IN BRIEF

- There is a growing interest in the use of web-based teaching to support the dental curriculum, especially as a means of self-directed learning.
- Communication, interactivity and displaying clinical images are the main strengths of web-based teaching.
- Web-based teaching appears to be more accepted by students than teachers.
- Both students and staff see web-based teaching as a means to supplement rather than replace traditional methods of learning in the dental undergraduate programme.

The attitudes of undergraduate students and staff to the use of electronic learning

B. Gupta¹, D. A. White² and A. D. Walmsley³

Background: Computer-aided learning (CAL) offers advantages over traditional methods of learning as it allows students to work in their own time and pace. The School of Dentistry at the University of Birmingham has created an electronic learning website, named the *Ecourse*. This is designed to be a web-based supplement to the dental undergraduate curriculum.

Aim: The aim of this study was to determine the attitudes of third year dental students and members of staff about the *Ecourse* website.

Method: A questionnaire was produced and piloted before being distributed to all 65 third year dental students to obtain their opinions about the *Ecourse* website. The views of *Ecourse* were sought from four members of staff by performing qualitative, semi-structured interviews.

Results: Lecture handouts and textbooks were reported as the sources used most often, by 96% of students. Eighty-six per cent of students are accessing the *Ecourse* mainly at the School of Dentistry, but 53% are also accessing it at home. Students liked the multiple-choice questions, downloading extra notes and looking at pictures and animation to explain clinical procedures. The majority of the students (79%) want the *Ecourse* to be used as a supplement to the undergraduate programme and 7% wanted it to replace formal lectures. Staff recognised the benefits of the *Ecourse* but were concerned about plagiarism, the effect on lecture attendance and the lack of feedback from students on existing CAL material.

Conclusion: Students consider the *Ecourse* as a positive method of supplementing traditional methods of learning in the dental undergraduate programme. However in contrast teaching staff expressed negative views on the use of e-learning.

The use of computers in dental and medical education can be traced back to the 1970s¹ where computer-aided learning (CAL) was initially distributed on floppy disks and restricted onto local computer networks.¹ However, CAL can now be used for distance learning as a result of the greater

flexibility provided by the internet. This is because information can be stored on one local computer but accessed and shared by computers around the world. Originally, web-based technology had limitations regarding the transmission of large multimedia files, but this may be overcome with the increased availability of high-speed internet connections.²

Studies have shown that students consider using computers in the dental curriculum as an effective tool,^{1,3,4} as CAL offers many advantages over traditional methods of learning. For example, CAL allows students to work in their own time and pace.⁵ It also allows the use of sound, videos and animation to put information across. Many believe CAL can be used to

support the dental curriculum to help overcome the problem of declining number of academic staff in UK dental schools.^{1,6} This is one of the main factors that has driven the development of CAL in dental education.

In 1999, School of Dentistry at the University of Birmingham created the *Ecourse* website, an internet-based supplement to the dental undergraduate curriculum. A study by Walmsley *et al.*⁷, found students were more comfortable using the Internet than members of staff. Furthermore, students were very keen on having lecture material available on the web but members of staff were less enthusiastic. A subsequent study into the use of the prosthetics speciality subject on the *Ecourse* found it

¹GDP, ²Senior Lecturer in Dental Public Health, ³Professor of Restorative Dentistry, School of Dentistry, The University of Birmingham, St. Chad's Queensway, Birmingham B4 6NN
*Correspondence to: Prof. A. D. Walmsley, School of Dentistry, St. Chad's Queensway, Birmingham B4 6NN
Email: a.d.walmsley@bham.ac.uk

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very successful with students.⁸ However, a lack of computers for access and insufficient printing facilities were the main problems identified, which prevented acceptance by students of such learning information.

