Attitudes and Perceptions of Teaching Staff About the Online Learning During the COVID19 Pandemic: A Case Study of Engineering Education

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Abstract—The general objective of the present research is to know the perceptions and evaluations that academic teaching staff from a engineering faculty have about the emergency online teaching-learning process that occurred in the context of the COVID 19 pandemic. Based on several previous works related to online learning (OL) and recently in the literature on emergency online learning (EOL), an instrument (questionnaire) was developed and implemented with the participation of 126 teachers from a Chilean university. The research is quantitative-descriptive and had the following specific objectives: (1) To know about the disposition (readiness) of the teaching staff towards the EOL, (2) To know about the their interactions with others during EOL, (3) To characterize the use of different Self-management skills during EOL, (4) To characterize the interaction with LMS and ICTs., and (5) To know about the available resources for EOL. In general, the results show that teaching staff show mastery in aspects related to self-management of learning, but a low level of motivation and readiness for EOL and a "loss" in aspects related to interaction with others (students and peers). These results provide a first approximation to university teachers ' perceptions of EOL and allow us to identify several aspects that should be improved. This research was financially supported by DAAD as part of the project Praxispartnerschaften zwischen Hochschulen und Unternehmen in Deutschland und in Entwicklungsländern ab 2017 (Project Nr. 57334905).

Keywords—emergency online learning, university online teaching-learning, online learning during COVID19 pandemic

1 Introduction

1.1 Online learning in the context of the COVID19 pandemic

For a long time, the online learning (OL) was reserved for a particular group of learners: mostly older people with multiple family, work, financial and other responsibilities. These students benefited from the opportunities offered by this type of educational modality compared to traditional face-to-face education [1, 4]. Expectations of designing and implementing comprehensive online university education programs were long held back in a number of countries due to the preponderance and predilection for face-to-face learning (FFL)[4]. However, the emergence of the COVID 19 virus (and its derivatives) not only generated health problems, but also affected social structures, generating various problems in the field of education [2,3,5]. In this regard, the United Nations notes with concern (1) the enormous disruption to education systems caused by the pandemic (affecting almost 1.6 billion students on all continents), (2) the accentuation of pre-existing educational disparities at all levels of education, and (3) that the effects of the pandemic threaten to erase decades of progress [5].

In this context (and as is well known), face-to-face activities were suspended as a preventive health measure, and "emergency e-learning" or "emergency online learning" (EOL) became the optimal alternative to continue the educational process. The basis form of EOL consist in the use a mix of information and communication technologies (ICT) [6-7] for the design and implementation of university training program, which were not originally planned for OL [6, 9, 10]. However, this resulted in new conditions for educational institutions, for which their main actors (students, teaching staff, faculty and academic authorities, etc.) were not necessarily prepared and equipped. It is clear that many students and academics had no previous experience in OL and that many universities also lacked the necessary technological equipment to offer EOL to all students and academics quickly and efficiently [7, 8, 13, 14]. In most cases, the outcome of OL in the emergency context has had its strengths and weaknesses, but it has also demonstrated the commitment of higher institutions (and their faculty members) to students and the quality of their education process [9-15].

1.2 Related researches

There is a large number of scientific publications reporting on OL and the use and valuation of educational and information technologies by students and university teachers [3, 5, 22-28]. Specifically to students' perceptions of OL, Smith et. al. [25] administered the Readiness for online learning questionnaire (developed by McVay in 2000) to 107 university students in a series of courses in Australia and the United States. The instrument had a good reliability score and yielded a structure of two identified factors: comfort with OL and self-management for learning [25]. The authors concluded that while the online learning readiness questionnaire is useful in both re-search and practice, its predictive validity could be refined and tested. In relation to gender and OL variables, Blankenship and Atkinson [26] examined differences between university students (women and men) and found significant differences in the groups' "comfort" with

