Attitudes of dental students towards using computers in education—a mixed design study

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مواقف طلبة طب الأسنان تجاه استخدام الحواسيب في التعليم. دراسة ذات تصميم مختلط

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الخلاصة: تستقصي هذه الدراسة مواقف طلبة طب الأسنان تجاه استخدام الحواسيب في التعليم. وقد استمدَّت التحليل الكمي من استيفاء 979 طالباً للاستبيانات، كما استمدَّت التحليل الكيفي من اقتراحات تقدَّم بها فريق فرعي يتألَّف من 339 طالباً. ولقد استُنْتج توقُّع المواقف الإيجابية نحو الحوسبة من بعض العوامل مثل: «استخدام الحواسيب لمدة تزيد عن سنة» و «الفرقة الدراسية». وأكَّد التحليل الكيفي لاقتراحات الطلاب هذه الموجودات وأثار قضايا جديدة مثل الحاجة إلى إنشاء موقع للكلية على الإنترنت. وتدل النتائج على أن الحاجة ماسة إلى تخطيط محكم لتحسين مهارات الطلاب وإدماج التطبيقات الحاسوبية في المنهج التدريسي.

ABSTRACT This mixed design study explored attitudes of dental students towards use of computers. It employed quantitative analyses of a questionnaire answered by 979 students and qualitative analysis of suggestions by a subgroup of 339. Positive attitudes towards computers were predicted by “computer use for > 1 year” and “year of study”. Qualitative analysis of students’ suggestions confirmed these findings and brought up new issues such as the need for establishing a website for the faculty. The results indicate that careful planning is needed to improve students’ skills and incorporate computer applications in educational curricula.

Attitudes des étudiants en dentisterie envers l’utilisation de l’ordinateur dans l’enseignement – étude qualitative et quantitative

RÉSUMÉ Cette étude de conception mixte a permis d’examiner les attitudes des étudiants en dentisterie envers l’utilisation de l’ordinateur. Elle était fondée sur l’analyse quantitative d’un questionnaire complété par 979 étudiants et sur l’analyse qualitative des suggestions d’un sous-groupe de 339 étudiants. Les réponses aux questions « utilisation d’un ordinateur > 1 an » et « année d’étude » permettaient de prédire les attitudes positives à l’égard de l’ordinateur. L’analyse qualitative des suggestions des étudiants a confirmé ces résultats et a soulevé de nouvelles questions telles que la nécessité de créer un site Web pour la faculté. Les résultats montrent qu’une planification rigoureuse est nécessaire pour améliorer les compétences des étudiants et intégrer les applications informatiques dans les programmes d’études.

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Introduction

Information and communication technology (ICT) provides automation, creative tools, local and global communications, and support for education [*1,2*]. The need for computer literacy and incorporation of computers into medical/dental education has been acknowledged for many years [*3*]. The advantages of ICT in undergraduate dental education include Internet, online databases, e-mail, digital video, computer-assisted learning and virtual classrooms [*4*].

The exponential growth in ICT and its applications in education sometimes exceed the adaptive power of students or staff, creating negative impressions [*5*]. Observations on students' competence in ICT are few, nonsystematic and pertain mostly to countries where the use of informatics is well developed [*4*]. Ascertaining the opinions of students is necessary to correct deficiencies and address negative attitudes [*3*].

As a part of a general plan for introducing e-government and the "computer for every house" project, the Ministry of Telecommunications and Information Technology offers Egyptian universities well equipped computer laboratories connected to the Internet. This offer was made to the Faculty of Dentistry, Alexandria University in 2004. At the same time, the faculty received a grant for a project for the use of ICT and computers in the educational process.

The present study was carried out to investigate computer attitudes of students in the Faculty of Dentistry, University of Alexandria, their need to learn computer skills, the most preferred modality for using ICT in education, and perceived barriers for this use. This was deemed a necessary step for analysing the background of students' ICT skills before teaching an elective computer course aimed at preparing students to use computers for submitting written assignments, searching the Internet and using simple statistical software packages.

