A comparative evaluation of computer literacy amongst dental educators and students

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A task-oriented questionnaire was designed, aiming to quickly assess competence with the use of computers. The questionnaire consisted of distinct computer-related skills, representing various competences in educational computer use. A total score from 0 to 49 was calculated upon completion of the questionnaire, based on the sum of all the positively identified competences. The questionnaire was distributed to an international group of leading dental educators during the DentEd Global Congress in Prague in 2001 and to a cohort of first year dental students (2001) in the Dental Faculty, University of Malmö, Sweden. Certain attitudes towards the role of information and communication technology (ICT) in dental education were also measured through Visual Analogue Scales in the educator’s group. A total of 149 questionnaires were collected from the educators’ group and 58 from the dental students. There was no significant difference in the average computer competence score between the two groups. The educators’ group average score was 20.7 (SD 9.9) and students’ average was 18.1 (SD 8.5).

A significant positive correlation \( r = 0.395277, P < 0.0001 \) was found between the competence measured by the questionnaire and the year of graduation in the educators’ group. The attitudes towards the role of ICT in dental education amongst the educators were very positive, regardless of their competence with computers, year of graduation or academic position. The results from this study indicate that there is wide diversity in computer competence amongst both students and academic staff. In addition, students’ actual competence in the use of computers might not be as high as is often perceived through self-assessment and ordinal scales.

Key words: DentEd; dental educators; students; computer literacy; competence; dental informatics.

Information and communication technology (ICT) is an increasingly important tool in all aspects of dental education. It is repeatedly stated that a graduate dentist, regardless of his priorities in research, public health, teaching or clinical care must be able to use ICT for the benefit of his personal and professional development (1, 2). A critical factor for the further implementation of ICT in dental education is the competence with computers of dental students as well as of the academic staff (3). The often limited computer literacy from the side of the tutors or the students can jeopardise even very well planned computer-based learning projects and minimise or eliminate the expected added value of ICT in learning (4). Computer literacy for the students should include generic data management, presentation and communication applications as well as search strategies and techniques. Dissemination applications and web publishing could be an additional field of interest for educators. A thorough and objective assessment of computer literacy of dental students as well as academic staff would therefore seem to be a necessity before designing and implementing any ICT-based learning strategy.

A number of studies have investigated the computer literacy of dental students in the past (5–8), but very few studies have focused on the academic staff. In addition, the major characteristic of previous studies is that they heavily relied on students’ self-perception, mainly as it is expressed through ordinal scales of various kinds. Previous studies on distance learning courses have shown that some students overestimate their competence with computers when asked to self-assess their skills using a scale: either numerical (such as 1–5) or descriptive (e.g. poor–excellent) (5, 7). In addition, students with different competence levels have different perceptions of the terms ‘poor’, ‘inadequate’, ‘adequate’, ‘good’ or ‘excellent’, which are often provided as options. Finally, it is observed that the most competent students are often more aware of the knowledge and skills they do
not possess and thereby assess themselves more strictly (7).

During the last few years ‘basic computer literacy’ has become a defined competency, described by educational structures such as European (http://www.ecdl.co.uk/) and International (http://www.acs.org.au/icdl/) Computer Driving Licence. Such structures assess computer literacy solely through task-oriented questions and exercises and not through registration of self-perceived competence.

The present study attempted at assessing computer literacy of a large group of international dental educators, through a simple, task-oriented questionnaire, which could minimise the inherent misperception risk of ordinal scales. These results were then compared with the results of first year dental students in the University of Malmö, Sweden.

**Material and methods**

*The questionnaire*

A questionnaire was designed aiming to assess quickly the users’ competence with computers in a structured way. This questionnaire was initially designed in 2000 in an attempt to investigate computer competence amongst applicants for distance learning courses and consequently reveal possible needs for remedial support prior to admission. The validity of the questionnaire was therefore studied during several occasions of distance learning courses in Malmö. The questionnaire is in principle a list of distinct computer-related skills, representing various competences useful in educational computer use. The different tasks were organised in five groups reflecting major areas of application of computers in dental educational settings. These groups were:

- Generic skills and file management,
- Software handling,
- Communication,
- World Wide Web and search skills,
- HTML coding.

