

USING WEBCT WITH AN OFF-CAMPUS DIAGNOSTIC ULTRASOUND COURSE

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ABSTRACT

Monash University in Melbourne, Australia, offers a Graduate Diploma in Medical Ultrasound by off-campus distance learning (DL). These DL students are required to study under significantly different circumstances than on-campus students. They miss the social and educational advantages of mixing with both their fellow students and their lecturers and tutors. In an attempt to compensate for this lack of personal interaction the academic staff involved in conducting DL courses need to find ways to encourage other forms of effective and efficient communication. In this paper we will describe the manner in which communication with these DL students is maintained, specifically in one subject in this Graduate Diploma, SON4000: Physics of Medical Ultrasound and Instrumentation. A decision was made early in 2003 to use WebCT to enhance lecturer-student and student-student communication and provide additional support to the students. We briefly describe the particular WebCT tools that we have specifically chosen to support SON4000. We discuss the initial cost to staff in setting WebCT up for a subject like SON4000, the perceived long term benefits to the teaching staff, and most importantly, the reactions and responses of the students in accessing the WebCT site and contributing to the various communication options. A summary of the WebCT student-tracking data and the use of the mid-semester evaluation survey is presented.

KEYWORDS

Distance learning, flexible learning, online teaching, WebCT

INTRODUCTION

The aim of this paper is to illustrate the manner in which lecturing staff attempted to make the staff-student and student-student interaction more effective for an online, off-campus distance learning (DL) subject using WebCT. The subject, SON4000 Physics of Medical Ultrasound and Instrumentation, is one of 8 single-semester subjects offered by the Department of Medical Imaging and Radiation Sciences at Monash University that makes up the Graduate Diploma of Medical Ultrasound (GDMU). The GDMU course coordinator is P.C. This is a 2-year part-time course offered in DL mode only to off-campus students. These, generally mature-age students are normally already employed full-time and are working in the field of medical diagnostic imaging, radiography or related field, and most will have a formal qualification in radiography. In order to become accredited by the Australian Sonographer Accreditation Registry (ASAR) and pursue a career in diagnostic ultrasound (sonography), they must complete an additional qualification, either through their professional body, the Australasian Society for Ultrasound in Medicine (ASUM) or by a Graduate Diploma like that offered by Monash University.

This paper briefly describes the GDMU structure and then concentrates on the SON4000 subject and the manner in which this is presented. Topics covered in this paper include the SON4000 subject details, the timetable and assessment and the electronic support now provided by using WebCT (version 3.7). The tools used within WebCT are described and justified.

In order to assess the impact of the use of WebCT in SON4000, a systematic way of surveying students and evaluating the subject was planned and is discussed in this paper. The subject SON4000 currently

runs from mid-February to late-June, so a full analysis of the use of WebCT in this subject is not possible in this paper, but some preliminary results are included, and a more complete analysis and discussion will be presented during the CBLIS-2003 conference in July.

It is hoped that some of our experiences might provide both ideas and inspirations to staff thinking of supporting DL-type subjects/courses with online material, not necessarily restricted to the use of WebCT.

SUBJECT BACKGROUND

SON4000 is a first semester subject for students undertaking the GDMU, and is taught using a hybrid system of printed (core) and digital resource materials, supported by an online WebCT site. The part-time students normally enroll in 2 subjects in any one semester. SON4000 is normally taken in the first semester of the course along with an anatomy subject.

It is often the first time these DL students have been exposed to physics since leaving secondary school, and this compounds the difficulties of teaching off-campus DL mode. The remaining subjects, anatomy, pathology, physiology, ethics, etc. are seen by the students as more relevant to their normal workday activities of scanning patients.

When designing this subject, the primary motivation has been to use best practice theories wherever possible (Chickering & Gamson, 1987), and to develop a highly engaging and interactive subject with frequent feedback to students (Salmon, 2000) within a friendly environment. Many students undertaking this subject will have no previous experience with learning in a DL mode or with learning online, and are likely to face the normal issues for off-campus students of juggling work and family commitments with their studies (Evans, 1994). For these reasons it was considered of vital importance to begin their online experience in a supportive and nurturing environment.

Students enrolled in SON4000 are provided with a comprehensive set of printed notes (about 550 pages) prepared in late 2000 with assistance from staff in Monash University's Centre for Learning and Teaching Support (CeLTS). This material is based on ASAR requirements for graduates and includes physics and instrumentation components of 2 ultrasound subjects presented to on-campus students during the 3rd and 4th years of a 4-year degree, the Bachelor of Radiography and Medical Imaging.

