Medical student access to multimedia devices: Most have it, some don't and what's next?

NASSER KHAN[1], WILLIAM COPPOLA[2], TIM RAYNE[3] & OWEN EPSTEIN[1]

[1]*Centre for Gastroenterology, Royal Free Hospital, Royal Free & University College Medical School, Royal Free Hospital, London NW3 2QG, UK,* [2]*Department of Primary Care and Population Sciences, Archway Campus, Royal Free & University College Medical School, Royal Free Hospital, London NW3 2QG, UK and* [3]*Royal Free Hospital, Royal Free & University College Medical School, London NW3 2QG, UK*

Abstract
In recent years, the rise in total student intake of medical schools across England has not been met by an increase in medical teachers. Computer aided learning (CAL) has the potential to address this disequilibrium. We conducted a survey of clinical medical students at our institution to ascertain the level of access to media devices capable of delivering vision and/or audio. The aim was to establish a baseline to assist CAL providers plan for appropriate modes of content delivery. A questionnaire was emailed to all clinical medical students at UCL. To validate the email survey, an identical paper questionnaire was distributed to a compulsory class for third year clinical medical students. The e-questionnaire and validation questionnaire response rate was 46 and 100% respectively. Eighty-six percent of students had home access to broadband Internet, and 85% of home computers were suitable for a full multimedia experience. Seventy-four percent of students indicated that their primary place of access was at home. Sixty-three percent of students had portable MP3 devices and over 50% owned an iPod. The hardware environment appears favourable for the introduction of complex multimedia teaching programs to medical students, but access is not universal. In addition to personal computers, inexpensive portable multimedia players might offer the opportunity to deliver 'on demand' learning. Medical schools planning for delivery of CAL should consider student access to desktop and portable media devices when designing an e-learning curriculum.

Keywords: *Computer aided learning, undergraduates, medical students*

1. Introduction

Over the last decade, the numbers of students gaining admission to medical school has steadily increased. The number of medical places has risen by over 2000, an increase of 40% in total intake [1]. This rise has occurred both as a result of the establishment of new medical schools, and by an increase in the number of students obtaining admission to established schools. However, increased student intake has not been matched by increased numbers of teaching staff [2]. This, together with rising costs of tertiary education, has resulted in

curriculum planners looking at new methods for delivering learning, and in particular, to consider the role of computer assisted learning (CAL) [3].

Most of the technologies used for delivering CAL, including desktop computers, web browsers and broadband Internet, have been enthusiastically adopted by the general public. In the UK, 57% of homes currently have a personal computer and 69% of these homes have broadband Internet access [4]. Broadband bandwidth can now support streaming video and the download of large multimedia files, offering the potential for remote access to rich audiovisual learning content. This has been matched by the development of multimedia authoring programs designed with sufficient simplicity, flexibility and depth for teachers to create content that is closely tailored to their students' needs [5].

A new generation of inexpensive and highly portable mobile devices with the potential to deliver learning on demand have recently emerged. These include personal digital assistants (PDAs), Apple iPods, MP3 players and smartphones. Podcasting is perhaps the most high-profile new distribution medium where pure audio or audiovisual content is seamlessly downloaded via an Internet connection to a docked iPod or MP3 player. This form of content dissemination has already been embraced by a number of higher education establishments [6] and 'iTunesU', has been adopted by a number of universities in the USA [7], allowing university students access to course content via iTunes.

Any attempt to deliver a digital curriculum requires that all students have equal access to the range of hardware devices that might be exploited for CAL. There is currently little published data about medical student access to, and use of, multimedia devices. The aim of this study was to determine to what extent medical students at a large, multicampus UK medical school has access to a range of desktop and portable devices which might be suitable for delivering CAL.

2. Methods

All University College London medical students have a university email account and are expected to access their email daily, as it is the default medium used for student communication. After gaining appropriate permissions, a questionnaire (Table I) were emailed to all third, fourth and fifth year medical students using a web-based survey system [8]. Two weeks after the original email, the same questionnaire was re-sent in order to maximise the response rate. To validate the e-questionnaire, an identical questionnaire modified for manual, rather than electronic completion, was distributed to 102 third year medical students attending an introductory lecture prior to commencing their clinical course at one of the three campuses.

3. Results

The questionnaire was emailed to 1163 clinical students, and 349 (30%) responded to the first mailing. An additional 186 (16%) responded to the re-send. In total, 535 (46%) of the student cohort responded to the email questionnaire. All 102 of the validation questionnaires (100%) were completed and returned for inclusion in the survey. The responses to the questionnaire are summarised in Table I.