Methods

Sample

Undergraduate students in all years in the Faculty of Dentistry were invited to participate in the study in December 2004. The students were approached in clinical/laboratory sessions and the purpose of the study explained to them. Participation was voluntary. The total number of students in the school was 1316. The number of students in years 1, 2, 3 and 4 were 365, 320, 370 and 261 respectively. Response rates for completing the questionnaire for years 1 to 4 were 64.7%, 74.7%, 76.8% and 84.6% respectively, with an overall rate of 74.4%.

Instrument

A questionnaire was developed by the authors to assess the attitudes of undergraduate students towards using computers in education. It was then tested on a sample of 20 students in the fourth year. Questions that were difficult to answer or needed explanation were modified. Ethical approval for the study was obtained from the faculty research committee. The final questionnaire was administered to students in all years. A blank space was provided at the end where students could add relevant suggestions in their own words.

Analytic strategy

Responses to the questionnaire were analysed using quantitative analysis strategies for categorical data. Logistic regression analysis was used to determine predictors of positive computer attitudes. Those who indicated that they wanted or strongly wanted to use computers in education were con-

sidered as having positive attitudes while those who indicated that they were worried or hoped never to use computers were considered as having negative attitudes. Those who were not sure of how they felt were not included in the regression analysis.

Suggestions provided by the students at the end of the questionnaire were the basis for qualitative analysis. Several advantages have been suggested for such open-ended questions, among which is the reassurance that all relevant issues have been covered in the original questionnaire [*6*]. In addition, using both quantitative and qualitative analytic strategies ensures the validity of the study by using a methodological triangulation technique where data obtained by one method is compared to that obtained by the other to see if they agree [*7*].

Themes emerging from students' suggestions were grouped in 2 categories: one converging with the responses to the questionnaire and the other category containing new themes and the frequency of different themes was counted.

Results

The total sample was compared with a subsample that used the space at the end of the questionnaire to provide suggestions as regards different variables (Table 1). The 2 samples were comparable in all factors except year where there was a statistically significant smaller proportion of third year students for the sample providing suggestions. The variables used to compare the whole sample and the sub-sample were the same as the independent variables (predictors) used for logistic regression analysis.

Table 2 shows the response to each item on the questionnaire. The majority of students (88.1%) wanted/strongly wanted to use computers in education. Most (63.3%) viewed computers as a supplemental tool to traditional educational activities. The most popular use (70.3%) was to view lectures as PowerPoint presentations. The majority of students (71.7%) preferred computer applications to be used for clinical courses. Computer courses were desired by 70%. The 2 most frequently cited obstacles for using computers were lack of time and inadequate computer skills.

Using logistic regression analysis to predict positive computer attitudes, statistically significant predictors were using a computer for > 1 year ($P = 0.004$) and year of study ($P = 0.03$) (Table 3). Students in the third year had the highest chance of having a positive attitude [odds ratio (OR) 1.73; $P = 0.03$]. Differences for other variables were not statistically significant.

Table 4 lists some of the themes that emerged from the suggestions and which agreed with the overall study sample results. Nearly a quarter of the comments expressed a positive attitude. This was based on several perceived benefits for using computers in education, such as increasing concentration in lectures through using imaginative approaches to the subject, increasing the speed of accessing information, decreasing the pressure on the teaching staff and helping Egypt to catch up with the modern world. Ten students (3.0%) indicated the necessity of using computers immediately, although some made comments of the "don't rush" type, advising thorough study of the advantages and disadvantages before committing. Other negative comments included limited resources, that there were no computers at all in the faculty, or questioned the seriousness of the intention to use computers. Some objectors mentioned that the education system itself needed to be put in order before computers were introduced, or that computers were not suitable for all curricula. Only 1 student, a female in fourth year with a grade of "very good" for the previous year,

Table 1 **Comparison between main sample of questionnaire and sub-sample of suggestions as regards some studied variables**

