given the fact that the time for e-tutorial attendance is not scheduled in the course calendar, and there are no guidelines for the time students or ALs should spend on it, increased participation may not be in the best interests of everyone involved. One of the most frequently quoted reasons for students not attending e-tutorials is that they are too time consuming. Hence care must be

taken not to over commit students or drive them to burn out. We propose that e-tutorials (as well as day schools and face-to-face tutorials) should be scheduled in the course calendar and guidelines for student time commitments should be given to each AL running e-tutorials.

E-tutorials should, in principle, provide a better chance for student interaction. However, the most-read postings remain those by the ALs containing attachments with questions and answers. Adding to the students' collection of problems with answers is a questionable use of an e-tutorial. There are plenty of self assessment questions and exercises with answers in the course books. There are also extra problem sets on the course website, not to mention the wealth of similar material freely available on the web, from reputable sources. This, in our opinion, suggests that e-tutorials should move away from the current model to become more of a skills-oriented tool for the student.

We have also sketched the profile of the e-tutorial participants, and some aspects of this could help with better targeting of future e-tutorials. A large number of students lurk in every e-tutorial, and some effort should be made to encourage more of them to actively participate. Analysis of the e-tutorials to identify successful or unsuccessful techniques is planned. Further insight will come from investigating the profile of the attendees and reviewing student feedback. Finally we have found some evidence that participation in an e-tutorial is correlated with improved performance.

Acknowledgments

A pilot e-tutorial on S381:

presentation and analysis of impact on student performance and learning

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Abstract

The Energetic Universe (S381) is a Level 3 course in the astronomy strand of the Open University Physical Science degree programme. Prior to 2006, the only form of tuition in this course was regional face-to-face tutorials. In the 2006 presentation, the whole student population was asked if they would like to participate in an e-tutorial. A subset of those who expressed interest was offered an e-tutorial with the purpose of analyzing any impact on performance using a valid control group. The e-tutorial did not offer specific support with assignments or the exam in the interest of not giving the group an unfair advantage over the whole student cohort. Nevertheless, we have compared the overall course performance of e-tutorial participants with a control group in order to identify any impact of the e-tutorial. Perhaps not surprisingly, we found none. We also report on student feedback on the perceived value of the e-tutorial, collected by a questionnaire distributed at the end of the course.

1 Introduction

S381 is a Level 3 astronomy course that examines advanced astrophysics topics, which rely heavily on current research. It brings together different threads of physics and astronomy knowledge, and is rich in mathematics and graphs. It has traditionally involved no online tuition, and has minimal online support in the form of a course website. However, the course has a well integrated e-component in the form of DVDs, which involves interactive applications and web links.

The aim of this project was to offer an e-tutorial in order to experiment with this mode of tuition in this particular course, pilot the introduction of e-tutorials in future presentations of the course and investigate any impact on student performance. Care had to be taken not to give the e-tutorial attendees any unfair advantage in the TMAs or exam. The invitation to participate was extended to the whole student cohort via the course web site. Associate Lecturers (ALs) were also asked to advertise the e-tutorial to their student groups. Expressions of interest were gathered until mid March. Statistical data on the students was obtained for the purpose of selecting homogeneous subgroups. Out of the 307 students registered on the 2006 presentation of S381, 34 expressed interest in the e-tutorial. From this self-selected group, a subset would be offered the e-tutorial while the rest would form the control sample for the purpose of the analysis of their TMA and exam results. The e-tutorial was planned to run for a week and delivered at the end of Block III and after students had submitted TMA 03, in a week scheduled as a consolidation week on the Study Calendar. However, due to student attrition, the e-tutorial was opened to the full group and ran for two weeks. There were about equal numbers of students who participated actively, who attended without contributing and who never attended. These formed the Active, Passive and Control groups respectively.

Section 2 of the report gives an overview of the content and style of the e-tutorial, while Section 3.1 presents the analysis of the impact of attending the e-tutorial on exam and TMA

performance. Section 3.2 discusses the responses to the student questionnaire and Section 4 concludes with some general observations and suggestions on the introduction of e-tutorials to S381 and other Level 3 (astro)physics courses.

2   E-tutorial content

Part of the e-tutorial took a lateral view of key concepts encountered in Blocks II, III and IV. They included convection and the definition and application of different timescales. Text providing a short discussion interspersed with short questions was posted in pdf format for each topic. The questions invited the students to flip through Blocks II and III and give short answers that helped them create useful summaries of the key points about each concept recognising their role in different systems.

Two problems specific to Block III were also explored. One was on the period distribution of cataclysmic variables (the systems extensively studied in this block) for which students had to apply knowledge acquired in the block. A luminosity-related problem was proposed on low-mass X-ray binaries (systems related to the binary systems studied in Block III). Students were invited to ask for the information they thought they would need in order to solve the problem. Along with these four main themes, student questions were entertained. Comments on student contributions were provided and each topic was closed with a comments file that supplemented student contributions. This took into account the preceding discussion and no pure "answers" file was posted. There was no intention to support the TMA or exam. One strand of the e-tutorial invited student questions and was intended to run in parallel. There was little response to that.

3   Analysis and results

Although the e-tutorial did not provide explicit support for the exam or TMA 04, it did provide additional study support. It is therefore reasonable to check whether it had any impact on student performance.

For the purpose of our analysis we used the groups as defined in the Introduction. The assignment to groups was performed on the basis of the records of postings on the e-tutorial conference. The names that do not appear in any record we classified as Control. Those who made no substantial contribution went into the Passive group. Any engagement with the questions qualified the sender as Active. The groups had the following sizes: Active contained 10 students, Passive had 14 out of which 3 eventually quit, and Control had 12 out of which 6 quit. In the results that follow, the group sizes are thus Active: 10; Passive: 11; Control: 6. As all these students signed up for the e-tutorial, there is some hope that they shared characteristics in terms of initial motivation, but this is by no means certain.

Historic data on TMA and exam scores for all years of the course presentation is shown in Figure 1. Data for each year from 2002 to 2006 is shown as the mean along with the standard deviation shown as an error bar. Exam scores were significantly lower than those on TMAs. Nevertheless, for the 2006 presentation exam scores were within one standard deviation or so of TMA scores, perhaps indicating improved exam performance (or a comparatively easier exam).
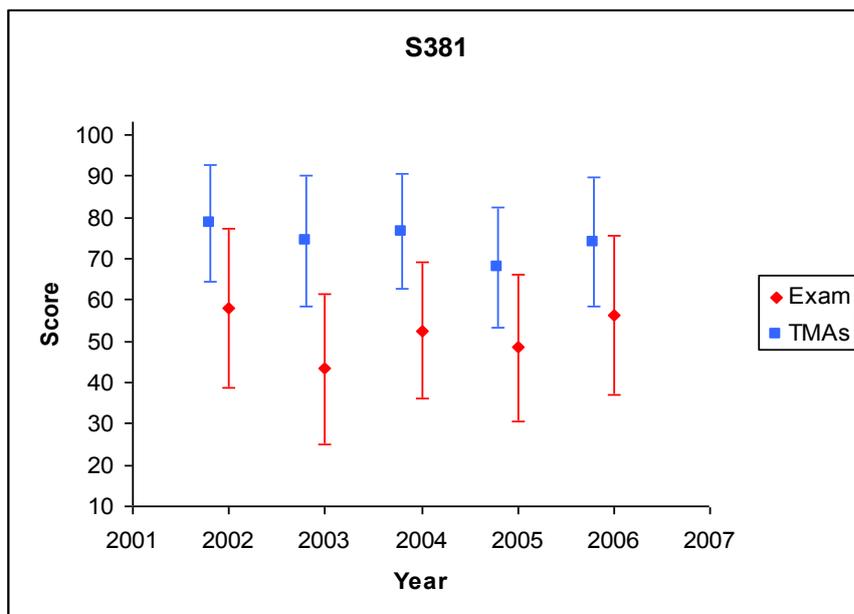
Figure 1   TMA and exam scores for all years of S381 presentation. Exam scores are consistently lower than those for TMAs.

3.1   Impact on performance

The group of Active participants is the one that we expected to benefit most from the additional study support. It is unclear what the effect for the Passive attendees is. Most downloaded attachments and some indicated that they used the material for revision. A few even made a communication-type posting without engaging in the topics under discussion. Moreover, due to the character of the e-tutorial, they would have to have read most of the discussion too, if they made any use of the attachments. Their involvement could thus range from none (that of the Control group) to active, which would be the case if they worked through the questions but did not post messages. For this reason they have been treated as a separate group. The Control group presumably would perform as well as the Active group in the absence of any additional support. It should be emphasized that the small size of each group makes the statistical significance of our results rather poor.

Figure 2 shows the scores for TMAs and the exam for the three groups. The spread in each group is large enough to preclude any trend from surfacing. The average TMA marks for all three groups are similar, and so are the marks for the exam. The Passive group did worse in the exam compared to their TMA average, but it is unclear how this could be interpreted in the e-tutorial attendance context. Similarly, the average scores for the TMAs show no trend. The slightly better TMA 04 score of the control group is due to their low submission rate for this TMA.
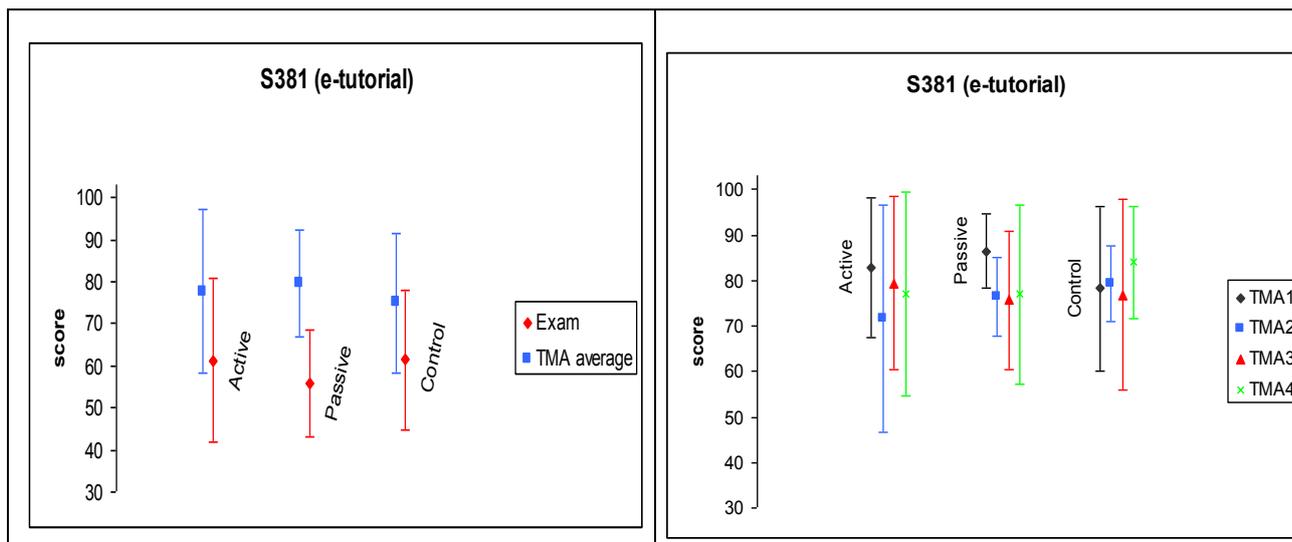
Figure 2 Performance on TMAs and exam of the 3 groups considered in the S381 e-tutorial. The left panel shows the average TMA and exam scores for the 3 groups. The right panel shows the scores on each TMA. All groups perform similarly on each form of assessment. There is no evidence of an impact of the e-tutorial on the score for TMA 04 compared with that for previous TMAs.

Particular exam questions provide another opportunity to investigate the impact of the e-tutorial. Questions 17 – 20 were composed of many steps and require lengthy answers and test more extensively particular aspects of the study material. Students had to answer two out of the 4 questions for 50% of the exam marks. Each question related to one of the blocks of the course. There was no single question that specifically covered the e-tutorial topics, but Question 19 was the closest one. Figure 3 shows the choices made and the average score each group achieved for these questions. The rates for all students taking the exam are also included for comparison. Question 19 had low attempt rates in general, and the e-tutorial does not seem to have boosted the participants' confidence in attempting it. The right panel includes the performance of students in part B of the exam (questions requiring a short answer), worth 30% of the exam score. The Active and Control group students who attempted Question 19 performed better on this question than the other students. Any potential impact of the e-tutorial, if present, has been masked.
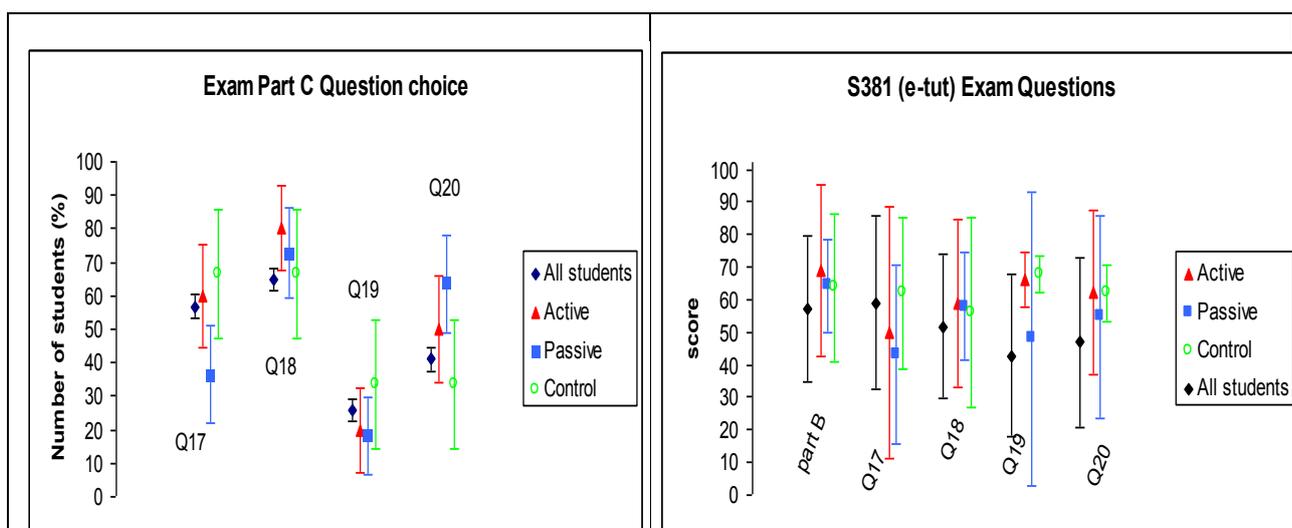
Figure 3 Exam question preferences (left panel) and performance (right panel) of the three e-tutorial groups. Data for all students is included for comparison.

3.2 Responses to the student questionnaire

After the course exam and before the results were communicated to the students, a questionnaire was distributed to all students who had expressed interest in the tutorial and had completed the course. The questionnaire aimed to explore the student perspective on the e-tutorial. More specifically, it enquired about the motivation of the students for taking up the offer of the e-tutorial and about its perceived usefulness. Further it attempted to identify any positive aspects as well as issues of concern, and invited reactions to the possibility of introducing e-tutorials in S381 and suggestions on their content and form. All Active participants responded, along with one Passive student (11 in total). The number of responses is too small to provide any definitive evaluation or suggestions. Despite that, they provide valuable insight and could inform future decisions about e-tutorials.

The main motivation for expressing interest in taking part in the e-tutorial was a positive past experience with e-tutorials (on the Level 2 astronomy course, S282), the wish to take advantage of all support on offer and curiosity about a new method of support. Most of the responders engaged actively and several downloaded the material with the intention of using it for revision (and some did).

They rated the usefulness as medium ("OK") and perceived it more like an extra activity, e.g., of the sort provided by the material in the DVD. Two would have preferred an extra face-to-face tutorial instead, if given the option, while most were happy with the e-tutorial. All of them would sign up for an e-tutorial in their next Science course and would recommend an S381 e-tutorial to a fellow student. Virtually all would favour the introduction of a mix of face-to-face tutorials and e-tutorials, but many would like e-tutorials to be in addition to the face-to-face tutorials currently offered.

Students appreciated the perspective of the unifying approach the e-tutorial took and found the material useful for revision. More pertinently for the mode of tuition, students valued the flexibility, extent and accessibility of an e-tutorial. The opportunity of checking answers with other students was also identified as a positive feature. Significantly, the e-tutorial was viewed as providing equal access and creating a level playing field for students, in contrast to the face-to-face tutorials. It is worth pointing out that 9% of the registered students were based outside the UK with no face-to-face provision whatsoever. Access to face-to-face tutorials is an issue within the UK as well, and it is more than a geographic location concern.

Among the negative aspects of the tutorial students quote the low number of active participants, the lack of human contact and the intimidating effect of others' contributions. Some would like more personal attention and encouragement, would prefer short and more focused questions, followed by a full wrap-up (possibly with complete answers). There was near unanimity on the whole endeavour being too time-consuming.

4 Discussion and suggestions

As our analysis has shown, it is not possible to identify any impact of attending the e-tutorial on the scores in either the following TMA or the exam. This should not come as a surprise as the e-tutorial was not designed to specifically support either, both to preserve fairness for the whole group and because this is rather typical of the e-tutorials offered on other courses (e.g., S282, S283). This has an impact on the attractiveness of an e-tutorial. It is evident that an e-tutorial advertised as supplying TMA or exam support would attract more participants. This has actually been the case with a revision real-time e-tutorial offered to the Region 1 group three days before the exam. Supporting evidence also comes from the attendance rates of

S283 e-tutorials that are dedicated to TMAs and revision. It would be appropriate to offer e-tutorials with specific TMA and exam support open all S381 students. Although there would be no statistically valid control group to test performance against, comparison of (pre standardization) average scores across the years may provide a means of evaluating the e-tutorials' impact. It is expected that any form of additional support would be beneficial to students. There has been no analysis, to our knowledge, of face-to-face tutorial attendees' performance. However, it is more important to recognize the features that would make an e-tutorial a more effective form of student support and in particular to address the issues raised by the participants.

There are issues about the scheduling and scope of an e-tutorial. Time spent on an e-tutorial is not explicitly scheduled in the study calendar of any of the courses offering e-tutorials. Only students with plenty of time on their hands would therefore participate in e-tutorials. As the responses to our questionnaire showed, a positive experience with an e-tutorial favorably predisposes students to attend future ones. A critical issue pertains to the accessibility of additional support. Many more students are excluded from face-to-face support either because of geographical location or because of mobility problems or work and family commitments. This does create an uneven playing field for the students. This study suggests that e-tutorials that were purpose-designed, timed, short and focused (e.g. run over two evenings), widely advertised and provided some replacement for human contact (e.g., a webcam accompanied by figures, images) could have better attendance. For an example of the use of a webcam and images in real-time e-tuition see Norton (2006).

Care must be given to encourage timid contributors as well as attendees. This requires a higher time investment on the part of the host AL. Also the time spent on the e-tutorial has to be limited to prevent over-investment in one part of the course and to avoid the possibility of poor performance and frustration and the consequent discouragement of students from attending any future e-tutorials.

Acknowledgements

References

Norton, A. (2006) *Real time, on-line astronomical observing,* πCETL project report

A 'past papers' forum in an e-tutorial format: an informal report

Roger O'Brien, AL in the London Region

Abstract

I have been worried for some time that e-tutorials are falling between several stools and failing either to inspire the students or excite the tutors. A fortunate idea and a few emails changed this a good deal. In 2007 we provided a *FirstClass* forum for each of S282 and S283 in which students could discuss the past exam papers for these courses. The analysis of the results is incomplete, but the success of the forums is clear.

For S283, 21 students contributed 298 messages to the past papers forum. This was easily the highest 'participation rate' for any S283 e-tutorial forum during the year. 37 other students read at least 10% of the messages. The impact for S282 was less dramatic, but still impressive: 13 students contributed 74 messages, and 79 other students read at least 10% of the messages.

1   Introduction

This exercise was the result of a conversation at the July meeting of the London Study Group. Two former students on S357 were extolling the virtues of going through past exam papers to members of the current S357 cohort. This has been a feature of S357 now for at least two presentations. It is done informally by students, using the OUSA S357 forum. At that time the idea did not germinate, but students on the OUSA S283 forum and on the S283 course forum began to exchange messages about comparing notes at some future date on their attempts at past papers.

On 22nd August, I asked Bob Lambourne, πCETL Director, for permission to support the students' efforts as part of my πCETL work. This was promptly granted. The idea snowballed rapidly and I thought of establishing the equivalent of an e-tutorial devoted to past papers for both S282 and S283. I contacted Jennie Bellamy, Course Manager for S283, who immediately offered to set up the forum. The S283 past papers forum was up and running on 23rd August.

It took a few days longer with S282, but there was exactly the same willingness to give it a go. The Course Team Chair does not work at Walton Hall, but Anne-Marie Gallen, S282 Course Manager, set the forum up for me.

It is not possible to provide this facility for S357 because that course does not use e-tutorials. However, I provided limited support on the OUSA S357 forum. Other tutors, still more commendably because unpaid, also supported this forum to some extent.

2   Data collection

There is no automated system to collect data about use of *FirstClass* forums. Some time ago I found that it is possible to save a file containing a list of the messages in an e-tutorial in a moderately useful form. I have appended a specimen to this report (see Appendix A).

The list of messages can be manipulated in several ways before being downloaded from *FirstClass*. I had chosen to sort the file into 'Threads' then in date order in each thread. This file can then be imported into a spreadsheet (I used Microsoft Excel). When importing the file, I rejected the some columns, which contain numbers of no use to me.

Within Excel, I gave the remaining columns headings, both to ensure that at a later date I would understand what the data was and to make the various sorting and filtering operations simpler. Next, I used the copy and paste facility to standardise the quoted name of each thread, dispensing with all those tiresome variations:

```
Re(2): GOOD LUCK        →      GOOD LUCK
```

This made an additional level of filtering possible; before that, each message in a thread was unique and could not be usefully summarised.

From a headed data set, in Excel it is possible to filter out and list elsewhere a subset of unique records. Thus, I obtained a list of contributors for each forum – see Appendix B for an example. Such a unique list is then used to provide criteria for counting items from the whole dataset.

Excel also provides formulae, which will separate date and time so that the usage of the forum can be plotted:

(a)   over the whole time it operated

(b)   by time of day to see when usage was highest

(c)   by day of week against time of day

Collecting the data on lurkers was both more tedious and more time-consuming. The method I adopted was to download the 'History' of an early message ('Ground Rules') to provide a list of names. *FirstClass* allows one to search through the 'History' records of an entire forum for a particular name. I could paste the name from the downloaded list into the 'find' form and the result displayed included a count of the number of 'hits'. I then typed this number into the spreadsheet next to the name and created a database of lurkers. As there were over 200 lurkers on the two forums the work involved was considerable.

The data on lurkers may not be complete. It is possible that other students logged on and read plenty of messages. I relied on the intuition that a new lurker would read the 'Ground Rules' message before diving into the maelstrom of other messages.

3   Results

Table 2, shows the levels of usage of other e-tutorials in S282 and S283. In comparison with this, the student involvement in the past papers e-tutorials (shown in Table 2 on the next page) is impressive for S283, and is about average for S282. The S283 contributions from the Course Team Chair and another tutor are evidence of unusual interest. Most e-tutorials do not receive contributions from any non-student except the presiding tutor. 90% of contributions to the S283 forum were from students, and 83% of the contributions to the S282 forum were from students.

Table 2 Usage of other e-tutorials in S282 and S283.

	S282	S283
total number of messages	118	82
tutor messages	48 (41%)	34 (41%)
student messages	70 (59%)	49 (60%)
number of contributors	16	13

Table 1: Usage of past papers e-tutorials in S282 and S283

S283	Past papers forum	S282	Past papers forum
331	**total messages**	**89**	**total messages**
31	from me	15	from me
1	from Course Team chair (Dave Rothery)		
1	from another tutor (Gemma Warriner)		
298	from students	74	from students
24	**participants**	**14**	**participants**
21	students	13	students
1	Course Team Chair		
1	volunteer tutor		
1	assigned tutor	1	assigned tutor
60	**threads were used**	**33**	**threads were used**
8	threads were administrative or social and contained	6	threads were administrative or social and contained
26	messages	14	messages
50%	of messages were in threads of 4 or fewer	85%	of threads contained 4 messages or fewer
52	threads were relevant and contained	27	threads were relevant and contained
305	messages	75	messages
90%	**of the messages were student-generated**	**83%**	**of the messages were student-generated**
60	students read some messages	~90	read an early message
		~ 40	read message near the end
average usage	**S283 e-tutorials, excluding past papers**	average usage	**S282 e-tutorials, excluding past papers**
82	messages, of which	120	messages, of which
34 (42%)	from tutor	50 (41%)	from tutor
49 (59%)	from students	70 (59%)	from students
74	**non-contributors (lurkers)**	**132**	**non-contributors (lurkers)**
37	read 10% or less	53	read 10% or less
37	read more than 10%	79	read more than 10%
61	**attended in total**	**93**	**attended in total**
	i.e. 24 contributors and 37 serious lurkers		i.e. 14 contributors and 79 serious lurkers
101	messages from Student P	25	messages from Student F
14	messages was average	7	messages was average
7	students above average	4	students above average
3	students sent direct to me	2	students sent direct to me

However, as might be expected, there is considerable variation in participation by different students
This is shown in Figures 1 and 2.
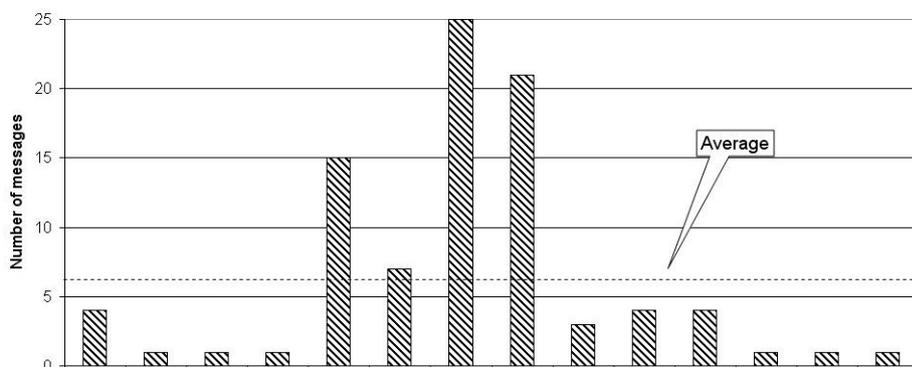
Figure 1   Numbers of messages posted by each contributor to the S282 past papers forum. Each bar represents a different contributor, and the fifth bar from the left is for the tutor.
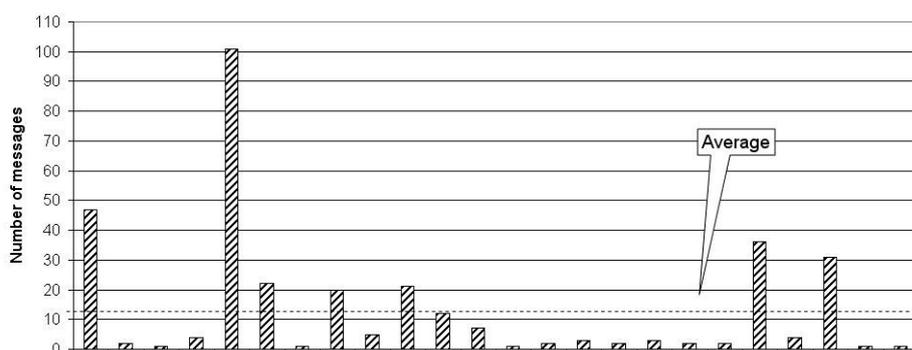
Figure 2   Numbers of messages posted by each contributor to the S283 past papers forum. Each bar represents a different contributor, and the third bar from the right is for the tutor.

The timing of contributions has also been explored. Both past papers forums showed a late rush of messages on the weekend 5-7 October, as shown in Figures 3 and 4.

It may also be worth noting that the traditional view of the OU student as a late-night worker is not wholly supported by the analysis here. As Figures 5 and 6 show, the planetary scientists (S283) were more active during the day, with peaks around 10:00 and 15:00 and again in the early evening, whereas astronomers (S282) had a burst of activity just before midnight, with smaller peaks around midday and 17:00.

The days of the week used to post messages also vary between the two courses (Figures 7 and 8). While is of no great significance in the long run, it is of importance to the tutor running the forum, who will need to be in attendance to monitor the most heavy traffic.
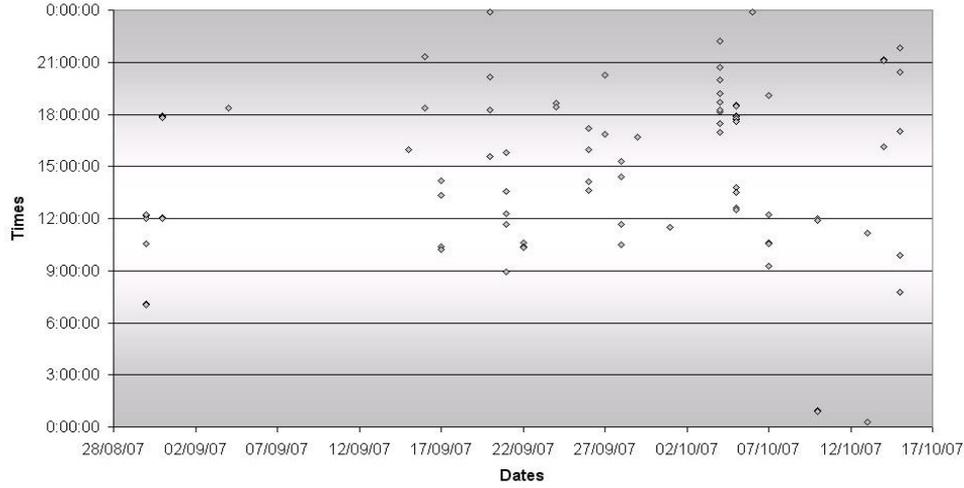
Figure 3   Dates and times when messages were posted to the S282 past papers forum.
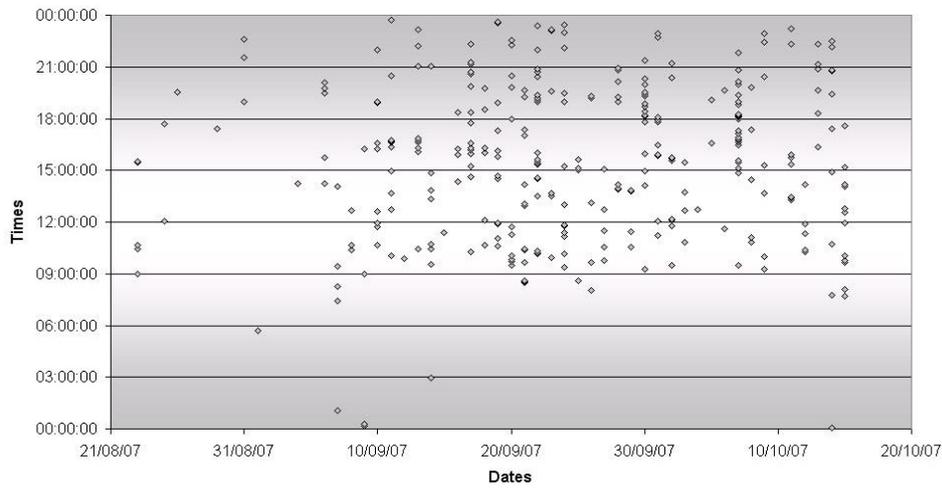
Figure 4   Dates and times when messages were posted to the S283 past papers forum.
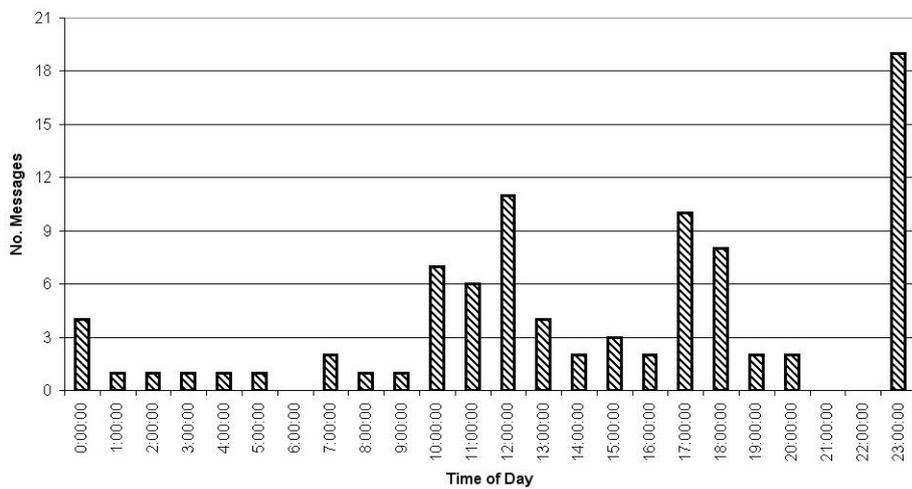
Figure 5   Distribution of time periods when S282 messages were posted.

