ORIGINAL ARTICLE

Digital teaching skills: self-perception report in health sciences

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ABSTRACT

Objective: To determine the level of digital skills among academics who teach first- to fifth-year students of health sciences programs using a self-perception questionnaire during the first semester 2023.
Materials and methods: The study used a descriptive and cross-sectional research design. The sample consisted of 63 professors of health sciences programs at Universidad de Viña del Mar, Chile. Digital teaching skills were assessed using the DigCompEdu CheckIn questionnaire and a Likert scale response format. The instrument considered the dimensions *professional commitment, digital resources/pedagogy, evaluation and feedback, student empowerment* and *facilitating students' digital skills*. Data were collected using Google Forms and analyzed with descriptive statistics that included means, standard deviation, coefficient of variation, percentages and frequencies.
Results: The results show that the professors, as a whole, achieved an average score of 3.4 in the complete instrument, with a standard deviation of 1.2. This indicates that professors are in an intermediate range in terms of digital teaching skills, thus suggesting that they have a moderate perception of their digital skills.
Conclusions: Professionals, in their teaching role, should feel empowered to address online security issues, use digital assessment tools and customize teaching through technology. By doing so, they will be able to provide a more comprehensive and high-quality education in today's digital age. Therefore, training in digital teaching skills among professors may be a criterion for improving educational quality and students' training in a world where digital skills play a key role.

Keywords: Computer Literacy; Information Technology; Education, Medical (Source: MeSH NLM).

INTRODUCTION

At present, digital revolution has transformed processes that allow social interaction, learning and recreation [1]. One of the challenges has been to evaluate the effects of digital revolution on educational systems and discuss about the usefulness of current information and communication technologies (ICTs) on teaching and learning environments [2]. Regarding this issue, digital revolution demands the development of educators' but also students' digital skills [3]. In terms of digital revolution, it is considered that these skills are part of the eight keys for personal development, social inclusion, employment and having a knowledge society by means of lifelong learning [4].

Based on the foregoing, the application in higher education has been summed up as the set of educators' and students' abilities, knowledge and attitudes that allow using technology and digital channels and tools to work, collaborate and solve problems with creativity [5]. Though traditional approaches have sought more development in multimedia literacy among students and to work skills such as searching, managing and editing data, using and evaluating resources, properly applying digital tools and services to potentiate learning [6], studies state that this framework has shown limitations in the direct application with students, which are explained in part by the use of techniques that are isolated and lack context [7] as well as the shortage of evidence that allow determining the impact of using ITCs on the diversity of learning outcomes among students [8].

This suggests the role that digital skills may play among educators themselves as architects of the teaching-learning process [9]; however, instruction, training and rating of digital skills for educators have had less development. An example can be seen in the analyzed results of the bibliographic references of Zhao et al.[10], wherein only six out of all the articles are related to the teaching activity and two researched the pedagogical approaches comprised by digital skills, and stated that a high number of educators had a basic/intermediate level of digital skills. Nevertheless, they felt they had a poor level when facing complex problems. Similarly, a Nordic research among newly qualified educators studied the contribution of ITCs during their training, which they reported as poor [11].

In this regard, it is admitted that digital teaching skills require a good command of ITCs for its proper inclusion in teaching

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processes. Also, there are some factors or mobilizing variables of digital teaching skills, including educator training (ITC management, work experience), resources (infrastructure and availability of technology and digital resources), usage time (percentage of use (percentage or extent of use inside and outside the classroom), lack of time, and attitude toward technology [12]. The latter is considered "critical" since it will determine both technology inclusion and resistance to use it with teaching purposes [13].

Though the teaching of sciences is related to the follow-up and use of technological advancements, the following questions should be asked: how do educators perceive their digital skills and how are these skills integrated in their academic activity? From this research question, this study is aimed to identify their perceptions regarding digital teaching skills among professors who teach first- to fifth-year students of health sciences programs during the first semester of 2023.

MATERIALS AND METHODS

Study design and population

The research approach is quantitative, and the study scope is characterized by being descriptive and cross-sectional, excluding experimental elements. The target population were professors at the School of Health Sciences at Universidad Viña del Mar, region of Valparaíso, Chile, in 2023.

Variables and measurements

The instrument used to collect information was the "DigCompEdu Chek-in" questionnaire (Cabero-Almenara and Palacios-Rodríguez, 2020), which was the analysis instrument of the European Framework for digital teaching skills (DigCompEdu), previously validated by Ghomi & Redecker [14]. This competence framework was chosen as the most adequate for experts to determine digital teaching skills among professors (Cabero-Almenara et al., 2020). The evaluation instrument consists of 22 items that address six areas of skills according to DigCompEdu. Each item evaluates different digital skills, and professors are asked to self-rate their skill level at the beginning and the end of the questionnaire by using categories that range from "newcomer" to "pioneer."