Variable	Whole sample		Suggestions sample		χ^2 (*P*)[a]
	No.	%	No.	%	
Sex					
Male	303	30.9	119	35.4	2.09 (0.15)
Female	676	69.1	217	64.6	
Have computer					
Mine	748	76.4	256	76.2	0.10 (0.95)
Not mine	143	14.6	48	14.3	
No	88	9.0	32	9.5	
Used computer for > 1 year					
Yes	465	47.5	168	50	0.53 (0.47)
No	514	52.5	168	50	
Year					
First	236	24.1	101	30.1	111.95 (< 0.0001)
Second	239	24.4	122	36.3	
Third	284	29.0	5	1.5	
Fourth	220	22.5	108	32.1	
Grade achieved last year[b]					
Excellent	70	7.2	24	7.1	5.77 (0.12)
Very good	335	34.2	122	36.3	
Good	423	43.2	113	33.6	
Fair	151	15.4	38	11.3	
Total	979		336		

[a]Test of difference between whole sample and sample that provided suggestions.
[b]For the suggestions sample, numbers do not sum to 336 because 39 questionnaires had missing answers.
P ***< 0.05 considered significant.***

and who owned a computer, frankly said, "I do not care about using computers because I do not like them."

Some comments expanded on topics mentioned in the questionnaire, adding more uses to computers in the faculty, such as patient care and recording student absences.

Table 5 displays themes that emerged from the suggestions which differed from the questionnaire items. These included having computers available in the faculty, which was expressed by 43.4% of those providing suggestions, and that the Internet should be available in the faculty. The main reason given for this was to help students who could not afford a computer although some suggested that reasonable fees could be charged for use or that there could be a system whereby computers were made available for purchase through instalments:

> "*Provide enough computers for students who cannot afford to buy them due to their high price which is greater than the income of the students and make these computers available through instalments*".

Table 2 **Attitudes of students to computers as obtained by quantitative analysis of questionnaire responses (*n* = 979)[a]**

Question/response	No.	%
How much do you want to use computers in education?		
Strongly want	524	53.5
Want	339	34.6
Not sure	53	5.4
Worried	45	4.6
Hope never to use them	13	1.3
How would you like computers to be used in education?		
Supplement to other activities	620	63.3
For distance education	284	29.0
Instead of other educational activities	91	9.3
Other	40	4.1
For what purpose would you like computer technology to be used in education?		
Lectures available as PowerPoint presentations	688	70.3
Using e-mail to ask staff members questions about courses	439	44.8
Text of lectures available on the Internet	411	42.0
Questions, tests, model answers & quizzes on the Internet	411	42.0
Resources related to study subject on the Internet as references, scientific journals and websites	355	36.3
Assignments about research questions using computers	336	34.3
What courses do you prefer computers to be used in?		
Clinical	702	71.7
Pre-clinical laboratory	561	57.3
Basic sciences	340	34.7
All	208	21.2
Do you want to take computer courses?		
Yes, through special courses in the faculty	346	35.3
Yes, through special courses outside the faculty	340	34.7
There is no need because I can use computers based on my own experience	281	28.7
What are the obstacles that may prevent you from using computers and the Internet in education?		
Not enough time	459	46.9
Inadequate computer skills	314	32.1
Fear of viruses and hackers	127	13.0
No computers available	161	16.4
High cost	123	12.6
Not trusting information on the Internet	63	6.4

[a]Number of responses to each question differs due to item non-response and selecting > 1 answer to the same question.

Table 3 **Logistic regression model to predict positive attitudes among dental students towards using computers in education**

Variable	χ^2	*P*-value	Category	OR	*P*-value
Sex	0.005	0.94	Female vs male	0.98	0.94
Computer ownership	4.12	0.13	Mine vs not mine	0.34	0.06
			None vs not mine	0.51	0.81
Used computer for > 1 year	8.28	0.004	No vs yes	0.37	0.004
Year	8.99	0.03	First vs fourth	0.63	0.24
			Second vs fourth	0.48	0.01
			Third vs fourth	1.73	0.03
Grade achieved last year	1.95	0.58	Excellent vs fair	2.76	0.25
			Very good vs fair	1.11	0.36
			Good vs fair	1.40	0.93

P ***< 0.05 considered significant.***
OR = odds ratio.