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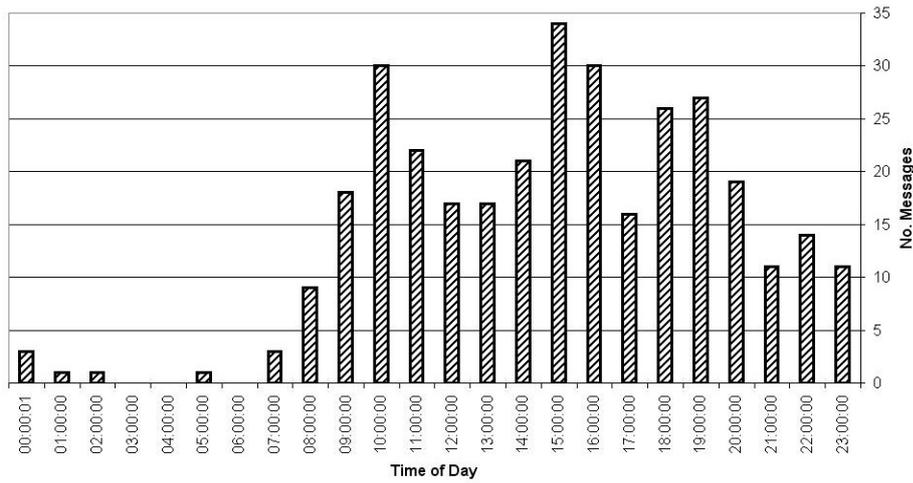
Figure 6   Distribution of time periods when S283 messages were posted.
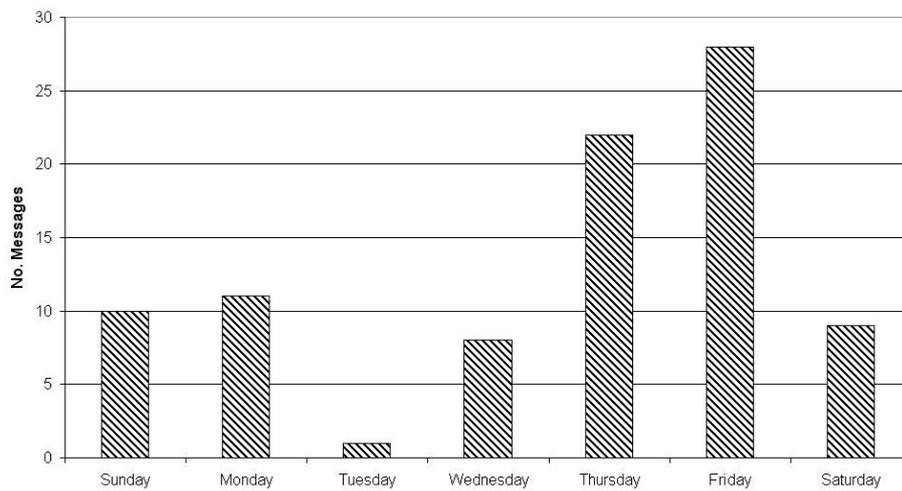
Figure 7   Numbers of messages posted each day of the week to the S282 past papers forum.
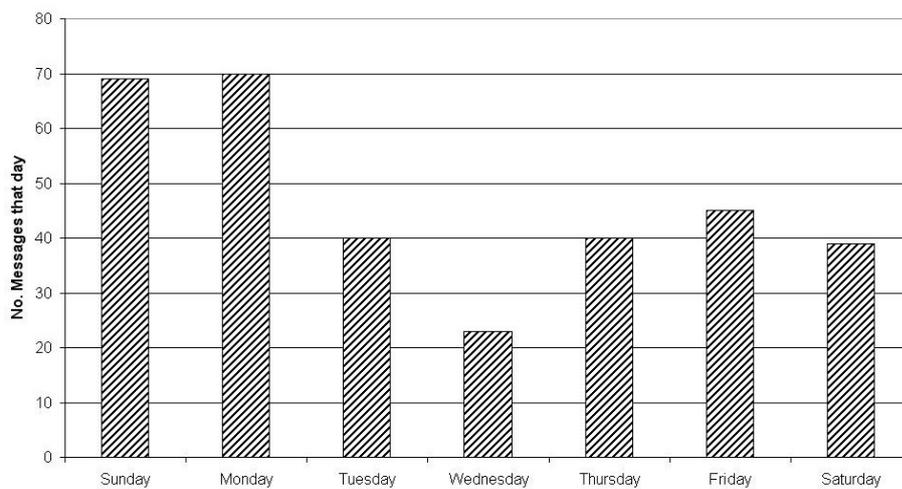
Figure 8   Numbers of messages posted each day of the week to the S283 past papers forum.

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5   Discussion

My personal concern has been *to find a distinctive role for the e-tutorials*. It is obvious, having conducted them, that e-tutorials cannot be a direct replacement for the face-to-face contact, which is the major attraction[1] of traditional tutorials.

Perhaps the main fault of e-tutorials has been that we have spent too much time deciding what ought to be done or what we wanted to do or trying to replace face-to-face tutorials, when we should have been trying to find out what the students wanted. Any form of tutorial ultimately stands or falls by the level of student participation that it attracts. The problem is still the same: how to find subjects and forums that will attract enough students to be worthwhile.

The method of finding out what students want also strikes me as faulty. We call for comments or send out questionnaires. The trouble with these procedures is that they sample the most committed students, who will take part in more or less anything, and who are also usually the most able. This is like measuring average literacy by interviewing people using a local library. In this case, students have voted with their e-feet and gone for a past papers forum, although it was hastily cobbled together and they were left mostly to their own devices. In other words, this is something the students wanted and were prepared to take up with vigour. With the benefit of hindsight's 20:20 vision, this was blindingly obvious.

Another factor in success, here, was take-up. In both forums, I was lucky to have keen students, who got working very quickly.

At the end of courses that provide frequent e-tutorials and for which there are other relevant forums, it is surprising that students still do not have a sound grasp of how to get the best out of the e-tutorial format. There were several cases of students simply altering the subject line – usually to find that another student altered it back. The correct procedure for starting a new 'thread' is to write a 'New message' with the new subject. It seems that few, if any, students know how to use the 'Find' facility. Some seem to have learned to use 'View' so that they can arrange the messages in a forum in a convenient way.

Perhaps inevitably, with so many messages, on S283 there were examples of duplicating threads; for example

S283 - 2003 paper

2003 Qs9 onwards

2003 Q14

Past paper 2003 Q12

2003 Q10

Paper 2003 Part II Q 10

From a tutor perspective, the time required for setting up the forum and posting the administrative messages is much the same, whatever the level of subsequent student interest. However, I found it hard to keep up with moderating two forums and to complete a taxing schedule of marking at the same time. The month before the exam is a time when tutors have a heavy workload of marking to

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[1]   …and, though no-one will admit it, the major put-off factor. The thought of having to meet the tutor, who gave so few marks to that TMA, must be daunting.

finish on a tighter schedule than during the rest of the course. I think this indicates that a different tutor is needed to moderate the past papers forum for each course.

I think that this exercise reinforces my previously expressed contention that tutors should be able to set up sub-forums to which the students have immediate access. If each exam paper could have its own sub-forum, the whole past papers forum would have a clear structure and would be less daunting to a late-comer.

The large numbers of non-contributing 'lurkers' suggests that another contention – that students should be able to contribute anonymously or pseudonymously – should be tried. I also think that tutors should include in the attendance the more persistent lurkers. I have used a criterion of reading more than 10% of the messages to indicate an attending lurker. I think this is fair, because many of the contributors read no more than 10% of the messages.

It must be conceded that the students who took an active part in past papers forums were, largely, familiar names from the other forums and e-tutorials, but there were others. It is possible that the provision of this facility, very close to the end of the course, allowed students to feel that any gaffes they made would not be seen for long.

6   Conclusions

6.1   General conclusions

- E-tutorials need a distinctive role of their own.

- One such role is to provide a past papers forum.

- Tutors should be encouraged to be innovative in e-tutorials, and appropriate support should be provided.

- Tutors should be able to set up sub-forums to give the e-tutorial a clear structure.

- Students should be able to contribute anonymously.

- Weekend tutor participation is vital for forums of this type.

- It is the ablest, most computer-literate students who contribute to these forums and get the most out of them.

- Students need coaching in the use of e-tutorials.

- The ideal time for a past papers forum is not a good time for tutors to be involved.

- The ideal tutor for a past papers forum is one who is already familiar to the students, through contributions to the OUSA forum, etc.

- We should count lurkers who read more than 10% of the messages on a forum as being 'present', just as we count quiet students, as well as lively ones, in a tutorial.

6.2   Conclusions specific to S282

- S282 lacks an active OU course forum, so the past papers forum should have been more forcefully advertised in the OUSA forum.

- The past papers forum forum for S282 was popular, but was not above average.

- One student, Student F, reacted with immediate enthusiasm and others followed his lead. We should consider coaching a (group of) student(s) to make use of the forum. I had met Student F at the SXR208 residential school and in other forums and I think that familiarity helped get things going. Perhaps some students, such as Student F, could be encouraged to refer to the past papers forum on the OUSA forum.

- Highest usage occurred on Thursday and Friday, with below average use on Tuesday (Figure 7).

6.3 Conclusions specific to S283

- The past papers forum was the most-used forum for S283 in the 2007 presentation. The reason that this forum was so successful was probably due to a number of factors.

- One student, student P, pitched in with great enthusiasm and willingness to try the questions and debate the answers. He sent more than a third (101) of the total student messages. I am not sure how one would go about arranging a similar student in advance for future presentations. Perhaps we should consider selecting and coaching a (group of) student(s).

- The forum was provided in response to student initiative (though there was quite a bit of elbow-jogging, by me, in the background).

- The contribution low point of the week for S283 was Wednesday, and Sunday and Monday were jointly the most active days (see Figure 8).

7 Proposals

- Provide past papers forums as part of the package of tutorial support for other Science courses that have e-tutorials.

- Recruit at least one tutor per course to moderate the past papers forum.

- Recruit tutors with a good track record of running e-tutorials and contributing to forums.

- Recruit tutors willing to provide some support at weekends.

- Advertise the past papers forum on the course website and on the relevant OUSA forums.

- Consider ways to recruit students to stimulate active discussion in forums.

Appendix A

Sample of the downloaded data-file for S282 past papers forum.

This is how it appears after downloading and after the names of students and tutor have been anonymised.

Conference	89		Files	0	Folders	oufcnt2.open.ac.uk : Roger O Brien	
23032	0	0	[Student A]	2K	Re(2): GOOD LUCK	15/10/2007 21:48
23032	0	0	[Student B]	2K	Re: GOOD LUCK	15/10/2007 20:26
23032	0	0	[Student C]	2K	Re(2): GOOD LUCK	15/10/2007 17:03
23032	0	0	[Student D]	2K	Re: GOOD LUCK	15/10/2007 09:53
23044	0	0	[Tutor]	2K	GOOD LUCK	15/10/2007 07:45
23032	0	0	[Student E]	2K	Thanks	14/10/2007 21:09
23044	0	0	[Tutor]	2K	Re(2): 2003 Q 11	14/10/2007 21:07
28212	0	0	[Student F]	3K	Re: 2003 Q 11	24/09/2007 18:37
23032	0	0	[Student G]	2K	Re(2): 2003 Q 11	22/09/2007 10:35
23032	0	0	[Student H]	3K	Re: 2003 Q 11	22/09/2007 10:24
23032	0	0	[Student G]	3K	2003 Q 11	21/09/2007 15:48
23044	0	0	[Tutor]	5K	Re(2): 2006 Q13	14/10/2007 16:08
23032	0	0	[Student J]	3K	Re: 2006 Q13	01/10/2007 11:29

23044	0	0	[Tutor]	3K	2006 Q13	31/08/2007 12:03
23032	0	0	[Student G]	2K	Re: completely off topic	13/10/2007 11:10
23032	0	0	[Student A]	2K	completely off topic	13/10/2007 00:17
28212	0	0	[Student F]	3K	Re: Question 1-8 2005	10/10/2007 12:01
23032	0	0	[Student A]	1K	Question 1-8 2005	10/10/2007 00:57
28212	0	0	[Student F]	3K	Re: question 1-8 2003	10/10/2007 11:52
23032	0	0	[Student A]	1K	question 1-8 2003	10/10/2007 00:55
23044	0	0	[Tutor]	2K	Re(7): 2004 Q 1-8	07/10/2007 19:04
28212	0	0	[Student F]	2K	Re(6): 2004 Q 1-8	07/10/2007 12:12
23044	0	7021	[Tutor]	60K	Re(6): 2004 Q 1-8	07/10/2007 10:37

Appendix B

Numbers of contributors to the S282 past papers forum from each of the participating students and the tutor.

Name	*Number of messages*
Student A	4
Student B	1
Student C	1
Student D	1
Tutor	15
Student E	7
Student F	25
Student G	21
Student H	3
Student J	4
Student K	4
Student L	1
Student M	1
Student N	1
14 contributors	

Live e-tutorials in S381 and SMT359

Hara Papathanassiou, πCETL, The Open University

Abstract

We report on the delivery and evaluation of synchronous e-tutorials that were offered to groups of students studying *The Energetic Universe* (S381) and *Electromagnetism* (SMT359) during the 2008 academic year. The e-tutorials were delivered via *Elluminate Live.* We present the software capabilities pertinent to the teaching of third level physics and astronomy courses. We discuss the way the e-tutorials were organized and run, as well as the feedback that has been solicited from the students. Finally, we present the analysis of student feedback.

1   Introduction

S381, *The Energetic Universe*, is an astronomy course and SMT359, *Electromagnetism*, is a physics course, both at third level. Both courses are supported by face-to-face tutorials, multimedia distribution on a DVD and a course-dedicated website. SMT359 is further supported by five asynchronous e-tutorials delivered on *FirstClass.* So far, the opportunity for real-time (synchronous) e-tutorials has been limited due to the lack of an appropriate platform. A real time e-tutorial was delivered for S381 in the 2006 presentation on *FirstClass*, but this was limited to typed exchanges on a conference. An additional limitation of *FirstClass* is the lack of appropriate tools for presentation of mathematics or the inclusion of figures. Mathematics and figures can be included as attachments, but preparation of attachments is not possible in a synchronous setting.

During the 2008 academic year, *Elluminate Live,* a platform that enables live communication (via text, voice, file sharing and white board) was piloted on a number of mathematics courses as part of the Maths On Line project. Later that year, *Elluminate Live* was adopted by the University as the platform of choice for real-time electronic tuition from 2009 onwards. Access to this software enabled the provision of live e-tutorials for some S381 and SMT359 students during 2008. S381 students in Region 1 (London) were offered additional tuition in electronic form, as well as the option of substituting one face-to-face session with a number of real-time e-tutorials. Their response was overwhelmingly in favour of e-tutorials. Similarly, SMT359 students in continental Europe and Scotland (who had not been provided with face-to-face tuition opportunities) were offered a number of e-tutorial sessions. Their response was rather limited.

In Section 2 we discuss the organization of the sessions and the *Elluminate Live* features that the sessions employed. Section 3 relates the author's general impressions of the functionality of the software and student reception of the tutorials as well as some informal student feedback. Section 4 describes the type of information that was sought in a questionnaire that was distributed to the participants. Section 5 presents the student responses to the questionnaire.

2   E-tutorial organization and the use of *Elluminate Live*

In total, seven e-tutorials were delivered for S381 and two for SMT359. Two of the S381 e-tutorials followed face-to-face tutorials on Blocks 3 and 4 of the course respectively and were similar to the face-to-face sessions in content and organization. They thus provided the opportunity for a direct comparison of the two modes of delivery. Four of the sessions (one for each block) were dedicated to revision and were delivered in a period 3-4 weeks prior to the exam. The final session was scheduled four days before the exam and was meant to deal with 'last minute problems' related to the exam. Sessions were planned for 1h 15min, but most overrun by 15 min to half an hour. The number of participants varied from two to eight.

After experimentation with the e-tutorial environment, the choice was made to use a limited number of the platform's features to provide functionality but not overburden participants with the overhead of familiarizing themselves with an excessive number of technical aspects. Functions that might introduce delays (e.g., file download at different connection speeds) were avoided mainly because they undermine the pace of the session. The features that were used included voice communication for all those in possession of a microphone, the chat window for typed communication, the whiteboard, and some use of the emoticons. A five-minute introduction was given at the beginning of most sessions demonstrating (via application sharing) the use of these features. A more detailed account of the use of these components follows.

Voice communication　Testing of the audio set-up was performed at the start of each session. This is recommended by the software support. Students were prompted to do this by an introductory screen, an example of which is shown in Figure 1. For sessions with a small number of participants (fewer than four), the number of simultaneous speakers was set as the number of total participants in order to promote an informal setting in which the tutor could be interrupted and questions could be asked as they arose.

Hi
Welcome to the block I revision S381 e-tutorial
The session will start at 5:15 pm (UK time)

While waiting, please test your audio, under

　　　Tools>Audio>Audio Wizard

You will need pencil and paper and the Equations list

If this is your first time in an Elluminate session, try to type or scribble

Hara
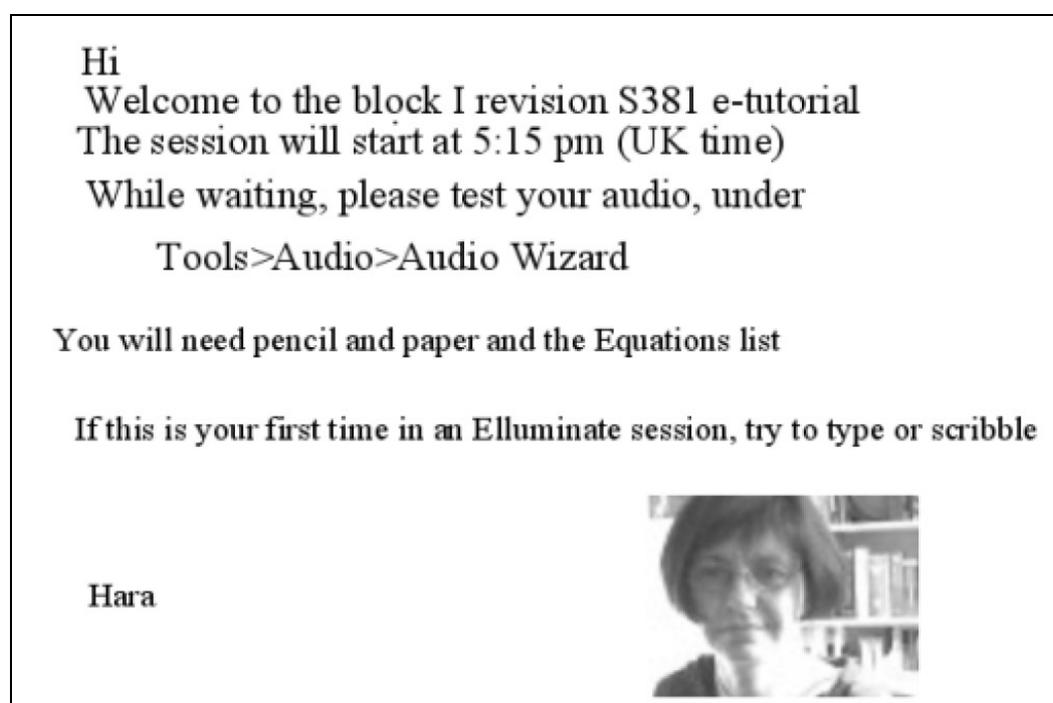
Figure 1　An example introductory whiteboard screen that was displayed during the waiting time before the official start of the e-tutorial. It is simple in construction and invites the students to perform the necessary audio set up procedure and to familiarize themselves with the whiteboard functions that are employed during the e-tutorial. The AL photo creates more of a face-to-face ambience without the nuisance and distraction of a continuous webcam view, which would not display anything more than a talking head.

Chat　This was used mainly by the students who did not have a microphone. It turned out that all students spontaneously exclusively used chat when one or two of them did not have a microphone. This seemed to be a self-imposed mode of organization that leveled the playing field and that was not anticipated.

Use of whiteboard　A tablet PC proved essential for optimal use of the whiteboard. As only the tutor was equipped with a tablet PC (provided by πCETL), the use of the whiteboard was rather uneven. The most demanding aspect is the presentation of maths. Students could type in equations as text (using a minimal ASCII character convention presented to them at the start of the session), cut and paste equations using the snapshot facility of *Elluminate Live* (though this offered limited opportunity for manipulation), or attempt writing them with the mouse. This last option was the most cumbersome, though students could achieve readable short chunks of maths. Simple figures (very

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useful for setting up electromagnetism problems) could be drawn using the standard paint options (for ellipses, rectangles and lines). For the revision tutorials, where the sessions were dealing exclusively with answering exam questions, the appropriate equations were identified with reference to the course's Equations Booklet (students were asked to have this at hand). Then, much of the work was based on students' suggestions dictated to the tutor, much like the way similar problems are tackled in a face-to-face session. Instead of whiteboard screens that are only accessible through an *Elluminate Live* session, it was deemed more useful to prepare a Microsoft *PowerPoint* presentation with a part of an exercise per page. The exercises' text was extracted from a pdf file using the snapshot tool of *Adobe Reader*. *PowerPoint* is the only presentation software that is loadable on *Elluminate Live*. However, this was not an insurmountable limitation as *OpenOffice* allows saving in Microsoft equivalent format. Each page includes the text of the exercise but most of it was left blank to be used for working out the answer. This provided a structure for the exercises that would be worked through during the session. Leaving most of the screen blank was used as an explicit invitation for student participation. For complicated or lengthy solutions, where it was not deemed appropriate to do the complete work during the tutorial, prepared pages with the answer might be included.

Use of single click functions   Significant use of the polling option was made, mainly for quick checks on the functioning of the software and to get feedback from students on whether a question had been answered or whether there were further questions. However, this did not require collecting the poll results or publishing them for students to see.

Application sharing   This was used sparingly, mainly for the initial *Elluminate Live* tour given at the start of the initial sessions and also for the display of an animation.

Several features were not deemed necessary for these sessions, and these included:

File sharing   In general, pdf files of the problems to be discussed during the session were distributed beforehand. On one occasion a file was shared during the session as a couple of the participants did not have a copy at hand. However, this should be avoided as it may introduce delays.

Video   There was little scope for a live video image. Moreover a single image can be viewed at any time. This would inevitably lead to the video screen being monopolized by the AL. Showing the AL's face throughout the session is not helpful, and it could be distracting. It was felt that the intended face-to-face experience could not be satisfactorily recreated. However, supplying a webcam snapshot (or photo) in the introductory screen made the interaction more personal. One student also shared video to show his face, but this was not pursued as the sessions were devoted to the course material with little time for trying out the software's features.

Hand raising   In all sessions, the maximum number of simultaneous talkers was set to three. This eliminated the need for the students to 'raise their hand' to request that the tutor give them permission to speak. It made communication spontaneous and did not create audio feedback so long as everyone kept their microphone switched off when not talking. Participation in sessions where microphone access was micromanaged has shown that communication is awkward and any attempt at it breaks the flow of the session.

Other functions, such as the *Web tour,* were not deemed useful for the sessions in question.

Most of the sessions were recorded and the links to the recordings were made available to the students in the majority of the cases.

3   Moderator and student impressions

There were few technical problems in connecting and participating. Competent Mac users experienced no difference in accessing the session, though one was frustrated to the point of abandoning the effort. Many students commented on the robustness and user friendliness of the platform.

A headset is essential for the moderator, though having it on for the whole of the session leads to some physical discomfort. Access to a microphone brought significant improvement to a student's

participation. As mentioned before, students without a microphone did not feel particularly disadvantaged, since the text chat facility proved an effective substitute.

The sessions were run by the tutor/moderator from a tablet PC and the use of the tablet pen was essential for the whiteboard function. For this, one must be prepared to run the whole session in tablet mode to avoid rotating the laptop screen during the session. An alternative to the tablet PC is a pen tablet connected via a USB port to the computer. Examples of the quality of the writing on *Elluminate*'s whiteboard are shown in Figure 2. The quality of the hand writing is comparable, though note that the tutor was much more experienced in the use of the tablet pen with the tablet PC. Advantages of the external USB tablet over the tablet PC include its low cost, small size, and thus portability, and the ease of simultaneous use of PC keyboard and the pen writing mode (the rotation of the tablet PC screen is a significant inhibitor to using both pen and keyboard functions in a session). The main disadvantage lies in the higher hand-eye coordination required to use the external tablet as one has to look at the PC screen while scribbling on a small tablet screen beside it. It is felt though that coordination would improve significantly with practice. The tablet tested here was the *WACOM pen tablet*, which is compatible with Windows editions later than 98. However, tablets of this sort have become popular and it should be easy to find an affordable one for any operating system.
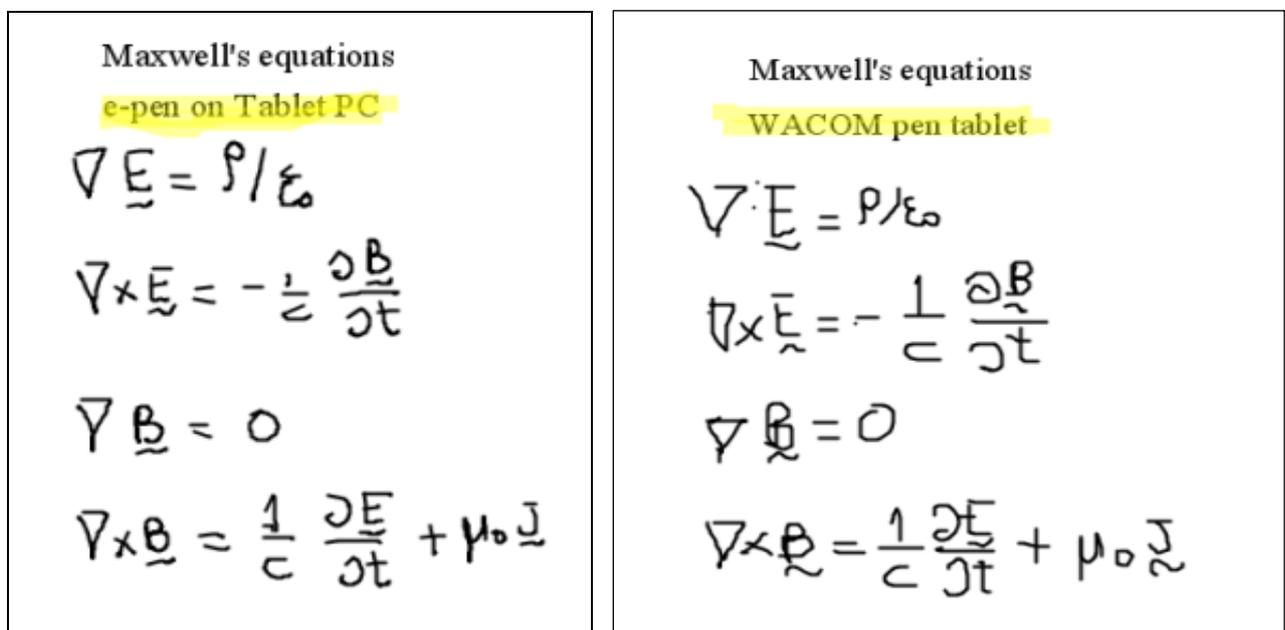
Figure 2   Examples of hand written equations using the e-pen on a tablet PC (left panel) and a USB- connected tablet (right hand panel).

Simple geometric shapes can be drawn on a whiteboard using the *Elluminate Live* drawing tools (for drawing lines, ellipses and rectangles). These only require the use of a mouse and no particular skill and are thus equally available to all participants.

These were intensive sessions that required a lot of preparation. Sessions for S381 were more numerous and significantly more successful than those for SMT359. Part of the reason was that S381 sessions were offered to the moderator's own tutor group and participants had already met at face-to-face tutorials beforehand. The small number of participants was committed, demanding and very appreciative of the extra support. The two SMT359 sessions were rather disappointing. A large number of regular sessions provide the opportunity to adapt to student expectations, and to correct the inevitable technical and other accidental blunders of previous sessions.

Sessions should not exceed 1h 15min by much. Leading the session is especially taxing, and moreover, longer sessions have diminishing returns. Trying to cram too much into a session converts it to a lecture (the main criticism of one SMT359 session). In our experience, a large number of

regular sessions can be more effective and successful with the students. However, this would require a larger number of contact hours for the AL. For students to commit, the time required for the sessions should be incorporated into their study schedule (most students will not commit to an e-tutorial because they would rather spend their limited time on self-study).

It is essential to prepare and rehearse the session in *Elluminate Live.* One can log in simultaneously both as a moderator and a participant from the same computer for a basic test. The use of the platform's functionality is best kept to a minimum and features should be used only if really needed. Extra functionality can be employed in later stages, as needed and when both moderator and participants are familiar with the software.

It is very important to record all sessions and to start the recording at the beginning of each session after all participants have consented. However, our personal opinion is that the recording should be distributed only to the group of participants or else their willingness to participate actively could be undermined.

4   Questionnaire content

A questionnaire was distributed to students and responses were collected. The questionnaire aimed to probe the students' experience with the e-tutorials, attempt a comparison with face-to-face tutorials and solicit student input on how to improve the sessions. It was estimated that students would need about 20 minutes to complete the questionnaire. Due to restrictions imposed by the University, the questionnaire was distributed to only those students who were in the e-tutorial moderator's student group. This excluded six students who participated in the SMT359 e-tutorials (mostly in the first one).

5   Student feedback

Seven students out of the total of nine who participated in at least one e-tutorial returned the questionnaire. They included the three SMT359 students from the e-tutorial moderator's student group who could be polled.