electronic communication (women were less comfortable than men with OL). The authors suggested that time management and self-management skills should be taught to students and teaching staff at an earlier age to better prepare them for OL environments [26]. The study also reported findings suggesting that university students were increasingly comfortable with online learning environments. Hung et. al. [27] developed and validated a multidimensional instrument on students' OL readiness. The authors identified five dimensions of analysis: self-management of learning, motivation for learning, computer/Internet self-efficacy (technology resources), learner control, and online communication self-efficacy. Research data collected from 1,051 university students indicated that student readiness levels were high on computer/Internet self-efficacy, motivation for learning and self-efficacy for online communication, but were low on learner control and self-management of learning [27]. Parkes et. al. investigated students' perceived readiness for OL [23]. Using three general categories (Learning and e-learning environment management; Interaction with the learning content; Interaction with the e-learning community), they established a set of competences associated with OL. In general, the results show that students consider themselves poorly prepared to reconcile work, social, family and study life in an e-learning environment. On the other hand, students rate themselves as relatively prepared in terms of skills associated with the use of technology and the Internet (e.g. in the use of information search engines, uploading and downloading resources, etc.). In relation to soft skills, students showed that they were not as well prepared in competences related to working with others [23].

2 Attitudes and perceptions of teaching staff about the EOL in engineering

2.1 Research questions

The general objective of this research is to learn about the perceptions and evaluations that university teachers have of the "emergency online learning" process that occurred in the context of the COVID 19 pandemic in Chile. The specific objectives of the research are:

1. To know about the disposition (readiness) of the teaching staff towards the EOL.
2. To know about the interaction with others during EOL.
3. To characterize the use of different self-management skills during EOL.
4. To characterize the interaction with LMS and ICTs.
5. To know about the resources available for EOL.

To address these objectives, and based on specific literature about OL and EOL, five main categories (Dimensions) were designed from which the questions (items) applied to students were derived (see Table 1). The research is quantitative-descriptive [30].Because the data were obtained at a specific point in time (online survey), it is also a non-experimental, descriptive cross-sectional research [31].

2.2 Instrument

Based on specific literature on EOL, the authors of this proposal developed a questionnaire that sought to explore "the perceptions and assessments that university teachers have of the EOL process in the context of the COVID 19 pandemic in Chile". The instrument is comprised of 24 items rated on a 5-point Likert scale (where 1 applies for "Strongly disagree" and 5 for "Strongly agree"). These items are grouped into 5 dimensions/factors that are derived from the literature presented in Table 1.

Table 1. Structure for the construction of instrument dimensions and items

Dimension/ Factors	Items	References
F1: Readiness for EOL	1,2,4,5,19,20 (6)	23, 24, 25
F2: Interaction with others during EOL	6,7,8 (3)	11, 24, 27
F3: Self-management skills during EOL	3,9,10,11,12,13,14,15 (8)	25, 26, 27, 33, 34
F4: Interaction with LMS and ICTs	16,17,18 (3)	23, 25, 32
F5: Resources for EOL	21,22,23,24 (4)	11, 23, 25

2.3 Methodology

The instrument was applied during the second academic semester of 2020, using the Google questionnaire tool. Students were contacted through an email, inviting them to answer the survey. Each academic completed the online questionnaire anonymously, considering ethical aspects according to Chilean social science research criteria. The study material consisted of 126 fully completed questionnaires. With the information consolidated, we proceeded to analyse teachers' perceptions of how they rated various aspects of their EOL experience. In order to respond to the five specific research objectives (see above), the responses to each item were analyzed using a descriptive analysis that took into account the mean and standard deviation, and also the homogeneity of each item with the corrected item/total correlation. The internal consistency of the full scale and sub-scales was analysed using Cronbach's alpha. All statistical analysis were carried out with SPSS software.

In relation to the reliability of the instrument it can be observed that the Cronbach's Alpha index for all items (24) is .894 indicating high consistency [30].