Table 4 **Themes identified from the qualitative analysis in agreement with results of questionnaire (*n* = 339)**

Main theme/category	No.	%
Attitude towards using computer in education		
Computer should be used in different courses	37	10.9
Computer is useful in education	35	10.3
Use computers immediately	10	2.9
Total positive attitude	82	24.2
Negative attitude	15	4.4
Modalities for using computer in education		
Supplement/substitute	14	4.1
Distance education	3	0.9
Uses of computer technology in education		
Online courses	45	13.3
CDs of lectures, demonstrations, etc.	36	10.6
Resources such as references, journals & websites	29	8.6
Communication with staff members for questions, feedback and discussion	19	5.6
Assignments for research projects	19	5.6
Quizzes, questions and tests	15	4.4
Other (patient care; recording attendance; security system)	5	1.5
Courses where computers may be used		
Lectures	90	26.5
Practical (clinical and laboratory)	73	21.5

Table 5 **Themes identified from the qualitative analysis differing from the results of questionnaire (*n* = 339)**

Main theme/category	No.	%
Computer accessibility on campus		
Faculty should make computers available for educational purposes	26	7.7
Faculty should make Internet available	21	6.2
Availability		
Adequate no. of machines	29	8.6
Good condition	11	3.2
Time to use	10	3.0
Computer location in faculty		
Computer laboratory	25	7.4
Library	14	4.1
Laboratories & clinics	11	3.2
All	147	43.4
Teaching computer		
Computer skills	22	6.5
Mandatory/elective	9	2.7
Personnel to teach computer	6	1.8
Free courses	5	1.5
Practical only	4	1.2
Internet	3	0.9
Courses in summer	3	0.9
For informatics diploma	1	0.3
All	53	15.6
Website for faculty		
Includes educational materials	11	3.2
Communication with rest of world	7	2.1
Academic rules	6	1.8
Website is necessary	5	1.5
Schedule for exams and lectures	4	1.2
Announcement of activities & conferences	4	1.2
All	37	10.9

"*I hope that the faculty provides computers as a reward for excellent students, especially those who cannot afford to buy them. I want very much to own a computer but I have financial barriers which I hope can be overcome*."

The availability of computers as suggested by students included providing enough units (29 students, 8.55%) (Table 5).

They also commented on the location of computers. The greatest number suggested a separate computing laboratory (25 students, 7.4%). Others considered that the natural place was the library or the laboratories and clinics:

"*There must be a computer laboratory in the faculty so that it will be easy to do research for those who do not have computers at home*."

"*Having computers in the library will be very practical in addition to the books there. The presence of the Internet will make a great difference*."

"*Old educational methods and aids should be substituted by new methods, e.g. patient sheets should be taken by means of computers attached to every dental unit in the clinic because this is what is used now and I intend to do that after my graduation*."

"*In the laboratory and clinical sessions, there must be computers and datashow so that all students can see (demonstrations)*."

The questionnaire asked if students wanted to take computer courses. Responses indicated a desire to study the Internet in addition to different computer programs (Table 5).

Just over a tenth of the students made suggestions related to constructing a website for the faculty. This was considered necessary since it could be used for the dissemination of educational materials, publishing academic rules, announcing lecture and exam schedules and promoting activities such as conferences and workshops. It could also be used for communication with other dental faculties and the academic community in general, or for strengthening

ties between members of the faculty and alumni.

Discussion

The present study explored computer attitudes of dental students in Alexandria University. It used a mixed design employing both quantitative and qualitative analysis techniques. A number of studies used the mixed quantitative–qualitative analysis strategy to extract the maximum benefit from available data. Sometimes new issues might arise from open-ended questions [*8*]. In the present study, the interest of students in a website was expressed as new theme in their suggestions.

Our results confirmed that students had positive attitudes. This seems to be the general attitude of students in different countries; students at universities in northern and southern Europe were equally positive about using computers in education [*9*]. The same situation also existed at King Abdul Aziz University, Jeddah where medical students were surveyed and 53% considered that computers and the Internet could improve studies and professional skills "very much" [*10*]. In most studies, however, a minority of students expressed negative attitudes. In our study, the number of students who indicated that they hoped never to use computers in their studies was minimal. It has been reported that a small minority of all college students experience some type of technophobia, which is a genuine aversion toward computers and computer use [*11–13*].