No face-to-face tutorials were offered to the SMT359 students (Region 9 group). Students in S381 (Region 1) were initially offered five face-to-face tutorials, out of which four took place and the last one was converted to a live e-tutorial at the students' request. All S381 e-tutorial attendees had also attended the face-to-face tutorials.

When questioned about why they opted to attend an e-tutorial, most students gave more than one reason. Six respondents quoted curiosity about what an e-tutorial entailed as one of the reasons for attending. Other reasons in order of popularity included seeking help with the exam or with the specific study block and a wish to obtain as much help as could be provided. Three students also mentioned the non-availability of face-to-face tutorials.

When asked to comment on their participation and use of the e-tutorial, all respondents claimed to have participated actively, while two also used the recording at a later stage. Participants were asked to characterize the level of technical difficulty of logging in and participating. The majority found it smooth with nothing to complain about, and one had some trouble that could be overcome without the student being put off. One had serious trouble logging in and investigated the issue by logging in with a PC and a Mac. This problem remained unresolved and seriously jeopardized the student's attendance.

Five students found the e-tutorials very useful and the rest saw them as an extra course-related activity that helped them with some aspects of the course material. Two students thought that having a microphone was necessary for proper participation, while four did not think that this was the case. Concerns raised touched upon the ease of typing for the participants, the necessity for the e-tutorial moderator to multitask, keeping an eye on the chat window, and the logistical problem that a large number of participants with microphones could create for the moderator. Much of the students' experience of the whiteboard was following the working out of a problem by the tutor. They had

rather limited opportunity to contribute themselves (mainly due to time constraints). There were three unqualified responses stating a positive experience with the use of the whiteboard. Comments included: the need for extra practice for all participants; the potential for the whiteboard screen to become cluttered and hard to follow; and the obvious advantage of the use of a tablet pen.

Students were asked to comment on their overall experience with the e-tutorials and identify positive and negative features. The most valued aspects were the mere provision of a tutorial (especially for those students who are not offered any face-to-face sessions)) and the better time investment through eliminating the need for travel. Also, the availability of recordings, which made possible revisiting or catching up with a missed session, was appreciated. Among the negative aspects were the technical problems presented and the wealth of software's features that may make participation daunting for less computer-literate students. All respondents were positive about signing up for an *Elluminate* e-tutorial in their next Science course, but one would prefer a mixed offering that included some face-to-face sessions as well. All would recommend a live e-tutorial to a fellow student in the next presentation of the corresponding course.

Students were asked to compare the usefulness of an *Elluminate Live* e-tutorial with that of a non-synchronous (*FirstClass*) e-tutorial and a face-to-face tutorial. Compared to face-to-face tutorials, all students found the live e-tutorials as good, with the exception of the student whose technical issues had hampered participation. Only one had experience with asynchronous e-tutorials and definitely preferred the synchronous ones.

Asked to comment in general on the use of synchronous e-tutorials, everyone was supportive and found the lack of need for travelling a compelling argument. One student was pleased that the number of participants was low since the session could better attend to each individual's needs. One attendee went as far as suggesting that *Elluminate Live* e-tutorials should be part of the core offering of all courses but was concerned that the system seemed better suited for users with some tablet pen or graphic capability.

5   Conclusions

Our experience in a dozen e-tutorial sessions during the 2008 academic year has shown that *Elluminate Live* is a reliable platform that should enable wide adoption of electronic real time tuition in third level physics and astronomy courses. It effectively supports voice communication and a whiteboard facility, the two of which make for a practical substitute for face-to-face tutorials. The additional capability to present multimedia materials is unrivaled by facilities normally available in face-to-face tutorials.

Simple geometric shapes can be readily drawn with the use of a mouse. Equations can be used with an easy cut and paste facility, but their manipulation requires some sort of an electronic pen. Testing of writing with the pen on the screen of a tablet PC and with a pen tablet favours the latter, especially given its low cost. Lectures are supported seamlessly by the platform. The interactivity of a tutorial depends on whether participants possess a microphone. However, the use of the whiteboard and chat go some way in supporting communication. The moderator, who is likely to possess an e-pen, has a clear advantage compared to the students who presumably will only be able to participate via voice, drawing, texting, cutting and pasting. However, the situation is very similar in a face-to-face tutorial. The e-tutorial is more effective if students attend and participate as they would in a face-to-face tutorial, i.e., listening, watching the whiteboard, taking notes, working through problems in their notebook and talking. The quality of the e-tutorial ends up depending only on the quality of the delivery, much as in a face-to-face session.

It is essential to prepare and rehearse an e-tutorial before the actual session. It is estimated that a few sessions are needed for the moderator to become capable with much of the platform's functionality. Half a dozen sessions are adequate to make one proficient with the software and not have to worry about presentation issues. The workload to prepare an e-session is significantly higher (e.g., double) than that for a face-to-face session with the same content. Given that the capabilities of the e-tutorial are greater (e.g., inclusion of multimedia), the preparation effort and time could be even longer.

Though the platform makes it straightforward to provide lectures, which students could watch at their convenience, its real power lies in the delivery of live e-tutorials. We feel that the adoption by the University of a real-time e-tutorial platform like *Elluminate Live* begs for a reconsideration of the tuition provision and could have a great impact on the quality of study. Real-time e-tutorials could become an integral part of the study programme rather that the widely ignored add-on they now are. They could be regular and frequent at a small cost (increased AL contact hours) that would be offset by savings in travel expenses (to conventional face-to-face tutorials). Combined with a shift to iCMAs and decreased AL involvement in marking assignments, this would also shift the focus of the AL role. AL tuition could involve more guidance and instruction, with highly targeted remedial help and less grading and marking.

Finally, *Elluminate Live* tutorials overcome the geographical boundaries of provision of tuition and bring support to all students on an equal footing. The limited number of students in continental Europe could be very effectively supported and could develop a much more active link with the University. A much larger number of non UK based students could be supported and feel part of a live educational environment.

The potential for use of live e-tutorials in supporting students was also recognized in students' responses to the questionnaire. Though these have no statistical validity, it is worth pointing out that all respondents were positive about attending such e-tutorials in Science courses in the future and would recommend them to other students studying the course.

Elluminate tutorials in SM358

John Bolton, Department of Physics and Astronomy, Open University

Abstract

Following the pilot of *Elluminate* tutorials in the Level 3 physics course SM359, *Electromagnetism* in 2008 [Paper 5], we decided that all the e-tutorials in the 2009 presentation of SM358, *The Quantum World*, should use the *Elluminate* system to deliver a series of real-time tutorials. This paper briefly describes the nature of the tutorials and analyses student feedback on them.

Introduction

In 2008, the tutorial provision for SM358 was split between face-to-face tuition, Day schools and e-tutorials run using the *Elluminate* system. Apart from the use of *Elluminate*, this tuition model was similar that described by Stuart Freake and Hara Papathanassiou in Paper 1.

The tutors worked in pairs, with one tutor taking the lead role in presenting a session and the other giving support, dealing with questions input via text and other procedural matters. Although we initially suggest six broad topics, the tutors themselves decided to split each topic in two and present two tutorials on it, each taking turns to lead the presentation. We therefore ended up with 12 tutorials, each about 1 hour long. These were listed on the Course Study Planner, and website messages gave reminders a few days before the start of each tutorial. At the start of each tutorial, tutors asked for permission to record the proceedings. The recording, together with any *PowerPoint* presentations used in the tutorial were placed on the course website a few days after the presentation. All students on the course were able to download these whether or not they had attended the tutorial.

Student feedback was sought through an electronic survey sent to all SM358 students in September 2009. We wanted to get feedback while students were still studying the course so that any relevant issues would be fresh in their minds, but many students could not spare the time to reply while completing their studies and revising for the exam; in the end, 54 responses were received. We cannot expect the self-selecting group of students who replied to be representative of the whole student population. By September, some of the weaker students had withdrawn from the course – either actively or passively – and we would expect less input from them. Nevertheless, the feedback is of interest, as it indicates how we might improve the *Elluminate* tutorials in future years.

Attendance of e-tutorials

Table 1 shows a complete list of all the *Elluminate* tutorials, together with the actual student attendance. Also shown is the percentage of survey responders who attended and the percentage of survey responders who looked at a recording of the tutorial or a *PowerPoint* presentation used within it.

For comparison, the numbers of students attending the Day schools are shown in Table 2.

Table 1: *Elluminate* tutorials in the 2009 presentation of SM358. Column 3 shows the actual attendance at each tutorial, also expressed as a percentage of the whole course population. Column 4 shows the percentage of respondents to the survey who attended and column 5 shows the percentage of respondents to the survey who viewed a recording of the tutorial or download the *PowerPoint* slides used in it. The last two tutorials occurred during the period of the survey, so we have no survey results on them.

	topic	attendance (actual)	attendance (survey)	viewing recording (survey)
1a	Wave functions	63 (16.5%)	22.2 %	22.2 %
1b	Schrödinger's equation	47 (12.3%)	22.2 %	25.9 %
2a	Wave packets	47 (12.3%)	22.2 %	22.2 %
2b	Scattering	34 (8.9%)	13.0 %	22.2 %
3a	Dirac notation	32 (8.4%)	20.4 %	25.9 %
3b	Spin	30 (7.8%)	14.8 %	22.2 %
4a	Entanglement	29 (7.6%)	14.8 %	18.5 %
4b	Quantum information	25 (6.5%)	14.8 %	18.5 %
5a	The hydrogen atom	19 (5.0%)	11.1 %	24.2 %
5b	Hydrogen-like systems	22 (5.7%)	7.4 %	20.4 %
6a	Revision and exam tips	25 (6.5%)	n/a	n/a
6b	Revision and exam tips	21 (5.5%)	n/a	n/a

Table 2: Attendance at the SM358 Day schools in 2009.

Day school	Attendance
Day school 1 Bristol	16
Day school 1 Manchester	15
Day school 1 London	36
Day school 2 Bristol	18
Day school 2 Manchester	15
Day school 2 London	36

Clearly, our respondents attended more e-tutorials than average, so they are not typical of the entire student population. This might be because they are more committed, and take up more learning opportunities open to them, or because their preferred study patterns involve a greater-than-average use of a computer.

It is also noteworthy that the number of respondents who viewed a recording of the tutorial, or who downloaded related *PowerPoint* slides, generally exceeds the number attending the original tutorial, especially when that attendance is low. Students who view a recording of the tutorial will get a similar experience to those who attended passively, not asking questions. Whether this is an inferior experience or not depends on the amount of interactivity students want, and we will return to this point later.

Survey results

For students who did not attend the *Elluminate* tutorials, we asked which factors most affected this non-attendance. The results shown in Table 3 indicate that *Elluminate* tutorials, at least in the form that we presented them, are not for everyone. Study time is limited and there is much to get through in the course, so it is not surprising that optional tutorials are not the highest priority. The various responses to the question about lack of computer equipment may arise because some students have internet access only at work. It seems difficult to interpret lack of awareness of the tutorials as being a slight reason for not attending; perhaps students were aware of the majority of the tutorials, but missed one or two because they did not log into the web-site during some periods.

Table 3: Reasons for not attending *Elluminate* tutorials on SM358

	Strong reason %	Significant reason %	Slight reason %	Not a reason %
Other study methods preferred	39.0	22.0	19.5	19.5
General lack of time	27.5	22.5	35.0	15.0
Inconvenient times of tutorials	10.0	15.0	42.5	32.5
Lack of computer equipment or internet connection	12.5	2.5	25.0	60.0
I was unaware of the *Elluminate* tutorials	2.6	5.1	25.6	66.7

We asked students who attended the *Elluminate* tutorials to say whether they agreed or disagreed with various statements, and the results are shown in Table 4. In each case, the largest response was neutral but, considering the ratio of agreements to disagreements, we can say that a fair number of students think that *Elluminate* tutorials are a good way of learning, and that additional benefits include feeling part of a community of students studying quantum mechanics and having increased confidence to carry on with the course.

However, the *Elluminate* tutorials were not successful in promoting interactive discussion. Most students said that the tutorials did not provide a good forum for getting answers to their questions on course content. This is linked to the fact that students felt more inhibited at asking questions than in a face-to-face tutorial, but students did appreciate the questions put by other students. Several issues are involved here. We may have to reconsider whether the recording of tutorials is appropriate; if this inhibits student questions, it may be counterproductive. Tutors may also need to put more thought into promoting interaction in their tutorials.

Table 4: Student opinions about *Elluminate* tutorials

Elluminate tutorials in SM358 …	Agree %	Neutral %	Disagree %
… are a good way of learning	37.5	50.0	12.5
… allow me to feel part of a community of students studying QM	40.2	50.0	9.4
… increase my confidence to carry	30.0	60.0	10.0

on with the course			
… allow me to get answers to my questions on course content	12.9	61.3	28.8
… give me more inhibitions to ask questions than face-to-face tutorials	45.1	45.2	9.7
… provide benefits from other student' questions	30.7	56.7	6.7

We asked students to specify the ideal length for an *Elluminate* tutorial, and the ideal ratio *L/A*, where *L* is the time spent by the tutor presenting pre-prepared material and *A* is the time spent answering student questions. Nearly all respondents thought that one hour was the ideal length, which matched the length of the tutorials given. The results for the ratio *L/A* were converted to give an ideal length of time for questions and answers in a one hour tutorial. The average result was 25 minutes, with a standard deviation of 13 minutes. All the tutorials incorporated fewer than 25 minutes of questions and answers, so there seems to be a demand to increase this aspect. Given that other teaching media, such as screenncasts, can make polished presentations which can be reused year after year, the answering of questions preceded by presentations that stimulate debate may be a distinctive and useful way of using *Elluminate* tutorials.

Before making such a recommendation, we should check that *Elluminate* is able to support adequate two-way communication in a subject like physics. While 76 % of respondents said that *Elluminate* is easy to use for following a presentation given by the tutor, only 45 % found it easy to use for two-way communication. This appears to be associated with the equipment used by students. Only 13 % of students used a microphone for communicating during an *Elluminate* session. This can be compared with 56.5 % who used typing and 65.2 % who used emoticons. We did advise students to buy an inexpensive headset or microphone if they wanted communicate in speech during the *Elluminate* sessions, but many students chose not to do this, and struggled on using text, which is not ideal. It is reasonable to expect that students will become more adept at using *Elluminate* when they meet it in more courses.

Conclusions

The introduction of *Elluminate* tutorials into SM358 has been a qualified success, but there is more scope for two-way interaction. We think it would be appropriate to include at least 20 minutes of questions in each hour of tutorial. There may be some difficulty in eliciting enough questions, but the rest of the tutorial should be designed to prompt debate. We also need to strengthen our advice to students about using headsets.

Real-time, on-line astronomical observing

Andrew Norton, Senior Lecturer in Physics and Astronomy
Project Director, πCETL Real-time, On-line Astronomical Observing

1　　Project aim

The aim of this πCETL project is to give Open University astronomy students (in the first instance those on the Level 1 short course S194 *Introducing astronomy*) the experience of acquiring astronomical data in real-time via an on-line observatory. In particular, the intention is to enable students to appreciate the nature of astronomical images and photometric measurements before they acquire their own data (through, for example, the Level 2 residential school course, SXR208 *Observing the Universe*). The goals are to (i) increase enjoyment of, and retention on, S194; (ii) prepare students for higher-level courses and encourage more students to register for Level 2 astronomy courses

2　　Background

2.1 Courses

The Open University offers a range of astronomy and planetary science (APS) courses across its three levels. Each of these is presented exclusively as distance learning courses. Students receive materials (printed items, DVDs, web-based items, etc) and are supported by tutors or Study Advisors using face-to-face tutorials, telephone-based tuition or electronic tuition via e-mail or computer conferencing.

At Level 1 (introductory courses), there is APS content in the 60 CATS point foundation course S103 *Discovering science*, equivalent to about 4 CATS points or 40 hours of study. This course is studied by around 5000 students a year, split between two course presentations. There is also a suite of three 10 CATS point short courses comprising S194 *Introducing astronomy*, S196 *The planets: an introduction*, and S197 *How the Universe works*, each equivalent to 100 hours of study, and presented four times a year to be studied over three or six months. Between them, these short courses are studied by 4000 students each year.

At Level 2 (intermediate courses), there are two 30 CATS point courses, namely S282 *Astronomy* and S283 *Planetary science and the search for life*, each studied by around 500 students each year. Complementing these two is the 15 CATS point course SXR208 *Observing the Universe*, which includes a one week residential school based at the Observatori Astronomic de Mallorca, attended by over 200 students each year, split between six residential weeks. As part of this latter course, students carry out a set of four projects at a well-equipped observatory. They work in groups of 4 – 6 to acquire and reduce their own photometric and spectroscopic data, analyze the results, and write up one of the projects as a formal report. There is significant emphasis on developing group working skills as part of this course.

At Level 3 (advanced courses) the OU offers the two 30 CATS point courses S357 *Space, time and cosmology* and S381 *The energetic Universe* in alternate years, each studied by around 300 students. Both of these courses are mathematically challenging and cover topics in relativity / cosmology and in high energy astrophysics, respectively. The final course available in the APS area is the 30 CATS point science project course, in either its physical science or geoscience version, SXP390 *Radiation and matter* or SXG390 *Geohazards*. In the first version, topics for the largely literature review-based project can include astrophysical jets or gravitational lensing, whilst in the latter version the topic can include asteroid impacts. These APS topics are studied by around 100 students each year, as the final course of their BSc degrees.

2.2 Facilities

This piCETL project builds on experience that OU staff have gained in running projects for SXR208 at the Observatori Astronomic de Mallorca (OAM). At the OU campus in Milton Keynes we have the George Abell Observatory, which is equipped with a state-of-the-art 40 cm Meade LX200 Schmidt-Cassegrain telescope. This is similar to the 24 cm and 30 cm LX200 telescopes used at the OAM, and equipped with a similar Santa Barbara Instruments Group (SBIG) STL1001E CCD camera with integral BVRI filter wheel. The George Abell Observatory has been refurbished in recent years, thanks to awards from the OU Capital Equipment Fund and General Purposes Fund.

The observatory is now used for four distinct types of activity.

(i)   It is a research facility for members of the OU Astronomy Research Group. Recent activity has included the first study of a particular 15th magnitude magnetic cataclysmic variable (Norton & Tanner, 2006, Astronomy & Astrophysics, 447, L17), follow-up observations of transiting exoplanets discovered by the SuperWASP project, and multicolour photometry of a unique microlensing event in Cassiopeia.

(ii)   It is a training facility at which we prepare Open University staff and postgraduate students for running the SXR208 course in Mallorca.

(iii)   It is a public facility, used by amateur astronomer members of the OU Astronomy Club for a variety of imaging activities and used as a centre-piece for outreach events such as University open days, science weeks, etc.

(iv)   Finally, it is a teaching facility, primarily as part of the πCETL project described in this report.

3   Real-time, on-line observing sessions

The project is aimed initially at students on S194 who study that course over either three or six months. One night per month is scheduled as a real-time, on-line observing night, and advertised to the students as an optional extra, via the *FirstClass* computer conferencing system which they use to communicate with each other and their Study Advisors. The project began in May 2006 and ran through to April 2007 in the first instance.

A cohort of OU postgraduate students, trained in the use of the telescope system, was recruited along with two Associate Lecturers who have roles as S194 Study Advisors. Two of the postgraduates assist at each session, assuming the role of telescope operators in the

observatory, whilst the project director communicates with the students via the computer conference, and one or other of the Study Advisors also assists in answering students' questions and engaging them in discussion.

The target lists for each session are pre-planned a day or so before each observing night to take advantage of transient astronomical objects and seasonal variations in target availability. A typical session is planned to include three or four examples from the following categories:

- Imaging of *unchanging* objects, such as galaxies, planetary nebulae, planets, etc.

- Imaging of *transient* or moving objects, such as extragalactic supernovae, or comets and asteroids.

- Multicolour photometry of star clusters to produce colour-magnitude diagrams.

- Time series photometry of variable stars, asteroids, etc.

During the spring, autumn or winter months, sessions run from 8 pm until midnight, however, this is not feasible during the summer when it doesn't get dark in Milton Keynes until around 10 pm. During these months, early evening solar observing is carried out instead, using a smaller telescope equipped with a narrow-band Hα filter.

On the evening of each session, the telescope operators and project director arrive at the observatory an hour in advance of the advertised on-line start time, in order to set up the telescope and acquire calibration images (bias frames, dark frames and flat fields). During the session, two webcams feed live images from the telescope dome and the control room to a webpage (http://observatory.open.ac.uk) where they can be viewed by the on-line students. As data are acquired, they are rapidly reduced and the images or other results are posted to the *FirstClass* conference along with commentary from the project director. During the session, questions are posed to the students and they respond or engage in discussion around the results obtained. There is also the possibility of students suggesting new targets, which can be rapidly observed and the results presented back to them – all weather permitting!

4   Results so far

The sessions run so far are as follows:

- May 15   **clear**
- June 12   cloudy
- July 10   (solar observing)   cloudy
- August 7   (solar observing)   **clear**
- September 11   partly clear (CCD broke)
- October 9   cloudy
- November 13   cloudy
- December 11   **clear**
- January 15   **clear**
- February 12   **clear**
- March 12 (Mallorca)   **clear**

Some of the early sessions were plagued by cloudy conditions, but the fraction with clear skies is perhaps only as should have been expected, given the typical weather in Milton Keynes. During the September session, the SBIG STL1001E CCD developed a fault just as the session was starting, so after a rapid re-configuration, the session was run instead with an

older SBIG ST-7 CCD which has a much smaller field of view. The STL1001E CCD was repaired by the supplier and returned in time for the October session. The session in March was run from the Observatori Astronomic de Mallorca, as the project director was based there at that time running the SXR208 course.
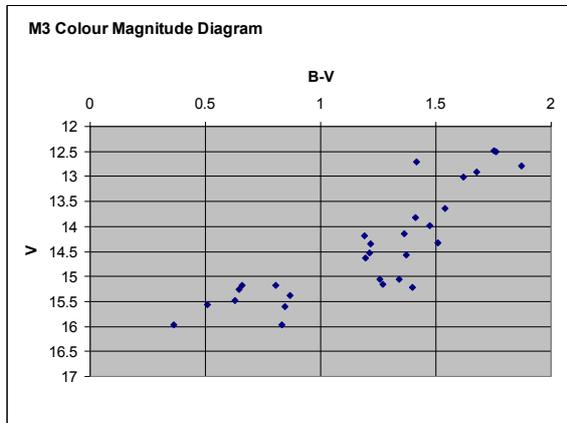
During several sessions, images of globular clusters were obtained in B and V filters. Aperture photometry of a few dozen stars around the periphery of the cluster was carried out, resulting in colour-magnitude diagrams such as that shown opposite. The red giant branch is clearly seen (brighter stars are redder) showing that this cluster is old. The results each time led into wide-ranging discussions with students on stellar evolution and star clusters in general.

Similarly, colour-magnitude diagrams (CMDs) were obtained of open clusters, where the main sequence is clearly visible and this offers further opportunity for quantitative measurement. The CMD opposite is a typical example obtained. The main sequence is clearly visible showing that the brighter stars in this case are bluer, and indicating that the open cluster in question is quite young.
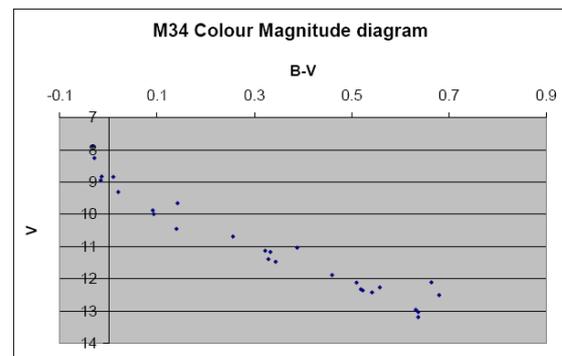
Another popular target was the planetary nebula M27 in Lyra, shown opposite. The image here was obtained as a three colour composite from separate images in B, V and R filters. This led to a discussion on star-death, and the origin of different coloured light from different atomic species in the nebula.
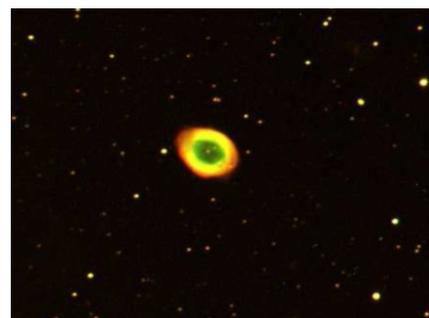
Other nebulae observed as targets include the Crab Nebula – a prominent supernova remnant – and the Orion Nebula – a star formation region. Both are shown below as obtained during observing sessions as three-colour composite BVR images. In each case much discussion was triggered over the origin and appearance of these objects.

Asteroids are another particularly nice target for these sessions, offering the possibility of good student interaction. By showing the students images of an asteroid field spaced half-an-hour or so apart, students have been invited to 'spot the moving object' prior to construction of short movies to illustrate the motion of the object with respect to the background stars. Suitable asteroid targets have been selected from the JPL Solar System Dynamics web site (http://ssd.jpl.nasa.gov/ sbwobs.cgi) and ephemerides for the chosen target downloaded from the same source (http://ssd.jpl.nasa.gov/horizons.cgi).

Although not yet acquired in the sessions to date, short period variable stars, such as contact binaries, offer the possibility of following a significant fraction of cyclical variability during the course of a single 4-hour session. The lightcurve of the contact binary V523 Cas shown below was compiled from three separate nights' observations at the OAM. This binary system has a 5.5 hour period, and watching the lightcurve being built up in real-time is an instructive activity for the students, allowing quantitative astrophysical measurements to be
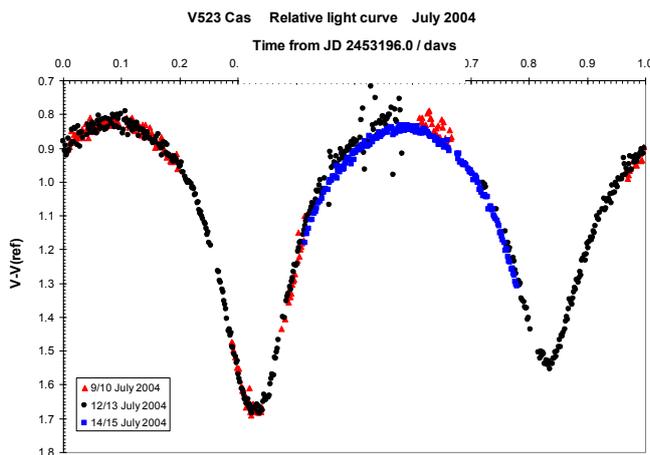
made. Indeed, it has become apparent that, although many of the students are relatively experienced amateur astronomers, often with long experience of obtaining high quality astronomical images, very few of them have ever thought of making any quantitative measurements from their data. The fact that such things can be done relatively easily is a revelation to many students.

Finally, the impressive nature of colour-composite images of spatially extended objects like spiral galaxies should not be under-estimated. These objects appear not to vary with time (barring the occasional supernova!) and so the 'real-time' aspect is not essential. However, students still enjoy the fact that the images are obtained as they watch, from that night's sky.

The examples below show BVR composites of the spiral galaxies M74 and M51, this time obtained in Mallorca.

In the case of cloudy or otherwise unsuitable weather conditions, the real-time, on-line sessions have generally not been run. There is the possibility of sharing archived data, and indeed during the October session, whilst waiting for a forecast break in the clouds, recent data acquired at the observatory showing an exoplanetary transit were shown to the students and discussed. In general however, this has not been the pattern followed in other months, as it is felt not to embody the 'real-time' aspect of this project which is one of its defining features.

5   Evaluation

During a live real-time, on-line session, i.e. one which is not adversely affected by weather, in excess of 50 students are involved in the *FirstClass* computer conference. Some of these are merely 'lurking' and just reading the various exchanges, but many interact enthusiastically.

A survey has begun to assess the impact of this project, and this is being carried out by Dr. Hara Papathanassiou. The survey will compare the numbers of S194 students who went on to do Level 2 astronomy courses *before* this initiative and *after* this initiative. The survey will also assess whether participation in these sessions improves retention and performance on the S194 course. Also, interviews with students could be used to assess ways of improving the experience.

6   Resources

Prior to the instigation of this πCETL project, the George Abell Observatory was already equipped with the 40 cm Meade LX200 telescope and its appropriate mounting and housing.

The other essential component used for the project is a good quality CCD camera. We have used an SBIG STL1001E CCD with BVRI filter wheel. This gives a 24 arcminute field of view on the LX200 telescope, with a high quality 1024×1024 pixel image.

In terms of software, we use MaximDL both to control the CCD camera and acquire the images, as well as for all aspects of data reduction and analysis. Starry Night Pro Plus is used to control the pointing of the telescope via its graphical night-sky interface, although this can simply be done via the Meade handset.

Relatively inexpensive Phillips webcams are used to pipe images from the observatory to a custom web-page, and provide a useful real-time component for the project.

Initially we used a small Coronado Personal Solar Telescope, backed by a Phillips TouCam, for the solar observing aspect of this project. However, this has a relatively small aperture and was unable to resolve granulation structure on the solar disc. We have now ordered a top-of-the-range Coronado SolarMax 90 Hα telescope (90 mm objective aperture, 0.7 Å narrow band filter) which will be piggy-back mounted on the LX200, using a custom-built mounting kit and counterweight system. This can be backed either by a CCD camera, a webcam, or a digital SLR camera body (see below).

A Tablet PC (an IBM/Lenovo Thinkpad X41) was used to rapidly annotate images before uploading to the *FirstClass* conference. The key software is PDF Annotator, which enables annotations to be written directly onto PDF files using the Tablet PC's pen. Images from MaximDL are saved as PDF files, and are then annotated in order to identify objects or features of interest before uploading the images to the *FirstClass* conference. The Tablet PC has proved to be a very versatile tool for all aspects of the project.

For the next stage of the project, it has been decided to purchase a few further items of hardware. In addition to the solar telescope mentioned above, we intend to make use of a digital SLR camera body to acquire real-time colour images of astronomical objects through one or other of the telescopes, and a Canon EOS 30 modified for astronomical use has now been obtained for this purpose. This offers enhanced red response and versatile operating modes suitable for long exposures and automatic dark-field subtraction. Although this will not give photometric data, it will complement the CCD camera by allowing true colour images to be acquired in single exposures.

A computerised weather station has now been obtained and installed. This will add to the real-time aspect of the project by feeding local data (from sensors both internal and external to the dome) to the observatory web page, enabling remote students to further experience the local conditions.

Acknowledgements

Production and use of screencasts for a Level 3 physics course

Gillian Stansfield[2] and Stuart Freake[3]

Abstract

Video screencasts have been produced to provide optional additional support for students studying an Open University course in electromagnetism. The three main uses for the screencasts were for developing students' problem solving skills, for enhancing asynchronous e-tutorials and for helping students to prepare for the end-of-course examination. Screencast solutions were produced for all of the assignment questions for the course, for half of the questions from a previous year's exam paper and for some of the exercises set during e-tutorials. In addition, screencasts of PowerPoint presentations were made for use in e-tutorials and to provide advice for students about the course examination. In total, 84 screencasts were produced with a combined running time of 560 minutes.