Regarding the data collection process, an invitation to collaborate in the research was e-mailed to all the professionals. Later, the self-perception questionnaire about teaching digital skills was administered during the first semester of 2023 (March-June). Also, all the participants were advised about the type of questionnaire and that their participation was voluntary and confidential. Data were collected in digital format using the free Google Forms platform, and then organized and encoded by Microsoft Excel before being transferred to the code statistical program called R-Project.

Statistical analysis

Data were analyzed using descriptive statistics. This involved using frequencies and bar graphs to describe participants according to variables such as years of experience in higher education, sex, age and contractual relationship with the institution as well as their teaching-related qualities. In addition, the positive responses (PR) (Likert scores 4 and 5), neutral responses (N) (Likert score 3) and negative responses (NR) (Likert scores 1 and 2) were assessed by means of frequency and percentage analysis to address the research objective. Likert assessments of the six variables—which were obtained from the responses to the 22 items of the questionnaire—were compared to evaluate the self-perception of digital skills. This was carried out using descriptive statistics that included mean, standard deviation and coefficient of variation.

Ethical considerations

This study complied with all the institutional procedures required. Participants were asked to provide their informed consent, which explained that their participation in the questionnaire was completely voluntary and they could decide not to response at any moment. Moreover, the confidentiality of their responses was guaranteed. It was emphasized that the information would be used only for research purposes and it would not be disclosed to the public in any manner.

RESULTS

When globally analyzing the characteristics of the study sample, it could be determined that 63 professors were included, out of whom 17 were males (27 %) and 46 females (73 %). The largest age groups were those between 36 and 40 years (36 %) and between 41 to 45 years (20 %). Concerning the academic background of the professors, 68.2 % had a master's degree, and this group was the largest of the study sample. All the professors worked at the School of Health Sciences and taught in the eight careers at Universidad de Viña del Mar (Table 1).

Table 1. Sample description according to age, sex and academic degree

Age/Academic degree	Females	Males	Total
26-30 years old	6	1	7
Professional title	4	1	5
Master's degree	2	0	2
31-35 years old	5	4	9
Professional title	3	1	4
Master's degree	2	3	5
36-40 years old	18	5	23
Professional title	1	1	2
Master's degree	17	3	20
PhD	0	1	1
41-45 years old	10	3	13
Professional title	1	0	1
Master's degree	9	2	11
PhD	0	1	1
46-50 years old	4	0	4
Professional title	3	0	3
PhD	1	0	1
> 50 years old	3	4	7
Professional title	1	2	3
Master's degree	2	2	4
Total	46	17	63

As to the years of teaching, most of the professors fell into the 7-10-year and > 10-year intervals, with 30.15 % and 31.7 %, respectively. Concerning the type of subject, 60.3 % of the professors were related to preclinical and clinical subjects taught in the 4th and 5th year, and 22 % to subject areas taught in the 2nd and 3rd year. In addition, 57.2 % were adjunct professors and 42.8 % permanent professors (Table 2).

Table 2. Sample description according to the years of university teaching, type of subject and characteristics of the contract signed with the university

	Permanent professor*	Adjunct professor**	Total
Years of teaching/type of subjects			
1-3 years	1	11	12
Preclinical and clinical subjects (4th and 5th year)		8	8
Subject areas (2nd and 3rd year)	1	2	3
Basic sciences (1st year of study)		1	1

	Permanent professor*	Adjunct professor**	Total
4 - 6 years	4	8	12
Preclinical and clinical subjects (4th and 5th year)	3	3	6
Subject areas (2nd and 3rd year)	1	2	3
Basic Sciences (1st year of study)		2	2
General training		1	1
7 - 10 years	8	11	19
Preclinical and clinical subjects (4th and 5th year)	4	9	13
Subject areas (2nd and 3rd year)	3	1	4
Basic sciences (1st year of study)	1	1	2
> 10 years	14	6	20
Preclinical and clinical (4th and 5th year)	8	3	11
Subject areas (2nd and 3rd year)	3	2	5
Basic sciences (1st year of study)	2		2
General training	1	1	2
Total	27	36	63

* Professor that has an indefinite contract and teaches on a regular basis.
** Professor that works under a service agreement and teaches according to the school requirements.