In addition, the students receive 2 CDs; one containing similar material in a different, e-book, style, and the other an image processing program, Scion Image, plus relevant images, to assist them in a fuller understanding of the digital nature the ultrasound images and the kinds of image processing that can be achieved with today's modern scanners.

All students are encouraged to attend a 2-day, on-campus workshop in early May, but distance usually means that only a little over half of the students can attend.

PREVIOUS ELECTRONIC METHODS OF COMMUNICATION

SON4000 has been offered on two previous occasions; in 2001 (with 8 students), and in 2002 (with 12 students, 1 from overseas). In these two years the subject was generally well received from the limited feedback obtained. This year the subject has attracted 20 students from around Australia and overseas. When offered in 2001, conventional email was used to maintain contact with the SON4000 students. Being effectively a one-on-one form of communication this did not develop any real feeling of an online community, and also meant that in many instances the subject lecturer, P.W., answered the same sorts of questions from different students on subject content; not a very efficient process from the lecturer's viewpoint.

In 2002, communication included discussion group activity supported by the Monash portal (Kennedy et al, 2002). This portal system allowed greater flexibility but still had a number of shortcomings; the portal system seemed very slow to respond at times (even from within Monash), allowed only text-based material on the portal pages which meant that additional pages incorporating graphics and symbols (in equations, for example) had to be saved on a separate server with the attendant time delay until this was up-loaded by the network administrator.

The overall effect from the students' point of view was an improvement from 2001, but a rather disjointed presentation of supporting material. While more supporting information was provided, it turned out that little use was actually made of the discussion groups by the students. There was some lecturer-student interaction but no student-student interaction using the Monash portal.

SUBJECT DETAILS IN 2003

In preparing for the 2003, it was decided to change (rather later than ideal) from the Monash portal to WebCT in order to provide enhanced online student support for SON4000. In doing this, the other subjects in the GDMU also had WebCT pages generated, along with an additional page to provide information that was common across the range of subjects offered. The WebCT support for SON4000 subject is the most highly developed of all these sites and is the only one that is discussed in this paper. The other material provided, printed notes and the 2 CDs, were basically unchanged.

The scope of SON4000 includes the following topics:

- sound waves and the interaction of sound and matter
- piezo-electric transducers and focussing and steering the ultrasound beam
- ultrasound attenuation and the dB scale
- basic modes of diagnostic ultrasound, data acquisition and image display
- scan converters and resolution, digital images and image processing
- diagnostic ultrasound equipment and B-mode ultrasound artefacts
- continuous wave and pulse Doppler ultrasound principles
- spectral, colour and power Doppler ultrasound and Doppler ultrasound artefacts
- harmonic imaging and other advances
- biological effects of diagnostic ultrasound and testing of ultrasound equipment

The SON4000 subject commenced this year on 17 February. 20 students enrolled; 1 from overseas (New Zealand), 1 from the Northern Territory, 1 from Queensland, 5 from New South Wales and the remainder from Victoria. Bearing in mind the size of Australia some 'local' students are over 3000 km from Melbourne; the 'tyranny of distance' really does apply for many of these students.

SON4000 is delivered over a 16-week semester with the last week's topic ending on 13 June with a short revision period before the final examination in late June. This is similar to the previous two years. Each week is devoted to a single topic. Topics 1 – 11 are essentially on the physics and instrumentation of medical ultrasound, and Topics 12 – 16 concerned with the digital aspects of medical imaging in a more general manner. The assessment of the SON4000 subject is unchanged from previous years as:

- Final examination paper (3 hours) 55%
- 1500 word assignment 10%
- Workshop report 20%
- Computer imaging exercises 15%

In addition there are two 'hurdles' where students are required to undertake certain activities, but no mark is returned towards their final assessment. The first hurdle activity, in Week/Topic 7, is a test where students are required to identify 10 image artefacts in diagnostic ultrasound. The second hurdle, in Week/Topic 11, requires students to search for a web-site with an interesting feature related to recent advances in sonography and present a short discussion of that material.

The other activity is a 2-day workshop conducted on the Clayton (Victoria) campus in May. This allows all students to complete the first 11 topics prior to attending the workshop. The workshop is lead by an expert sonographer who picks out important elements of the subject, with particular emphasis on the link between the clinical/anatomical and physics/instrumentation aspects of diagnostic ultrasound, and demonstrates these ideas using modern ultrasound imaging scanners. In this workshop, students are required to repeat and extend these demonstrations. Images acquired during the workshop are provided (in electronic form) to all attendees for inclusion in a subsequent report.