2.4 Sample characterisation

The object of the study is a group of the academic staff of a Faculty of Engineering from a Chilean University. The sample selected is non-probabilistic. A total of 133 academics responded to the survey, but in the end only 126 were considered valid in the data analysis process (126 surveys were fully completed). In relation to gender, 7.94% of the sample are female (10) and 92.06% are male (116). Regarding the distribution by age group, 36% of the participants of the survey are between 30-39 years old (45), 33% are between 40-49 years old (42) and 30% are older than 50 years (39). With regard to the years of teaching experience, 37% have between 0-10 years (47), 34%

have between 11-20 years (43) and 29% more than 20 years (36). Concerning the distribution of the participants by engineering school, most of them (42) work in industrial engineering (33%). The same number of participants work in mechanical engineering (20%) and computer engineering (20%) (25 in each field), 16% teach in electrical engineering (20), and 14 participants work in mining engineering (11%).

2.5 Results

Table 2 presents the 24 items that make up each of the factors proposed in the instrument, the mean the homogeneity index (IT-Cr= Corrected item-total correlations) and the percentages of responses in degrees of agreement for each of the items: low (1 to 2), medium (3) and high (4 to 5) levels.

Table 2. Descriptive analysis of the scales

Items	$\bar{x}$	IT- Cr	Low 1-2	Med 3	High 4-5
F1: Readiness for EOL					
Q1. Preparation for online learning.	3.13	.72	26.2%	39.7%	34.1%
Q2. Motivation to online teaching.	2.49	.569	52.4%	23.8%	23.8%
Q4. Usefulness of flexibility of time.	3.40	.457	24.6%	25.4%	50%
Q5. Usefulness of flexibility of space.	3.10	.621	32.5%	27%	40.5%
Q19. Proactivity responding to new tasks.	3.50	.504	15.9%	34.1%	50%
Q20. Responsibility for my own working process in the online modality compared to face-to-face teaching.	3.17	.269	29.4%	29.4%	41.3%
F2: Interaction with others during EOL					
Q6. Facilitation of interaction with the students.	1.94	.521	73%	15.9%	11.1%
Q7. Facilitation of interaction with peers.	1.95	.377	73.8%	14.3%	11.9%
Q8. Facilitation of group activities.	2.21	.409	60.3%	25.4%	14.3%
F3: Self-management skills during EOL					
Q3. Mastery of strategies and resources.	3.38	.539	16.7%	39.7%	43.7%
Q9. Awareness of best working strategies.	3.78	.521	6.3%	31%	62.7%
Q10. Awareness of working styles OL.	3.93	.477	6.3%	20.6%	73%
Q11. Awareness of times when it is most effective to plan and develop teaching materials.	3.94	.593	9.5%	16.7%	73.8%
Q12. Awareness of the times when it is most effective for me to do evaluations work.	3.88	.618	10.3%	16.7%	73%
Q13. Awareness of length of my concentration time.	3.76	.543	11.1%	27.8%	61.1%
Q14. Awareness of systematic daily schedule of work.	2.75	.447	45.2%	23.8%	31%
Q15. Mastery of plan my work week online.	3.13	.510	29.4%	33.3%	37.3%
F4: Interaction with LMS and ICTs					
Q16. Mastery of use the LMS and learning software for EOL.	3.96	.425	8.7%	21.4%	69.8%
Q17. Mastery of use ICTs (Video platform, information tools, etc.) for the EOL.	3.84	.524	9.5%	23.8%	66.7%
Q18. Confidence at use of LMS and ITCs for the teaching-learning process	3.98	.474	5.6%	21.4%	73%

Items	x̄	IT- Cr	Low 1-2	Med 3	High 4-5
F5: Resources for EOL					
Q21. Computer ownership all the time.	4.21	.394	12.7%	13.5%	73.8%
Q22. Software ownership.	3.36	.371	27.8%	23%	49.2%
Q23. Access to the Internet.	3.79	.44	17.5%	19%	63.5%
Q24. Place (at home) to work and teaching in a concentrated way.	3.35	.464	28.6%	19%	52.4%

Regarding the "Readiness for EOL" [23-25] of the teaching staff, the flexibility of time offered by online learning is perceived as useful (50%) and to a lesser extent the flexibility of space offered by this type of learning (40.5%). They recognise that they are proactive in responding to new EOL tasks (50%) but with less significantly that they feel more responsible for the teaching-learning process in the online format (41.3%), and also that only 23.9% feel motivated to teach online. Specifically with regard to motivation and readiness for EOL: 52.4% feel low motivation and 65.9% of the participants feel medium and low prepared for EOL.