Since 1999, the Ecourse has evolved considerably and contains information from most areas of speciality teaching on the dental undergraduate programme. Information on the Ecourse includes programme aims and objectives and downloadable lecture handouts. Animation is being introduced in various aspects of the course where it helps to describe clinical procedures such as non-surgical endodontics and operative techniques. The Ecourse also has an element of interactivity, with multiple-choice questions and on-line vivas, which provide feedback to students. Students and lecturers can also discuss matters with each other, via the bulletin and messaging boards (2-way communication). This latter development is still in its infancy as students are reticent to communicate their views and staff are concerned that such an activity will add to their workload. Within the School of Dentistry, the Ecourse can be accessed from the computer cluster, which consists of 17 computers, all with Ethernet 10/100 Mb connection to the internet, and one laser printer. Further access can be obtained from the student common room (three computers, no printer). The Ecourse website can only be accessed by using the *Internet Explorer* web browser. The opening screen, a screenshot of interactive animation and the on-line case studies from the Ecourse website are shown in Figure 1. Previous work has shown that the Ecourse has been successful within the speciality teaching area of removable prosthodontics.⁸ However involving a whole institution moves it away from the enthusiast to the involvement of all teaching staff. Such a change may raise a number of issues which need to be considered when introducing such a culture change within a dental school.

AIM

The aim of this study was to determine the attitudes about the Ecourse website of third year dental students and members of teaching staff. The level of access and the successful aspects of the Ecourse website were specifically sought.

METHOD

A questionnaire was used to obtain the opinions from students about the Ecourse website. This questionnaire (Fig. 2) was piloted and refined before being distributed to the third year students (65 students). The third year students were selected because most of the content on the Ecourse website

Fig. 1
(a) The Ecourse 'home page'
(b) interactive animation,
and (c) on-line case studies

relates to speciality teaching, which takes place mainly in the third year and early fourth year of the dental programme. All responses from the questionnaire were treated anonymously and this was stated on each questionnaire. Qualitative, semi-structured interviews⁹ were carried out with four members of staff, representing contributors and non-contributors to the Ecourse, to ascertain their opinions and attitudes towards the Ecourse website. Each interview was recorded on an audiotape and transcribed for theme analysis.

RESULTS

The student questionnaire

A total of 57 questionnaires were completed, giving an 88% response rate. A comparison of students' reported use of different sources of information, to find dentally related material, is shown in Figure 3. Lecture handouts and textbooks were the sources used by most students (96%). The main reasons for using these two sources were '*lecture handouts contain the relevant information required for our exams*' and '*lecture handouts and textbooks are readily available especially at home*'. Journals were used by the least students, because '*it's difficult finding information in journals*' and

'journals are long winded and complicated'. The Ecourse was another popular source of information (75%) reported by students, because '*it's easy to access*'.

Ninety-five of students reported using the internet. Of the small number who did not use the internet, the main reason given was '*I have no time at the dental hospital and I have no access at home*'. Of those who use the internet, the Ecourse is generally accessed two to three times a week or on a fortnightly basis (58% of students). However, 70% of students reported accessing the internet on a daily basis or two to three times a week.

Most students (63%) are happy with the ease of access to the computer cluster, as seen in Figure 4. However, 79% of the students stated that the facilities in the computer cluster could be improved. The most common improvement students want to see is '*more computers*'. Eighty-six per cent of students are accessing the Ecourse mainly at the School of Dentistry, but 53% are also accessing it at home. At the school, 63% of students report accessing the Ecourse during lunchtimes. Of the 13 students who 'disagree' that access to the computer cluster is easy, 11 of them reported accessing it at the busiest time of the day, ie lunchtimes.

Fig. 2 Evaluation of the Ecourse website student questionnaire

This is a questionnaire to help the Dental School evaluate the 'Ecourse' website and its use in the dental undergraduate curriculum. Please answer the questions below. All responses will be treated anonymously.

1. Which of the following sources do you use to find out dentally related information? (Please tick all those that apply.)

- ☐ Lecture handouts ☐ Textbooks ☐ Journals ☐ CAL programs
☐ Ecourse website ☐ Ask lecturers ☐ Other Internet sites (please specify)
☐ Other sources (please specify)

2. Which of the above do you use **most** often? Why?

3. Which of the above do you use **least** often? Why?

4. Do you use the Internet? ☐ Yes ☐ No

If **no**, can you please give a reason why? (now go to question 6)

5. How often do you access the Internet?

- ☐ Never ☐ Daily ☐ Weekly ☐ Fortnightly ☐ Monthly
☐ less than once per month

If you have ticked **weekly**, how many times a week do you use it =

6. How do you feel about the following statement? 'I find it easy to access the computer cluster at the dental hospital.'

