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Validation of a Questionnaire on ICTs (Information and Communication Technologies) Skills of Undergraduate Health Students in Brazil*

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The use of ICTs (information and communication technologies) is becoming more common in education, being viewed as one of the important strategies in training health care workers. As the use of ICT by students depends on their perception of easy level of use, among other factors, this paper presents the construction and statistical validation process of the ICTs scale. The instrument was applied to a sample of 244 freshmen students of five health courses, offered by a public university in Brazil. The scale aims to evaluate whether students felt able to use ICT if they were used as tools for learning. Data were collected by means of a questionnaire applied in person during the period of a week. Statistical analysis of the principal (PC), factorial (PAF), and internal consistency (Alpha Coefficient) components was performed. The scale presents a unifactorial structure, with 37 items, explaining 88.25% of the total variance, and Alpha coefficient of 0.977. Results indicate a statistically valid and reliable scale. Further research in different education contexts is suggested.

Keywords: health education, factorial analysis, ICTs (information and communication technologies)

Introduction

There is a need for increasing the number of health care professionals all around the world (WHO (World Health Organization), 2007). As the quality of health care depends on the quantity and quality of staff (Brasil, 2003; WHO, 2006), it is expected that e-learning starts being even more used in order to guarantee a more equitable access to quality health services (WHO, 2013).

Advocates of ICTs (information and communication technologies) in education often regard them as capable of bringing positive changes in the teaching-learning process (Kozma, 2003; Kumar, 2009; Silveira et al., 2012). Thus differentiated instructional strategies can be implemented in order to reduce the imbalance between the skills of health professionals and the needs of the population (Westera, 2012).

Nevertheless the use of ICTs in education by students is not automatic, depending on their perception about the usefulness, quality, value (Chiu, Hsu, Sun, Lin, & Sun, 2005) and ease of use of these technologies. It seems that students who use more technology tools are those who have prior knowledge about them

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(Bennett, Bishop, Dalgarno, Waycott, & Kennedy, 2012).

Therefore, some knowledge and skills on ICTs use need to be developed by students so that they can benefit from them (Lorenzo, Garcia, & Murias, 2010). In order to know if Brazilian health freshmen students of a public university felt able to use ICTs if they were available as tools for learning, a questionnaire was applied and validated in 2012.

Method

Quantitative study (Creswell, 2010) aimed to validate a scale to measure the easy level of use of ICT perceived by health students. The instrument was constructed by Guimarães (2013) to be used in corporate training contexts, from a review of 28 articles that examined self-efficacy in using computers. The questionnaire was adapted for this study and used with 37 items, associated with an 11-point scale, ranging from 0 to 10 ("Very easy" to "Very difficult"). The second part of the instrument contained questions aimed at gathering personal information (age, sex, course, semester, availability of computer, and Internet at home).

The application occurred in person during freshmen's classes resulting in the return of 244 questionnaires (89.65% of students enrolled). After this time, the scale was subjected to factor analysis. Statistical analysis of the factorial consistency was performed using the factor analysis method (PAF) with Promax rotation.

The data analysis was performed using the IBM SPSS Statistics, version 20. The study was approved by the Ethics in Research Committee of the university in April 2012.

Results

Table 1 shows the characterization of 244 freshmen enrolled in the first semester of 2012. The campus offers five courses (nursing, pharmacy, physiotherapy, public health, and occupational therapy). The course that offers the largest number of vacancies is public health which reflects the higher number of students (24.59%). Among all students 81.14% were female and 86.06% were 20 years old or less.

Table 1

Profile of Freshmen Enrolled of Five Health Courses in Brazil

Variable	Frequency	Valid percent (%)
Course		
Nursing	45	18.44
Pharmacy	46	18.85
Physiotherapy	47	19.26
Public health	60	24.59
Occupational therapy	46	18.86
Total	244	100
Age		
≤ 17 years old	60	24.59
18 to 20 years old	150	61.47
21 to 23 years old	24	9.83
≥ 24 years old	10	4.11
Sex		
Female	198	81.14
Male	46	18.86

The value of KMO was 0.938 indicating an excellent factorability of the matrix. The Bartlett test of sphericity had a small significance level ($p < 0.0001$), indicating a low probability that the population matrix

was an identity one. Visual inspection of the matrix showed that over 50% of the assumed correlation values were greater than 0.30, also indicating the factorability of the matrix.

As in the study of Guimarães (2013), there were indications that the factor solution would be the best option. Thus, the analysis of the internal consistency of the scale-factor solution, all variables were grouped into a single factor. The reliability index (Cronbach's alpha) showed a value of 0.977, with factor loadings ranging from 0.520 to 0.747, ensuring the psychometric quality factor grouped. Considering Eigen values greater than 1.0 the total variance explained was 88.25%. Thus, the instrument of ease/difficulty in the use of ICTs has been properly validated for this population, with 37 items about the general use of common tools and applications in computer use.

The results of the questionnaire are shown in Table 2.

Table 2
Responses to the Question: "How Hard Do You Consider the Handling of ICTs?"