Those students attending the 2-day on-campus workshop in previous years remarked on the additional value of the activity in getting to know their fellow students. Those students unable to attend are provided with the images as examples of the activities of the workshop, but are required to construct their report using ultrasound images acquired in their own workplace.

Following the workshop the students complete 5 computer imaging topics, where each topic has two short assessable exercises (each worth 1.5%) to be completed and returned in electronic form.

WEBCT USE IN 2003

In designing the SON4000 WebCT site a number of decisions were made, including use of a uniform set of icons, style and layout across all SON subjects in the GDMU. This was done in an attempt to make the navigation around these sites similar for students new to this type of communication. Many of the students indicated little or no experience with computers, so there was a real need to make the whole online experience as straightforward as possible.

What is WebCT? WebCT (for Web Course Tools) is an online information tool. It is essentially a structured layout of clearly labeled hyperlinks that link to a set of tools and pages. The links to subject pages are grouped within the subject WebCT site, and the student simply clicks on the icon/links to get to the information embedded. Certain links take the student to other screens with further links, some links display single pages.

Decisions made specifically with regard to SON4000 were: pages would be written in html to minimise download times for these off-campus students, all additional pages would be opened in a new window to decrease the possibility of students inadvertently closing the SON4000 web-site, a separate discussion group would be arranged for each topic, plus separate groups for the workshop and WebCT questions, all discussion groups would be public (one-to-many) and all WebCT Mail would be private (one-to-one). The tools used are basically restricted to single pages (including a Subject Information page as the first Homepage icon), the Calendar (to reinforce and correct where necessary the details in the subject printed material), Quiz and Survey links, and Assignment links.

To encourage appropriate use of the discussion tool, the lecturer posted the first message in each separate topic to demonstrate to students which topics to use for posting particular queries, and also, most importantly, to create a friendly online personality and hopefully break down some of the barriers to communication between strangers (Salmon, 2000).

The printed material included a “getting-to-know-you” questionnaire and students were encouraged to submit this electronically as an assignment within WebCT. The purpose was to provide familiarisation with electronic submission and to encourage later assignments and reports to be submitted electronically. This exercise was fairly successful with all but 3 of the 16 returned questionnaires being submitted electronically.

In the previous two years, the Topic 7 artefacts test was provided as a Word file on the CD, with responses being submitted in a range of ways. For 2003, the 10 images were presented using the Quiz format provided within WebCT. This was reasonably easy to set up as the basic data was in electronic form to start with, and this quiz is currently being attempted by the students. It is a ‘one attempt only’ quiz using predominantly a multiple-choice format, where students select the artefact name from a list

provided. The immediate feedback to the student using the WebCT Quiz was a strong incentive to use this form of testing.

Other uses of WebCT were in providing the previous year's examination paper (as a pdf document) hints to students on using WebCT, setting up their computer to accommodate the screen layout, and the use of student evaluation surveys within the Quiz and Survey tool. It was decided to conduct a mid-semester survey (to check on the way the students handled this supporting online technology) as well as a final evaluation survey just after the examination. In the previous two years the use of evaluation surveys in printed form following the exam had delivered 0 and 1 responses in 2001 and 2002 respectively.

We hoped that the use of a brief, but well designed, electronic mid-semester evaluation survey would bear more fruit for the final evaluation late in June. The first survey stressed to students the anonymity of the evaluation and the value we would place on all survey responses to improve the subject and its support for future students.

The SON4000 WebCT site, and the properties and use of the various tools and pages, will be described in some detail during the paper presentation.

STUDENT TIME COMMITMENT

Students are expected to devote about 3-4 hours per week to this subject. For each topic, students are provided with printed notes (between 5 and 25 pages), and a number of attached readings (up to about 20 additional pages). The notes also include worked examples, activities (with answers in relevant cases), points for reflection, plus a few "typical" exam questions and useful web-pages (URLs). A CD provides the same information presented in a slightly different way, using color where appropriate, and with a considerable number of multiple-choice questions for each topic.