The rating of the responses ranged from 1 to 5 to analyze the variables and achieve adequate data interpretation. Means, standard deviations and coefficients of variation among professors were provided for all the statements of each dimension. Professors achieved an average score of 3.4 in the entire questionnaire, with a standard deviation of 1.2. This points out that professors were in an intermediate range, thus suggesting a moderate perception of their digital teaching skills. Furthermore, in descending order, the results by dimensions were as follows: Dimension 2: Digital resources (3.8), Dimension 1: Professional commitment (3.7), Dimension 3: Digital pedagogy (3.5), Dimension 5: Student empowerment (3.1), Dimension 4: Evaluation and feedback (3.1), and Dimension 6: Facilitating students' digital skills (3.0). Coefficient of variation (CV) of item A2 suggests that the participants' responses tend to spread around the mean of approximately 18 %. This means that the variability of the participants' opinion is moderate in this item since the responses tend to be closer to the mean score. Moreover, item F4 shows a CV of 44 %, which evidences more variety of responses regarding the mean (Table 3).

Table 3. Frequencies, percentages, mean scores, standard deviation and coefficient of variation of the questionnaire items

DigCompEdu Check-In Questionnaire [12][14]	Never		Rarely		Sometimes		Usually		Always				
Dimension 1: Professional commitment (A)	f	%	f	%	f	%	f	%	f	%	M	SD	CV
A1. I systematically use different digital channels to improve communication with students and colleagues. For example: e-mails, messaging applications such as WhatsApp, blogs and the school's website.	0	0	3	4.8	12	19	26	41.3	21	34.9	4.1	0.85	21 %
A2. I use digital technologies to work with my colleagues inside and outside my educational organization.	0	0	1	1.6	11	17.5	32	50.8	19	30.2	4.1	0.73	18 %

DigCompEdu Check-In Questionnaire [12][14]	Never		Rarely		Sometimes		Usually		Always				
Dimension 1: Professional commitment (A)	f	%	f	%	f	%	f	%	f	%	M	SD	CV
A3. I actively develop my digital teaching skills.	1	1.6	6	9.5	19	30.2	27	42.9	10	15.9	3.6	0.92	25 %
A4. I participate in online training opportunities, for example, online university courses, massive open online courses (MOOCs), webinars.	7	11.1	10	15.9	26	41.3	17	27	3	4.8	3.0	1.03	35 %
Dimension 2: Digital resources (B)													
B1: I use different internet sites (websites) and search strategies to find and select a wide range of digital resources.	1	1.6	3	4.8	14	22.2	25	39.7	20	31.7	4.0	0.93	24 %
B2: I create my own digital resources and modify existing ones to adapt them to my needs as a teacher.	2	3.2	10	15.9	14	22.2	27	42.9	10	15.9	3.5	1.04	29 %
B3: I effectively protect sensitive content, for example: exams, grades and personal data.	5	7.9	8	12.7	8	12.7	10	15.9	32	50.8	3.9	1.36	35 %
Dimension 3: Digital pedagogy (C)													
C1: I carefully reflect on how, when and why to use digital technologies in class to ensure that their added valued is used.	1	1.6	4	6.3	11	17.5	28	44.4	19	30.2	4.0	0.93	24 %
C2: I supervise activities and interactions of my students in the online collaboration environments that we use.	4	6.3	8	12.7	20	31.7	20	31.7	11	17.5	3.4	1.11	32 %
C3: When my students work in groups or teams, they use digital technologies to acquire and document knowledge.	1	1.6	2	3.2	25	39.7	22	34.9	13	20.6	3.7	0.88	24 %
C4: I use digital technologies to allow students to plan, document and evaluate their learning themselves. For example: quizzes for self-evaluation, e-portfolios, blogs and forums.	4	6.3	15	23.8	25	39.7	14	22.2	5	7.9	3.0	1.02	34 %
Dimension 4: Evaluation and feedback (D)													
D1: I use digital evaluation strategies to monitor the students' progress.	9	14.3	14	22.2	21	33.3	14	22.2	5	7.9	2.9	1.15	40 %