Data about use of the screencasts was extracted from the logs of the course's Moodle website and a sample of students completed an online survey about the screencasts. Students expressed very positive views about the screencast solutions to assignment questions and exam questions, and indicated very strong support for continued provision of these screencasts in future presentations of the course and also for provision of similar screencasts for other physics and astronomy courses. The screencasts produced for e-tutorials were appreciated by the relatively small number of students who participated. The asynchronous e-tutorials are likely to be replaced by synchronous e-tutorials in future presentations, and there could be a role for use of screencast presentations in the synchronous tutorials.

1   Introduction

1.1 What are screencasts?

A screencast is a digital video recording of what happens on the presenter's computer screen and an accompanying audio narration. This is also known as *video screen capture*. Screencasts have been technically possible for some years, but have recently become far more popular since the advent of versatile screen recording software, such as *Camtasia Studio 5*[1]. They are widely used by software companies such as Microsoft for demonstrating and teaching software features, in Word 2007 for example. They can be paused, rewound, restarted and indeed watched on fast forward as often as required.

Screencasts have great potential in a variety of fields and their use for educational purposes is growing rapidly. We first became aware of them from seeing the use that Matthew Juniper of Cambridge University made of them in a fluid mechanics course[2]. Screencasts can be used to deliver a lecture or presentation, where the student hears the lecture while watching visual materials being presented on the screen. They are also useful for watching and listening to the solution to a problem.

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1.2 Why screencasts were developed for an Open University physics course

This report is concerned with screencasts developed for the third level Open University course, SMT359 *Electromagnetism*. Our main motivation for producing them was to enhance support for our distance-learning students, to improve their learning experience and hopefully to improve their retention and progress.

The *Electromagnetism* course is presented over a nine-month period, and the main learning materials are three 250-page books, together with computer simulations and conventional video programmes on DVDs. There is also a course website that provides additional learning materials, including several hundred exercises with solutions. Students are required to submit four assignments during the course and these are marked by associate lecturers (ALs, also known as tutors), who annotate the scripts with teaching comments and often attach specimen answers generated by the course team when returning the marked assignment. There is a three-hour exam at the end of the course. Associate lecturers provide face-to-face tutorials, day schools and e-tutorials during the course. The latter are asynchronous web-based forums delivered on *FirstClass*. These proved not to be popular in the previous presentation of the course, partly because they were text-based and thus not very engaging, but also because they were not a good environment for anything other than problem solving. These e-tutorials did not incorporate many of the positive qualities of a live tutorial.

We envisaged that screencasts could be used to support students in a number of different ways.

Problem solving A major learning outcome for the course is that students should be able to solve a wide variety of electromagnetism problems. The course books include numerous worked examples and exercises and there are additional exercises on the website, all of which should help develop students' problem solving skills, and the assignments and exam test the achievement of these skills. However, the solutions to the exercises and the specimen answers to the assignments are generally fairly concise, and might be too concise for some students. One of the things that students really value about face-to-face tutorials and day schools is the tutor guiding them through the solution to a problem, so that they can see and hear the tutor's thought processes as they tackle the problem. The course materials include two conventional video recording of a tutor working through assignment questions with a student; these were produced to support students as they tackle the first assignment and were very popular with students. It was not feasible on cost grounds to produce more videos like these, but we envisaged that screencasts of a tutor solving problems would provide a very useful low-cost alternative. They would be far more engaging than just reading printed solutions because they introduce the extra dimensions of animation and speech and provide a reassuring personal touch, and we thought they should be particularly helpful for students who were struggling with the course.

Enhancing the asynchronous e-tutorials The asynchronous e-tutorials provided via *FirstClass* forums during the first presentation of the course were not well attended, and we thought that by incorporating some screencasts we might be able to overcome some of the shortcomings of this type of tutorial support. It should be possible to include a mini lecture in the form of a narrated *PowerPoint* presentation, complete with animations and with the ability to annotate slides by writing on a tablet pc during the presentation. The tutor's voice should again add a welcome reassuring personal touch that is missing from a text-based e-tutorial. Screencasts of solutions to exercises set for students during the tutorial should also provide for a greater sense of presence than printed solutions.

Advice and support for the examination   The course materials include a specimen exam paper with printed solutions, and students have access to copies of previous exam papers but without the solutions. In addition, many tutors provide tutorials near the end of the course to help with revision and preparation for the exam, and they work through some typical exam questions. However, significant numbers of students are unable to attend these sessions, and we thought that screencasts could be used to help these students prepare for the exam. This support could be in the form of screencasts of a tutor working through questions from a previous exam paper, together with a narrated *PowerPoint* presentation that gave the sort of advice that a tutor would normally incorporate into a revision tutorial.

1.3   Production of screencasts

A major advantage of screencasts as opposed to conventionally recorded videos is that a screencast can be made by just one person in their office or home. The ease of screencast creation and publishing is directly attributable to the availability of applications like *Camtasia Studio*, which is an 'all-in-one' screencast creation, editing, and publishing tool. It captures what is displayed in a selected area of a computer screen along with voice narration. The video and audio can then be edited, and graphics, titles and overlays can be added. The completed video can be published in a variety of formats, such as *Flash* videos for streaming over the web.

A tablet pc is needed to produce screencasts showing handwritten solutions to problems, and an external microphone is required to record the narration. *Windows Journal* is one suitable application to use for handwritten solutions, though *PDF Annotator* or *Word 2007* can also be used. *PowerPoint* is also excellent for screencasts of lectures or presentations as it is designed for a presentation format. In addition, when using a tablet pc, *PowerPoint* slides can be annotated with handwriting. It is also possible to include a webcam image of the presenter in a screencast.

2   The πCETL project

In March 2008 the Physics Innovations Centre for Excellence in Teaching and Learning (πCETL) at the Open University approved a project proposal for production of screencasts to support students studying SMT359 *Electromagnetism*. The project provided funding for consultancy contracts for three SMT359 ALs to produce screencasts for use in e-tutorials and screencasts of solutions to assignment questions, and also funded licences for the *Camtasia Studio 5* software and headsets for these ALs. The ALs had already been provided with tablet pcs as part of another πCETL project to enable them to mark electronically submitted assignments. A member of the course team used part of his πCETL time allocation to produce screencasts of solutions to some assignment questions, screencasts of solutions to questions from a previous exam paper and a screencast presentation that provided advice about the course examination. A total of 84 screencasts were made available to SMT359 students, with a total running time 560 minutes.

2.1   Production of the screencasts

There are two issues to be addressed when creating a screencast. The first is the pedagogy and the second is familiarisation with the software, *Camtasia Studio 5*, and its capabilities.

The success of a screencast depends crucially on how well the teaching material is prepared. However experienced one is at live teaching, it is advisable to script, or at the very least to semi script everything that the screencast should contain, and the solutions to all problems

should be worked out in advance. The more thorough the preparation, the more professional the final screencast is likely to be.

Familiarisation with the software involves negotiating a steep learning curve. The *Camtasia Studio* website provides a wide range of training materials and documentation in their online Learning Center[3], and a book by Daniel Park, *Camtasia Studio 5: The Definitive Guide*[4,] is very useful for reference. We produced a 'quick start guide' to creating a screencast for ALs to use at the start of the project, and a revised version of this is attached as Appendix 1.

Each screencast was recorded, edited and produced in the appropriate video format by one person, either an AL working at home or a course team member working in their office at the Open University. The video files were then installed on the course website for access by students. Most of the screencasts were produced as *Flash* videos, which can be played with the free *Adobe Flash Player*. Most students have this application installed on their computer as this is the format used by *YouTube* and other video-sharing websites, but a link was provided to a website from which the *Flash* player can be downloaded in case. Some of the screencasts used in e-tutorials were produced in .avi or .wmv format, since these were more straightforward to install in *FirstClass*.

Creating a screencast can take up to eight times as long as the playing time, even when the presenter is already familiar with the academic material and the software. The time required depends on the quality demanded of the final product. The screencasts that we produced were regarded as tutorial materials, rather than OU course materials, and we accepted that inevitably they would contain minor errors and verbal infelicities, just as there would be in a face to face tutorial.

The screencast project got underway after the course had started. This was a disadvantage as students did not get information about the screencasts in the printed *Introduction and Guide* they received at the start of the course. The screencasts were advertised frequently in news messages on the course website, but some students do not make much use of the website, and so they never knew about the screencasts' existence. This should not be a problem in future presentations as students can be informed about the screencasts at the start of the course and can be given advice about how to use them in the *Course Guide*.

2.2 Screencast solutions to TMA questions

We considered a number of options for providing screencasts to develop students' problem solving skills. These included use of screencasts in e-tutorials to demonstrate problem solving, which is discussed in Section 2.2, and also producing:

- screencasts of solutions to the additional exercises on the course website;

- screencasts of solutions to problems that were matched to questions set in assignments; students could use these problems and view the screencasts in preparation for tackling the relevant assignment questions;

- screencasts of solutions to assignment questions that the students had already tackled.

We adopted the third of these options, with the particular aim of trying to support students who were struggling with the course. Tutors generally provide a large number of comments and detailed feedback on students' assignments and often include specimen solutions produced by the course team when they return marked assignments. However, the specimen solutions may be too concise for some students; what they would find helpful is to see a tutor working through the solution, providing useful tips as they go, and this is what a screencast can provide.

Screencast solutions were produced to all the questions for all four tutor marked assignments (TMAs) for the *Electromagnetism* course. The screencasts were from 2 to 20 minutes long, and in most cases separate screencasts were produced for each subsection of a question. In total there were 50 of these screencasts, with a combined running time of 305 minutes. All of these screencasts were produced in *Flash* format. The first four columns of Table 2 give further details of these screencasts.

For the first two assignments the screencast solutions were very detailed, in order to help students who were having difficulties and hopefully give them confidence to continue to study the course. Screencast solutions for the third and fourth assignments were not quite so detailed.

The screencast solutions were made available to students on the course website three weeks after the cut-off dates for each assignment. A news message was posted on the website to notify students that the screencasts were available, and this message indicated that the screencasts were intended particularly for students who had difficulties with the assignment. We suggested that students should focus on the questions that they had problems with and that they should not need to watch all of them. We also pointed out that the handwritten answers did not have the polished look of the printed course materials, and that they contained some minor imperfections. We pointed out that the screencasts would also be useful for revision.

It would have been beneficial to students if the screencasts had been accessible at the time that they received their marked assignments from their tutors, which could have been as early as the day after the cut-off date. However, a significant minority of students are granted extensions to the cut-off date, so open access to the solutions was delayed for three weeks.

2.3 Screencasts for e-tutorials

Screencasts were used in three of the five e-tutorials offered to SMT359 students. The three tutors who were to present these e-tutorials were each asked to produce about 10 minutes of screencast material, but in fact they produced a total of 14 screencasts, with a combined running time of 100 minutes. These screencasts were mostly narrated *PowerPoint* presentations, summarising and reviewing the course material, but five of the screencasts were solutions to problems that had been set in the e-tutorials.

The e-tutorials opened on a Friday, and typically closed the following Tuesday. During this time, all students could access all of the material posted by the tutor and could post messages and answer questions. However, even after the e-tutorial was closed for new messages, it was still open in read-only mode until the end of the course, so students could download the material the tutor had posted in the forum, including the screencasts, and could read all of the messages posted by the tutor and the students.

e-tutorial 2: Electric and magnetic fields in matter (16-20 May 2008) This was the first e-tutorial to use screencasts and was presented by Stan Zochowski, the SMT359 tutor in the London region. As well as posting questions and summaries, Stan created five screencasts, which were beautifully prepared *PowerPoint* presentations summarising aspects of his topic. These set a very high standard for other tutors to follow. Each screencast was made available in three different formats, .avi, .wmv and *Flash*, so students could choose which to use, depending on what software they had. The screencast files were uploaded to the *FirstClass* forum used for the e-tutorial. The files were quite big, typically 5-10 MB and ran for about 10 minutes, and they took a few minutes to download with a broadband connection.

e-tutorial 3: Electromagnetic induction (20-24 June 2008) This e-tutorial was presented by Craig McFarlane, the SMT359 tutor in the South region. Craig produced six screencasts in addition to questions and summaries written in pdf files. Three of Craig's screencasts were narrated *PowerPoint* presentations summarising difficult concepts in the course, and three were produced by writing directly on the screen of a tablet pc while recording an audio commentary. Again, the standard of screencast produced was very high. As with e-tutorial 2, the screencasts for this e-tutorial were uploaded to *FirstClass*, and were large files which the students could download. Both .avi and .wmv files were produced, each running for about 5 minutes.

e-tutorial 4: Electromagnetic waves (22-26 August 2008) This e-tutorial was presented by Gillian Stansfield, who prepared five screencasts. Two of them were narrated *PowerPoint* presentations, each lasting about 15 minutes. The other three were solutions to relevant past exam questions, and these were animated handwritten solutions with audio commentary. Screencast solutions to two further relevant exam questions were made available. Unlike the screencasts for the previous two e-tutorials, these screencasts were produced as *Flash* videos only. There were several reasons for this. *Flash* videos can be streamed from the web – the student doesn't have to wait to download a large file. It isn't possible to stream videos from *FirstClass*, so the files were streamed from the course website, and a link to them was provided in the *FirstClass* conference. Use of *Flash* videos should also avoid the difficulties experienced by a few students in the previous e-tutorials with downloading and/or viewing videos in other formats. *Flash* files are also smaller than the corresponding .avi or .wmv files, and they can easily be displayed in full screen mode.

2.4 Screencasts for exam advice and revision

A 20-minute narrated *PowerPoint* screencast giving advice about the exam was produced by Stuart Freake. The aim was to provide the sort of tips that a tutor would give students in a revision and exam preparation tutorial, since a significant proportion of students do not attend these face to face tutorials.

Screencast solutions to half of the questions from the 2006 examination for the course were also produced, using a style very similar to that used for the solutions to assignment questions. These amounted to 19 screencasts running for a total of 132 minutes. A variety of generic points about answering exam questions were included in these screencasts. Our hope was that both types of exam-focussed screencast would help prepare students for the exam, build their confidence and motivate them to attend on the day.

3 Evaluation

During the presentation of the course, the course team received a small amount of feedback about the screencasts in email messages from students and in postings on the course forum. This was all very positive, and a few excerpts are quoted below:

"… a huge thank you… for producing some really useful feedback videos on TMA01. I hope we see more of these videos for future TMAs. It is really helpful being shown the correct methodology for solving problems that I have struggled with."

 "Very many thanks for all the work you must have put in to making these presentations [for the e-tutorial]. *I personally found them hugely helpful, because I find it much faster to pick up a topic if the visuals have an accompanying audio presentation. I know there has not been much interaction with students over the past few days, but I expect that is because we were*

all working our way through your many examples. Anyhow, once again, many thanks for a weekend that has got me up to speed again."

"Just thought I'd point out that the worked answers for 2006 [exam] *are well worth watching even if you managed the questions OK - there are some top tips in there! Thanks for all this…"*

A more systematic evaluation of the use and effectiveness of the screencasts was carried out by in two ways: information about the number of students accessing the screencasts and when they did so was obtained from the logs of the course Moodle website, and students were asked to complete an online survey after the course had finished to elicit their views about the screencasts.

3.1 Moodle website data

The Moodle VLE provides some limited statistics about numbers of students visiting each resource page, the total number of visits to each resource page and the number of downloads of each file. The resource-page-visits data is automatically stored for each month, and Table 1 compares numbers of students and numbers of visits month by month throughout the course for the resource pages containing screencasts. Several points should be noted.

- It is not possible to deduce how many students visited a particular page during the course presentation. For example, 113 different students visited the TMA Feedback page in April, and it is possible (though highly unlikely) that all of the students who visited this page in subsequent months were subsets of these 113 students; at the other extreme it is possible (though highly unlikely again) that all of the 316 registered students visited this page at least once, since the monthly student numbers total 529.

- It is clear that students did not look at screencasts of the TMA solutions only in the month after they were posted on the website; students continued to visit the pages in subsequent months, and there was significant use in October during the revision period.

- It is not possible to tell how many screencasts were viewed during a visit to a resource page.

- Visits to these pages must include an unknown number of visits by tutors, course team members and other OU staff.

Table 1 Monthly data for numbers of individual students accessing resource pages that contain screencast links and for numbers of student-visits to these pages.

Web page	April		May		June		July		August		September		October		Total visits
	Students	Visits	Students	Visits	Students	Visits	Students	Visits	Students	Visits	Students	Visits	Students	Visits	
TMA Feedback* (from 11 Apr)	113	183	105	195	71	134	56	73	53	136	62	117	69	116	954
TMA 01* (from 22 Apr)									12	15	22	40	32	58	113
TMA 02 (from 27 Jun)					18	27	31	38	19	30	11	18	22	38	151
TMA 03 (from 22 Aug)									30	75	23	35	23	32	142
TMA 04 (from 29 Sep)											12	12	41	48	60
Screencasts for e-tutorial 4 ** (from 22 Aug)									22	35	21	40	15	23	98
Exam advice and solutions (from 18 Sep)											82	165	136	408	573

*Between April and August 27 the TMA 01 solutions were accessed directly from the TMA Feedback page. After this, a TMA 01 subpage was created in the TMA Feedback page. Solutions for TMAs 02 - 04 were always accessed from subpages in the TMA Feedback page. All of the visits to the TMA Feedback page in April and May were related to TMA 01 solutions, visits to this page in June and July would have been related to TMA 01 or TMA 02 solutions, in August to TMAs 01-03 and in September to TMAs 01-04.

** The only e-tutorial for which data is available is e-tutorial 4. Screencasts for e-tutorials 2 and 3 were posted in the *FirstClass* forum rather than on the course website, and *FirstClass* does not store data about the number of students accessing these files.

The VLE statistics also listed the cumulative number of downloads of each screencast file. These numbers were updated at the end of each month, and the cumulative data for the end of the previous month were automatically deleted. Thus in order to keep track of the monthly downloads for each screencast it would have been necessary to print out or store the cumulative figures at the end of each month. Unfortunately this was not realised until late in the course, so we only recorded the cumulative downloads at the end of August, September and October, and data derived from this information is shown in Tables 2-4.

Table 2 shows the numbers of downloads of each of the screencast solutions to TMA questions, and the following points are worth noting.

- There were 116 downloads for the first of these screencast, over twice the number for any of the other TMA solution screencasts. Many students would have looked at the first screencast to see what it was all about. They may have then decided that they did not need to make use of other TMA screencasts, or may have been very selective about which screencasts they subsequently viewed. Also, the decrease in the number of active students as the course progresses will also contribute to a decrease in screencast use.

Table 2 Download data for screencasts of TMA solutions.

	screencast solution	duration / min	filesize / MB	numbers of downloads			
				up to end August	during September	during October	up to end October
TMA 01 Part 1	**1a**	20	7	75	15	26	**116**
Cut-off 14 Mar	**1b**	4	2	24	7	16	**47**
Solutions posted 11 Apr	**1c**	3	2	27	6	14	**47**
Produced by	**1d**	8	3	23	8	11	**42**
Gillian Stansfield	**2a,b**	10	5	20	9	17	**46**
(AL in East region)	**2c,d**	9	4	19	4	15	**38**
	2e	3	1	21	4	12	**37**
TMA 01 Part 2	**3**	9	3	37	7	13	**57**
Cut-off 25 Apr	**4pt1**	15	7	28	7	12	**47**
Solutions posted 16 May	**4pt2**	11	4	20	5	12	**37**
Produced by	**5a,b**	14	6	22	8	15	**45**
Gillian Stansfield	**5c**	11	5	19	6	14	**39**
	6a	9	5	30	5	13	**48**
	6b	8	5	30	4	11	**45**
	Totals	**134**	**59**	**395**	**95**	**201**	**691**
TMA 02	**1a**	6	2	26	4	17	**47**
Cut-off 6 June	**1b**	8	3	13	4	15	**32**
Solutions posted 27 June	**1c**	10	4	14	4	14	**32**
Produced by	**2(essay)**	21	18	12	4	10	**26**
Gillian Stansfield	**3a**	7	4	18	5	16	**39**
& Stuart Freake	**3b**	10	5	13	5	14	**32**
	4a	15	7	17	6	20	**43**
	4b	2	1	14	7	12	**33**
	4c	5	2	9	6	13	**28**
	4d	5	2	12	5	10	**27**
	4e	5	3	14	7	10	**31**
	5	10	5	17	3	13	**33**
	essay advice	5	2	12	2	2	**16**
	Totals	**109**	**58**	**191**	**62**	**166**	**419**
TMA 03	**1ai**	3	4	17	11	18	**46**
Cut-off 25 July	**1aii**	3	4	7	6	13	**26**
Solutions posted 22 Aug	**1aiii**	3	4	6	6	13	**25**
Produced by	**1b**	3	7	6	6	11	**23**
Stan Zochowski	**2a**	4	3	8	7	11	**26**
(AL in London region)	**2b**	4	3	4	4	10	**18**
	2c	2	2	2	4	9	**15**
	2d	3	3	2	4	9	**15**
	3a	6	5	3	6	12	**21**
	3b	2	2	2	3	9	**14**
	4	8	11	7	6	8	**21**
	5a	2	2	6	4	12	**22**
	5b	3	2	6	2	10	**18**
	5c	5	4	5	2	9	**16**
	5d	5	4	7	3	6	**16**
	Totals	**56**	**60**	**88**	**74**	**160**	**322**
TMA 04	**1a,bi**	4	2		9	32	**41**
Cut-off 12 Sept	**1bii**	4	2		8	22	**30**
Solutions posted 29 Sept	**2**	4	2		8	23	**31**
Produced by	**3**	3	2		7	23	**30**
Craig McFarlane	**5a,b**	2	1		7	26	**33**
(AL in South region)	**5c,d**	3	1		6	22	**28**
	5e	2	1		6	23	**29**
	6	4	1		6	26	**32**
	Totals	**26**	**12**		**57**	**197**	**254**
	Overall totals	**325**	**189**	**674**	**288**	**724**	**1686**

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- It is not possible to distinguish between a download when a student viewed the complete screencast and perhaps even replayed parts of it and a download when a student started the screencast and immediately closed it down. Also, it is not possible to tell how many of the downloads were attributable to students downloading a screencast for a second or third time in a particular month or in subsequent months.

- The screencasts were aimed at students who were struggling with TMA questions and who needed more help than provided by their tutors' comments and specimen answers. Thus we expected that most students would not need to view most of the screencasts. However, these statistics do not tell us whether it was the students who had difficulty with particular TMA questions who viewed the associated screencasts.

- Some students made use of the screencast solutions for revision immediately prior to the mid-October exam

Data for screencast downloads for e-tutorials 2 and 3 are not available; these files were available for download directly from the *FirstClass* forum (rather than from the course website), and *FirstClass* does not provide data about numbers of downloads. However, Table 3 shows download data for the screencasts that were linked to e-tutorial 4. As with the other e-tutorials, student participation was disappointing: only five students posted messages and the largest number of students reading a message posted in the forum was 36. Just over half of the downloads of the *PowerPoint* presentations took place during the e-tutorial or immediately after it closed, but significant numbers of students downloaded these presentations during September and October, presumably for revision. The numbers of students viewing the screencasts of solutions to exam questions during the e-tutorial was much lower, indicating that few of the students tackled the exam questions during the e-tutorial.

Table 4 shows download data for the screencasts associated with the course exam. Downloads of the exam advice presentation totalled just over half of the 197 students who sat the exam, and downloads of screencast solutions to exam questions were at the same level or even higher.

Table 3 Download data for screencasts associated with e-tutorial 4. These screencasts were placed on the website on 22 August.

	question number	duration / min	filesize / MB	numbers of downloads			
				up to end August	during September	during October	up to end October
PowerPoint presentations	Pres 1	13	12	31	14	9	**54**
	Pres 2	19	9	16	9	5	**30**
Exam solutions accessed via e-tutorial linK	9	7	2	10	11	8	**29**
	11	11	6	8	10	2	**20**
	17a	6	2	6	7	4	**17**
	17b	3	1	6	5	4	**15**
	17c	10	4	6	4	2	**12**
	17d,e	5	2	5	4	2	**11**
	18a,bi	13	7	8			**?**
	18bii,iii	12	7	9			**?**
	Totals	67	31	58	41	22	**104**

Table 4   Download data for the screencasts related to the exam. These screencasts were placed on the website on 18 September. The numbers of downloads of exam solutions include the data from Table 4.

	question number	duration / min	filesize / MB	numbers of downloads			
				up to end August	during September	during October	up to end October
Powerpoint presentation giving advice about exam	n/a	21	5		45	63	**108**
Solutions to questions from 2006 exam	1	6	3		52	153	**205**
	3	7	3		38	124	**162**
	5	7	3		36	124	**160**
	7	4	2		24	122	**146**
	9	7	2	10	34	99	**143**
	11	7	3	8	32	116	**156**
	13a	5	2		28	115	**143**
	13b	9	4		23	103	**126**
	13c	6	3		19	85	**104**
	13d	5	2		22	88	**110**
	16a	4	1		22	100	**122**
	16bi	8	3		19	90	**109**
	16bii,iii	8	3		18	83	**101**
	17a	6	2	6	23	98	**127**
	17b	3	1	6	21	90	**117**
	17c	10	4	6	18	84	**108**
	17d,e	5	2	5	18	81	**104**
	18a,bi	13	7	8	25	98	**131**
	18bii,iii	12	7	9	21	79	**109**
	Totals	**132**	**57**	**58**	**493**	**1932**	**2483**

3.2 Online survey

An online survey was developed to collect information directly from students about the extent to which they viewed the different types of screencasts and their views about these screencasts. A copy of this survey is attached as Appendix 2. All students who were still registered for the course at the time of the exam and who had not already been asked to complete two other OU surveys during the year received an email message in the week after the exam asking them to complete this survey, and 53 of these 155 students did so, a response rate of 34%.

Awareness and use of screencasts   75% of those responding to the survey had watched some of the screencasts, and that included 43% who had watched solutions to TMA questions, 68% who had watched solutions to exam questions and 28% who had watched screencasts provided in e-tutorials. Significant numbers of students said they were unaware of the existence of the screencasts: 25% were unaware of the TMA solution screencasts, 15% unaware of the exam solution screencasts and 51% unaware of the e-tutorial screencasts. The 13 students who did not watch any screencasts included five who were unaware of the existence of the screencasts, and who probably make minimal use of a computer for studying. Other reasons for not viewing the screencasts were that students didn't want to spend more time using a computer or didn't like using a computer for studying; they could not spare the time or felt it was more important to spend time studying the course materials; and they didn't feel they needed help with TMA or exam questions. Non-participation in e-tutorials was also a reason that students had not viewed screencasts. Only one student mentioned problems accessing the screencasts; he/she did not have internet access at home and was not able to download screencasts to a memory stick from a computer in a library.

Difficulties viewing screencasts About 90% of the 40 students who had viewed the TMA or exam solutions via the course website said that they had no problems with doing this. One student could not view the screencasts with an old home computer so had to use a work computer, two had to install Flash plug-ins and two had to ask for help from somebody else. Three students (including one in Afghanistan) said they would prefer it if the screencasts could be downloaded for use offline. Students were also asked if they had any difficulties viewing e-tutorial screencasts from the *FirstClass* forums, and about 70% of the 21 students who responded had no difficulties. Three students had to install a video codec to run the screencasts (which were in either .avi or .wmv formats for e-tutorials 2 and 3) and a couple indicated that not all of the screencasts would run on their computer for unidentified reasons.

Screencasts of solutions to TMA questions

Pattern of use of TMA screencasts 23 students indicated that they had watched some of these screencasts, and one third of them had watched all of the screencasts for all TMAs. At the other extreme were four students who watched 'a few' screencasts for between one and four of the assignments but watched none for the other assignments. Between these extremes were students who initially watched all, most or about half of the screencasts but became more selective for later assignments, dropping down to a few or none. There are some indications that students who performed less well on the course made more use of the screencasts of TMA solutions than did the students who performed better. The eight students who viewed all of the TMA screencasts had average marks for continuous assessment and exam of 71% and 41%, whereas the average marks for the 24 students who were aware of the TMA screencasts but watched few or none of them were 82% and 61%.

Students were asked when they had watched screencasts associated with each of the TMAs, and they were given four options for their responses: Within 2 weeks of posting on website, More than 2 weeks but before next TMA cut-off, Later in course but before revision, and As part of revision for exam. The first and fourth options were selected most frequently. In particular, about 90% of the students who had watched TMA screencasts had looked at some of the TMA 01 screencasts before the second TMA was due. Significant numbers of students had watched screencasts in two or more of these periods.   About half of them watched solutions from each TMA in the revision period before the exam. About half of the students said that their 'strategy' was to watch all of the screencasts, and about half said they focussed on solutions to questions they had difficulty with (including a few in the first group). Other 'strategies' adopted by a few students were to pick a few solutions at random or to start with the first screencast for a TMA and continue until they ran out of time.

Students' views about the screencast solutions to TMA questions Five questions in the survey asked about possible benefits of these screencasts, about the time spent viewing them and about their future availability, and the results are shown in Figure 1. Students thought that the screencasts were very helpful and that they probably increased their confidence in tackling subsequent TMAs. They were divided over whether watching the screencasts resulted in better marks in subsequent TMAs, but most of them thought that their time watching the screencasts was definitely well spent, and they were almost unanimous that screencast solutions should be produced for future presentations of SMT359.

Aspects of TMA screencasts that students found most helpful The most frequent comments made by students when asked what they found most helpful were related to being able to see the approach taken by a tutor to a solution, together with the tutor's verbal explanations of the logic behind their approach and tips for students about answering questions. They also appreciated seeing the level of detail that was appropriate in TMA

solutions: "*Seeing and hearing how the tutor tackled the question, and the level of explanation we are required to write in the TMAs.*" A couple of students commented that they found the screencasts useful even though they had got good marks: "*Despite the fact that I generally got good marks in my TMAs, I still found the screencasts very useful.*"; and a couple of others said that these screencasts were a good substitute for seeing a tutor tackle problems in a tutorial: "*Tutorials were 65 miles so didn't manage to go. Screencasts were a good substitute.*" The amount of detail in the solutions for the last two TMAs was substantially less that for the first two, and a couple of students said they would have preferred the more detailed solutions to be provided for all of the TMAs.

Overall, how helpful did you find the screencast TMA solutions that you watched?	Bar chart with categories (very helpful, fairly helpful, not very helpful, not at all helpful) on the vertical axis and a scale from 0 to 100. very helpful ≈ 61, fairly helpful ≈ 39, not very helpful ≈ 0, not at all helpful ≈ 0.
Did watching screencasts increase your confidence in tackling subsequent TMAs?	Bar chart with categories (definitely, probably, probably not, definitely not) on the vertical axis and a scale from 0 to 100. definitely ≈ 22, probably ≈ 64, probably not ≈ 14, definitely not ≈ 0.
Do you think that watching the screencasts resulted in better marks for subsequent TMAs?	Bar chart with categories (definitely, probably, probably not, definitely not) on the vertical axis and a scale from 0 to 100. definitely ≈ 25, probably ≈ 45, probably not ≈ 30, definitely not ≈ 0.
Do you think that the time you spent watching TMA screencasts was well spent?	Bar chart with categories (definitely, probably, probably not, definitely not) on the vertical axis and a scale from 0 to 100. definitely ≈ 61, probably ≈ 39, probably not ≈ 0, definitely not ≈ 0.
Should screencasts of TMA solutions be produced for future presentations of SMT359?	Bar chart with categories (definitely, probably, probably not, definitely not) on the vertical axis and a scale from 0 to 100. definitely ≈ 91, probably ≈ 9, probably not ≈ 0, definitely not ≈ 0.