STAFF TIME COMMITMENT

In 2001 (for 8 students) the lecturer spent typically 30 minutes per working day answering emails, letters and telephone calls in supporting students. This translates into about 2-3 hours per week which would be about the time devoted to conventional lectures and computer laboratory supervision for on-campus students. In addition to this was the considerable time spent in preparing the written notes and CD material with the assistance of CeLTS. In 2002 the weekly commitment for the lecturer (with 12 students) was similar; less time was devoted to basic material preparation but considerable time was spent coming to grips with the my.monash portal.

This year the time devoted to setting up the WebCT site amounted to about 1 full working week; attendance at a 2-day workshop in January to learn the basics of WebCT plus about a further 20-30 hours to get the SON4000 WebCT site in acceptable form (after a few abortive attempts!). In addition, it takes about the same 30 minutes per working day to attend to the questions and concerns of the 20 students using the Discussion Groups and WebCT Mail. It was made clear to students from the start that all contact had to be through WebCT unless they had real difficulties – in the end there were 2 phone calls and 1 conventional email only from students who were experiencing computer problems (not essentially associated with WebCT).

EVALUATION PLAN

As mentioned above, a decision to conduct a mid-semester student survey was made early on, in addition to the final survey following the exam in June. The key questions were listed as follows:

- Is transferring of the subject support to the WebCT platform achieving the intended effective contact with students while also improving efficiency in academic workload?
- If, so, is this likely to be a long-term benefit, or is it dependent on the current academic lecturer for SON4000?

- Do students feel they have sufficient personal interaction with their lecturer and with each other?
- Do students feel that the design of the subject has allowed them to achieve their maximum learning outcomes? If yes, how? If not, why?

The mid-semester survey is underway at the time of preparing this manuscript. It is 'time-stamped' within WebCT to operate between Weeks 7 and 8. This is another advantage of WebCT in that certain pages/tools/activities for the students can be designed, implemented and tested within the WebCT environment well before their intended use, and then only 'seen' by the students within specific time intervals.

The use of a 'dummy' WebCT student account has proved essential so that the designer/lecturer (the dummy!) can actually test out the various activities, as in some activities the student's view and what the designer can see are somewhat different.

EVALUATION METHODS

The methods for evaluation of SON4000 in 2003 are listed as follows:

- Monitoring of the online subject support (particularly discussions) by an external evaluator (D.W. from HEDU/CeLTS) in order to gain data on both staff-student and student-student interactions.
- Surveying students in mid-semester; again to seek information about the level of interaction and support, but also to gain data on subject design and online material (currently underway).
- Interviewing, on a regular basis (fortnightly) the academic in charge of the subject (P.W.) by the external evaluator to gain information on the level of interaction and to collate data on academic workload and efficiency. This also allowed time for some reflection on the whole process.
- Tracking the students' access to the online material and their Discussion Group and WebCT Mail postings. This was to be conducted on a weekly basis (although the first week's data was lost when the Monash ITS WebCT team 'reset' all WebCT sites just prior to the commencement date of the normal first semester teaching!).
- Discussing the online support provided with students during the workshop (for students able to attend), or by phone for those unable to attend.
- Surveying students directly after the examination in late June; asking questions on perceived learning outcomes, communication and support, as well as on the overall design of the subject.
- Analysing the final examination marks, and marks from other assessment components with the level of participation in the online Discussion Groups and other means of communication through the SON4000 WebCT site.

With the timing of the writing of this paper, the following sections and conclusions are necessarily tentative and incomplete, however, a more complete discussion will be presented during the conference.

TRACKING STUDENTS USING WEBCT

Of the 20 students who commenced this subject in February 2003, 19 still remain. Figure 1 shows the total number of 'hits' made by the students to the SON4000 WebCT site on a weekly basis (apart from week 1 – see the previous section). In addition, Figure 1 also shows the number of total discussion group items read during these site visits, and the number of discussion group items posted by students. On average there are currently (to the end of Week 9 following the Easter break) a total of over 1856 'hits'; an average of almost 93 per student, 1253 items read by students, and 36 postings, averaging around 2 for each student.