DigCompEdu Check-In Questionnaire [12][14]	Never		Rarely		Sometimes		Usually		Always				
Dimension 1: Professional commitment (A)	f	%	f	%	f	%	f	%	f	%	M	SD	CV
D2: I analyze all data available to identify students who need additional support. "Data" includes students' participation, performance, grades, attendance, activities and social interactions in online environments. "Students who need additional support" are those at risk of dropping out or underperforming, students who have learning disorders or specific learning needs, students who lack transversal skills (social, verbal or study skills).	3	4.8	11	17.5	22	34.9	20	31.7	7	11.1	3.3	1.03	31 %
D3: I use digital technologies to provide effective feedback.	4	6.3	9	14.3	28	44.4	19	30.2	3	4.8	3.1	0.93	30 %
Dimension 5: Student empowerment (E)													
E1: When I propose digital assignments, I consider and address potential digital problems such as equal access to digital devices and resources, compatibility problems or low level of digital skills among students.	5	7.9	9	14.3	19	30.2	19	30.2	11	17.5	3.3	1.16	35 %
E2: I use digital technologies to offer students personalized learning opportunities. For example: I give different students different digital assignments to address individual learning needs, taking into account preferences and interest, among others.	8	12.7	12	19	25	39.7	15	23.8	3	4.8	2.9	1.06	37 %
E3: I use digital technologies for students to actively participate in class.	4	6.3	9	14.3	29	46	15	23.8	6	9.5	3.2	1.00	32 %
Dimension 6: Facilitating students' digital skills (F)													
F1: I teach students how to assess the reliability of the information sought online and to identify misinformation and bias.	6	9.5	11	17.5	23	36.5	16	25.4	7	11.1	3.1	1.11	36 %
F2: I set up assignments which require students to use digital media to communicate and collaborate with each other or with an outside audience.	3	4.8	15	23.8	21	33.3	21	33.3	3	4.8	3.1	0.97	31 %

DigCompEdu Check-In Questionnaire [12][14]	Never		Rarely		Sometimes		Usually		Always				
Dimension 1: Professional commitment (A)	f	%	f	%	f	%	f	%	f	%	M	SD	CV
F3: I set up assignments which require students to create digital content, e.g., videos, audios, photos, presentations, blogs, wikis.	5	7.9	10	15.9	26	41.3	17	27	5	7.9	3.1	1.03	33 %
F4: I teach students how to behave safely and responsibly online.	11	17.5	22	34.9	13	20.6	13	20.6	4	6.3	2.6	1.17	44 %
F5: I encourage students to use digital technologies creatively to solve concrete problems, e.g., to overcome obstacles or challenges emerging in the learning process.	6	9.5	6	9.5	28	44.4	16	25.4	7	11.1	3.2	1.07	33 %

The results of PR (Likert scores 4 and 5), N (Likert score 3) and NR (Likert scores 1 and 2) of each item are shown. According to the distribution of responses, it is possible to point out that skills in A2: Professional collaboration, A1: Organizational communication, B1: Selection of digital resources and C1: Teaching have a positive perception reaching mean scores over 4.0. Moreover, skills in F4: Wellbeing, D1: Evaluation strategies and E2: Differentiation and personalization evidence a negative perception and have mean scores under 3.0 (Figure 1).

It should be noted that the results show professors' negative perception regarding digital skills, specifically concerning items in F4: I teach students to use how to behave safely and responsibly online, D1: I use digital evaluation strategies to monitor students' progress and E2: I use digital technologies to offer students personalized learning opportunities—skills that are directly related to the teaching role.

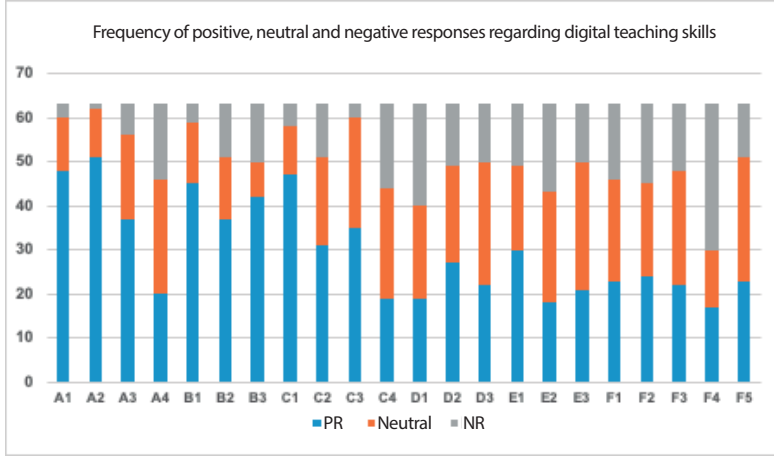

Figure 1. Distribution of NR, N and PR regarding self-perception of digital teaching skills

Before answering the questionnaire, 47.6 % of the professors perceived themselves at an intermediate and integrator level, followed by the explorer (25.4 %) and expert (15.9 %) levels. Subsequently and after answering the questionnaire, there was evidence of a drop of 3.2 % at the integrator level and an increase of 1.6 % at the explorer and newcomer levels. The other levels—expert, leader and pioneer—kept the same ratings (Table 4).