Figure 1 Students views about screencast solutions for TMA questions. Horizontal scales are percentages of students who had viewed some TMA screencasts.

Advice students would give to future SMT359 students about TMA screencasts   14 students wrote in some advice for future students, and this was generally rather terse but always encouraged students to use the screencasts. Some typical comments were: *"use them!"*; *"they are a must!"*; *"watch them ;)"*; and slightly more expansively: *"They are a valuable resource, time allocated to them is well spent."*; *"watch them, all of them, even if you got a good tma mark!!"* and *"watch them, great for revision"*.

Suggestions for improvements to TMA screencasts   14 students responded to the request to suggest improvement, of whom four explicitly said that they were unable to suggest any way that the screencasts could be improved. Other suggestions were: to provide video files for download to students' computers; to extend the solutions to TMA 03 and 04 to make them more like the solutions for the first two TMAs; to provide a screencast of a sample TMA question before the first TMA; and to include short comments on why *not* to do something in a particular way if several students were making the same error.

Screencasts produced for e-tutorials

Use of e-tutorial screencasts   Only about half of students who responded to the survey said that they had been aware of the existence of the screencasts produced for e-tutorials, and only about 70% of those who were aware had logged into a *FirstClass* tutorial and 56% (14 students) had viewed some of the e-tutorial screencasts. For e-tutorial 2, seven students watched all of the screencasts and five viewed some of them, for e-tutorial 3, eight watched all and four watched some and for e-tutorial 4, seven watched all and three watched some.

Students' views about e-tutorial screencasts   The 14 students who watched some of these screencasts were asked to indicate the extent of their agreement with seven statements using a five-point scale, Strongly agree, Agree, Neither agree nor disagree, Disagree, Disagree strongly. The distributions of responses are shown in Table 5. Six of the statements were essentially our reasons for including screencasts in e-tutorials, and for each of them about half of the students agreed and the remainder were split between those who strongly agreed and those who neither agreed nor disagreed. The other statement (the sixth in the table) was a comparison of 'review' screencasts and 'solution' screencasts, and here 57% of responders had no preference and most of the remainder preferred the reviews.

Screencasts of solutions to exam questions

Use of exam solutions screencasts   About 80% of the 45 students who were aware of the existence of the exam screencasts viewed some of them. Screencasts were available for solutions to six of the 12 short questions from the 2006 *Electromagnetism* exam paper and for four of the six long questions, and three quarters of the students who viewed exam screencasts said that they viewed the solutions to all or almost all of these questions.

Helpfulness of exam solution screencasts   Students were asked to rate the helpfulness of the exam solution screencasts as Not at all helpful, Not very helpful, Fairly helpful or Very helpful. About 82% of users rated the overall helpfulness as Very helpful and the other 18% gave them a Fairly helpful rating. The results for more specific areas in which the screencasts were helpful were:

- Building confidence that I could tackle the exam: 47% Fairly helpful, 41% Very helpful

- Giving useful advice about preparing for the exam: 62% Fairly helpful, 26% Very helpful

- Demonstrating methods of tackling exam questions: 33% Fairly helpful, 58% Very helpful

- Showing the amount of detail required in an answer:26% Fairly helpful, 68% Very helpful

About 85% of students who had used these screencasts would definitely recommend to future students of the course that they should view these exam solution screencasts and 12% probably

Table 5 Students' views about e-tutorial screencasts. Only 14 of the 53 students responding to the survey had viewed these screencasts, and the tabulated numbers are percentages of these 14.

Statement	Strongly agree	Agree	Neither agree nor disagree	Disagree	Disagree strongly
Screencasts made the tutor more real and approachable	14	50	36	0	0
Animated images made it easier to understand material in screencasts	21	50	29	0	0
The narration that accompanied the video recording of the screen made it easier to understand the material	29	57	14	0	0
The screencasts provided good introductions and summaries to material	21	50	29	0	0
The screencasts made the tutorials more interesting	21	50	29	0	0
Screencasts that provided reviews or explanations of course material were more useful than those that provided solutions to exercises	0	36	57	7	0
Overall the screencasts enhanced the e-tutorials	29	57	14	0	0

would, and 94% would definitely like to have screencasts of exam solutions for other courses that they study in future years. Here are a few of the comments that students wrote:

"*Helped consolidate knowledge of course materials and ensured correct methods were used to obtain suitable answers*."

"*The screencasts do help you to understand how to answer the exam questions but they do more than that, they also teach & inform you about the subject & they helped me to appreciate the physics better. It's like going on lots of mini journeys of discovery especially if like me it's impossible to attend [tutorials], any chance of a dvd of these screencasts being included in the course material?*"

"*I thought the screencasts on exam 2006 were excellent – particularly the ones where the actual writing appeared in real time as one thought along.*"

However, there were a number of students who were unhappy about the time required to view these screencasts and would have preferred to have received a simple print out of solutions. The other suggestion made by students was that screencast solutions should be provided for

all of the questions from the 2006 paper, not just half of them, and some students even suggested that we should produce screencast solutions for other previous exam papers as well.

'Advice about the examination' screencast   Just over 70% of the students who watched exam solution screencasts also watched the *PowerPoint* presentation that gave advice about the course exam. They were asked how helpful this screencast was, and their responses were:

- Not at all helpful 9% Not very helpful 9%   Fairly helpful 68%   Very helpful 14%

Demographic and performance correlations   The survey data was combined with demographic data from the OU student database and with data about students' performance on the TMAs, the exam and the course overall in order to investigate whether use of screencasts was related to any of these factors. However, the number of responses to the survey was relatively low (53, or 34%) and the numbers of students using each type of screencast was a subset of this small number of responders, so there is little of statistical significance that has been extracted from the data. Female students and students with less than two A levels or the equivalent of two A levels made more use of the screencasts, and, perhaps surprisingly, students older than 60 made more use of them and students younger than 30 made less use of them than the average. The students with average TMA scores of 60-79% were twice as likely to use screencast solutions to TMAs as the average, and they rated these screencasts most highly for helpfulness. In contrast, students with average TMA scores greater than 80% or less than 50% were more likely *not to have watched any* of the TMA solution screencasts, and those with average TMA scores greater than 90% or less than 30% were more like *not to have watched any* of the exam solutions. We reiterate that not too much can be read into these results because of the small samples involved.

4   Discussion

Raising awareness about the screencasts   This screencast project got underway after the start of the course when all of the course materials had already been produced and distributed. This meant that there was no information about the screencasts in the printed materials or the DVDs, and students were informed about the screencasts via news messages on the course website or the student forum. This was not adequate for many students: 25% of those responding to the survey said they did not know of the existence of the TMA screencasts; 15% didn't know about the exam screencasts and 50% didn't know about the e-tutorial screencasts. There are a number of possible ways to improve this situation. Information about the screencasts could be included in the course *Introduction and Guide*, which is sent out in the mailing of course materials, and this information could include some of the very positive comments that students have made about the SMT359 screencasts, as well as guidance about how to access and use the screencasts. It might also help if the links to the TMA screencasts were located on the same web page as the assignment booklets. Links could also be created from the appropriate weeks in the study calendar on the website to the pages containing the screencasts that become available in those weeks.

TMA screencasts

Timing of access to screencasts of TMA solutions   In an ideal world, all students would submit their assignments by the cut-off date, and the screencast solutions would be placed on the course website the next day so that they were available to students when their marked assignments were returned. This would maximise their use and their usefulness. However, significant numbers of students are granted extensions, and this means that there must be a

delay before the solutions are posted on a website accessible to all students. In this project the delay was three weeks, but even then there must have been a small number of students who had longer extensions than this. If the assignments are summative, then there needs to be a more rigid limit to the length of extensions that can be given, and the maximum extension needs to be a compromise between maximising the usefulness of the screencasts for the vast majority of students who submit before the cut-off date – which means making the screencasts available as soon as possible – and providing sufficient flexibility to distance-learning students who, for a variety of reasons, need extensions. Alternatively, we require a mechanism for providing access to the screencasts only to those students who have submitted their assignments. One option might be for the tutor to provide the URL for the web page for the screencasts when they return the marked assignment to a student and to make it a disciplinary offence for students to pass on or receive this URL. Alternatively it might be possible for access to the screencasts to be via the Moodle gradebook or a student's course record, and for this access to be switched on only when there is a record that the student has submitted their assignment. Of course, all of these problems could disappear if the assignments were completely formative; it might even be sensible to make each screencast available before the cut-off date, with students given the strong message that viewing them before submitting their assignment would be to their disadvantage. Whether this would be sound psychology or not is, of course, another question.

How detailed should we make the screencast solutions for the TMA questions? The TMA screencasts were aimed particularly at meeting the needs of students who had difficulties with the assignments. We therefore included a lot of explanatory comments and tips about tackling electromagnetism problems, particularly in the screencasts for the first two TMAs. Screencasts for the last TMAs were significantly shorter, since we assumed that students would have learned from the earlier screencasts and many of the students who struggled with the early assignments would have dropped out. However, student feedback indicated a preference for the more-detailed screencasts, and in future course presentations the later screencasts could also take this approach. Students who did not require all of the detail could be advised to use the scroll bar on the video player to move through the screencast more rapidly and to pick out the sections that they needed.

Alternative ways of developing problem-solving skills It could be argued that screencast support with problem solving would be better if it were available *before* students tackled an assignment rather than afterwards. This could be done by providing screencast solutions to some of the many additional exercises that are provided for students to supplement the exercises in the course books. It would also be possible to provide additional problems, specifically designed to develop the important skills tested in TMAs, and to produce screencast solutions to these problems. However, we would be concerned that many students would not tackle these problems for themselves, but would simply view the screencast solutions, just as many students simply read the answers to exercises in the course books without making serious attempts at them. Of course, the 2008 TMA questions and their screencast solutions could be made available to students in future years, and these would provide an excellent resource for students preparing to answer assignment questions.

Implications of the new formative assessment model for the *Electromagnetism* course
In 2010 the current continuous assessment model of four summative TMAs will be replaced by four half-length formative TMAs and six short formative interactive computer marked assignments (iCMAs). The same formative TMAs will be used each year, which means that the screencast solutions will only need to be produced once – though we may wish to remake some of them in light of feedback and experience. The iCMAs will be designed to test the most import learning outcomes, and it should be possible to provide some of the solutions as

screencasts, or to create links from conventional (on-screen text) solutions to screencasts that provide remedial teaching.

E-tutorial screencasts

The *FirstClass* asynchronous e-tutorials were not very successful in the first presentation of the *Electromagnetism* course, and they were even less popular in 2008 in spite of efforts to enhance them by including screencasts. However, the very small number of students who participated did make positive comments about the screencast presentations, and these screencasts could be made available to students via the course website in future years.

In 2010 we plan to trial the use of synchronous e-tutorials delivered via *Elluminate Live.* This application allows a tutor to deliver *live* the sort of materials that we included in the recorded screencasts that were provided for *Electromagnetism* students in 2008. However, there may still be a role for the use of pre-recorded screencasts in *Elluminate* tutorials, since their use would reduce pressure on the tutor during the session and would allow materials to be shared easily between tutors running different sessions, thus reducing their workload or allowing more time online with students.

Exam screencasts

The exam-related screencasts were more-widely viewed than those related to TMAs or e-tutorials, with over half the number of students who sat the exam accessing each of them. The increased viewing numbers are not surprising: students are always keen to get as much support as they can to prepare for the exam, and the exam screencasts were used at the end of the course when a larger proportion of students were aware of, and had tried, screencasts. Student feedback indicated that 82% found the exam solutions very helpful overall, 85% would recommend them to future *Electromagnetism* students and 94% would like to have similar screencasts for future courses that they study. This is very positive feedback, and should encourage the wider adoption of screencasts for this purpose.

But perhaps some caution is required. We do not know how the students used the exam solutions: did they simply read the question and then look at the solution, or did they take the course team's advice and have a serious attempt at tackling each question before viewing the screencasts? It would be interesting to investigate this in a future study.

The exam screencasts produced in 2008 can be used in future presentations of the course. But there were requests from students for screencasts for more exam questions. We produced screencasts for only half of the questions from the 2006 paper and this was partly because of constraints on production time but also because we wanted there to be some questions without solutions that could be used by tutors in face-to-face revision tutorials and that might provoke discussion between students on the course forum. Screencasts could now be produced for solutions to the 2008 exam questions, and there have been suggestions from students that we also produce screencast solutions to questions from exams for the predecessor electromagnetism course. However, the screencasts that have already been produced achieve our aim of demonstrating how to tackle exam questions, showing the level of detail expected in answers and giving advice and various tips, and it is not clear that students' time would be well spent viewing additional solutions. An alternative would be to simply provide very brief text solutions to the other half of the questions from the 2006 exam (and possibly also for the questions from the 2008 exam) so that students who attempt these questions can check whether they have the correct answer.

Miscellaneous issues

Quality and quality assurance of screencasts   The Open University is renowned for the high quality of its teaching materials, and this is true both of academic quality and production standards. This high quality is attributable to the course team peer review process and external assessors, and the involvement of editors, graphic designers, software developers, etc., in the production process. Now that each course has its own website and the course team can install whatever material they choose on the site, there is the possibility that the quality of the learning materials available to students will not be maintained. This could certainly be the case with the screencast materials.

The *Electromagnetism* screencasts were each produced by a single associate lecturer or course team member, without the benefit of comments or feedback from other academics before they were made available to students. There were inevitably minor errors of notation, verbal infelicities and places where the presentation could have been improved. Also, the sound quality and picture clarity could undoubtedly have been improved and were nowhere near as high as for the OU's normal audiovisual materials. However, if we had wanted to create the screencasts using the normal OU high-quality production methods they would never have happened because of the time and resources required. We prefer to think of the screencasts as the equivalent of what a tutor might provide in a face-to-face tutorial, and accept that minor imperfections will be present. Most of the screencasts were checked by one other academic before being made available to students and this ensured that there were no major errors or sources of confusion for students, and we believe that this is the appropriate level of quality assurance. Of course, it is important to choose carefully the people who are asked to produce the screencasts.

Alternatives to *Camtasia Studio*   We used *Camtasia Studio 5* to produce the *Electromagnetism* screencasts following recommendations from a number of other users of this application. This is a very powerful application and we only used a small fraction of the options that it provides. An educational licence for *Camtasia Studio 6* cost $179 in January 2009, and this cost may inhibit greater use of screencasting. However, there are free open-source applications available for creating screencasts, for example, *CamStudio*[i], and it would be worth investigating whether this would provide an effective alternative development tool.

Alternative video file formats   We chose to produce the screencasts (apart from some of the e-tutorial screencasts) in *Flash* video format, since this allowed them to be streamed from the course website and resulted in smaller file sizes that the alternative .avi or .wmv formats. However, some students said that they would like all of the screencasts for a TMA, or those related to the exam, to all be downloadable as a batch from the website so that they could be run offline from students' computers. Another option would be to put screencast files on the course DVD, though this would only be possible for the screencasts that were available months before the start of the course. These alternative delivery options should be investigated before the next presentation of the course.

Making the production of screencasts part of the role of both ALs and fulltime staff in Student Support Teams   The *Electromagnetism* screencasts were produced as part of a πCETL project, which provided consultancies to three ALs for the time they spent. When πCETL funding ends in 2010, alternative routes will need to be used for producing new screencasts. Fortunately, at this time the pilot Student Support Teams for physics and astronomy courses will be getting underway, and will be exploring many new ways of supporting students. We anticipate that the greater flexibility in allocation of student support roles to ALs and fulltime academic staff should allow plenty of scope for production of screencasts by members of the team. Involving more people in production of screencasts will require suitable training to be provided, and this could comprise the quick start guide that we

have produced (Appendix 1), the training materials on the Camtasia website and perhaps some *Elluminate*-based training sessions.

Other uses of screencasts   We explored several applications of screencasts in the *Electromagnetism* course, but there are many other possible uses. They could be used to provide responses to specific difficulties raised by students (e.g., providing additional explanations of difficult concepts, expanding on solutions to exercises in the course books) and these screencasts could be available in an FAQs page on the course website. Screencasts could be used to discuss topical news items relating to electromagnetism. Also, access to screencasts does not have to be via a computer: *Camtasia Studio* allows generation of podcasts that can be viewed from a mobile phone, and this opens up still more ways of using screencasts. It will be part of the role of the Students Support Teams to explore new ways of using screencasts for student support.

Improved retention   Finally we note that the retention on the *Electromagnetism* course was 5% higher in 2008 than in the previous presentation. A variety of factors may have contributed to this improvement: all of the course materials and the additional exercises were available for study before the scheduled study times, whereas for the previous presentation there were some delays in provision of materials; ALs were more familiar with the course and may have provided better support for students; electronic submission of TMAs became an option in 2008. However, the screencast solutions for TMA questions were particularly aimed at students who were struggling with assignments and were at risk of dropping out, and the exam-support screencasts were designed to build students confidence that they could successfully tackle the examination, and these screencasts may have played an important part in improving retention on the course.

5   Conclusions

This πCETL project produced a large number of screencasts to support students studying SMT359 *Electromagnetism*.   The screencasts of solutions to TMA questions and solutions to exam questions were particularly well-received by students, and we believe that this form of addition optional student support should be extended to other physics and astronomy courses. Though students thought that screencasts enhanced the asynchronous e-tutorials, the low participation in these e-tutorials means that they will be replaced in the next presentation by *Elluminate* tutorials. Screencast presentations could be an effective component of these tutorials.

This project has only explored a few of the possible uses screencasts in OU courses. The introduction of Student Support Teams should provide an environment within which many other uses can be developed over the next few years.

[1] Camtasia Studio can be downloaded for a 30-day free trial from http://www.techsmith.com/camtasia.asp. Camtasia Studio 5 was used for this project, but version 6 is now available.

[2] Matthew Juniper's website: http://www2.eng.cam.ac.uk/~mpj1001/AM_website/index.html

[3] *Camtasia Studio* Learning Center at http://www.techsmith.com/learn/camtasia/default.asp. This website contains many useful "How to …" guides and training videos.

[4] Daniel Park (2008), *Camtasia Studio 5: The definitive guide*, Wordware Publishing, Inc, Plano, Texas

[5] *CamStudio* free video streaming software, available from http://camstudio.org

Appendix 1 Quick start guide

Appendix 2 Student survey

Quick-start guide to creating screencasts using Camtasia Studio 5

1 Access to the software

The Camtasia Studio software can be downloaded for a 30-day free trial from:
http://www.techsmith.com/camtasia.asp

If you are involved with a πCETL project that involves production of screencasts, then you will be provided with a licence key for version 5 of Camtasia Studio, and not for the recently released version 6. The older version (v5.1.0) can be downloaded from
http://www.techsmith.com/download/oldversions.asp#camtasia

2 Training materials

The TechSmith website provides a wide range of training materials and documentation in their online Learning Center at http://www.techsmith.com/learn/camtasia/default.asp. These materials include:

• Camtasia Studio At a Glance Guide, an 8 page summary which can be downloaded as a pdf file from the Camtasia Studio Documentation link;

• Camtasia Studio Online Help, a 300 page guide which can be downloaded as a pdf file from the Documentation link or as a (hyperlinked) HTML version that can be viewed in a web browser;

• a set of brief online screencasts, which can be accessed from the Getting Started link: *Getting Started*; *How to Record*; *How to Edit*; *How to Produce*; *How to Share*; *How to Use the Recorder*; these can also be accessed from the Tutorial Videos area of the Camtasia Welcome screen, which can be displayed by clicking on **Show Welcome Screen** on the **Help** menu in the Camtasia Studio window;

• a more extensive set of screencast tutorials on specific topics, which can be accessed by clicking on **Help** / **Quick Start Videos** in the Camtasia Studio window;

• context-specific help is available from within the application by clicking on the F1 key.

A book that provides very helpful information and guidance is *Camtasia Studio 5: The Definitive Guide* by Daniel Park. This is available from Amazon for about £20.

3 Introduction

Two of the possible uses of the Camtasia Studio video screen recording application are for narrated worked solutions to problems and for PowerPoint presentations, and methods of producing these are outlined below. It is also possible to mix the two. There are many other potential applications, and hopefully these will be explored in the next months and years.

Camtasia Studio is a powerful application and the notes below are intended as an introduction that should help you to create a simple screencast. There are many knobs and whistles available within the application that you can explore at your leisure ……

4 How to create a screencast of a handwritten solution to a problem using a Tablet PC

4.1 Before recording

1 **Vital first step** Sketch an outline of the solution that you will record and note the specific teaching points that you will make in the narration.
Don't expect it to be like teaching a class!
Your solution needs to be (semi) scripted. It is generally the case that the better the preparation

before recording starts, the more professional is the screencast. You may wish to start by summarising the question, perhaps highlighting onscreen salient points in the question text or drawing a diagram. It is probably a good idea to build in a few breaks in the script, places where you can pause the recording to gather your thoughts, to change pens, to paste new material on the screen, etc.

2   Set up the Tablet PC in tablet mode, with the display in a landscape orientation.

3   Since the Tablet PC's keyboard is not accessible in tablet mode, we recommend connecting an external USB keyboard. This allows various Hotkeys to be used to pause, restart and stop recording, and facilitates insertion of file names, as described below.

4   Select the application in which you will write the solution. Options include **PDF Annotator, Microsoft Word and Windows Journal**, all of which should be pre-installed on the πCETL Tablet PCs and all of which allow you to write with the Tablet PC stylus on a 'blank sheet of paper'. *Windows Journal has been used effectively for many πCETL screencasts, and in these notes we will assume that is the application that is being used.*

5   Start **Windows Journal** and open a new document. You can select an appropriate page style in Windows Journal by clicking on **File / Page Setup**; the **Style** tab allows you to choose blank or ruled pages and a background colour, and the **Background and Title Area** tab allows you to choose whether to include a title area at the top of the page. However, blank white pages may be the best option. You can make your chosen page style the default option by clicking on the **Set as Default** button at the bottom of the **Page Setup** window. Add several pages to the document (**Insert / New Page**) so that you don't have to add pages while recording. Also click on **View / Toolbars** and ensure that all of the toolbars (Standard, Pen, Format, and View) are displayed.

6   Select **Page Width** from the **View** menu so that the page fills the width of the window. Adjust the position and size of the Windows Journal window so that it occupies the full height of the screen, its left edge is at the left edge of the screen and its width is about ¾ of the screen width – this should give the writing area a width to height ratio of about 4:3, which is suitable for display in a web browser.

7   Decide what combination of pens, line widths, ink colours, etc. you will use when writing the solution. You can use the first page to experiment with different lines widths, ink colours, etc. The **Pen** and **Highlighter** buttons on the **Pen** toolbar each allow easy access to five line width / ink colour combinations, and you can preset these combinations by selecting the **Pen Settings** or **Highlighter Settings** from the drop down menus associated with these buttons.

8   Copy and paste into the Windows Journal window any material that you want students to see on screen at the start of the screencast, for example, the text of the problem that you will be solving or a diagram.   However, note that it is often better to develop a diagram as part of the screencast solution.

4.2   Setting up Camtasia Studio

1   Open Camtasia Studio and select **New Screen Recording** from the Welcome screen, or click on **Make a recording** in the Task List on the left of the window. The Camtasia Recorder window will open.

2   Plug in a USB headset. (Use of an external USB microphone rather than the internal microphone is recommended, since it minimises background noise in the recording from the computer fan, etc.)
To set up the microphone, in the Settings box of the Camtasia Recorder window check **Microphone** and then click on the **Audio options** link. Make sure that the appropriate device is selected and the source is Microphone, and then click on the **Audio Setup Wizard** button and

follow the instructions for adjusting the volume level. Leave the audio format at its default setting.

3   If you wish to use an onscreen pointer during the recording (strongly recommended), click on **Effects / Options** to open the Effects window. Click on the **Cursor** tab and choose appropriate options from the Cursor and Highlight cursor sections. Then click **OK**. (Note that you don't see the cursor while recording – it only appears on playback.)

4   Click on the **Select area to record** button, and then click on the screen within the 'writing' area of the Windows Journal window; a Camtasia Recorder Selection Area window will open. Select **800 x 600** from the **Preset Sizes** dropdown list (since this is suitable aspect ratio for display in a web browser), and use the sizing handle at the bottom right corner of the selected area to adjust the area so that it covers the largest possible region of the page but does not include the menu bars at the top or the task bar at the bottom. Then drag the right edge of the Windows Journal window so that its vertical scroll bar is just included in the recorded area; the viewer will then be able to see what is causing a page to move up or down. Note that once you have selected the appropriate recording area for a particular application window, you can subsequently click on the **Last area selected** button to automatically set up the same recording area, and this enables you to produce a set of screencasts with the same size.

5   Select the pen, colour and line width that you intend to use at the start of the recording.

4.3   Recording a screencast with Camtasia Studio

1   When ready, click on the **Record** button in the Camtasia Recorder Selection Area window. Work through the problem solution – with script and solution at hand – writing on the screen and speaking into the microphone.

2   While recording, the cursor is not displayed; it only shows up on playback. Try not to move the cursor unnecessarily, as this can be distracting to the viewer.

3   A control bar is displayed below the recording area, with a button that toggles between **Pause** and **Resume**, and other buttons to **Stop** or to **Delete** the recording. If you are using an external keyboard, you may find it easier to use Hotkey **F9** to **Record** / **Pause / Resume** recording and to use Hotkey **F10** to **Stop** recording**.** (You can choose your own Hotkeys by selecting **Tools / Options** from the Camtasia Recorder window, then selecting the **Hotkeys** tab and making the appropriate choice of keys.)

4   It is probably best not to try to do the whole recording in one take – this quite difficult to do. Click on the **Pause** button (or Hotkey **F9**) when you want to temporarily stop recording, for example, to change pens, to add more material to the screen or to collect your thoughts. Click on the **Resume** button (Hotkey **F9**) when ready to restart recording.

5   If you make a mistake that you will want to edit out, you can insert a marker so that you will easily be able to find the mistake at the editing stage. To insert a marker, use Hotkeys **Ctrl+Shift+M.**

6   Click on the **Delete** button (red **X**) if you wish to abort the recording and delete the file without viewing it.

7   Click on the **Stop** button (or use Hotkey **F10**) when you have finished a recording sequence. You might choose to split the recording of a solution into several sequences, each terminated by stopping (rather than pausing) the recording. The sequences can then be stitched together at the editing stage. The Camtasia Recorder Preview window opens automatically when you Stop the recording, and the recording is played back.
After viewing the recording, you can choose whether to Save or Delete it.

8   You should create folders to store the files you produce: for example, you could create a folder named **Camtasia** in **My Documents**, and create a subfolder **TMA02 solutions** for files relating to screencasts for TMA02. When you choose to **Save** a recording, the file is saved as a .camrec file. (This video file format is only viewable using Camtasia – the file still needs to be 'produced' before it can be shared more widely.) You can choose the folder where it will be stored and can give the file an appropriate filename. Choose a short, systematic filename – for example, tma02q3b_2 for the second sequence of the solution to question 3, part (b), in TMA02. This will allow the files to be easily identified later if you have a large number of them.

9   After saving a recording you are offered options to edit or produce the recording, or to create another recording. Generally you will need to edit a recording in some way (see section 4.4), and this is probably best done immediately after stopping recording while it is fresh in your mind. After editing a sequence, you can then record additional sequences (see point 13 in section 4.4). When all sequences have been recorded and edited together, you will need to produce the screencast so that it can be shared (see section 4.5).

4.4   Editing a screencast recording with Camtasia Studio

The *How to Edit with Camtasia Studio* video tutorial gives a good overview of the editing process. To access this from the Camtasia Studio application, click on **Help / Quick Start Videos** and select *Edit with Camtasia Studio*. The menu for the video tutorials also lists a series of video tutorials that discuss specific editing facilities, of which the most useful are *Add a Title Clip* and *Add a Callout*.

Here is an outline of steps in the editing process.

1   If you choose to edit immediately after you have saved a video recording, the Camtasia Studio Project Settings window will open automatically. Select the **Web** preset (since students will view the video in a web browser) and select **Change the video dimensions**. We recommend that you *do not apply SmartFocus*; this results in the video area zooming in on parts of the screen where you are writing and panning around in somewhat unpredictable ways, which can be quite distracting and off-putting for the viewer.

     If you are editing at a later time, open Camtasia Studio, click on **Import media…** in the Add section of the Task List, and select the .camrec video file(s) that you want to edit, and click on **Open**. The file(s) will now appear in the Clip Bin in the centre of the window. Drag the file(s) to the video track on the time line at the bottom of the screen; click on **File / Project Settings** to open the Project Settings window, and proceed as in the previous paragraph.

2   The editing process creates a .camproj file from the one or more .camrec files that were generated by the recording process. Save the .camproj file by selecting **File / Save project as…**, ensure that the **Save in:** box displays the name of the folder where the .camrec file is stored, insert a name in the **File name:** box (it's simplest to use the same name as for the .camrec file, though they will have different extensions), and select **Move source clips to project folder** (which will keep the clips for this recording in a subfolder within the current folder). Click on **Save**. Periodically saving the .camproj file during the editing process is strongly recommended. Note that the .camproj file is quite small, since it just keeps a record of the *editing* operations carried out on the .camrec files that are on the timeline.

3   If you have already created a .camproj file for your screencast and wish to edit or re-edit this, then start the Camtasia Studio application and select **File / Open Project**, locate the folder where the .camproj file is stored and double click on its icon to open it. The appropriate .camrec files appear in the Clip Bin and on the timeline and can be edited as required.

4   Your recorded video clip will be shown on the timeline at the bottom of the screen and in the preview window on the right. Playback of the video clip is controlled using the buttons below the

preview window. The first button plays from the beginning of the timeline, and the second plays from the event marker.

5   Clicking at a particular point on the time scale at the top of the timeline places the 'event marker' (green triangle) at that point of the recording, and the corresponding video frame is displayed in the preview window. **Zoom In** and **Zoom Out** buttons (magnifying glass icons) on the tool bar above the timeline can be used to expand and contract the time scale around the event marker to enable this marker to be positioned more precisely.

6   *To place a marker on the timeline*, for example, to indicate the start or end of a section that you want to cut, select **Edit / Markers / Add a Marker**, or **Ctrl+M** (note, *not* **Ctrl+Shift+M** as used during recording).

7   *To cut out part of the video*, click on the time scale at the starting point for the cut and drag the pointer to the end point of the cut. This highlights in blue the section that will be removed, and clicking on the **Cut** button (scissors icon on the toolbar above the timeline) deletes this section. This process not irrevocable – just click on the **Undo** button on the toolbar at the top of the Camtasia Studio window if you change your mind.

8   *To split a video clip in order to allow insertion of additional material* (extra video, a title frame, etc.), click on the time scale at the point where the split is to be made, and then click on the **Split** button on the tool bar above the timeline.

9   *To insert additional material into a break between two video sequences*, first place the material in the Clip Bin in the centre of the Camtasia Studio window. This can be done by dragging the file from the folder where it is located or by clicking on **Import media…** in the Add section of the Task List on the left of the Camtasia Studio window and browsing to the location of the required file, selecting it and then clicking on **Open**. The imported file can then be dragged from the Clip Bin and dropped on the timeline, and it will appear at the closest break in the video track to the point where it was dropped.