Items	Missing	Mean	Standard deviation	Valid percent (%)		
				0−3	4−6	7−10
1. Use a word editor to write texts	0	1.26	2.129	89.2	6.1	4.7
2. Print a document	0	1.24	2.235	88.1	6.9	5.1
3. Use the computer to organize information	2	1.60	2.197	85.8	9.8	4.4
4. Start a computer software	0	1.48	2.201	87.7	6.1	6.1
5. Delete files when they are no longer needed	2	0.71	1.701	95.3	2.5	2.2
6. Copy a file	3	0.77	1.754	95.3	2.2	2.5
7. Understand words and terms related to the use of Internet	3	2.44	2.274	74.1	19.7	6.2
8. Edit a file information	0	1.96	2.275	82.3	11.2	6.5
9. Use the Internet to fetch data	1	1.09	1.916	92.4	4.3	3.3
10. Ask question during a chat	2	1.38	2.200	88.7	6.9	4.4
11. Delete e-mail	0	0.67	1.761	96.0	1.1	2.9
12. Print e-mail	1	0.96	1.989	92.4	4.3	3.3
13. Send e-mail	3	0.66	1.737	96.0	1.5	2.6
14. Edit text before forwarding it	2	1.17	2.075	89.8	6.5	3.6
15. Attach a file to an e-mail message	2	0.96	1.830	93.8	3.3	2.9
16. Find an e-mail from a particular sender or with a specific subject	1	1.50	2.121	87.0	8.0	5.1
17. Save messages to a file	4	2.02	2.194	78.4	16.5	5.1
18. Change the password on websites	1	1.46	2.155	87.3	8.3	4.3
19. Communicate in chat rooms	1	1.33	2.272	88.0	7.2	4.7
20. Download a new software from the Internet	1	2.13	2.564	74.3	17.8	8.0
21. Search certain terms or issues on the Internet using a search engine tool	3	1.18	2.014	89.8	6.6	3.6
22. Use advanced search parameters as logical operators (and, or, not), filters, etc.	1	3.12	2.716	64.9	21.4	13.8
23. Communicate through forums (virtual communities of discussion) on a subject of your interest	0	2.06	2.433	77.6	14.8	7.6
24. Talk to more than one person using the same screen	0	1.17	2.173	89.9	4.7	5.4
25. Chat on the Internet through audio (sound)	2	1.76	2.370	83.6	9.5	6.9
26. Chat on the Internet through image and sound (webcam or video)	3	1.49	2.300	86.5	7.3	6.2
27. Send files to other people in a virtual learning environment	5	1.82	2.295	81.3	12.5	6.3
28. Create a list of favorite pages for easy access	3	1.53	2.250	81.2	14.2	3.6

(Table 2 continued)

Items	Missing	Mean	Standard deviation	Valid percent (%)		
				0–3	4–6	7–10
29. Find hyperlinks on web pages	5	2.40	2.635	72.8	18.8	8.5
30. Install plugins (Flash, Shockwave, Java, etc.) required to access documents, photos, videos, and webpages	6	2.95	3.012	64.2	21.0	14.8
31. Access webpages using the standard navigation features (forward, back, home, and reload buttons)	3	1.22	2.256	87.6	7.7	4.7
32. Save files downloaded from the internet at specific locations in the computer's hard drive	3	1.65	2.579	82.1	10.9	6.9
33. Compress and decompress files using specific software such as WinZip, WinRAR and others	3	3.46	3.301	58.8	21.2	20.1
34. Configure audio options on your computer, enabling and disabling the sound as needed	3	1.49	2.411	86.5	6.2	7.3
35. Evaluate which program is needed for opening files of video and audio (avi, mpeg, mp3, etc.)	4	2.72	2.951	68.1	18.7	13.2
36. Install software	3	2.52	2.838	70.1	19.0	10.9
37. Convert text files from one extension to another	3	3.88	3.180	53.3	25.9	20.8

The descriptive results of the questionnaire showed that most participants did not consider difficult the skills addressed, regarding the use of ICTs, since all items showed a concentration of responses greater than 50% in grades 0 to 3 (the easier ones). The averages ranged from 0.77 to 3.88, indicating low difficulty in most of the skills described in the questionnaire. However, the standard deviation was high on all items, indicating heterogeneity of responses among participants.

The main difficulties reported by students referred to the use of ICTs in items 22 "Use advanced search parameters as logical operators (and, or, not), filters, etc.", 30 "Install plugins (Flash, Shockwave, Java, etc.) required to access documents, photos, videos, and webpages", 33 "Compress and decompress files using specific software such as WinZip, WinRAR and others", 35 "Evaluate which program is needed for opening files of video and audio", and 37 "Convert text files from one extension to another".

All students (100%) reported having personal computers and Internet access at home. Thus, professors can use ICTs for education in the classroom or in extra-class activities, having in mind, however, that some students may need training and technical support, particularly in relation to skills reported in the previous paragraph.

Discussion

Traditional types of education are increasingly being viewed as insufficient to handle the increased needs of health care workers. The use of ICTs is proving to be a valuable adjunct to improving students' learning (Knight & Wood, 2005), the workforce and the population's health (Taylor, Abbott, & Hudson, 2008).

However, despite the importance of ICTs and e-learning in health, its use is not an end in itself (Frehywot et al., 2013). Technology is just a delivery vehicle of instruction. What really seems to influence learning is the instructional strategy used (Parker, Bianchi, & Cheah, 2008), which should be appropriate to the educational objectives and the characteristics of the students (Canto Filho et al., 2012), in order to lead them through meaningful activities (Lowther, Ross, & Strahl, 2006).

Despite the growth of personal computers from 1980 we cannot assume that all students will be able to handle them perfectly. Although all students reported having a personal computer and Internet access at home,

it was seen in this study that there is a great variability among students skills regarding the use of ICT. If such differences are not observed, the use of ICTs in education can produce undesirable effects (Verhoeven, Heerwegh, & De Wit, 2010).

Conclusions

The scale obtained through factor analysis proved valid and reliable, with a one-factor structure, with excellent index of internal consistency and no loss of any items. Although the scale needs improvement incorporating abilities to handle new technologies used in educational contexts, such as podcasts, games, and augmented reality, the good psychometric indices constitutes already a contribution to the knowledge of the area.

Further studies will be necessary in order to optimize health student's learning processes, the training of the healthcare workforce and the high investments being made by universities in Brazil.

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