Table 4. Results before and after according to self-perception of digital teaching skills

Level	Before %	After %	Difference
Newcomer	6.3	7.9	+1.6
Explorer	25.4	27	+1.6
Integrator	47.6	44.4	-3.2
Expert	15.9	15.9	0
Leader	3.2	3.2	0
Pioneer	1.6	1.6	0

DISCUSSION

After the analysis of the results, a first parameter to discuss is related to digital skills, which is an essential component of education in the current digital age. Educators play a key role in the effective inclusion of technology in the classroom and communication with students and colleagues. In this context, it is important to understand educators' perception of their own digital skills, how they influence their teaching activities and the systematic further training that they need to improve their good command [15].

It should be pointed out that educators are globally at an intermediate level of digital teaching skills and the dimension with higher self-perception is that related to didactic, curricular and methodological elements. The results of this study reveal a positive professors' perception of their digital skills in two essential areas: the A2 category, related to the ability to take advantage of digital technologies as effective means of collaboration, both inside and outside of their educational environment [16], and the A1 category, reflected in the ability to systematically manage a variety of digital channels to improve communication with their students and colleagues [17]. This digital adaptability and willingness to use tools such as e-mails, messaging applications, blogs and institutional websites show a proactive attitude toward the continuous improvement and efficacy in their educational environment [18].

The second criterion to discuss is focused on the perception of digital teaching skills as an additional but not inherent element to educational role. The foregoing is a noteworthy aspect in a context where technology is increasingly present in education. This perception sets forth significant challenges, but also offers the opportunity to reflect and discuss about the role of digital skills in contemporary teaching [19]. One of the reasons behind this perception is the idea that teaching mainly consists in the transmission of knowledge and skills and that technology is just a complement that can be used to make such process easier. In this sense, some educators can see digital skills as "additional" and not as directly related to their main mission, i.e., to educate students. These beliefs may be due to resistance to change, lack of adequate training or feeling that technology may be a distraction instead of a useful tool [20]. However, it is important to challenge this perception and accept that digital skills are not simply optional complements but fundamental for educators at present.

Despite most digital skills are self-perceived by the professors of this study as moderate and received a positive response, some reveled the opposite through a negative perception similarly to another study that used the same instrument [21]. Regarding the negative perception evidenced in some items, it is essential to understand why some educators may feel insecure or not competent in this aspect and how it may affect the quality of teaching and learning. The D1 category is related to the use of tools in digital evaluation to monitor students' progress, while the E2 category is related to the use of digital technologies that allow offering personalized learning opportunity.

The lack of these teaching skills is similar to that described in other studies [22], which show that as to evaluation, the availability of instruments applied through technology still remains unable to offer creativity, distinguish between reproductive and significant learning and provide prompt feedback. Also, educators have trouble diversifying the tools used in digital format. If they do not feel competent to use these technologies, they will probably miss the opportunity to give more effective education, e.g., the use of technology and digital tools can benefit learning styles, which is a key component to design spaces and processes both of teaching and learning, and evaluations in a context akin to health sciences [23].

Specifically, item F4 states that teaching safe and responsible online behaviors is essential in the digital age. Plagiarism and other ethical problems related to online information are growing concerns [24]. If educators feel that they do not have the necessary skills to address these issues, students may commit dishonest academic practices or navigate the digital world unsafely.

Therefore, capabilities and development of skills among professors in these areas linked to technology and use of digital resources with academic purposes are fundamental as current educational approaches require educators to adapt to evolutions within the educational shift in health sciences [25]. Educational institutions should verify and even facilitate the acquisition of digital skills to enable educators to be prepared to face new developments and difficulties raised from the teaching and learning process [26]. Being an educator who is skilled in the digital realm makes it possible to take advantage of the opportunities that may arise along with skills inherent to ICTs, as well as address challenges set forth, for an active participation in the society of knowledge of the 21st century [27]. Furthermore, these results highlight the importance of implementing professional development programs adapted to each educator, aimed to reach higher levels of skills, including those focused on innovative exploration and pedagogical leadership by using ITCs.

Professionals, in their teaching role, should feel capable of addressing online security issues, using digital evaluation tools and personalizing teaching through technology. Then, they will be able to provide a more complete and noteworthy education in the current digital age. Therefore, to invest in the development of teaching digital skills is equivalent to invest in educational quality and students' training in a world marked by digital skills.

In conclusion, educators play a key role in digital literacy of their students. As long as educators have enough tools to guide the training process through technology, they will be able to provide more comprehensive, safe, efficient and broad-discretion education [28,29] as well as the skills required by students to solve problems in health sciences in a digital age [30].

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