Ninety-three percent of email respondents have access to a home computer and 87% had access from their place of work or study, which included the three main campus hospitals, peripheral teaching hospitals and general practitioner placements. Eighty-five percent of home computers had soundcards and speakers, while only 18% of the students reported access to sound via speakers from their study or workplace computers. Eighty-six percent of

Table I. Questionnaire responses for original and validation surveys.

	Email responses ($n = 535$)	Validation responses ($n = 102$)
Response rate	46%	100%
1. How often do you use a personal computer?		
Every day	86%	88%
Every few days	11%	10%
Every week	1.5%	0%
Less frequently	0.5%	1%
2. Do you have access to a personal computer at home?★		
Yes	93%	97%
No	7%	3%
3. Do you have access to a personal computer at your place of work/study?		
Yes	87%	99%
No	13%	1%
4. Which of the following does your computer at home have?		
Sound card and speakers	85%	87%
The ability to listen with headphones	85%	91%
Broadband internet access	86%	92%
Dial-up internet access	19%	18%
A CD-ROM or DVD-ROM	96%	87%
Email	91%	84%
5. Which of the following does your computer at work/place of study have?		
Sound card and speakers	18%	47%
The ability to listen with headphones	45%	73%
Broadband internet access	91%	96%
Dial-up internet access	9%	6%
A CD-ROM or DVD-ROM	85%	91%
Email	96%	97%
6. If you have indicated that you have access to a personal computer at both home and work. At which location do you spend most time using a computer?		
At home	74%	75%
At work	10%	9%
Both approximately equally	16%	16%
7. Which of the following devices do you own, or have easy access to?		
MP3 player (any type)	63%	54%
Handheld PC/PDA	22%	12%
iPod	55%	56%
8. Which of the following have you used in your studies in past?		
Electronic learning resources	80%	78%
Interactive self-assessment tools	75%	73%
Virtual learning environments e.g. WebCT	77%	81%
Educational websites	81%	82%

★Home is defined as the term-time address.

email respondents had home Broadband access and 96% of home computers had CD-ROM or DVD-ROM readers. Similar specifications for Internet access, CDs and DVDs were reported for computers available from their place of study or work. Seventy-four percent of student respondents indicated that their home computer was their primary access point for university-related activity.

Sixty-three percent of students have an iPod and/or an MP3 player and 22% own a handheld personal digital assistant (PDA).

Table II. Sample free text responses to last item in questionnaire.

LAPT-lite for medical students (LAPT is a certainty based assessment module)
WebCT
E-medicine.com
BMJ Learning website
www.fleshandbones.com
PubMed
www.google.com

A number of free text responses were elicited by the last question and a selection is shown in Table II.

4. Discussion

It is widely recognised that the traditional lecture format is not the best way of conveying information [9'10] and considerable emphasis is now placed on self-directed learning [11]. Universities need to provide learning resources and CAL is increasingly recognised as one medium that can provide effective learning resources for medical students [12]. This, together with increasing student numbers, a relative reduction in teaching faculty numbers and availability due to government reforms such as the European Working Time Directive, makes it likely that medical schools will look increasingly towards the potential of CAL and Broadband Internet to deliver learning material. This is likely to be supported by a range of other resources including e-tutoring, notice boards, chat-lines, Wikis and Blogs.

The response rate to the twice-sent electronic questionnaire was 46% which is comparable with the response rates to traditional postal questionnaires [13] and may reflect the tendency of students to disregard unsolicited email as junk email [14]. This is supported by the observation that using the same web-based application, response rates are substantially higher when students are asked to evaluate their teaching ($\sim$75%) [15]. The results of the e-questionnaire were, however, in close accord with the identical questionnaire completed by hand with a 100% sample response rate.

Around 85% of this sample of medical students has home access to fully multimedia enabled personal computers with broadband internet access. By contrast, access to fully multimedia specified campus computers is limited by the lack of audio facilities, which in turn, reflects the placement of computer clusters in quiet areas in libraries or other communal learning areas. Any shortcomings in the provision of on-campus multimedia equipment may be compensated for by the availability in the student's home of multimedia enabled personal computers, although 15% of students in this sample did not have home access to either a personal computer or broadband internet.