The majority of students thought that computers should supplement and not substitute traditional educational activities. This might be because students expect instruction and education to follow the traditional format of professor teaching directly to students and they feel they are owed this and anything else—even if provided by computers—is inferior [*2,14*].

The most popular suggested use of computers was to display lectures as PowerPoint presentations in the same form they were delivered in the lecture room. This seems to be a general attitude of students in a number of countries [*15,16*] which they claim would not influence lecture attendance. Making lectures available for students on the Internet or on CDs would allow students who missed the lecture to review it. In addition, it could partly solve the problem of the great number of students enrolled in the faculty.

Qualitative analysis of students' suggestions showed that students wanted to learn computer skills through courses that did not add to their current study burden. They suggested summer courses or electives suitable for their schedule. A limited computer course is already offered in the first preparatory year in the faculty. The major drawback for expanding this course to teach practical computer skills is the length of time elapsed between giving the course in the preparatory year and application of the acquired skills in the third and fourth years where clinical courses are given. Greenhalgh commented that students tend to use "just in time learning": most of them try to learn the required features of software when they actually use them. Thus, much initial training may not be popular or effective [*17*]. Review of related studies in different countries indicates that limited courses for basic computer skills are taught, that students acquire their competence from sources outside the university but that they would like to receive computer training mostly in the university [*4,16,18,19*]. It has been suggested that the lack of experience with computers may be addressed by including suitable computing courses at the secondary school level [*20*]. Mattheos et al. suggested that basic computer literacy should be a requisite for dental

school admission so that students are able to handle applications in the field of dentistry effectively [*4*]. As a more realistic alternative, they suggested categorizing students' competence with ICT on entry to dental school so that less competent students could receive appropriate training. Considering that a third of the students in our study felt that lack of adequate skills was a barrier to using computers in education and two-thirds indicated a need and desire to have computer courses, careful planning to improve and upgrade the skills of students is needed to avoid increasing the study burden of students and cost and time implications for teaching staff.

Sex was not a significant predictor of computer attitude in the logistic regression model. The issue of gender and attitude to computers is controversial. Macleod et al. concluded that as the use of ICT becomes regular within higher education, sex differences disappear [*9*]. While in the early 1990s, more males than females felt the importance of computer in education, by the late 1990s, the views of both sexes had converged [*21,22*].

As regards previous experience with computers, the consensus is that it predisposes to a positive computer attitude [*23,24*], a finding encountered in our study also.

Year of study was also a significant predictor of positive attitudes, with third year students most likely to have positive attitudes. These students are in a good position to realize the potential of computers in helping them in their studies and can afford the time to use them more than fourth year students, who are under a lot of stress to complete clinical requirements and to collect study materials for the final examination. In a generally similar finding, Rajab and Baqain found that significantly more clinical than preclinical students used the Internet for dentistry [*16*].

Lack of time was the most important barrier to using computers in education in our study and in others [*15,16*]. This emphasizes the need to avoid duplication of educational material through traditional and computer-based routes, leading to waste of students' time [*25*]. Lack of availability was an important barrier in our study and in others [*15,16*]. Although nearly three-quarters of the students in our study and that of Walmsley et al. owned a computer or had access to one at home, they still felt the need for a computer presence in the faculty [*15*]. Inadequate skill was the second most frequent barrier in our study. In contrast Walmsley et al. found that lack of confidence in ability was the least important barrier [*15*].

In view of the prevailing positive attitudes of dental students towards using computers in education, there is a pressing need to revise the current curriculum so that shortcomings in the educational process can be redressed by appropriate computer technology. While computers are neither intended nor desired to replace the traditional role of the teaching staff, they can help in various aspects of didactic and practical education. The immediate tasks requiring attention and planning are managing the upgrading of students' computer skills and establishing a website for the faculty.

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Survey of the use of the Internet and e-mail by physicians in the Region

We would like to draw the kind attention of our readers to the above-mentioned survey that the WHO Regional Office for the Eastern Mediterranean is conducting as part of its effort to assess needs of physicians for health and biomedical information on the Internet. The data will be used to help the Regional Office in drawing up plans for future health information support in the Region. Your participation in this survey would be most appreciated. The survey can be accessed at: http://www.emro.who.int/useinternet/