Indicate your answer by ticking one of the boxes below, which closely matches your answer.

- ☐ strongly agree ☐ agree ☐ neutral ☐ disagree ☐ strongly disagree

7. Do you feel the facilities in the computer cluster can be improved?

- ☐ Yes ☐ No If **yes**, how?

8. Have you used any of the material on the Ecourse website? ☐ Yes ☐ No

If **yes**, will you continue to use the Ecourse website in the future? ☐ Yes ☐ No

What are your reasons? (Now go to Question 9.)

If **no**, will you be using the Ecourse website in the future? ☐ Yes ☐ No

What are your reasons? (Thank you for completing this questionnaire.)

9. Where do you use the Ecourse website? (Please tick all those that apply.)

- ☐ Home ☐ Dental Hospital ☐ Medical School ☐ Other (please specify)

10. How often do you access the Ecourse website?

- ☐ Never ☐ Daily ☐ Weekly ☐ Fortnightly ☐ Monthly
☐ less than once per month

If you have ticked weekly, how many times a week do you use it =

11. When do you access the Ecourse website **most often** at the dental hospital?

- ☐ Never access it at the dental hospital
☐ At lunchtimes
☐ Before the morning lecture
☐ During the afternoon clinic
☐ Before clinics in the morning, after the lecture.
☐ At the end of clinics, in the evening
☐ During the morning clinic
☐ Other (please specify)

12. Which of the following **features** on the Ecourse website do you find most useful? (Please tick all those that apply.)

- ☐ Downloading lecture notes that you've missed
☐ The tip of the day

- ☐ Downloading extra notes to supplement your existing notes

- ☐ The MCQs

- ☐ The messaging board/discussion area

- ☐ The on-line vivas

- ☐ Printing notes, pictures etc, from the Ecourse website

- ☐ Other (please specify)

- ☐ Looking at pictures and animation to explain clinical procedures

- ☐ The bulletin board

13. Why do you like the above feature(s) that you have ticked?

14. Are there any features that you **don't** like? ☐ Yes ☐ No

If **yes**, which features? Why don't you like these features?

15. Would you use the Ecourse website as a **first** source of information?

- ☐ Yes ☐ No

What are your reasons?

16. Why did you use the Ecourse website? (Please tick all those that apply.)

- ☐ I was looking for a particular piece of information

- ☐ I wanted to 'read around the subject'

- ☐ I wanted to get hold of some lecture notes (or equivalent)

- ☐ I was told to use it

- ☐ Other (please specify)

17. Do you feel that the information on the Ecourse website has helped you **learn** more about a particular subject? ☐ Yes ☐ No

What are your reasons?

18. Which **sections** of the Ecourse website have you used? (Please tick all those that apply.)

- ☐ B Med Sc ☐ Oral Biology ☐ Periodontology ☐ MCQs

- ☐ Clinical Practice Guidelines ☐ Oral Medicine ☐ On-line vivas ☐ OSCE

- ☐ Cons revision notes ☐ Orthodontics ☐ CAL Downloads ☐ Endodontics

- ☐ Dental Public Health ☐ Prosthetics ☐ Masters in GDP forum ☐ Cons S T

- ☐ Electives Scheme ☐ Staff Updates ☐ Computer Requirements

19. Which particular **section(s)** of the Ecourse website did you find **most** useful? Why?

20. Which particular **section(s)** of the Ecourse website did you find **least** useful? Why? How can they be improved?

21. Should there be more material on the Ecourse website? ☐ Yes ☐ No

If **yes**, what other material would you like to see on the Ecourse website?

22. Should the Ecourse website (select **one** option):

- ☐ be removed from the course

- ☐ replace lectures and tutorials

- ☐ supplement lectures

What are your reasons?