10 *To create a title frame* at the start of the video, or frames to subdivide the video into sections, click on **Title Clips…** in the Add section of the Task List. Choose a name to identify the frame, choose a background colour or a background image, choose font, size, colour, etc and key in appropriate text, and then click **OK**. The title clip will appear in the Clip Bin, and can then be dragged to the appropriate point on the timeline. The duration of the title clip can be changed by dragging its end point on the video track of the timeline. (See video tutorial *Add a Title Clip*.)

11 *A table of contents (TOC)* can be useful for longer screencasts because it displays headings for different sections (e.g., the different parts of a multi-part solution), and allows the viewer to go straight to the section they are interested in by clicking on the appropriate heading in the TOC. Camtasia uses marker names as the headings in the TOC, so to add a section heading that will appear in a TOC, click on the timeline at the point where the section starts, and select **Edit / Markers / Add a Marker**, or **Ctrl+M**. Then key in the required heading in the Marker Name window and click OK. If using a TOC, you must delete from the timeline any markers that don't indicate sections for the TOC. Note that a TOC takes up some screen space and therefore limits the maximum size of the window where the screen video is displayed

12 *To create a callout* to draw attention to some aspect of the video (e.g. a labelled arrow, a speech bubble, a text box), click on the timeline at the point in the video where you wish the callout to appear, then click on **Callouts** in the Edit section of the Task List. Click on **Add a Callout** (green plus sign), and select the callout type, orientation, colour, text font, etc., and add any text required. The callout appears in the preview window, and it can be dragged to the appropriate position, and adjusted to a suitable size. Click on **Finished** to complete the process. The duration of the callout (default is 5 s) can be adjusted by dragging the start or end of the callout in the Callouts track of the timeline. (See video tutorial *Add a Callout*.)

13 ***To record another sequence for your screencast,*** click on **Make a recording** at the top of the Task List. Make the application (e.g. Windows Journal) that you're using to write your solution visible, and select **Last area** in the Camtasia Recorder window so that the new sequence is exactly the same size as the previous one. When the new recording is finished and saved, it will automatically be added to the Clip Bin and to the timeline in the current .camproj window.

14 The audio track can be enhanced in various ways. You can use the Audio Enhancements window (opened by clicking on a button on the toolbar or by selecting **Audio Enhancements** from the Edit section of the Task List) to even out sound levels and to remove noise and clicks. Alternatively, if a particular section of the audio track is too loud (or not loud enough), highlight in on the timeline and then click one or more times on the **Volume Up (25%)** (or **Volume Down (25%)**) buttons on the toolbar above the timeline. Another button on the toolbar allows a highlighted section of the track to be replaced by silence (good for eliminating unwanted sounds or words).

15 When the editing is complete, save the project again. You may wish to play through the video in the preview window before moving on to the production stage.

4.5 Producing a recording for sharing over the web

The *How to Produce Videos* tutorial gives a good overview of the 'production' process. To access this video tutorial from the Camtasia Studio application, click on **Help / Quick Start Videos** and select *How to Produce Videos* from the Producing and Sharing section. Another useful tutorial in this section is titled *Create Better Quality, Smaller File Size Videos*

Here is an outline of steps in the production process.

1   After finishing editing your video, click on **Produce video as…** in the Produce section of the Task List. This opens the Production Wizard window.

2   The Wizard offers 3 production options:
Production Presets – these provide standard formats for different delivery routes (Web, CD, etc.), but they may use higher quality video and audio (and therefore larger file sizes) than required for handwritten solutions on a Tablet PC. However, if you click on the **All** button you can select from the dropdown list of Production Presets any of the preset formats that you may have defined when producing previous screencasts (see end of point 6 below).
Recommend my production settings – the Wizard helps you to choose various video, audio and appearance formats. This option always produces Flash files.
Custom production settings – this option allows a choice of file types – Flash, avi, Windows media, etc. and choice of video and audio quality.

We recommend using the second option, **Recommend my Production settings**, to produce an acceptable screencast, and then saving the formats as a preset that can be used for subsequent screencasts using **Production Presets / Manage …**

3   Select **Recommend my Production settings**. Choose the **Web** option (but note that you can also produce video suitable for iPods, mobiles, etc.), and click on **Next**.
Check the boxes for **My video includes screen recording** and **My audio includes voice narration**, and click on **Next**.

4   The video quality can be fairly low as written solutions on the Tablet PC only require a low frame rate and moderate spatial and colour resolution. Setting the video slider at the mid point of the scale gives reasonable results. Click **Next** to continue.

5   Reasonable audio quality is required; setting the audio slider at its mid point, or at three-quarters of full scale, should give good results. Click **Next** to continue.

6   Select the **Express Show** template (or **Express Show with TOC** if you want to include a table of contents in the screencast window). The Express Show options have the advantage that the produced video can be viewed in full-screen mode. Click on the **Preview** button at the bottom left of the Production Wizard window to see a 10-second clip of the produced video. If this is satisfactory, click **Next** to continue. Otherwise, use the **Back** button to go back and modify selected production parameters.

7   Give the screencast files a Production name; this can be the same as the file name of the .camproj file (but without the extension). The file can be saved in the same folder as the .camproj file. Check the **Organise produced files into subfolders** box, and click **Next** to continue.

8   You can now review the production settings you have selected, and modify them if necessary by clicking on **Modify Settings…** or by using the **Back** button, or can cancel this production process. Click **Finish** if you are happy to proceed.

9   Camtasia Studio now *renders* your file – this may take almost as long as the running time of the screencast. When rendering is complete, a web browser window opens within which you can play the screencast that you have produced. After reviewing the screencast, close the browser window.

10   The Production Wizard asks if you are satisfied with the video that has been produced. If you are not happy with the video, click **No**. You can then produce the video again using different production settings to change the balance between video and audio quality and file size, etc. However, you may decide that you need to record all or parts of the video again, or to re-edit the video. In these cases, if you have closed Camtasia Studio since editing and producing the project, you can re-open the project from the Camtasia Studio window either by clicking on the project name in Recent Projects area of the Welcome window, or by clicking on **File / Recent Projects**, or by clicking on **File / Open Project** and browsing to find the .camproj file for the project and opening this.

11   If you are satisfied with the produced video, select **Yes**, and click on **Next**. Select either **Open production folder** or **Zip output to send to your Web administrator**. If you are going to need to zip the files together for distribution, then select the second of these options.

     You can save the production settings that you have used so that they can easily be applied to subsequent screencasts. This is useful if you are going to produce solutions to a set of TMA questions or exercises, for example. To do this, click on **Create Production Preset…**, choose a Preset name (e.g. TMA solutions) and insert appropriate information in the Description box (e.g. Flash Express show, video 1/4, audio 1/2). Then click on **OK** and on **Finish.**

12   The contents of the subfolder where the production files are stored are displayed. They include a video file (Shockwave Flash Object), an HTML file that opens a web browser where the screencast is played, a Java Script file, and an XML file that contains production information about the screencast. If you selected the zip option, they also include a zipped file containing the four production files. To play the screencast, you need to click on the HTML file; note that the video file and the Java Script file must be in the same folder as the HTML file.

13   Note that email systems may not allow you to send the file named swfobject (a Java Script file) as an attachment. However, if all of the files in the production folder are zipped, then it should be possible to email the zipped files. Note that the files must be extracted from the zipped folder to a new folder before clicking on the HTML file; clicking on the HTML file in the zip archive doesn't play the video.

14   To make the Flash video available on a server, *all* of the files in the production folder should be copied to the same folder on the server, and a link made to the HTML file.

15 An alternative way of distributing screencasts is to use the OU's online Document Publishing System at http://intranet.open.ac.uk/document-publisher/index.aspx. This allows OU staff (including ALs) to upload a file to the system, and then to distribute the URL for the stored file to OU staff and students. Recipients can access the URL and download the file to their computer. Each screencast can be uploaded to the Publishing System as a zipped file, and recipients need to be informed that they should extract the contents of the zipped file to a separate folder and click on the HTML file to view the screencast. If a number of screencasts are to be distributed, all of the files could be combined into a single zip file. The Document Publishing System limits file size to less than 20 MB.

5   How to create a screencast of a PowerPoint presentation

5.1 Setting up PowerPoint

1 When you first open PowerPoint after installing Camtasia Studio, you should be offered the options *Show me how to record PowerPoint*, which is a five minute online video tutorial, and *Open the Getting Started presentation*, which is a set of PowerPoint slides summarising how to produce a PowerPoint video presentation. These provide a helpful overview of the process. To view the video at a later time, in the Camtasia Studio application click on **Help** / **Quick Start Videos** and then select **Record a PowerPoint Presentation**. Other videos are available on **Editing PowerPoint Recordings** and **Producing PowerPoint Recordings.**

If you are not offered these options, the PowerPoint Add-In may not have been enabled when you installed Camtasia Studio. To enable the Add-In, open the Camtasia Studio application, click on **Tools** / **Options**, and select the **PowerPoint** tab; then check **Enable PowerPoint Add-In** and click on **OK**.

The Add-In also provides a Camtasia Studio toolbar in the PowerPoint window, and this contains buttons for setting up recording options. If this toolbar is not visible in the PowerPoint window after the Add-In is enabled, click on **View** / **Toolbars** and ensure that the **Camtasia Studio** toolbar is checked.

2 Create the PowerPoint slides for your presentation just as you would for a live presentation, bearing in mind that you will be able to use the cursor as a pointer and can add handwritten annotation while recording if you wish. Note that if you avoid animation of slide changes, the video frame rate can be smaller and hence the file size smaller.

3 During the recording, markers will be inserted automatically on the timeline at the transitions between slides. If you choose to produce your screencast with a table of contents (TOC), then the video will be played with a TOC in the browser window and the items in the TOC will be the titles of your slides. The slide titles are hyperlinked to the appropriate point in the screencast, so it is straightforward for the viewer to select a slide that they want to view. If you use this option, then you need to give your slides short but meaningful titles.

4 If you are using a Tablet PC, decide whether you want to record in the laptop or tablet configuration. If you just intend to add little or no annotation during the presentation, then the laptop mode may be more convenient; the screen can be folded back to an almost horizontal position for ease of writing on it. However, if you intend to add a lot of detailed annotation to the slides by hand during the recording, then you may want to use the tablet mode; this means that you won't have access to the internal keyboard and will not be able to use Hotkey combinations to Pause/Resume the recording or to Stop the recording. If you have a USB keyboard that you can use with the Tablet PC, then you can overcome this drawback. If you don't have a USB keyboard that you can use, you can reprogram one of the Tablet PC buttons – the buttons beside the power on/off switch – to Pause/Resume the recording (see the end of

point 6 below). The default function of the centre of the three Tablet PC buttons is the same as the Esc key, and this Stops a PowerPoint presentation and reverts to Normal View.

5   Open your PowerPoint presentation and click on the **Record audio** button (microphone icon on the Camtasia Studio toolbar) to enable sound recording. Then click on the **recording options** button (second from right on the Camtasia Studio toolbar). The Camtasia Studio Add-In Options window will open.

6   Check the boxes to **Start recording paused** (which will allow you to check audio level before starting the recording) and to **Edit in Camtasia Studio when finished**.

   If you wish to use the mouse/stylus cursor as a pointer during the recording, ensure that the **Record mouse cursor** box is checked; checking the **Highlight cursor** box will add a yellow disc to the pointer, but this will only be visible when you play back the recording.

   Selecting **Prompt to continue recording** from the dropdown options for At the end of the presentation will allow you to choose at the end of the slide show whether to stop recording or to continue the narration.

   Select a video frame rate: 5 frames per second is adequate for adding handwritten annotation, though rapidly drawn lines may appear a bit jumpy.

   Ensure the **Record audio** box is checked, and click on the **Advanced…** button. Ensure that the correct Audio Device – your headset – is selected from the dropdown list and click on the **Audio Setup Wizard…** button. Select **Microphone** as the recording source and click on **Next**. Follow the instructions given to automatically adjust the volume input level, and click on **Finish**.

   Select **Save as CAMREC** as the Output File Type and click **OK** to close the Advanced Video and Audio Setup window.

   You can use Hotkeys to pause, resume and stop recording. With PowerPoint recordings, the default Hotkeys are Ctrl+Shift+F9 to Pause/Resume recording and Ctrl+Shift+F10 to Stop recording, but we recommend that you reassign the Hotkeys so that they are the same as used when recording solutions to problems, namely F9 for Pause/Resume and F10 for Stop. Then click on **OK**. (The notes that follow assume that the Hotkeys have been reassigned in this way.)

   If you do not have an external keyboard and want to program one of the Tablet PC keys to duplicate the F9 function so that you can easily Pause/Resume recording in the tablet mode, then proceed as follows. With the computer in the laptop mode so that the keyboard is accessible, click on the **Change tablet and pen settings** button at the right of the task bar, and select **Properties…** from the drop down menu. Select the **Tablet Buttons** tab and click on the name of the Tablet Button key that you intend to reprogram, e.g. the 'Enter' button. Click on the **Change…** button, and from the Action… dropdown list select **Press a key or key combination**. Click on the **Keys:** box to highlight its contents, press the **F9** key, click on the **Apply** button and then on **OK**. Clicking on the Tablet PC 'Enter' button will now Pause/Resume a PowerPoint screencast recording. A similar procedure can be used to revert to the original function of the Enter button.

5.2   Recording a PowerPoint presentation

1   Click on the **Record** button on the Camtasia Studio toolbar in the PowerPoint window. The PowerPoint presentation will appear in Slide View, and a popup box at the bottom of the screen will indicate that the recording is paused. Speak a few sentences to check that the audio level is OK.

2   When ready to start recording, either click on the **begin recording** button in the popup, or use Hotkey F9 (or the reprogrammed Tablet PC button, if appropriate). Talk through your PowerPoint slides, using the cursor as a pointer.

You can pause the recording using Hotkey **F9**, and then restart using the same Hotkey when you are ready to continue.

Move to the next slide as you would with a normal PowerPoint presentation (using **Enter** or the right arrow on keyboard, or click on right arrow at the bottom left of screen), or tap anywhere on the screen with the stylus.

3   If you wish to annotate the slides during the presentation, click on the button with the pen symbol at the bottom left of the screen and drag the stylus away from the button while in contact with the screen (this dragging operation seems necessary to make the popup menu remain on screen). Then select Ballpoint **Pen**, **Felt Tip Pen** or **Highlighter**, and **Ink Color**, from the popup menu. You may wish to pause the recording (**F9**) while selecting the pen, and restart (**F9** again) when you are ready to continue so that the popup menus are not recorded in the presentation. The arrow pointer can be reselected in a similar way. Note that when you are using the pen rather than the pointer, tapping anywhere on the screen with the stylus does *not* advance the slides, but tapping on the arrow keys at the bottom left of the screen does change the slides.

4   When you reach the end of the slide show, the recording will pause automatically and you will be offered the options to stop recording or to continue. If you wish to continue, click on the **Continue Recording** button, and when you have finished your narration, use Hotkey **F10** or **Esc** to stop; otherwise click on **Stop Recording**.

5   When you stop recording, you are given the options to Keep or to Discard any annotation that you have made to the slides. Keeping the annotation does not save it – if you want to preserve the annotation you will need to Save the annotated file, and to use a new file name if you still want to be able to access the original file.

When you confirm that you want to stop recording, the Save Camtasia Recording As… window opens, and you can choose a folder and a filename. Then click on the **Save** button. The file is saved in .camrec format, and you are offered options to produce or edit your recording, or to look at online video tutorials about producing or editing the recording. These video tutorials give useful overviews of the production and editing processes.

5.3   Editing a PowerPoint recording

This process is similar to editing any other recording in Camtasia Studio, and is described in Section 4.4. Specific points to note:

1   Choose the **Web** preset (640 x 480) in the Project Setting window, since students will view the screencast in a browser window.

2   Animated transitions between slides can be set up in the PowerPoint presentation. Alternatively, you can insert transitions as part of the Camtasia Studio editing process. However, animated transitions are best avoided since they require a higher video frame rate, and therefore will result in larger files for students to download / stream over the internet.

3   Extra pictures or video clips can be inserted in the original recording. Simply split the recording at the appropriate point, and then drag the additional material from the Clip Bin to the break in the recording. If you discover a problem with the presentation of a particular slide, you can re-record that part of the presentation and slot it into the original recording in this way.

5.4   Producing a PowerPoint recording

Producing a PowerPoint recording is similar to producing other types of recording, and is described in Section 4.5. Specific points to note:

1   You can omit the editing stage if you are happy with the original recording and/or you want to get the video out to students rapidly. If you opt to produce the video without editing, the Production Wizard window opens automatically. Otherwise, after editing, open the wizard from the Camtasia Studio window by selecting **Produce video as…** from the Task List.

2   The Production Wizard window offers three production routes.

3   The simplest is to use **Production Presets**: in this case either click on the **Web** button, or if you have already saved your own preset then click on the **All** button and select your required preset from the dropdown list. A description of the selected Production Preset appears below the buttons. Click on **Next**, enter a Production name (which can be the same as the name of the .camproj file but without the extension) and a folder (which can be the folder where the .camproj file is located), check the **Organise produced files into sub-folders** box and click on **Next**, and then on **Finish**, to render the screencast.

4   The Web preset produces a screencast that probably has better video and audio quality than required, and that has larger file size than is necessary. It also does not allow inclusion of a table of contents. The **Recommend my production settings** option, provides some additional flexibility, but we recommend producing and saving an appropriate production preset using the **Custom production settings** option.

5   To use this option, click on the **Custom production settings** option, and click on **Next**.

6   Select the **SWF/FLV** Flash option, and click on **Next**.

7   From the Templates dropdown list select either **ExpressShow** or **ExpressShow with TOC**, depending on whether you wish to include a table of contents.

8   Click on the **Flash Options…** button, and select the video tab. Select **SWF** format, **16-Bit (High Color)**, a Frame rate of **5**, check the **Use JPEG compression** box and set the quality slider to about **30%** and check the **Compressed SWF** box. Then click on the **Apply** button, and on **OK**.

9   Ensure that the **Embed Video into HTM**L box is checked, and click on **Next**.

10 Enter a Production name for the output file (which can be the same as the name of the .camproj file but without the extension) and a folder where it will be stored (which can be the folder where the .camproj file is located). Check the **Organise produced files into sub-folders**, the **Show production results** and the **Play video after production** boxes, and click on **Next** and then on **Finish** to start the rendering of the screencast.

11 When rendering is complete, you can review the screencast that has been produced. When you close the web browser where the screencast is displayed, you can review the Production Results. If you want to produce other screencasts in the same way, click on the **Create Production Preset…** button, and enter a name and description for the Production Preset and click on **OK** and then **Finish**. Your new Production Preset will now appear on the dropdown list of presets when you click on the **All**… button on the first screen of the Production Wizard.

SMT359 Screencasts Survey 2008

Screencasts are a new way of providing additional support for students, and tutors and the course team have been exploring ways in which they might be used while at the same time getting to grips with the technology. We have provided screencasts of solutions to TMA questions and exam questions, and screencasts were also produced by tutors for some of the e-tutorials.

These trials are funded by the Physics Innovations Centre for Excellence in Teaching and Learning (*n*CETL).

We are excited about the potential of these screencasts, but realise that this year's resource could be improved. Your feedback will help us revise and improve the SMT359 screencasts for the next presentation of the course, and also indicate how we might use screencasts in other physics and astronomy courses.

We would therefore be most grateful if you would spare the time to complete this survey. We estimate that this will take about 20 minutes of your time. Completion of the survey is entirely voluntary and has no effect on your assessment.

Thank you in advance,

Stuart Freake
SMT359 Course Team

Gillian Stansfield
SMT359 Associate Lecturer, Region 6

Section A

1a. Were you aware of the existence of the different types of screencasts?
(Please select one option for each type of screencast)

Screencasts of solutions to TMA questions.

◯ Yes   ◯ No

Screencasts of solutions to exam questions.

◯ Yes   ◯ No

Screencasts provided in FirstClass e-tutorials.

◯ Yes   ◯ No

1b. Did you watch any of the SMT359 screencasts?

◯ Yes - <u>please go to question 3</u>

◯ No

---

2. If you DID NOT watch any of the screencasts, please indicate the reasons:
(Please select one option for each statement)

Don't have access to a networked computer.

◯ Major reason   ◯ Minor reason   ◯ Not a reason

Don't like using my computer for studying.

◯ Major reason   ◯ Minor reason   ◯ Not a reason

Didn't want to spend more time using a computer.

◯ Major reason   ◯ Minor reason   ◯ Not a reason

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Attempts to download the screencasts were unsuccessful.

○ Major reason   ○ Minor reason   ○ Not a reason

Downloading screencasts would take too long on my dial-up connection.

○ Major reason   ○ Minor reason   ○ Not a reason

Couldn't spare the time.

○ Major reason   ○ Minor reason   ○ Not a reason

More important to spend time studying the course materials.

○ Major reason   ○ Minor reason   ○ Not a reason

Didn't feel I needed help with TMA or exam questions.

○ Major reason   ○ Minor reason   ○ Not a reason

Didn't participate in e-tutorials.

○ Major reason   ○ Minor reason   ○ Not a reason

Other reason(s). *(Please specify below)*

○ Major reason   ○ Minor reason   ○ Not a reason

Please state here:

If you DID NOT watch any of the screencasts, <u>please go to Section D</u>.

---

3. Which of the following types of screencasts did you watch?
    (Please select one option for each type of screencast)

    Screencasts of solutions to TMA questions.

    ○ Yes   ○ No

    Screencasts of solutions to exam questions.

    ○ Yes   ○ No

    Screencasts provided in FirstClass e-tutorials.

    ○ Yes   ○ No

4a. What difficulties did you have viewing the TMA or exam screencasts from the course website?
    (Please select all that apply)

    ☐ No difficulties viewing this type of screencast
    ☐ These screencasts would not run on my computer
    ☐ Had to install additional software to view these screencasts

    Please specify what software you had to install (if any):

☐ Had to get help from family/friend/colleague
☐ Took a long time to download because no broadband
☐ Other difficulties *(Please specify below)*

Please state here:

4b. What difficulties did you have viewing the e-tutorial screencasts from the FirstClass forum?
(Please select all that apply)

☐ No difficulties viewing this type of screencast
☐ These screencasts would not run on my computer
☐ Had to install additional software to view these screencasts

Please specify what software you had to install (if any):

☐ Had to get help from family/friend/colleague
☐ Took a long time to download because no broadband
☐ Other difficulties *(Please specify below)*

Please state here:

Section B: Screencasts of solutions to TMA questions

If you DID NOT watch any of the TMA screencasts, please go to Section C.

5. **How many screencasts did you watch for each TMA?**
   (Please select one option for each TMA)

   TMA 01 (14 screencasts available for Parts I and II):

   ○ None   ○ A few   ○ About half   ○ Most of them   ○ All of them

   TMA 02 (12 screencasts available):

   ○ None   ○ A few   ○ About half   ○ Most of them   ○ All of them

   TMA 03 (15 screencasts available):

   ○ None   ○ A few   ○ About half   ○ Most of them   ○ All of them

   TMA 04 (8 screencasts available):

   ○ None   ○ A few   ○ About half   ○ Most of them   ○ All of them

6. **When did you watch the screencasts?**
   (Please select all that apply for each TMA)

   TMA 01:

☐ Within 2 weeks of posting on website
☐ More than 2 weeks after posting but before next TMA cut-off
☐ Later in course but before revision
☐ As part of revision for exam

TMA 02:

☐ Within 2 weeks of posting on website
☐ More than 2 weeks after posting but before next TMA cut-off
☐ Later in course but before revision
☐ As part of revision for exam

TMA 03:

☐ Within 2 weeks of posting on website
☐ More than 2 weeks after posting but before next TMA cut-off
☐ Later in course but before revision
☐ As part of revision for exam

TMA 04:

☐ Within 2 weeks of posting on website
☐ More than 2 weeks after posting but before next TMA cut-off
☐ Later in course but before revision
☐ As part of revision for exam

7. **How did you choose the TMA screencasts you watched?**
   (Please select one option for each statement)

   Focussed on solutions for questions I had difficulty with.

   ○ Yes   ○ No

   Picked a few screencasts at random.

   ○ Yes   ○ No

   Started with first screencast for a TMA and continued until ran out of time.

   ○ Yes   ○ No

   Watched all of the TMA screencasts.

   ○ Yes   ○ No

   Other. *(Please specify below)*

   ○ Yes   ○ No

   Please state here:

8. **Overall, how helpful did you find the screencast TMA solutions that you watched?**

   ○ Not at all helpful   ○ Not very helpful   ○ Fairly helpful   ○ Very helpful

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9. Did watching the screencasts increase your confidence in tackling subsequent TMAs?

○ Definitely   ○ Probably   ○ Probably not   ○ Definitely not

10. Do you think that watching the screencasts resulted in better marks for subsequent TMAs?

○ Definitely   ○ Probably   ○ Probably not   ○ Definitely not

11. Do you think that the time you spent watching TMA screencasts was well spent?

○ Definitely   ○ Probably   ○ Probably not   ○ Definitely not

12. Should screencasts of TMA solutions be produced for future presentations of SMT359?

○ Definitely   ○ Probably   ○ Probably not   ○ Definitely not

13. Please note below which aspects of these TMA screencasts you found most helpful.

Please state here:

14. Please note any advice you have for future SMT359 students about viewing TMA screencasts.

Please state here:

15. Please note any suggestions for how the screencasts of TMA solutions could be improved.

Please state here:

Section C: Screencasts of solutions to exam questions

If you DID NOT watch any of the exam solution screencasts, please go to Section D.

16. How many of the six screencasts for short questions (from Part 1 of the exam) did you watch?

○ 0   ○ 1 - 2   ○ 3 - 4   ○ 5 - 6

17. How many of the 13 screencasts for four of the long questions (from Parts 2 - 4 of the exam) did you watch?

○ 0   ○ 1 - 4   ○ 5 - 8   ○ 9 - 13

18. Overall, how helpful did you find the screencast solutions to the exam questions?

○ Not at all helpful   ○ Not very helpful   ○ Fairly helpful   ○ Very helpful

19. How helpful were the exam solution screencasts for each of the following areas?
(Please select one option for each of the areas)

Building confidence that I could tackle the exam.

○ Not at all helpful   ○ Not very helpful   ○ Fairly helpful   ○ Very helpful

Giving useful advice about preparing for the exam.

○ Not at all helpful   ○ Not very helpful   ○ Fairly helpful   ○ Very helpful

Demonstrating methods of tackling exam questions.

○ Not at all helpful   ○ Not very helpful   ○ Fairly helpful   ○ Very helpful

Showing the amount of detail required in an answer.

○ Not at all helpful   ○ Not very helpful   ○ Fairly helpful   ○ Very helpful

Other areas. *(Please specify below)*

○ Not at all helpful   ○ Not very helpful   ○ Fairly helpful   ○ Very helpful

Please state here:

20. Would you recommend to future SMT359 students that they view these exam solution screencasts?

○ Definitely   ○ Probably   ○ Probably not   ○ Definitely not

21. Would you like to have screencasts of exam solutions for courses you study in future years?

○ Definitely   ○ Probably   ○ Probably not   ○ Definitely not

22. Please note any suggestions you have for how the exam solution screencasts could be improved.

Please state here:

23. Did you watch the 'Advice about the examination' screencast?

○ Yes

○ No – <u>please go to Section D</u>

24. How helpful was the 'Advice about the examination' screencast?

○ Not at all helpful   ○ Not very helpful   ○ Fairly helpful   ○ Very helpful

25. **Please note any suggestions you have for additional topics that could be discussed in this screencast, or for other changes that could be made to improve it.**

Please state here:

Section D: Screencasts produced for e-tutorials

26. **Did you log into any of the FirstClass e-tutorials?**

○ Yes - <u>please go to Question 28</u>

○ No

---

27. **If you DID NOT log into any of the e-tutorials, please indicate the reasons:**
(Please select one option for each statement)

Don't have access to a networked computer.

○ Major reason   ○ Minor reason   ○ Not a reason

Don't like communicating via computer.

○ Major reason   ○ Minor reason   ○ Not a reason

Didn't want to spend more time using a computer.

○ Major reason   ○ Minor reason   ○ Not a reason

Couldn't spare the time.

○ Major reason   ○ Minor reason   ○ Not a reason

Didn't feel I needed help with the course.

○ Major reason   ○ Minor reason   ○ Not a reason

More important to spend time studying the course materials.

○ Major reason   ○ Minor reason   ○ Not a reason

Don't usually find tutorials very helpful.

○ Major reason   ○ Minor reason   ○ Not a reason

Haven't found e-tutorials helpful on previous courses.

○ Major reason   ○ Minor reason   ○ Not a reason

Other reason(s). *(Please specify below)*

○ Major reason   ○ Minor reason   ○ Not a reason

Please state here:

If you DID NOT log into any of the e-tutorials, **please go to Question 31**.

Five e-tutorials were run on FirstClass forums during the course:

E1	February	Maths background	Hara Papathanassiou
E2	May	Fields in materials	Stan Zochowski
E3	June	EM induction	Craig McFarlane
E4	August	EM waves	Gillian Stansfield
E5	September	Revision	David Dolman

28. Please indicate the extent of your participation in each of the five e-tutorials.
   (Please select the e-tutorials E1 - E5 to which each statement applies)

   Did not access this e-tutorial:

   ☐ E1   ☐ E2   ☐ E3   ☐ E4   ☐ E5

   Posted three or more messages:

   ☐ E1   ☐ E2   ☐ E3   ☐ E4   ☐ E5

   Posted one or two messages:

   ☐ E1   ☐ E2   ☐ E3   ☐ E4   ☐ E5

   Read messages but did not post messages:

   ☐ E1   ☐ E2   ☐ E3   ☐ E4   ☐ E5

   Tried most questions:

   ☐ E1   ☐ E2   ☐ E3   ☐ E4   ☐ E5

   Tried a few questions:

   ☐ E1   ☐ E2   ☐ E3   ☐ E4   ☐ E5

   Downloaded questions for future use:

   ☐ E1   ☐ E2   ☐ E3   ☐ E4   ☐ E5

   Watched some of the video screencasts:

   N/A E1   ☐ E2   ☐ E3   ☐ E4   ☐ E5

   Watched all of the video screencasts:

   N/A E1   ☐ E2   ☐ E3   ☐ E4   ☐ E5

29. If you DID watch some of the screencasts provided in the e-tutorials, please indicate your agreement or disagreement with the following statements.
   (Please select one option for each statement)

Screencasts made the tutor more real and approachable:

○ Strongly agree
○ Agree
○ Neither agree nor disagree
○ Disagree
○ Disagree strongly

Animated images made it easier to understand material in screencasts:

○ Strongly agree
○ Agree
○ Neither agree nor disagree
○ Disagree
○ Disagree strongly

The narration that accompanied the video recording of the screen made it easier to understand the material:

○ Strongly agree
○ Agree
○ Neither agree nor disagree
○ Disagree
○ Disagree strongly

The screencasts provided good introductions and summaries to material:

○ Strongly agree
○ Agree
○ Neither agree nor disagree
○ Disagree
○ Disagree strongly

The screencasts made the tutorials more interesting:

○ Strongly agree
○ Agree
○ Neither agree nor disagree
○ Disagree
○ Disagree strongly

Screencasts that provided reviews or explanations of course material were more useful than those that provided solutions to exercises:

○ Strongly agree
○ Agree
○ Neither agree nor disagree
○ Disagree
○ Disagree strongly

Overall, the screencasts enhanced the e-tutorials:

○ Strongly agree
○ Agree
○ Neither agree nor disagree
○ Disagree
○ Disagree strongly

30. Please use the box below to tell us about any changes that you think we should make to the provision of e-tutorials or to the use of screencasts within e-tutorials in future presentations of SMT359.