The tasks were ordered by increasing difficulty or complexity, reflecting elementary, intermediate and expert competences. In each of the tasks the user could respond with only ‘yes’ or ‘no’, depending on whether he or she was able to perform the respective task. A final score was calculated by the sum of all the positively identified competencies and it could be from 0 to a maximum of 49. This structure can guarantee the reproducibility of the questionnaire in different environments and occasions. The designers of the questionnaire estimated that possession of the necessary skills needed for an average dental educator would be reflected by a score between 22 and 26. The necessary skills for a student would be somehow lower, with a score between 20 and 22. The questionnaire is available at http://cert.od.mah.se/prag/Competence.pdf.

**Sample a : dental educators and decision makers**

The above-mentioned questionnaire was distributed to the participants of the DentEd Global Conference in Prague in April 2001 (http://www.dented.org/dentedevolves.php). The Global Conference attracted approximately 240 participants from 49 different countries, all actively involved in academic dental education and distinguished for both their disciplinary expertise as well as their engagement in various aspects of the educational process. The participants of the Global Conference were organised in different thematic and disciplinary sections, securing a balanced representation of all disciplines and directions within modern clinical dentistry, education, research and administration.

All participants received an anonymous copy of the questionnaire before a plenary session and were informed through a brief oral announcement about the structure and aims of this survey. It was emphasised that the questionnaire was not any kind of test and was an attempt to develop and calibrate an instrument for objectively assessing competence with computers and attitudes towards ICT. During the completion of the questionnaire, participants should have expected to encounter some tasks or questions which might seem incomprehensible, as the questionnaire aimed at assessing various levels of competence, from elementary to very advanced. The first page of the questionnaire also included written instructions and information. The participants should leave the completed questionnaires upon exit from the plenary session.

Apart from computer-related tasks, the questionnaire included three statements, the agreement with which could be stated with the help of a 0–10 Visual Analogue Scale (VAS) as seen in Fig. 1. These three statements were not part of the competence assessment and were not included in the calculation of the final score. The statements were added to investigate attitudes towards some current issues relevant to computer-assisted learning and its role in dental education.

**Sample b : first year dental students in Malmö**

The same questionnaire was distributed in March 2001 to the whole cohort of first year dental students in the Faculty of Odontology, University of Malmö. Fifty-eight students (28 female, 25 male; five did not state
gender) received the questionnaire during a scheduled seminar session and were asked to hand it to their supervisor before they left the room. The questionnaire distributed to the students did not include the three statements and VAS as the one for dental educators.

Results

The 149 questionnaires collected at the end of the DentEd plenary session amount to approximately 70% of the participants present in the session. The sample included 113 males (75%) and 36 females (25%). Of these, 128 (86%) were qualified dentists, whilst 20 (14%) were not. The age distribution, country of origin, current position and year of graduation of the participants who filled in the questionnaire can be seen in Table 1.

The average score as measured by the positively identified tasks in the questionnaire was 20.7 (SD 9.9). The average score for Junior Staff was 26, for Senior Staff 19 and for Professors and Deans 20, but these differences were not statistically significant. However, a significant positive correlation ($r = 0.39$, $P < 0.0001$) was found between the competence measured by the questionnaire and the year of graduation. The average score for each of the groups can be seen in Table 2. There was no correlation between competence measured and gender or geographical location. However, as 65% of the sample were Europeans and 75% males, it would be very difficult to show such correlations.

The average score on the VAS regarding ‘basic computer literacy’ being a necessary skill for the dentist was 8.81 (SD 2.2). The agreement with the second statement was higher with a mean of 9.1 (SD 1.8). The mean score on the third statement (Fig. 1) was 8.2 (SD 2.4). There was no correlation between the attitudes as expressed on the VAS and any other features of the sample, such as gender, country of origin, professional background and year of graduation.