23. Any other comments?

The proportion of students who reported having used material on the Ecourse website was 95%. The main reasons for using the Ecourse were 'I was looking for a particular piece of information' and 'I wanted to read around the subject'. All these students reported that they would continue to use the Ecourse in the future, for the following key reason: 'it has well-structured

material with useful clinical information to support academic stuff'. The three students who have not used the Ecourse before, all said they intend to use it in the future, because 'I'm sure it's specific to the course and worthwhile giving the time to it'. About 44% of students said they would use the Ecourse as a first source of information, mainly because 'it's a good starting point

for finding information'. Reasons for not using the Ecourse as a first source of information included 'textbooks have more information and it takes time looking for information on Ecourse' and 'lectures explain information better'.

Many of the third year students (90%) felt that the Ecourse had helped them learn more about a particular subject. Common

Source of information

Fig. 3 A bar chart showing the sources of dentally related information used by third year dental students

reasons given for this were 'it's helped understand clinical procedures better, especially the animation', 'additional notes, not in textbooks, are available' and 'it's my only source for practical advice'. However, three students felt the Ecourse did not help with their learning giving reasons such as 'I still need other sources to explain things better'.

There were a number of features of the Ecourse liked by students. 'Downloading extra notes to supplement your existing notes' was popular because 'they helped supplement lectures and understanding'. 'Looking at pictures and animation to explain clinical procedures' was a popular feature too because they 'help illustrate clinical procedures well'. Forty-four per cent of students found the MCQs useful because they 'help expand/test my knowledge and prepare for exams'.

Although the Ecourse contains information from a variety of speciality teaching areas, not all third year subject areas are covered. However, as expected, those subjects taught mainly in the third year were accessed on the Ecourse, eg conservative dentistry, endodontics, prosthetics and periodontology. Students felt that these were also the most useful sections on the Ecourse. The main reasons that were given were 'lots of information and step-by-step guides are available', 'good preparation for exams and clinical procedures' and 'interactive stuff/animation was very helpful'. Some sections not directly applicable to the third year of the dental programme were also being accessed, eg the OSCE and the Electives Scheme (both for fourth years). This shows students are encouraged to investigate other aspects of the course. A small proportion of the students (18%) stat-

ed some features of the Ecourse were not useful. The main feature disliked by these students was 'Downloading notes' because there 'weren't enough of them from each speciality'. Orthodontics was stated to be the least useful section, because 'there's no relevant information for third years'. The orthodontic component of the Ecourse presently consists of a series of case studies, and students requested tutorial notes and information on programme requirements, which would be more helpful to them in their third year.

Of those students who completed the questionnaire, 67% want more material on the Ecourse. Common suggestions given by the students include 'make all the sections to the same standard as prosthetics, endo and cons', 'give a list of useful/important journal articles', 'put more step-by-step clinical guides, eg crown preps' and 'more useful clinical/practical tips not found in textbooks'.

Many of the students (79%) wanted the Ecourse to be used as a supplement to the undergraduate programme and a few (7%) wanted the Ecourse to replace formal lectures. Students recognised the limitations of the Ecourse and the importance of lectures. Other reasons given for using the Ecourse as a supplement to the programme were: 'can't guarantee everyone has access to Ecourse – they will miss out on important information', 'lectures help understand the material and are more important', 'students become slackers if all the notes were on Ecourse', 'it can get boring if everything was on the web' and 'we still need contact with lecturers'.

The staff interviews

The staff interviewed reported a range of

internet use from those who had no involvement to one member who had produced material for the Ecourse. Staff generally used computers and the internet for email and for finding information related to their speciality, eg searching for journal articles. This was in addition to writing lectures and academic material.

From the interviews, a number of concerns emerged relating to the Ecourse and CAL. The staff highlighted that there were a limited number of computers at the dental hospital which would cause access difficulties for students, especially if core teaching in the undergraduate programme were delivered via the Ecourse: 'There are approximately 70 students per year, and at most times there are 3 or 4 years in the building ...and there are about 20 computers, which aren't enough for all the students. If all the lectures for core learning were delivered via Ecourse, it would not be feasible.' Conversely, some felt access was not a problem: 'I've been surprised how often I've been in there myself and it's not being used, and with the number of students in this building I would have thought it be actually hard to get hold of computers at most times, but it's not the case.'