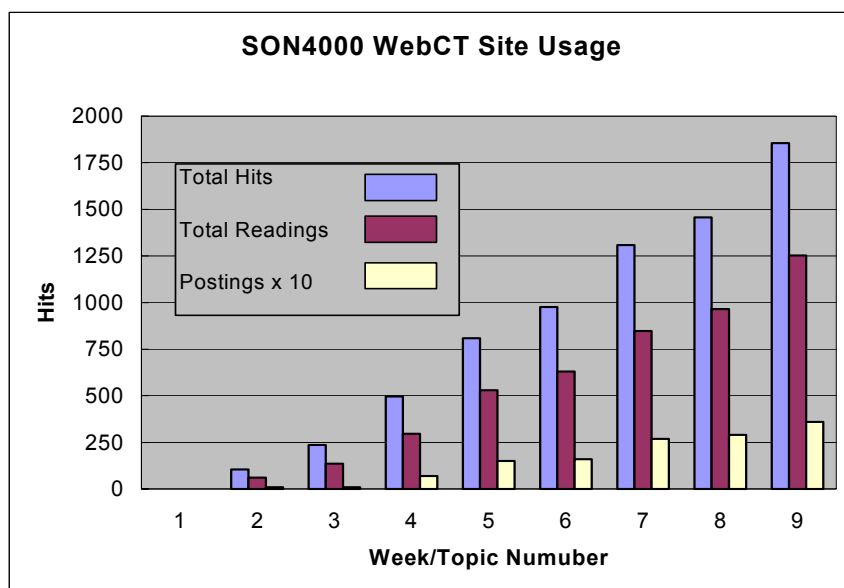


Figure 1. Summary of student access to the SON4000 WebCT site to Week 9

MID-SEMESTER SURVEY

The mid-semester survey comprised 10 multiple-choice questions and 3 short answer questions. The emphasis on this survey was to enquire whether students were comfortable with the online technology used in supporting SON4000; specifically the SON4000 WebCT site. Nearly half of the students had responded within 1 week of the survey being made available online. The questions and ‘average’ scores and additional comment are summarized in the Appendix.

DISCUSSION

The most important point to make is that the student use of WebCT in terms of access far exceeds that for the previous two years by way of electronic communication. However, based on the survey students obviously found the accessing and navigation around WebCT far more difficult than envisaged by the lecturer. This is put down partly to the printed notes not being up-dated in time to include specific details about how to access and use WebCT (the printed notes still contain details about the portal!).

There is no doubt that some technical difficulties were also experienced by students, and from earlier comments this included: never having used computers online previously, not having access to a computer from the start of the subject (despite being a ‘pre-requisite’ for enrolling in the subject!), and problems with internet service providers. All these appear to have been solved by about week 3.

The study time commitment was also well in excess of what students (and the lecturer) expected. Whether the online support engaged students for long periods of time (indicated by one response to survey Question 12) is difficult to say. The comments about the time commitment is more serious than in the previous two years with the subject material essentially unchanged.

Many students have commented on the positive aspects of WebCT in terms of getting immediate feedback to questions (they were told in the notes that their questions would be attended to within 2 working days). There was some (but not much) student-to-student interaction within WebCT, and this was partly due to the lecturer indicating a couple of times that he would respond to specific questions only after leaving students to ‘have a go’ first. This approach was used sparingly, but did appear to work.

Apart from the direct feedback gleaned from this mid-semester survey and other comments, the following more general points are offered:

- There were no 'repeated questions'; students did look at the lecturer's responses to questions previously raised by other students.
- Most students, from the start, placed their questions of a general subject matter in the correctly identified Discussion Group.
- Most students differentiated from the start between queries that required a 'public' response (using a Discussion Group) and 'private' response (using WebCT Mail).

Despite the significant number of times the students have accessed the SON4000 WebCT site, there were comparatively few discussion questions posted, although, it has to be pointed out that on many occasions, each posting outlined 4 or 5 areas requiring clarification.

CONCLUSION

The subject is still underway, but early indications are that the move to WebCT has been reasonably successful. Despite early problems for some students in accessing their online materials (due partly to a lack of printed support documentation), students appear to have appreciated the support provided using WebCT. Most problems have arisen from a lack of access to hardware or network services, and from the occasional hiccups in the central administration of the WebCT service at Monash University.

Active participation in posting questions in the discussion groups and mail has been lower than expected, despite a conscious attempt to be as nurturing and personable as possible, but this can partly be explained by students submitting multiple questions in each discussion message posted.

Feedback from the use of other WebCT tools has been similarly encouraging. The Week/Topic 7 artefacts quiz has been completed by 80% of the students (within one week of the quiz being available) who found the exercise worthwhile and use of the WebCT Quiz tool appropriate, and was far more efficient in the use of the lecturer's time than in previous years.

Response rates to the mid-semester survey are higher than seen in previous years, and the responses are generally positive in terms of what we have attempted to achieve using WebCT.