In relation to the "Interaction with others during EOL" [11, 24, 27] all items are rated extremely low. The students considered that EOL disturbed the interaction with peers and teachers: as very low and low was valuated with 73% of preferences the item "Online learning facilitates interaction with the teacher"; and "Online learning facilitates interaction with other participants" with 73.8% of preferences. Regarding to the "Group activities" during EOL, only 14.3% of the participants considered that group activities are "easier" thanks to the online learning".

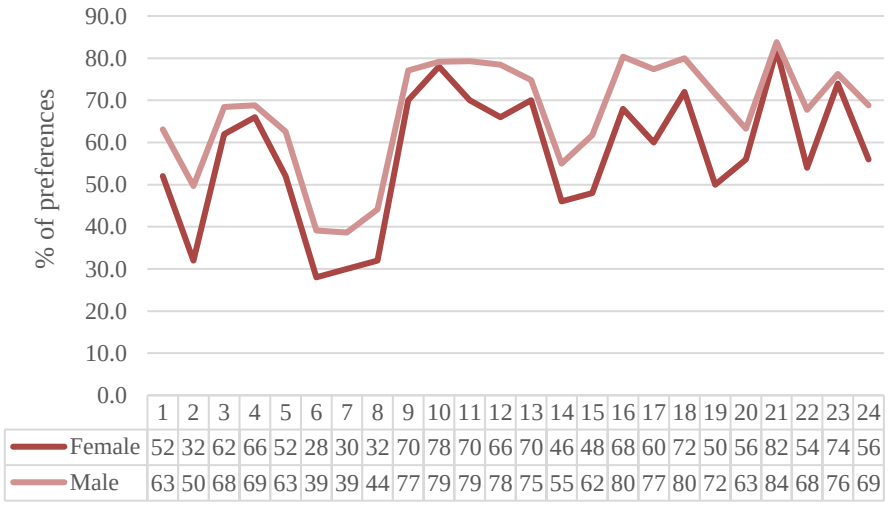
In terms of " Self-management skills during EOL " [25 - 27], the teaching staff claim to know their working style (73%), the times when they are most effective to plan and develop teaching material (73.8%), the times when they are most effective at doing teaching work (73%) and the length of their concentration time (61.1%). Only 43.7% of the participants recognise that they have mastered the strategies and resources for autonomous learning. In this dimension, the items with the lowest scores are the statements referring to planning the work and study week online (37.3%) and having a systematic work and study schedule (31%).

Regarding the dimension that inquiries into "Interaction with LMS and ICTs" [23, 25], participants reported that they know how to use the LMS and learning software (69.8%; only 8.7% considered difficulties with LMS and software), and know how to use ICTs (Video platform, information tools, etc.) for the EOL 66.7% (only 9.5% considered difficulties at this item). The confidence at the use of LMS and ITCs for their learning process was evaluated with high percentages (73%, and 3.98 average points).

In respect of "Resources for EOL" [11, 23, 25] the participants considered having a computer permanently available for online classes (73.8%) and access to the internet (63.5%). However, when the middle and low percentages are added together, 47.6% of participants report difficulties in having a place at home where they can work concentrate, and 50.8% do not have all the necessary software for EOL.

Another important aspect is the perception of the participants about the relevance of the different items by gender. Figure 1 shows the differences between the participants

related to the relevance of each indicators. In general, men gave a high average of preferences in the valuation of all items than women (67.04% and 57.3% respectively). For the female participants, all items are lower valuated. In particular, regarding to motivation and readiness for EOL: women feel 52% of readiness for EOL and extreme low motivation for EOL (32%). All items related to the "Interaction with others during EOL" and "Interaction with LMS and ICTs" are lowest rated for women than men. In particular, the highest valuated items for men are related to "Interaction with LMS and ICTs" and the disposition of "Resources for EOL".