There was concern about the free access to the internet and the Ecourse. Members of staff spend a lot of time in producing lecture and tutorial material. If this was freely available on the Ecourse they will not be acknowledged for their work and there would be the potential of plagiarism: 'We don't know who's accessing the information on Ecourse and we spend a lot of time on this material, why should it be freely available to everyone?' There was also apprehension that some of the clinical pic-

tures that are available on the Ecourse may compromise patient confidentiality.

Staff expressed that there is lack of feedback from students about the material currently available on the Ecourse. As a result, they did not know if the material is useful or a waste of their time. Staff also stated that they *'don't know what is the role or aim of Ecourse'*. As a result, they did not know what material to place on the Ecourse and whether there is any benefit to the students. Some raised the question of whether the Ecourse and CAL are better than traditional methods of learning.

Some members of staff felt that placing lecture notes on the Ecourse had no benefit: *'I'm not sure that if I put lecture notes up that people would attend my lectures... lectures are a formal way of making sure that we have covered certain ground with the students... we have to prove that we have taught you a core curriculum and unless we have seen you in a lecture room and we've given you certain information or pointers in the right direction, I'm not sure how I could be sure that everyone in the year has been given the same information.'* They were also concerned that printing material from the Ecourse would add more cost to running the dental school, as it is not regulated. It was expressed that lectures offered more advantages over the Ecourse and CAL. For example, staff expressed that lectures provide an opportunity for students to ask questions and sort out any problems they may have.

The staff interviewed did report some advantages of using the Ecourse and e-learning. Staff acknowledged that the Ecourse allows students to work in their own time and at their own pace: *'...this enables, I think, the student to be able to do work outside the tutorial, outside the sort of seminar room or lecture room, at their own pace, and actually try and identify problems that maybe they've got with a certain subject, ... before it becomes a problem in an exam really.'* As the Ecourse is internet based, information such as the programme syllabus can be stored in a central location for access by all the dental students. This information can easily be updated and distributed via the Ecourse. As a result, some members of staff felt that this would be most useful for student timetables, where any changes to the timetable often fail to reach the student notice board in time. Staff also agreed that the Ecourse could be added to the current armamentarium of teaching methods to aid student learning.

The staff interviewed made some suggestions for the future of the Ecourse. They wanted more consultation before time and money is invested in developing the site further and staff expressed the necessity for student feedback to make sure that

'useful' material is placed on the Ecourse. As a result they felt that the use of CAL in the undergraduate programme would be more cost-effective. They also felt that timetables and the programme syllabus should be placed on the Ecourse so that it would be universally accessible.

DISCUSSION

Students' attitudes to Ecourse

Most students are positive about the Ecourse and generally do not have access problems to the website. However, students have expressed the need for more computers and printers to be able to access the Ecourse more freely.

On the whole, students find the Ecourse useful as a source of information and feel that it is helping their learning experience. Nevertheless, simply asking students if they feel the Ecourse has helped learning is not an objective measure of Ecourse's ability to improve student learning. There are a small number of students in the third year who are not comfortable using computers and the Ecourse. In the questionnaires, one particular student had stated that they find the internet *'difficult and time-consuming to use'* and requested for a *'supervisor present at all times to assist those who struggle'*. This highlights one of the main barriers to using CAL in education, ie students who cannot use computers will be seriously disadvantaged. In 1996 and 1997, Bristol dental school obtained opinions from their students on the use of IT in the undergraduate curriculum³ and the main complaint from students was the lack of adequate training in IT.