Please state here:

31. In SMT359 we have used screencasts for TMA solutions, for exam solutions and to enhance e-tutorials. Please note below any suggestions for other ways that screencasts could be used to support SMT359 students in future years.

Please state here:

32. Would you find it more convenient to watch screencasts on an MP3 player or mobile phone rather than on a computer?

○ Yes

○ No

Section E: Further contact

33. Would you be willing to participate in a follow up telephone interview?

○ Yes

○ No

If 'Yes', please provide your telephone number.

Phone:

Section F: General comments

We would be very grateful for any further comments you may have about your experience of studying this course. These help us to improve the courses and services we offer to students. It is also very useful for us to be able to illustrate the findings in internal reports and external publications with quotes from your comments. We must stress that these would never be attributed to an individual student and your comments will remain completely anonymous like your responses to the earlier questions.

If however you feel you would rather we did not use your comments in this way please tick the box before continuing: ☐

Please enter any further comments here:

Investigating the effectiveness of video screencasts for student support Gillian Stansfield and Stuart Freake

Abstract

Screencasts combine in a video file a recording of what happens on the presenter's computer screen and an accompanying audio narration. A number of uses have been made of this technology to support students on a Level 3 physics course, including demonstrating methods of tackling TMA and exam questions and providing materials for e-tutorials. Techniques used include writing on a Tablet PC screen and producing narrated PowerPoint presentations. Informal feedback from students has been positive, and a more systematic survey of students' views about the value of this type of support will be conducted at the end of the course in October 2008.

TMA solutions

Students benefit from watching experienced practitioners tackle problems, and this is one of the activities that they most appreciate at face-to-face tutorials. We have produced screencasts for SMT359 *Electromagnetism* that show tutors solving TMA questions, and these were posted on the course website three weeks after the cut-off date for the assignment. They were aimed particularly at students who were struggling with the course. These screencasts could be used as worked examples in future presentations of the course.

Each screencast was produced by a tutor or course team member in their office/home using Camtasia Studio 5 [1]. It can take up to eight times the playing time to produce a video clip, even when the presenter is already familiar with the academic material and the software. This preparation time also depends on the quality demanded of the final product. We regard these screencasts as tutorial materials, rather than OU course materials, and we accept that there will inevitably be minor errors and verbal infelicities, just as there would be in a tutorial.

Screencasts were saved in Flash format, uploaded to the OU Document Publishing System, and LTS then made them accessible to students via links on a resource page on the course website. About 2 hours of video were produced for each assignment, split into a dozen separate clips, with lengths from 4 to 20 minutes. File sizes are typically 0.5 MB per minute.
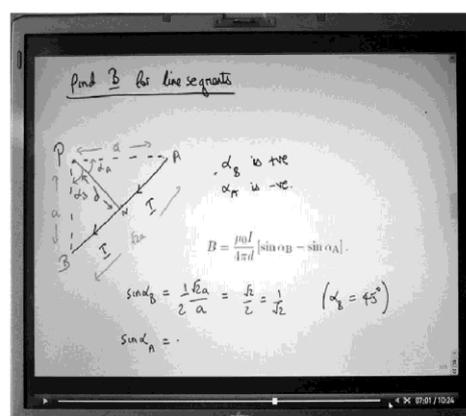
A screenshot from a screencast in which a tutor wrote out the solution to a TMA question on the screen of a Tablet PC while simultaneously recording a narration in which she explained what she was doing.

"... a huge thank you...for producing some really useful feedback videos on TMA01. I hope we see more of these videos for future TMAs. It is really helpful being shown the correct methodology for solving problems that I have struggled with."

Student Feedback

"Fantastic service! For those of us who...find it difficult to get to tutorials, this is great."

"...the clips...were excellent...helped reinforce the ideas in those areas where...I wasn't totally confident in my method."

Solutions to exam questions We have also produced screencasts showing solutions to questions on a previous year's exam. These should enhance students' exam skills and boost confidence.

E-tutorial materials Tutors have enhanced asynchronous e-tutorials in a FirstClass forum by providing screencast presentations rather like they might use at face-to-face tutorials. Many of these take the form of narrated PowerPoint presentations, but screencast solutions to exercises set in the e-tutorials have also been used. Our aims are that the screencasts should make the tutor seem less remote and they should motivate the students to participate.

Evaluation Students will be asked to complete an online survey after the exam to ascertain the use they have made of the screencasts and their views about the effectiveness of these new methods of support.

[1] For information about Camtasia Studio 5, see http://www.techsmith.com/camtasia.asp

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CHASE: Prior course grades as indicators of success and failure in SM358

John Bolton: Department of Physics and Astronomy, Open University

Abstract

A computer program, CHASE, has been written which allows us to explore the effects of prior courses, and the grades obtained in them, on student performance in the
Level 3 physics course SM358, *The Quantum World*. The aim is to provide better course choice advice by giving students direct access to the histograms output by the program, so that they can see how students with similar backgrounds to their own have fared in the past. This concept could be expanded to other courses across the University.

Introduction

For many years, Level 3 physics and astronomy courses have attracted a very wide range of students with disparate course backgrounds. This is partly a consequence of the nature of the subjects covered: quantum theory, general relativity, cosmology and astrophysics are all at the cutting edge of our understanding of the physical world, and it is natural that many students interested in science and mathematics should regard these topics as a culmination of their undergraduate studies. However, all these subjects require a solid background in mathematics and physics or astronomy. Although some specific mathematical techniques can be picked up in the course of studying the Level 3 courses, considerable facility with mathematics is needed to do this, so giving accurate course choice advice is not straightforward.

The specific course considered here is SM358, *The Quantum World*. This course and its predecessors have always attracted students with different backgrounds and intentions: those who specialize in physical science, and take mathematics courses in order to do this, and those who specialize in mathematics, and take Level 3 physics courses as a way of applying their mathematical skills to real world problems. The *Quantum World* course is in both the Physical Science and the Mathematics named award programmes, but the split between science and mathematics students goes deeper than this, and includes students who are not signed up for any specific award.

This paper describes the use of a computer tool that was initially developed within the πCETL in order to understand the extent to which students with different course backgrounds succeed with SM358. The tool has applications beyond Level 3 physics and may be used more generally across the University. It is provisionally called CHASE (Course Histogram Analyser for Successful Enrolment) − although this name may change when the University renames its Courses as Modules.

CHASE allows us to calculate sets histograms, each showing the distribution of grades obtained in SM358 by a subset of students with a given set of prior course backgrounds. The aim was to improve course choice advice by giving prospective students and their advisors access to these histograms. It was hoped that such direct evidence of success and failure would have more impact than advice based anecdotal evidence. We anticipated that histograms would be visually dramatic, and that information about all grades would be of interest to Level 3 students, who are coming to the end of their degrees and are therefore focussing more strongly than before on their degree classification.

Construction of the analysis tool

Student data was accessed from a central Open University data bank (WEBMI), and downloaded as Excel files before being imported into *Mathematica*, where the CHASE code was written. *Mathematica* provides a convenient programming language for our purposes because it has a wide range of commands for defining patterns, implementing pattern matching, handling lists and plotting histogram charts.

For all students initially registered on SM358, the following data was captured:

- Withdrawal dates for SM358;

- Final course grades for SM358;

- Results for the four summative tutor-marked assignments (TMAs) for SM358;

- Course grades on all prior courses;

- Course grades for courses taken concurrently with SM358.

In addition, we imported other background information, including data on gender, ethnicity, sponsored student status and educational qualifications on joining the OU, but this data was not used in the research described here.

The WEBMI data included students who were provisionally registered on SM358 but decided not to embark on the course. We excluded these students by ignoring any who withdrew before the course start date. Next, we decided on a set of relevant prior courses. Although studying any course might be expected to improve study skills, this effect was assumed to be of minor importance compared with the very specific skills and knowledge need to study SM358. We therefore restricted attention to prior courses in physics, astronomy or mathematics, at all levels. For the complete set of students on SM358, CHASE then generated a large table. Each student occupied a single row and specific columns represented the SM358 course grade, the four SM358 TMA scores, course grades on the relevant prior courses, concurrent courses and background student data.

Some course backgrounds turn out to be unique, or are shared by a very small number of students. It is therefore essential to group prior courses in sensible ways, so that students within a given group can be assumed to have a broadly similar preparation for SM358, but each group contains a reasonable number of students.

One example concerns courses that are discontinued and have been replaced by others. For instance, the recommended second level physics course S207 had S271 as its predecessor, which we think provides comparably good preparation for SM358. This judgement is incorporated into CHASE, which converts all instances of S271 into S207. A list of equivalences used for SM358 is shown in Table 1. It is important to note that these equivalences refer to preparation for SM358; different judgements might be made for other courses.

Table 1: A list of equivalences for discontinued courses, relevant for SM358.

Discontinued Course	Current Equivalent
S271	S207
SM351, SM355	SM358
SM352, SMT356	SMT359
S354	S357
M100, M101, MST282, MZS101	MS221
MS283, MS284, MST281, MSZS121	MST121
M202, M203	M208
MST204, MSZS204, M207, MSZS207	MST209

Our program allowed us to select students with any given set of prior course grades, and then analyse their performance on SM358. Any set of prior courses and grades could be constructed using the Boolean operators AND, OR and NOT but, in general, the construction of these sets was time-consuming, limiting our ability to explore freely. CHASE therefore made full use of the power of *Mathematica* to define and match general patterns.

We defined many subgroups of courses. For example, P3 represents all physics courses at Level 3 and PA23 represents all physics and astronomy courses at Levels 2 and 3. We also defined ranges of grade. For example, P3[n,m] represents a result between Grade n and Grade m in a Level 3 physics course. Similarly, P3[1] represents a Grade 1 in a Level 3 physics course. Using such subgroups of courses and grades, together with the AND, OR and NOT operators we could rapidly define any prior course criterion of interest, extract the students that satisfied this criterion and analyse their success on SM358. For illustrative purposes, Table 2 shows some of the subgroups introduced, together with the notation used to define them.

Table 2: Examples of subgroups of prior course results. The advantage of defining subgroups like this (and many more) is to facilitate exploration with the program, so that significant criteria for likely success or failure be found quickly.

M[0]	No Maths courses at any level
M3[1]	Grade 1 in any maths courses at Level 3
M23[1,3]	Grade 1—3 in any maths courses at Levels 2 or 3
M3Applied[1,4]	Grade 1—4 in any applied maths course at Level 3
P2[1,2]	Grade 1—2 in Level 2 physics course
PA3[1,3]	Grades 1—3 in any Level 3 physics or astronomy course
PAM3[1]	Grade 1 in any Physics, Maths or Astronomy course at Level 3

Background course population results

Table 3 shows the most common relevant courses taken prior to SM358, with physics and astronomy courses shown in the upper half of the table and mathematics courses in the lower half. In the advice given to prospective students, we emphasized the importance of knowledge gained from a good pass in MST209 *and* a pass in S207, but many students ignored this advice and only 29 % met both these criteria.

Table 3: The most common relevant courses taken prior to SM358.

Code	Course name	%
S207	The physical world	52.0
SXR207	Physics by experiment	30.8
S103	Science: a foundation course	30.3
SMT359	Electromagnetism	23.5
S357	Space time and cosmology	21.4
S381	The energetic Universe	19.6
S282	Astronomy	15.9
SXR103	Practising science	14.1
SMXR359	Electromagnetism: experiments applications and simulations	12.5
S197	How the Universe works	12.3
S281	Astronomy and planetary science	11.5
S194	Introducing astronomy,	11.0
S283	Planetary science and the search for life	9.40
SXR208	Observing the Universe	8.88
S196	Planets: an introduction	8.09
S151	Maths for science	4.96
S198	Exploring Mars	4.96
MST209	Mathematical methods and models	55.6
MST121	Using mathematics	40.5
MS221	Exploring mathematics	37.1
M208	Pure mathematics	13.6
MSXR209	Mathematical modelling	9.14
MT365	Graphs networks and design	6.79
M337	Complex analysis	6.53
MS324	Waves diffusion and variational principles	5.74
MST322	Mathematical methods and fluid dynamics	5.74
M336	Groups and geometry	4.96

Using CHASE, we could quickly find the percentages of students taking particular combinations of courses, as shown in Table 4 (for science backgrounds) and Table 5 (for maths backgrounds). This analysis shows that large numbers of students are potentially at risk. Around a quarter have no physics or astronomy credits with the Open University, and a similar percentage have no maths credits (around 12 % have neither). Of course, we would expect some of these students to have suitable backgrounds from other sources, but we have no way of determining this from the data available to us.

Other students have taken OU courses, but not at an appropriate level: around 4.7 % have Astronomy credits at Levels 1 or 2 but do not have the recommended physics background and around 12.5 % have lower level maths credits but have not passed either of the main second-level maths courses, MST209 or M208. Finally, some students have barely scrapped through recommended prior courses. Around 6.5 % have a bare pass in S207, and around 10.4 % have a bare pass in MST209 (around 2.6 % have bare passes in both). Such bare passes may indicate that students have struggled with important background material, and so are likely to struggle with any course that builds on it.

Table 4: Physics and Astronomy backgrounds of SM358 students.

Course combination	%
S207 (Grades 1-3)	45.4
S207 (Grade 4)	6.5
No Physics or Astronomy with OU	26.4
Astronomy at Level 1 but no higher Physics or Astronomy	1.6
Astronomy at Level 2 but no higher, and no Physics	3.1
Level 2 Physics (not S207) and no Level 3 Physics or Astronomy	1.0
Physics or Astronomy at Level 3, but no Physics at Level 2	15.1

Table 5: Mathematics backgrounds of SM358 students.

Course combination	%
MST209 (Grades 1-3)	45.2
MST209 (Grade 4)	10.4
No OU Maths courses	25.3
MST121, but no Maths at Level 2 or above	6.8
MS221, but no MST209, M208 or higher level Maths	5.7
M208 but no MST209 or Maths at Levels 3 or above	0.8
Maths at Level 3 or higher, but no Maths at Levels 1 or 2	5.7

Course success and failure results

Using CHASE, we explored the actual successes achieved by students with various backgrounds. Our aim in doing this was to get a better understanding of success criteria and to pass this information on to prospective students, allowing them to make better-informed course choices.

Figure 1 shows the SM358 course results for all students, with passes in black and non-passes results in grey. Students who sat the main exam are represented to the left of the vertical dashed line. Here, the histogram bars indicate passing grades (1—4), failure with the right to resit (Q) and failure with no right to resit (5E). Students who did not sit the final exam are represented to the right of the vertical dashed line. Here histogram bars indicate students who deferred until the resit exam (X), and students with good TMA results (5G), bad TMA results (5B) and no TMA results (5Z). Students represented in the bar labelled 5G would have been able to pass the course if they had sat and passed the exam; those represented in the bars labelled 5B and 5Z would have failed the course even if they had sat and passed the exam.
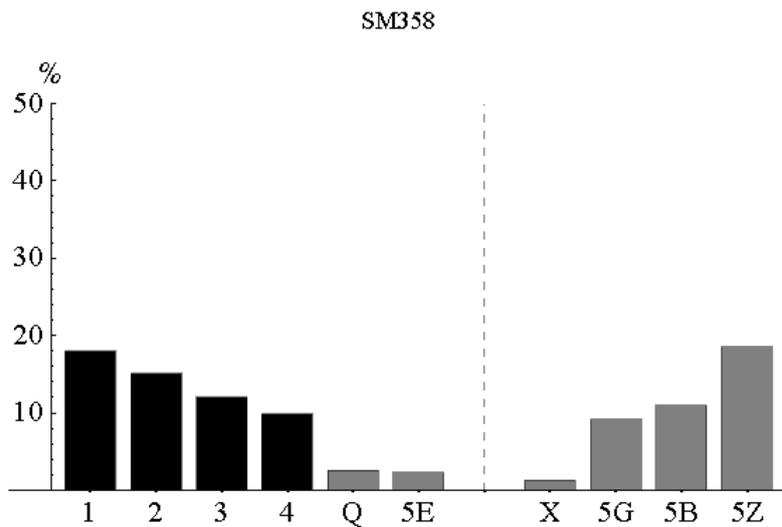
SM358

Figure 1: Overall course results (383 students).
Retention rate = 60.1 %, Pass rate = 55.1 %, Grade 1 rate = 18.0 %.

CHASE was designed to produce similar histograms for subsets of students with particular prior course backgrounds. Figure 2 shows the results achieved by students with no Open University maths credits and Figure 3 shows the results achieved by students with no Open University physics or astronomy credits.
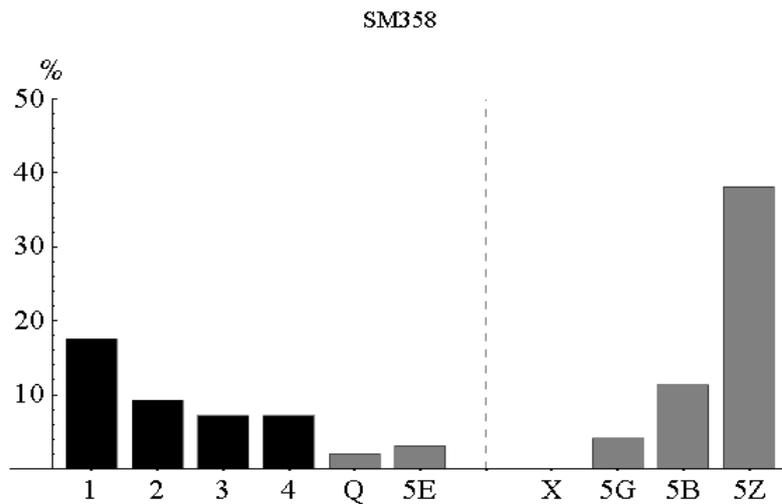
SM358

Figure 2: No Open University maths courses (97 students).
Retention rate = 46.4%, Pass rate = 41.2 %, Grade 1 rate = 17.5 %.

SM358
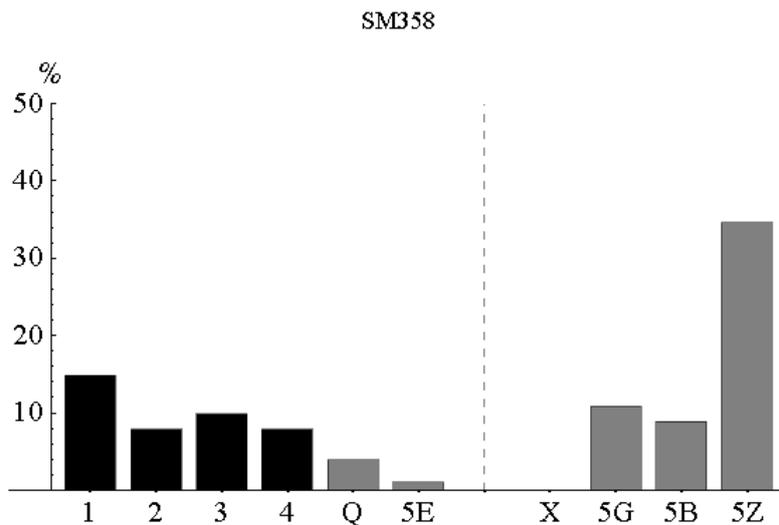
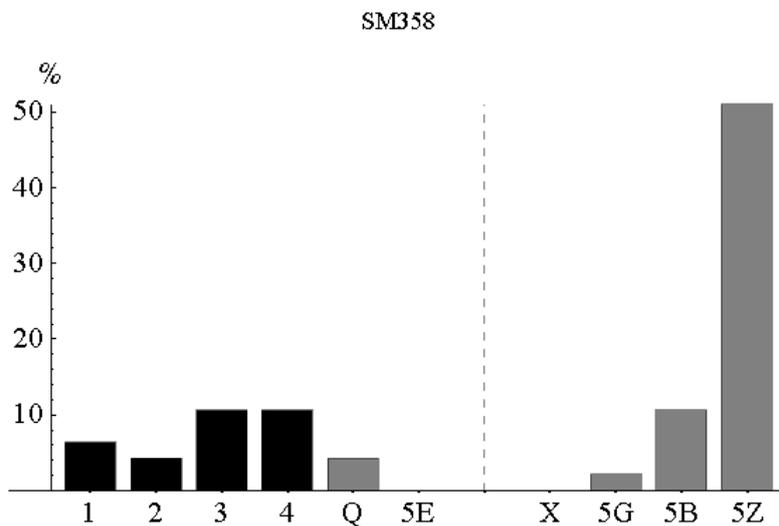**Figure 3**: No Open University physics or astronomy courses (101 students).
Retention rate = 45.5 %, Pass rate = 40.6 %, Grade 1 rate = 14.9 %.

In both cases, the retention and pass rates are significantly down compared to the overall performance of Figure 1, but the Grade 1 rates are not very different.
This is probably because the groups represented in Figures 2 and 3 are very diverse. Some students will have gained a good background from outside the OU, and we would expect many of these students to do well and even obtain Grade 1's. However, many students will have had inadequate preparation, leading to a low retention rate. Students who have no Open University Maths, Physics or Astronomy courses fare even worse, as shown in Figure 4.

SM358

Figure 4: No Open University Maths, Physics or Astronomy courses (47 students).
Retention rate = 36.2 %, Pass rate = 40.6 %, Grade 1 rate = 6.4 %.

While it is important to prepare for SM358 by taking appropriate prior courses, Figures 5 and 6 show that bare passes in either S207 or MST209 are strongly negative indicators. The high numbers of students in categories 5B and 5Z in these cases suggests that many of students with bare passes struggle with the course material of SM358. This is not surprising because a bare pass in S207 or MST209 is likely to signify difficulties with the concepts and techniques that underlie SM358. None of these students get Grade 1 in SM358, and it is perhaps remarkable that a few get Grade 2 or 3.
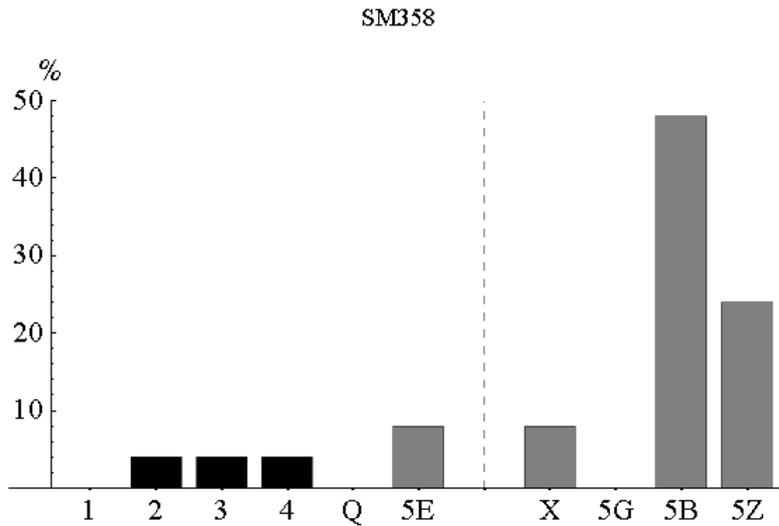
SM358

Figure 5: S207 at Grade 4 (25 students).
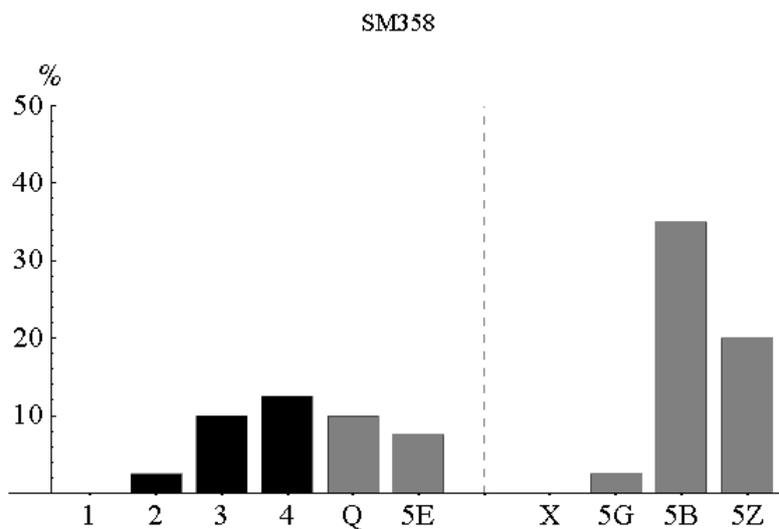Retention rate = 20 %, Pass rate = 12 %, Grade 1 rate = 0 %.

SM358

Figure 6: MST209 at grade 4 (40 students).
Retention Rate = 42.5 %, Pass rate = 25 %, Grade 1 rate = 0 %.

Such unpromising behaviour can be contrasted with the success achieved by students who have good passes (Grades 1—3) in both S207 and MST209 (see Figure 7). These students are generally well prepared for SM358, and although the Grade 1 rate is not much greater than for the overall course population, the sum of the Grade 1 and Grade 2 rates is significantly increased. We conclude that having Grades 1—3 in both S207 and MST209 is a clear positive indicator for success. Nevertheless, it would not be sensible (either morally or economically) to attempt to restrict access to the course to these students because they account for only 27 % of the course population and 37% of the passes. The majority of passes come from students with apparently less favourable backgrounds.
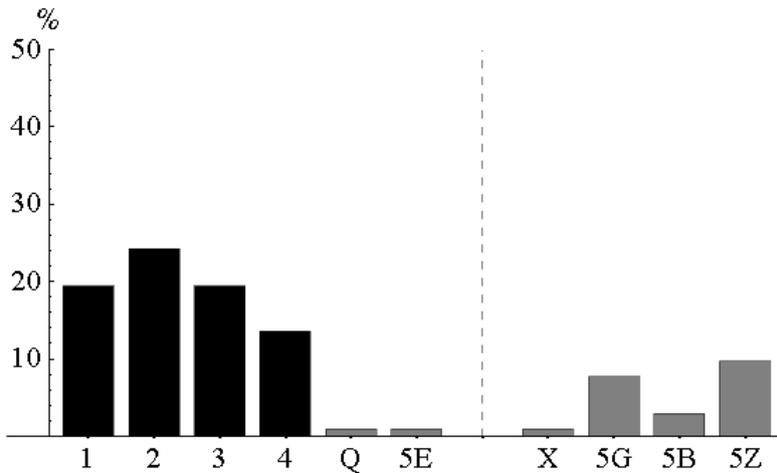
SM358

%

50

40

30

20

10

1 2 3 4 Q 5E   X 5G 5B 5Z

Figure 7: Good passes (Grades 1—3) in both S207 and MST209 (103 students). Retention rate = 78.6 %, pass rate = 76.7 %, Grade 1 rate = 19.4 %.

A more complete picture of the effect of grades obtained in S207 and MST209 on pass rates in SM358 is shown in Table 6. The number of students in each case is shown in brackets, so some results are not statistically significant, but this is something that will improve in future years when we pool data from different presentations of the course.

Table 6: Pass rates in SM358 for different combinations of course grades for S207 and MST209. In each case, 0 corresponds to the absence of a pass, whether the course was taken or not.

	S207[1]	S207[2]	S207[3]	S207[4]	S207[0]
MST207[1]	95.8 % (24)	80.0 % (5)	100.0 % (1)	-- (0)	79.4 % (34)
MST207[2]	68.8 % (16)	86.7 % (15)	83.3 % (6)	0.0 % (1)	64.7 % (17)
MST209[3]	50.0 % (8)	73.3 % (15)	53.3 % (13)	40.0 % (5)	53.8 % (13)
MST209[4]	0.0 % (2)	44.4 % (9)	28.6 % (14)	10.0 % (10)	20.0 % (5)
MST209[0]	94.4 % (18)	50.0 % (16)	8.3 % (12)	0.0 % (9)	42.6 % (115)

This table suggests other ways of specifying positive criteria. For example, MST209 at Grade 1—2 is strongly positive whether S207 is taken or not. Also, S207 at Grades 1—2 is strongly positive, provided cases with MST209 at Grade 4 are excluded. Figures 8 and 9 show the histograms corresponding to these criteria. From the nature of the material in SM358, we think it very likely that students passing SM358 without any OU maths credits will have studied maths elsewhere. The situation is less clear cut for students without any OU physics or astronomy credits, as it may be possible to complete most of the assessment of SM358 by treating it as a course in applied mathematics.
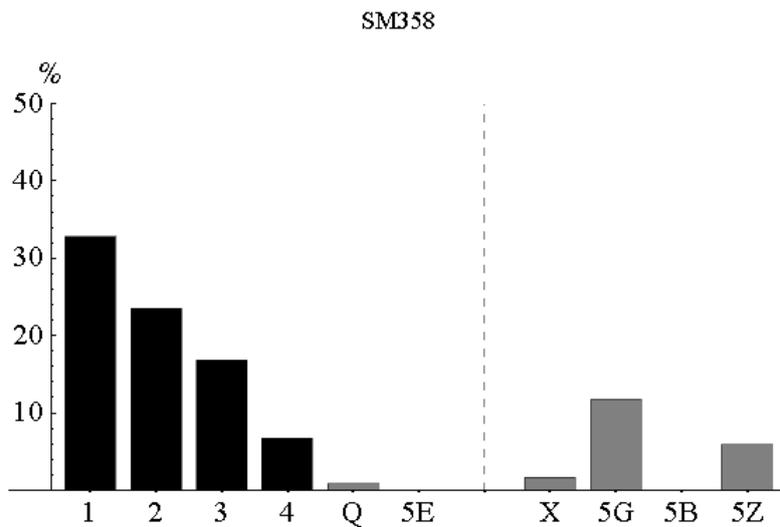
SM358

Figure 8: MST209 Grades 1—2, irrespective of S207 (119 students). Retention rate = 80.7 %, Pass rate = 79.8 %, Grade 1 rate = 32.8 %.
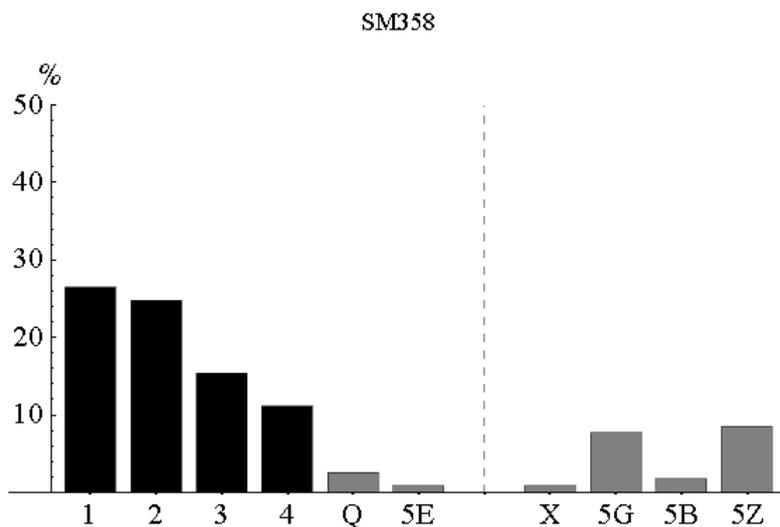
SM358

Figure 9: S207 Grades 1—2 and no MST209 Grade 4 (117 students). Retention rate = 81.2 %, Pass rate = 77.8 %, Grade 1 rate = 26.5 %.