	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Female	52	32	62	66	52	28	30	32	70	78	70	66	70	46	48	68	60	72	50	56	82	54	74	56
Male	63	50	68	69	63	39	39	44	77	79	79	78	75	55	62	80	77	80	72	63	84	68	76	69

Fig. 1. Percentage of preferences of the different items related to universtity teachers' attitudes and perceptions of EOL by gender

3 Discussion and conclusion

In the face of the COVID19 pandemic and the health measures resulting from it, EOL became the only possible alternative for continuing the training process at all levels of education. In general, Chilean university EOL experiences are characterised, as in many other countries, by a combination of synchronous and asynchronous activities. For synchronous activities, video conferencing software (e.g. Zoom, Google Meet or Microsoft Teams) is used, while for asynchronous activities, educational platforms based on e.g. Moodle (Educandus, etc.) and other various resources present in ICTs and other Internet platforms are frequently used. Since the design of EOL, many doubts remain about the quality and effectiveness of these educational processes for students and the teaching staff who, in many cases, were not prepared for this type of modality. On the other hand, the pandemic has also revealed the gaps and inequalities among students and teachers in terms of access to the internet, the possession (or not) of the necessary technologies for EOL (computers and software), as well as a reality in which

students from more affluent socioeconomic sectors of society were better "prepared" for EOL than students from other segments [22].

Seeking to understand the response of university teachers to "emergency online education "the general objective of this research was to know about the perceptions and evaluations that university teachers at a Chilean university have about the "emergency" online learning process that occurred in the context of the COVID 19 pandemic. Based on previous works regarding OL and recent research on EOL [11, 28, 29], an instrument (questionnaire) was developed and implemented through an online tool, with the participation of 126 academics. In relation to the reliability of the instrument it can be noted that the Cronbach's Alpha index for all items (24) is .891 indicating high consistency [40]. The results of the research according to the specific objectives presents that about the "disposition (readiness) of the participants towards the EOL", the teachers perceive flexibility of time as useful but to a lesser extent flexibility of space, but a low motivation and low readiness for EOL is recognized. About "the interaction with others during EOL", were the lowest rated items of the questionnaire: the participants considered that EOL disturbs and does not facilitate the interaction with peers and students at teaching-learning activities. Concerning "the use of different Self-management skills during EOL", the teaching staff considered knowing their working style, the times when they are most effective at working, and the length of their concentration time. Although teachers recognised that they have mastered the strategies and resources for teaching work, but in general they have problems with working strategies for teaching online. Related to "the resources available for EOL", the participants considered having a computer permanently available for online classes and access to the internet. However, when the middle and low percentages are added together, 47% of teachers report difficulties in having a place at home where they can concentrate, and do not have all the necessary software for EOL.

The research results confirms the findings of Blankenship and Atkinson [36] about the differences between the genders (female and male), showing that men feel more "comfort" with EOL: for the female participants all items related to their perceptions of EOL are lower valuated. Specifically the items related to the "Readiness for EOL", "Interaction with others during EOL" and "Interaction with LMS and ICTs" are rated lower for women than for men.

As a limitation of the present research, both the size and the characteristics of the sample (126 teachers from an engineering faculty) should be taken into account. Future studies should consider the (larger) sample size and probability sampling techniques, including participants from other faculties and universities as the object of study.

The results obtained are a first approximation to EOL and the perceptions of Chilean university teachers of it. They allow us to identify various aspects of the EOL experience in the context of the global pandemic. The next step for the authors of this article will be to strengthen the research instrument for its subsequent reapplication. In this way, the authors hope to continue contributing to the understanding of the online education processes experienced by university teachers, recognizing aspects that need to be corrected by teachers and university authorities in the design and implementation of OL and EOL in Chilean context.

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