The majority of students prefer MCQs, information on clinical procedures and supplemental information, ie students want material that cannot be obtained from other sources such as lecture notes and textbooks. The comments expressed by

students also highlight the assessment driven culture of dental schools where material that will help in the examination are particularly sought after. The use of clinical pictures and animation on the Ecourse is a popular part of the material. A study by Plasschaert *et al.*¹⁰ agreed that CAL for students should include text, sound and images. Interestingly, a study by Marsh *et al.*¹¹ found that when information is delivered using the internet, animations are not necessary and may actually decrease the effectiveness of the teaching material. Even though students like animation, not all members of staff will have the time to learn how to and produce these animations. Overall, students expressed the importance of contact with members of staff and thus want the Ecourse to supplement rather than replace lectures.

Staff attitudes to Ecourse

This preliminary study using qualitative methodology has highlighted an overriding concern amongst staff about different aspects of the Ecourse, although some staff have been actively involved in the development of the site.

While it is clear that members of staff are aware of the benefits of CAL, they are not willing to accept them. They are concerned that the Ecourse cannot provide the same standard of teaching if it replaces traditional methods. Consequently, they are hesitant to invest into the Ecourse and this reluctance to contribute makes it difficult to evaluate the benefits of this medium as a learning resource.

There has been considerable debate in the literature about whether CAL is better than traditional methods of teaching. Reviews by Grigg *et al.*¹ and Schitteck *et al.*¹² have shown that CAL or 'blended' learning is just as successful as traditional methods of teaching. A randomised controlled trial by Williams *et*

al.¹³ showed students objectively performed better with CAL than lectures. However, the present consensus is that CAL should be used to supplement rather than replace traditional teaching, as e-learning is not suited to all students.^{12,14} Many studies fail to take into account that there are different types of CAL available, eg some are interactive, some are problem-based and others just display text and images like a textbook.

Teaching staff are reluctant to let go of material which they 'own', as they are concerned that users outside the university will plagiarise their material. The Ecourse is protected by a username and password system, which prevents access from outside the University as this electronic material is particularly sought after by students from other institutions. This opens a debate as to whether such a teaching resource should be shared or only available to those within the school where it is created. The issue of staff reluctance to take on e-learning or to share their materials is a major hurdle and is seen as a problem in other institutions.¹⁷ This will only be solved over time, as students demand the materials online, and new staff arrive who lead the way with developing online courses.

Internally teachers are concerned about reduced lecture attendance if lecture notes are placed on the Ecourse. Interestingly, students have indicated that lectures are important to them as they provide contact and interaction with the staff. Several studies have revealed similar findings.^{15,16} Hence, the Ecourse being used to replace current learning methods is no longer an issue.

Members of staff should be aware that traditional teaching is limited by staff resources.^{1,6} There is also an onus on students in higher education to be responsible for their learning. The Ecourse provides students with a method for self-directed learning. The time and cost involved developing the Ecourse may initially be high but this will be

offset by the fall in demand for staff resources in the long term.

The future of Ecourse

The Ecourse is being introduced into the dental undergraduate curriculum on a gradual basis and as a supplement to existing teaching methods. Following a successful staff development day, a policy has now been drawn up for all teaching staff which highlights the aims and benefits of the Ecourse with suggestions on how to 'blend' CAL into their teaching. There is a risk that the student-learning environment will become crowded if the Ecourse is to be used as a supplement to the present programme and therefore the material on the Ecourse needs to be constantly evaluated to ensure its usefulness. Currently, some sections on the Ecourse have electronic 'evaluation forms' which allow students to make suggestions anonymously. This continual monitoring allows the Ecourse to reflect current views and opinions of both staff and students.

CONCLUSIONS

Most students are positive about using the Ecourse in the undergraduate programme. However, if the Ecourse is integrated more extensively into the undergraduate curriculum, access will become difficult. Most students prefer the Ecourse to have material that is not available from other sources such as lectures and textbooks and have also identified the importance of lectures as they provide contact and interaction with the staff.

Teaching staff see the potential advantages of using CAL such as the Ecourse within the curriculum. However, a number of issues have been identified, which need to be addressed before the Ecourse is readily integrated into the curriculum. The main issues are to identify the role the Ecourse is expected to play in undergraduate teaching and to what extent. However, it appears that both students and staff see the Ecourse as a means to

supplement rather than replace traditional methods of learning in the dental undergraduate programme.

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