We now consider indicators extending beyond the strongly recommended prior courses, S207 and MST209. It is important to do this because of the wide breadth of student backgrounds on SM358. Although many students ignore our advice, it would be useful to have a wider set of backgrounds that can be recommended, and to communicate even more strongly which backgrounds are highly risky.

For students who do not have the recommended good pass in MST209, it is interesting to see if any alternatives can be recommended. Figures 10 and 11 suggest that a Grade 1—2 pass in MS221 may be sufficient, but a Grade 3—4 pass is not.
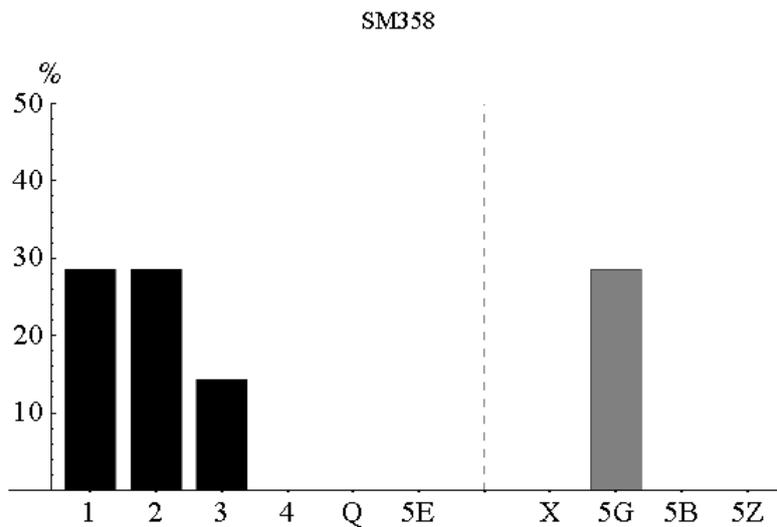
SM358

Figure 10: MS221 at Grades 1—2 and no higher maths (7 students)
Retention rate = 71.4 %, pass rate = 71.4 %, Grade 1 rate = 28.5 %.
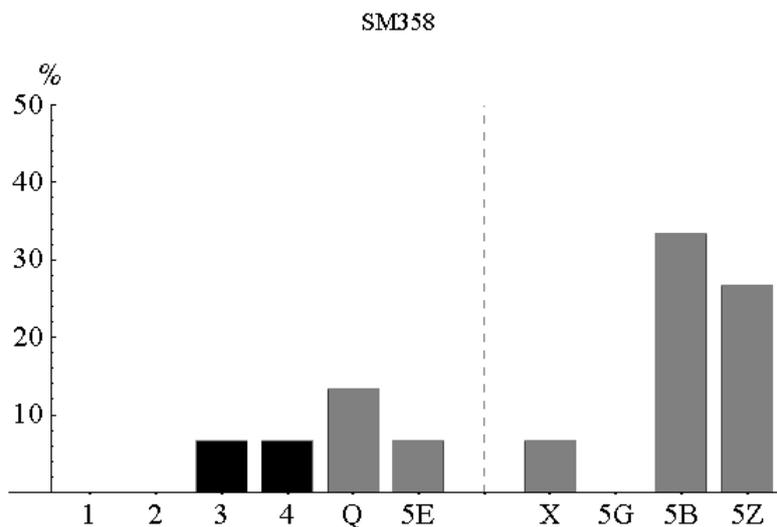
SM358

Figure 11: MS221 at Grades 3—4 and no higher maths (15 students).
Retention rate = 33.3 %, Pass rate = 13.3 %, Grade 1 rate = 0 %.

These results are obtained from a small subset of students so they may not be reliable, but if they pass the test of time, they suggest that the mathematical facility demonstrated by a very good pass in MS221 may compensate for a lack of knowledge of advanced mathematical techniques. This is plausible because most of the advanced mathematical techniques used in SM358 are taught concisely within the course. While it would be advantageous to see these techniques for the second time around, it may be possible for very able students to pick them up from a first reading.

We can also ask whether the second-level pure maths course M208 is an adequate substitute for MST209. Figure 12 shows results for students who have taken M208, but have not taken any other Level 2 or Level 3 maths courses beyond MS221. The numbers are again small, so it is too early to draw definite conclusions. We may tentatively say that these students seem to drop out or do very well. It may be that pure maths students have difficulties making the cultural transition to either applied maths or physics, but that those who become acclimatised tend to do well.
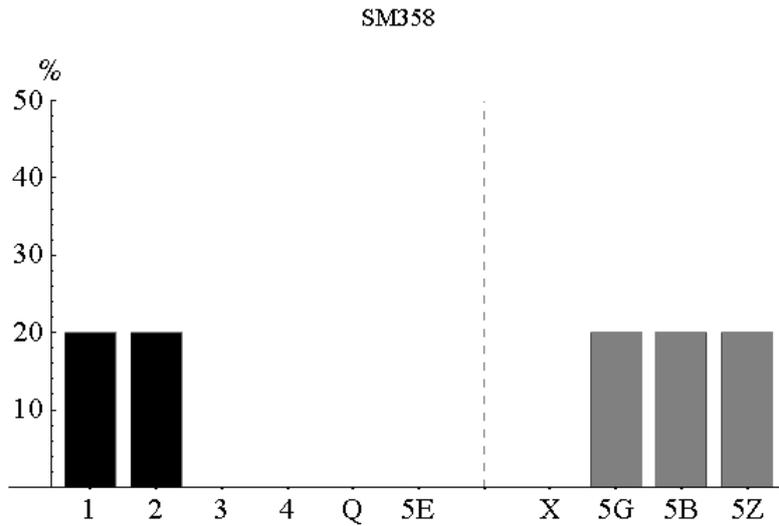
134

SM358

Figure 12: M208 but no MST209 or Level 3 maths (5 students)
Retention rate = 40 %, Pass rate = 40 %, Grade 1 rate = 20 %.

For students who do not have a credit in S207, we can ask whether other physics, astronomy or applied maths courses can provide suitable alternatives. Looking at the results in Figures 13 and 14 we can see that other physics, astronomy or applied maths credits at Level 3 are positive indicators, even in the absence of S207.
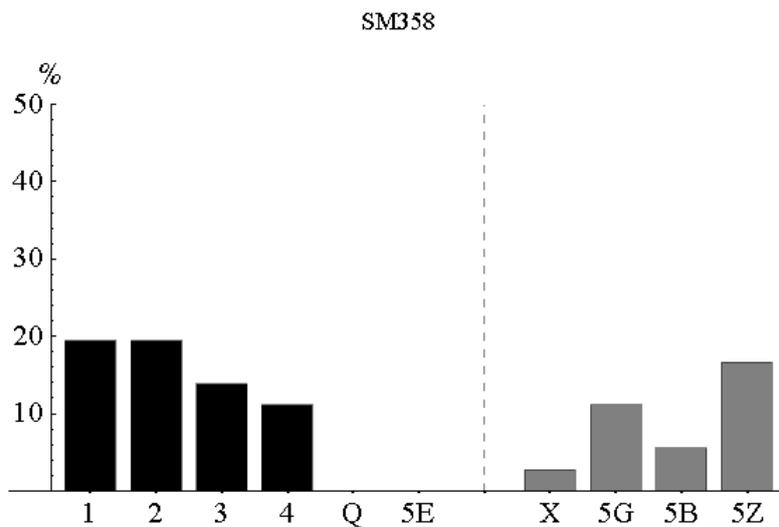
SM358

Figure 13: Physics or astronomy at Level 3, but no S207 and no maths at Level 3 (36 students). Retention rate = 63.9 %, Pass rate = 63.9 %, Grade 1 rate = 19.4 %.
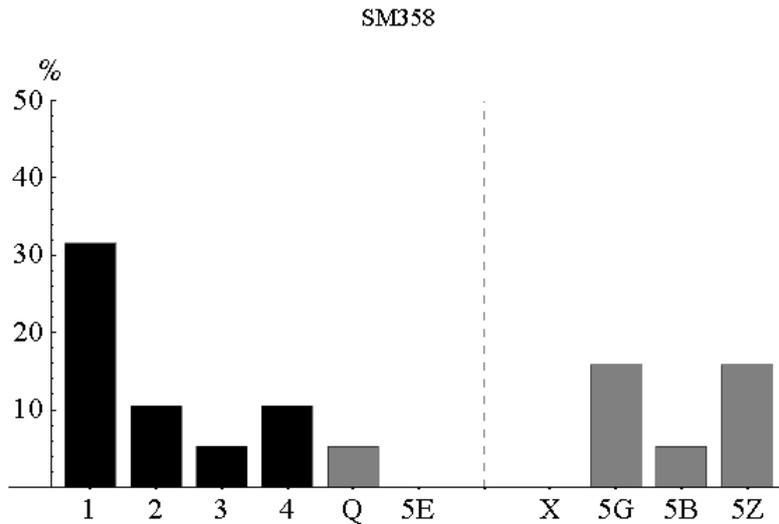
SM358

Figure 14: Applied maths at Level 3, but no physics or astronomy at Levels 2 or 3 (19 students). Retention rate = 63.2 %, Pass rate = 57.9 %, Grade 1 rate = 31.5 %.

Figure 15 shows that physics or astronomy credits at Level 2, without S207 or physics or astronomy at Level 3 leads to better results than the complete absence of physics and astronomy (cf. Figure 3). Also, Figure 16 shows that pure maths at Level 3, without physics or astronomy at Levels 2 or 3, and without applied maths at Level 3, leads to less satisfactory outcomes. Here, the situation is reminiscent of the discussion around Figure 12 for S208 and may again illustrate a cultural gap between pure maths and physics, astronomy and applied maths.
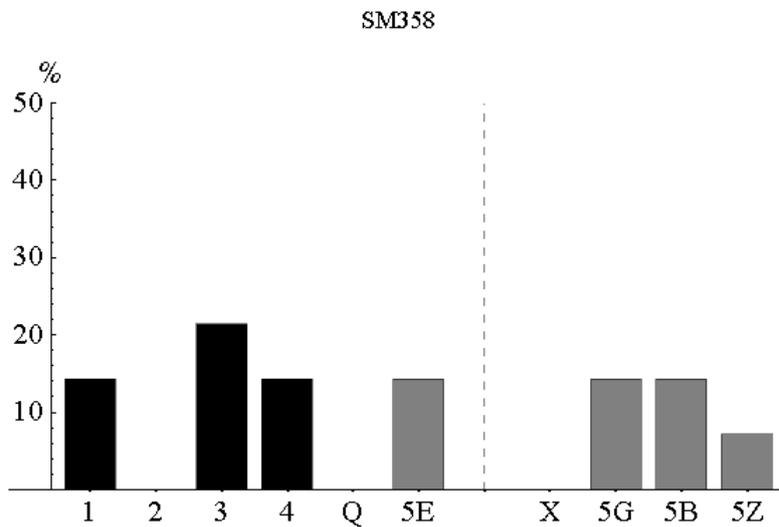
SM358

Figure 15: Physics or astronomy at Level 2, but no S207 and no physics, astronomy or maths at Level 3 (14 students).
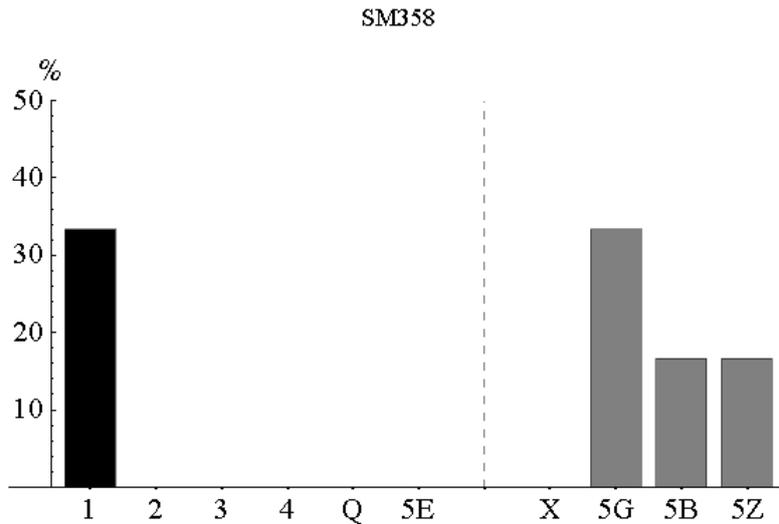Retention rate = 64.3 %, Pass rate = 50.0 %, Grade 1 rate = 14.2 %.

SM358

Figure 16: Pure maths at Level 3, but no physics, astronomy at Levels 2 or 3 and no applied maths at Level 3 (6 students).
Retention rate = 33.3 %, Pass rate = 33.3 %, Grade 1 rate = 33.3 %.

The course population of SM358 is almost equally divided between those who have already completed a Level 3 physics, astronomy or maths course, and those who have not. The step from Level 2 to Level 3 is a significant one, especially in a hierarchical subject like physics. We would therefore expect it to be advantageous to tackle other cognate Level 3 courses before taking SM358. This expectation is confirmed by Figures 17—19.
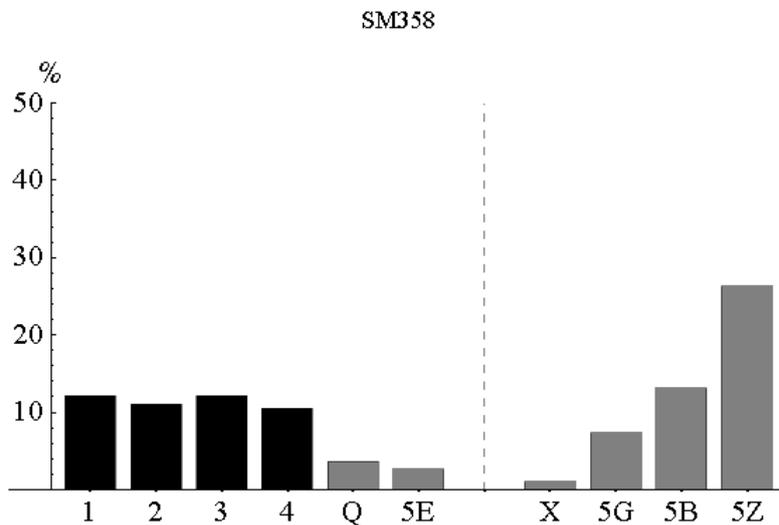
SM358

Figure 17: No Level 3 physics, astronomy or maths courses (190 students).
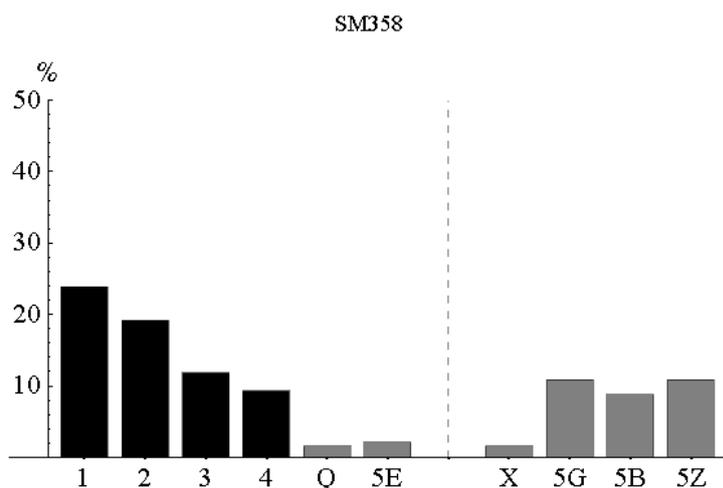Retention rate = 52.1 %, Pass rate = 45.8 %, Grade 1 rate = 12.1 %.

SM358

Figure 18: At least one Level 3 physics, astronomy or maths courses (193 students). Retention rate = 67.9 %, Pass rate = 64.2 %, Grade 1 rate = 23.8 %.

SM358
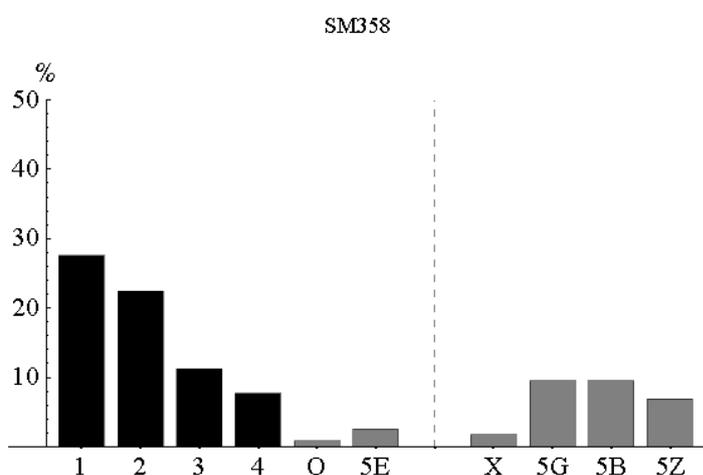
Figure 19: At least two Level 3 physics, astronomy or maths courses (116 students). Retention rate = 72.4 %, Pass rate = 69.0 %, Grade 1 rate = 27.6 %.

Concurrent courses

CHASE also allows us to track the success of students who take other courses, concurrent with SM358. Table 7 shows Retention rates, Pass rates and Grade 1 rates for students taking various numbers of concurrent CATS points.

Table 7:   Retention rate, Pass rate and Grade 1 rate for students studying various numbers of concurrent points

concurrent points	Retention rate (%)	Pass rate (%)	Grade 1 rate (%)
0 (168 students)	64.3	60.7	19.0
30 (128 students)	57.8	51.6	14.8
60 (50 students)	64.0	56.0	28.0
90 (32 students)	40.6	37.5	6.3
120 (4 students)	75.0	75.0	50.0
180 (1 student)	0.0	0.0	0.0

Clearly, no firm rules can be drawn up because the study opportunities of individual students vary so greatly. There is some indication studying concurrent courses tends to produce lower retention and pass rates, but the enhanced Grade 1 rate for students taking 60 concurrent points may indicate that can be offset by the fact that the more able and committed students tend to take more courses simultaneously.

We also compared the pass rates on SM358 with the pass rates on the most common concurrent courses for the subgroup of students who took both courses concurrently. The results are shown in Table 8.

Table 8: Pass rates on concurrent courses compared with those on SM358 for the subgroup of students taking both courses.

Course concurrent with SM358	No. of shared students	Pass rate on concurrent course (%)	Pass rate on SM358 (%)
S357	106	54.7	56.6
SXP390	38	52.6	55.3
MST322	33	24.2	39.4
M337	17	52.9	58.8
M381	15	40.0	53.3
T356	13	76.9	53.8
MST209	13	46.2	53.8

SM358 compares favourable with most courses except for T356, *Engineering small worlds: micro and nano technologies*. This is interesting because the two courses share a common domain of interest, but the mathematical and technical demands of SM358 are inevitably much greater. It is also worth noting that MST322, *Mathematical methods and fluid mechanics*, seems to be a poor fit for SM358, as students studying both courses together tend to do badly in both. We conjecture that the fit between MST322 and SMT359, *Electromagnetism*, would be much better.

Summary and outlook

We have developed a computer tool, CHASE, that allows us to explore the influence of different prior course results on success or failure in a given course, and applied this tool to SM358, *The Quantum World*. CHASE contains much hidden code, but at the point of application, it is designed to be quick and easy to use. This is essential so that many different combinations of prior course backgrounds can be explored in the search for significant patterns. To illustrate this point, all the histograms presented in this paper were produced by the following instructions:

```
SubHistogram[All]

SubHistogram[M[0]]

SubHistogram[PA[0]]

SubHistogram[PAM[0]]

SubHistogram[S207[4]]

SubHistogram[MST209[4]]

SubHistogram[S207[1,3] && MST209[1,3]]

SubHistogram[MST209[1,2]]

SubHistogram[S207[1,2] && !MST209[4]]

SubHistogram[Isolated[MS221[1,2], M2Codes] && M348[0]]
```

```
SubHistogram[Isolated[MS221[3,4], M2Codes] && M348[0]]
SubHistogram[M208[1,4] && MST209[0] && M348[0]]
SubHistogram[PA3[1,4] && S207[0] && M348[0]]
SubHistogram[M3Applied[1,4] && PA23[0]]
SubHistogram[PA2[1,4] && S207[0] && PAM3[0],SM358]
SubHistogram[M3Pure[1,4] && PA23[0] && M3Applied[0]]
SubHistogram[PAM3[0]]
SubHistogram[PAM3[1,4]]
SubHistogram[Many[PAM3[1,4],2]]
```

For SM358, some clear positive indicators that emerged were:

- Grades 1—3 in both S207 and MST209;

- Grades 1—2 in MST209, irrespective of S207;

- Grades 1—2 in S207, in the absence of MST209 at Grade 4 (although it must then be presumed that mathematical skills come from elsewhere);

- Passes in physics, astronomy or maths courses at Level 3. The outlook is even better if two or more of these courses are passed.

It is also important to note that Grade 4 passes in MST209 or S207 are strongly negative indicators. More tentatively, our results suggest that Grades 1—2 in MS221 can compensate for the lack of S207 and Level 2 physics or astronomy courses can compensate for the lack of S207.

There is some evidence that students who take no other courses alongside SM358 tend to do better than students who take other courses concurrently. This issue is strongly connected to the time available for study, which is very variable between students, so no strong recommendations can be made. We can say, however, that the fluid mechanics course MST322 appears to be a poor fit for SM358.

While these conclusions are of interest to prospective students and course advisors, our ultimate aim is to give students direct access to the histograms so that they can judge their own chances of success. We have recently secured agreement for this to happen in the 2011 presentation of all Level 3 Physics and Astronomy courses. Students will have access to a website where they can input their own grades for prior courses, and see how students with similar backgrounds have done in the past. The website will include a feedback section so that students can tell us whether the histograms have helped their course choice decisions. We will also track the students who have visited the website and compare their performance with the rest of the student cohort. When this pilot had been evaluated, we hope to extend the CHASE software to cover more courses in the Science faculty and across the University.

Finally, it is worth noting that a number of improvements have recently been made to SM358, including the provision of interactive computer marked questions, screencasts and *Elluminate* tutorials. Some of these measures may affect the ability of students at the margins to pass the course, so we will have to check whether our general conclusions remain unchanged or whether the new improvements make SM358 behave like a different course. In the absence of any significant changes in behaviour, we will able to pool data from different presentations to sharpen some our more tentative conclusions.

Developing a Physics and Astronomy web site for students

Dave Edwards

28 November 2008

Abstract

A website has been developed to support Open University physics and astronomy students throughout their studies. This is live for registered students at http://learn.open.ac.uk/site/PHYSICS-ASTRONOMY and is proving popular, with the average visit lasting more than 18 minutes. The site provides information about physics and astronomy courses and qualifications, study advice, student experiences in video form, access to information about the Department of Physics and Astronomy, links to relevant outside organisations, careers information with links to careers advice, and a wealth of resources related to physical science.

Introduction

The challenge of maintaining and even boosting student retention through a whole programme of study is an important issue for the Open University, especially in light of the government's ELQ policy. The challenge will be even greater in the future, since there are likely to be fewer opportunities for face-to-face meetings between students and Associate Lecturers, especially on higher-level courses. The Physics and Astronomy Department offers a complex mix of qualifications and courses, interfacing with qualifications and courses from other parts of the University. Personal interactions play an important role for many students as they select future courses, and maintain their motivation to study.

A website has been developed for students studying physics and astronomy courses with the Open University. The aims of the site are to support students throughout their studies of these subjects, and to enhance the sense of community between students and the Department of Physics and Astronomy. The Physics and Astronomy student website aims to become a site that students will return to regularly throughout their studies, with a community aspect. It should encourage students to take further courses in physics and astronomy, and help them succeed in their study and career goals.

The work on developing the website was carried out from June 2007 to September 2008.

Related web sites

There are several existing websites describing the research and teaching of the Department of Physics and Astronomy and the Science Faculty. Students may access these sites but the content is not specifically aimed at students. The University's online prospectus provides details of *all* courses and study programmes, and the StudentHome pages of the University website provide access to generic study support information and OU news. However, physics and astronomy students need to search for relevant information amongst a vast amount of information that is not necessarily relevant to their study area.

Programme websites were recently developed for Chemistry and Social Science students, and the general content of these sites was used to guide the initial development of the Physics and Astronomy (P&A) student site. As part of the University's move towards promoting programme-based study and student support, websites with similar aims are being constructed for programmes of study across the University.

The tools used

The P&A website was developed within the Open University's Moodle framework. This has the advantage that the general style of the web pages should be familiar to students because individual course websites use Moodle pages. Video editing was done using Serif Movie Plus 5, which proved very easy to use.

Site content

The plan was to provide

- descriptions of individual courses and the qualifications in which they can be included;

- guidance on the suitability of courses;

- material to help students progress from one course to the next;

- information about the residential school courses;

- information about postgraduate study;

- other useful resources, to encourage students to return to the site regularly.

During the building of the site, improvements to the online prospectus made detailed descriptions of courses and qualifications much less relevant, so this material was mostly taken out.

A number of short video statements from students were incorporated in the site. These allow other students to sample the views of their peers about courses, credit transfer arrangements and career plans.

Material to help students progress from course to course is provided in the form of mathematics material from the Level 1 Science Short Courses and the Level 2 S207 Maths Handbook.

Other physical science material is being developed by Associate Lecturers as part of a PILS project and may be available for use on this site later.

There are links to information about the MSc degrees in medical physics and in science, and to the Department's research activities.

A gallery of photographs of Associate Lecturer and Study Adviser, with brief notes about the courses they tutor and their other interests, is provided on the site. There is also a link to the website for Fusion (the student-run Physics and Astronomy Society).

Links are provided to the wider physical science community – including the Institute of Physics and physicsworld.com websites, the Royal Astronomical Society, and lists of local astronomical societies.

Links are also provided to a variety of external resources – including national and international laboratories, observatories and research organisations, tools for practical astronomy, astronomy magazines, physics blogs, and a physics cartoon.

The site also includes a careers section. This part of the site was developed as part of a PILS project. It offers access to the Institute of Physics and the OU Careers Advisory Service sites, along with well over one hundred career case histories provided by alumni.

Development process

Initially, the project aimed to replicate and adapt the Chemistry programme website for students. However, it took some months to obtain server access and when server access was obtained it was to the new Moodle facilities. These offer a fairly restricted web page layout and so the structure of the site had to be entirely different to the Chemistry site.

Several students volunteered to record video statements about their experiences. These video clips were edited and uploaded to the site in the Windows .wmv and Quicktime .mov formats, along with transcripts, to maximise accessibility.

Discussions were held fairly late in the project with Eleanor Crabb and Sarah Davies to help achieve commonality with other science programme websites.

Course chairs and course managers were consulted to obtain appropriate preparatory materials, and they also helped in contacting associate lecturers in order to obtain photos and information about course tutors and study advisers.

Valuable help with the careers pages was provided by Katherine Davison of the Alumni Office and Ellen Cocking of the Careers Advisory Service.

Some interactive facilities were incorporated in the site. There is a wiki on the Observers' page where students can exchange ideas about astronomical observing, a forum in the *Careers* area, and in the *Your ideas and feedback* area there is a wiki for building new resources along with a more conventional feedback form. There is also a link to an OU wiki about events in Second Life, where some physical science discussion has been held and tasks are being carried out.

Use of the site

Feedback from students has been very limited, with students mostly gaining access only close to the end of the project. One student has requested extra maths support, and so far the other interactive elements have not been used.

In October 2008, 1224 students had access to the site. 778 of these (67.3%) visited the site (on average 1.3 times). Although many visits were simply brief looks, more than 26% of the visits lasted longer than one hour. Also, more than 45% of visits lasted between 30 seconds and 15 minutes. The statistics provided by Moodle have limited time resolution, so working out an average length of visit cannot be done very precisely. However, the average visit to the site has a minimum value of 18 minutes, and it may be rather longer. So far the most popular page is *Your physics and astronomy pathway* (435 visits). The next most popular pages are *Can I study Astronomy?* (169 visits), *Extra study skills* (138) and *Residential schools* (92). The collection of careers pages had 19 visits (but note that these pages were still under development throughout October).

The most popular downloads were the various maths skills books (a total of 125 downloads), followed by a video of a student discussing the first night at the SXR208 residential school (32 visits), and a video of a student describing his degree profile for going into teaching physics (30). More detailed statistics on the use of the site, access to individual pages and numbers of downloads, extracted from the Moodle system, are provided in the Appendix.

Dissemination

The work on developing the site was described at the Physics Higher Education Conference of the Higher Education Academy, in Edinburgh on 4th September 2008. The Academy has published a summary of the presentation in the conference proceedings, available on their

website (http://www.heacademy.ac.uk/physsci/publications/conferenceproceedings). The collection of alumni career experiences attracted particular interest, with several people expressing a desire to see it made openly available on the internet. The work on the careers section has been described in a report to PILS, and this should be available on the PILS website in due course.

Conclusion

The Physics and Astronomy web site for students is proving to be very interesting to Open University students studying physical science courses. This is demonstrated by the considerable amount of time they have devoted to studying the content and by the large proportion of P&A students who have visited the site. Students seem particularly interested in the information about degree pathways and about studying astronomy. In terms of study skills they are particularly looking for help with maths.

Appendix

Physics and astronomy web site - statistics for April to October 2008

Student usage	April	May	June	July	August	Sept	Oct
Registered students	19	21	60	135	205	545	1224
Unique students	2	7	42	81	96	378	778
Unique students / %	10.5	33.3	70	60	46.8	69.4	63.6
Visits	9	10	60	109	125	507	997
Visits per student	4.5	1.4	1.4	1.3	1.3	1.3	1.3
Duration of visits / %							
0-30s	88.9	20.0	10.0	24.8	21.6	20.3	22.2
30s-5m	11.1	30.0	53.3	45.0	28.8	40.0	33.4
5m-15m	0.0	0.0	15.0	11.0	11.2	12.6	11.8
15m-30m	0.0	20.0	6.7	4.6	4.8	4.3	4.1
30m-1h	0.0	10.0	6.7	2.8	4.0	2.6	2.2
>1h	0.0	20.0	8.3	11.9	29.6	20.1	26.3
Total viewing times *							
time / min	0.5	182	541	1030	2548	7258	17759
time / hour	0	3	9	17	42	121	296
Average viewing time per visit *							
time / min	0.06	18	9	9	20	14	18

* calculated from minimum recorded viewing times

Most popular pages

rank	page	visits
1	Your physics and astronomy pathway	435
2	Can I study astronomy?	169
3	Extra study skills	138
4	Residential schools	92
5	Can I study physics?	83
6	OU physical science community	79
7	Postgraduate study	77
8	Careers	74
9	BSc in Physical Science	72
10	Physical science community and resources	65
11	Physics and astronomy courses within an Open degree	59
12	Undergraduate physics and astronomy courses	42
13	Ideas and feedback	36
14	Can I study medical physics?	30
15	Course workload	30

Most popular downloads

rank	download	number
1	ebook_s207_maths-handbook_e4i1_s	62
2	ebook_s180_mathsskillsbooklet_e3	46
3	Tony-FirstNight-SXR208.wmv	32
4	paulgooch-degree-profile.wmv	30
5	maths-skills.pdf	25
6	Paul-OpenAndPhysSci.wmv	20
7	maths-skills.pdf	17
8	John-SXR208teamwork.wmv	15
9	Paul-degree-profile_1.mov	12
10	Tony-FirstNight-SXR208.mov	10