The academic workload associated with the move to the WebCT environment has been reasonable, and no more than in previous years while supporting a large increase in student numbers and supporting a huge increase in electronic communication.

Apart from an initial investment to prepare online materials and to structure the WebCT subject (about one week, including training in the use of WebCT), the ongoing time commitment is comparable to the time which would be required to teach the same subject face-to-face, or to run the subject in a different online format. The generally positive responses by the students to this WebCT support has also helped make the whole exercise a rewarding, if challenging, exercise.

The ability to use text/graphics/equations in providing supporting electronic material, especially in response to student's questions, and being able to up-load these pages to the WebCT site independently of a network administrator has also been a distinct advantage.

It is also expected that more useful and complete student feedback will be returned at the conclusion of the subject based on the mid-semester response, and thus subsequent iterations of this subject should require a decreased time commitment in establishing the subject, although all material will be reviewed annually for relevancy and currency. A more complete analysis of this SON4000 subject will be presented at the CBLIS-2003 conference in July.

APPENDIX
The Mid-Semester Evaluation Survey

Question 1: Did you feel you knew where to look for information about this subject?

1. Never
2. Rarely
3. Sometimes
4. Mostly
5. Always

Average 'score' = 4.5

Question 2: Have you felt able to contact your lecturer on areas of difficulty?

1. Never
2. Rarely
3. Sometimes
4. Mostly
5. Always

Average 'score' = 4.9

Question 3: Have you felt welcomed/encouraged to contact your lecturer on areas of difficulty?

1. Never
2. Rarely
3. Sometimes
4. Mostly
5. Always

Average 'score' = 5.0

Question 4: Have you felt able to contact your fellow students in your subject?

1. Never
2. Rarely
3. Sometimes
4. Mostly
5. Always

Average 'score' = 3.9

Question 5: Did your lecturer answer questions posted (from you or fellow students)?

1. Never
2. Rarely
3. Sometimes
4. Mostly
5. Always

Average 'score' = 4.9

Question 6: Have you been able to keep up with the pace of the subject (the topics week-by-week)?

1. Never
2. Rarely
3. Sometimes
4. Mostly
5. Always

Average 'score' = 2.8

Question 7: How many hours per week do you generally spend working on this subject?

1. Less than 2 hours
2. 2 - 3 hours
3. 3 - 4 hours
4. 4 - 5 hours
5. More than 5 hours

Average 'score' = 4.5

Question 8: Is this more or less time than you expected to spend?

1. More than I expected
2. About what I expected
3. Less than I expected

Average 'score' = 1.6

Question 9: Have you had difficulty in learning how to use the features of WebCT?

1. Major difficulties
2. Minor difficulties
3. Generally easy to learn
4. Always easy to learn

Average 'score' = 2.6

Question 10: Have you had any difficulties in learning online in general? Tick as many boxes as appropriate.

- | | |
|---------------------------------------|----------------------------|
| 1. Internet access problems | Ticked by 13% of students |
| 2. Problems with access to a computer | Ticked by 13% of students |
| 3. Difficulty with using WebCT | Ticked by 0% of students |
| 4. Other technical difficulties | Ticked by 50% of students |
| 5. Lack of online resources | Ticked by 0% of students |
| 6. Motivation issues | Ticked by 13% of students |
| 7. Time issues | Ticked by 100% of students |

Question 11: What have you enjoyed most with this subject so far?

Responses include: “subject progresses really well, one topic leads into the next”, “interface with the lecturer and students via WebCT, is great”, “applying the physics in practice, worked examples are given how this knowledge will be used”, “the format of the topics”.

Question 12: What have you enjoyed least with this subject so far?

Responses include: “earlier stuff was bit dry but getting more interesting as I go”, “I have found that each topic has taken me longer than I thought it would”, “find it very hard to maintain my concentration when doing the readings”, “it is sometimes hard to apply theory without practice”.

Question 13: Do you have any other comments?

Responses include: “finding it difficult to keep up because I don't have a background in radiography”, “the course is well run, with lots of help available”, “the workshops are great ideas, both for resolving any queries and to meet other students”, “I receive more support in this subject”, “reading through all the emails online is very time consuming and often is a waste of time”, “would probably be easier to manage if the notes were a little more structured”, “the support from staff is fantastic, thank you”.

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SON4000 handbook web page
<http://www.monash.edu.au>

SCION Corporation web page from which Scion Image may be downloaded
<http://www.scion.com/>

WebCT Home page
<http://www.webct.com/>

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