This survey included students from one of the largest medical schools in Europe. It is likely that both campus and home access to multimedia enabled personal computers will vary between medical schools and between countries. The survey indicates the importance of evaluating local access when developing and delivering CAL. Assumptions cannot be made that campus facilities will offer sound, and not all students will have home access to appropriately specified PCs. Most students use computers at home in preference to their place of study or work, and home, rather than university, might be positively identified as the target venue for delivering CAL. This could relieve hard-pressed medical school budgets of the need to build and constantly upgrade multimedia facilities and could encourage freedom of students to engage in CAL anywhere and at any time [16].

If the full potential of CAL and learning on demand is to be achieved, there remains the problem of providing all students with equal off-campus access as this survey indicates that a significant minority of students did not have appropriate home facilities. Many higher education institutions in the USA stipulate the possession of a laptop computer for first year undergraduates and offer a number of ownership schemes to ensure equal access. Establishing ownership schemes in UK medical schools is not currently on the agenda and would be a costly solution. An alternative approach might be to exploit the potential of relatively inexpensive mobile cross-platform media players. Fully multimedia specified PDAs running Windows mobile software and offering Wi-fi Internet access can now be purchased for less than £200, and lightweight video-enabled iPods and MP3 audio players can be purchased for under £100. Over half the respondents owned or had use of an iPod or other digital media player. Perhaps the time has come for CAL developers to leapfrog the concept of content delivery via university and home-based personal computers and develop content for delivery on these highly portable multimedia devices which offer the potential for learning anywhere, anytime, at relatively low cost to the user. Podcasting curriculum content is easily achieved with a relatively small investment and some universities have already started delivering pre-recorded lectures to students on these mobile media players [17].

The opportunity now exists to consider delivering on demand e-learning directly to students in their preferred learning environment. Considerable thought and effort would be required to develop the appropriate curriculum. With the emergence of the new generation of portable mobile media players the opportunity already exists for disseminating on-demand learning using these devices in addition to, or even as an alternative to, desktop and laptop personal computers. Students are media savvy and take a more pragmatic approach to how they obtain their information compared to 30 years ago [18] and while CAL and e-learning remains only part of a blended learning experience, there is good evidence that a well designed dual modality multimedia presentation increases information retention and transfer [19].

This survey indicates that the hardware and internet access is in place for most, but not all, students and they are enthusiastic users. All that remains is for teachers and institutions to recognise the full educational potential of the range of media players now available to distribute CAL and for them to plan how to provide access to a high quality audiovisual learning experience equally to all students most effectively and most economically.

Acknowledgements

References

1. The NHS Plan. DOH Jul 2000.
2. Council of Heads of Medical Schools Survey; 2001.

3. Greenhalgh T. Computer assisted learning in undergraduate medical education. BMJ 2001;322:40–44.

4. http://www.statistics.gov.uk

5. McGee JB. Using multimedia virtual patients to enhance the clinical curriculum for medical students. Medinfo 1998;9(Part 2):732–735.

6. Johnson L, Grayden S. Podcasts-an emerging form of digital publishing. International journal of computerized dentistry 2006;9:205–218.

7. http://www.washingtonpost.com/wp-dyn/content/article/2007/10/31/AR2007103102521.html (accessed March 2008).

8. Opinio, © 2007 ObjectPlanet, Inc. Oslo, Norway.

9. Kimmel P. Abandoning the lecture: curriculum reform in the introduction to clinical medicine. The Pharos 1992;55:36–38.

10. Blight D. What's the Use of Lectures? Middlesex, UK: Penguin; 1972.

11. Spencer JA. Learner centred approaches in medical education. BMJ 1999;318:1280–1283.

12. Ward JPT. Communication and information technology in medical education. Lancet 2001;357:792–796.

13. Frankfort-Nachmias C, Nachmias D. Research methods in the social sciences, 5th ed. London: Arnold; 1996.

14. Berge ZL Collins M. Computer mediated scholarly discussion groups. Computers and Education 1995;24: 183–189.

15. Coppola W. Personal communications. August 2006.

16. Wolff B. Laptop use in university common spaces. Educause Quarterly 2006;1:74–76.

17. http://itunes.stanford.edu/ (accessed April 2008).

18. Dolnicar S. Should we still lecture or just post examination questions on the Web?: the nature of the shift towards pragmatism in undergraduate lecture attendance. Quality in Higher Education 2005;11:103–115.

19. Mayer RE. Multi-media learning. Cambridge: Cambridge University Press; 2001.