All 58 students filled in and returned the questionnaires. Students’ average competence was 18.1 (SD 8.5). There was a strong positive correlation between gender and competence with computers in this group ($r = 0.51$, $P < 0.0001$), with the average score for male students being 22.2 and for female 13.6.

Although the average computer competence score for the educators (20.7) was slightly higher than that of the first year students’ (18.1), this difference was of marginal significance ($P = 0.067$). Both groups were on average below the lower level set by questionnaire designers as the necessary skill (22 for educators and 20 for students).

Discussion

The results of the current study demonstrated that the group of international dental educators
possessed on average intermediate computer skills, comparable to those of first year dental students in the University of Malmö. However, as the large standard deviations also show, these average scores conceal extreme variations for both the students’ as well as the educators’ group. This finding confirms several previous observations (10) and indicates that computer literacy remains the field where both students as well academics demonstrate extreme diversity of competence. Such a diversity can jeopardize not only the attempts to take advantage of ICT in dental education, but it can also constitute an educational and political problem, which could intensify inequalities amongst professionals in future (3). Universities have to deal with this increased diversity as early as possible within the curriculum. Strategies and ideas on how this remediation could be achieved have since long been a discussion topic within the DentEd consortium, a discussion well reflected in the consortium’s first major summative publication (3).

It comes as no surprise to see the computer competence score correlating with the year of graduation for the educators’ group. However, it might be surprising to see that first year dental students in Malmö were not particularly competent, at least in comparison with this specific educators’ group. Sweden is a country well advanced in both ICT infrastructure as well as the implementation of ICT in all aspects of everyday life (11). In addition, a previous study has shown Swedish dental students to be amongst the most advanced in implementation of ICT in comparison with their colleagues from other European universities (10).

These results possibly reflect the fact that undergraduate students often overestimate their competence with computers (7, 9). A widespread but not evident empirical assumption educators often adopt is that students should be competent with computers simply because they are young. This is why we chose to investigate first year students in this study, therefore students who are less likely to have been exposed to educational use of computers. Such students often have a high self-perception of their competence, which is then expressed through evaluations based on self-assessment through ordinal scales. However, the fact that one can use computers on a daily basis for communication, gaming and word processing does not imply that he or she automatically possesses the competency required for computer use in educational settings of the dental school. Therefore, a high level of self-perceived competence was sometimes found to be accompanied by a low actual competence when it comes to specific tasks associated with the educational use of computers.

The results cannot be generalised due to the very specific nature and composition of the sample. However, what is of major importance is that the educators’ group included many of the most influential people within dental education at both national and international levels. Therefore, attitudes within the participants of this group are of great importance.

Despite the wide variety in competence with computers amongst educators, the positive attitudes towards the importance of computer literacy are very high. This indicates that the role of ICT in dental education is equally well identified by educators of different computer literacy levels and academic positions, although the motives behind each group might differ.

Although this questionnaire was used several times in the past, this was the first time it was used on such a large scale and therefore the results and competence scores cannot be safely interpreted to concrete conclusions on users’ actual competencies and needs. However, the strength of this questionnaire is that the scores are based on concrete and clear tasks which reflect actual competences and have therefore a much better predictive value than previously used methodologies. The questionnaire is not an objective examination, but rather a guided subjective investigation and as it is used in a non-threatening manner (not as an examination), it can bypass students’ own perceptions and therefore achieve a more objective description of the computer literacy. Educational structures such as ECDL and ICDL have developed detailed and complicated assessment methodologies which are based on the same principles as this task-oriented questionnaire. However, the main objective of this questionnaire is not to certify a certain competence, but rather to constitute a handy and not threatening instrument for a quick assessment of user’s competence level and consequent needs for remedial support.

The results of the questionnaires collected to date will be studied in order to improve the structure of the questionnaire. Future plans include the development of a database-driven, web-based version of the questionnaire. Through automatic comparisons with stored data, the programme will be able to provide automatic feedback upon completion of the questionnaire which will include not only the final score but also scores for the various subcategories, relations to other user groups, as well as recommendations for remedial support if needed.
References


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