The Impact of ICT on The Virtual Education of Students of The Salesian Polytechnical University as A Challenge Due to The Pandemic

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ABSTRACT

Despite the Covid-19 pandemic, Ecuadorian university institutions have started a new academic period in the virtual modality. The objective of this study was to evaluate the impact of ICT in the virtual teaching of students of the Salesian Poly-technic University as a challenge due to the pandemic. A structured questionnaire with a Likert scale was used, applied to 5432 students. The questionnaire yielded high-reliability coefficients in the pilot test and the real stage of the study, $\alpha = 0.95$ and $\alpha = 0.98$ respectively. The results indicate that ICT has allowed students to carry out tasks, evaluations and receive feedback from their teachers. However, the effectiveness of the virtual environment compared to the traditional environ-ment is discussed. In conclusion, ICT applied in virtual education allows students to develop a rhythm of self-taught learning strategies, whose knowledge can be applied to solving tasks and evaluations.

Keywords: ICT, Virtual education, impact, pandemic, university

INTRODUCTION

Education in the modern era has used the capabilities of technology to support the educational process. Although it is true, higher education institutions, until before the current pandemic, relied on ICT for the management of the teaching-learning process, as well as its corresponding evaluation, through academic systems, virtual platforms, and the use of Institutional emails (Janssen et al., 2016, Ghanbarzadeh and Ghapanchi, 2018, Proichev and Chemerys, 2020).

To continue teaching activities, educational institutions have had the challenge of adapting to a new way of teaching, facing a series of problems in the process. These problems are due to the short time to effect the change from face-to-face to virtual education (Schröder-Turk and Kane, 2020), little affinity towards technology on the part of a part of teachers and also of the students themselves (Toquero, 2020), there is also the problem of adaptation of a physical space to teach or receive classes (Kerres, 2020).

In higher education institutions the obstacles to carrying out the work of virtual teaching vary according to the universities and the regions of the world. The scope and context of this study focus on Ecuadorian universities, in which difficulties are practical, especially in some careers that normally require the use of laboratories to carry out practices with specialized tools; To a lesser extent, education actors have difficulties in adapting to communication and evaluation tools. Another major obstacle is the limited financial resources of some universities for the acquisition of licenses for videoconferencing platforms and virtual learning environments.

The objective of this study is to evaluate the impact of ICT in the virtual teaching of students of the Salesian Polytechnic University as a challenge due to the pandemic. Why is it important to evaluate the impact that TICs have on the virtual teaching of students of the Salesian Polytechnic University in times of pandemic? To know the effects, benefits, and advantages of making use of ICT tools in higher education. This information can then be used to improve communication between teacher and students, and the teaching-learning process.

Documentary research is applied, a review of primary and secondary sources on the subject. Then the deductive method for the identification of indicators for the construction of a structured questionnaire with a Likert scale applied to students of the Universidad Politécnica Salesiana, Guayaquil campus.

MATERIALS AND METHODS

MATERIALS

A search for information was carried out on the main scientific articles that dealt with the topic of pandemic and education, which allowed the definition of the indicators for measuring the impact.

Table 1. Indicators for ICT impact measurement.

Dimensions	Indicators	References
Teaching-learning process	-Self-taught learning strategy	(Jiménez et al., 2017)
	-Curricular development	(Lanuza et al., 2018)
	-Evaluations	(Al Lily et al., 2020)
	-Feedback	(Lanuza et al., 2018)
	-Effectiveness of the process	(Vinueza and Simbaña, 2017)
	-Knowledge	(Langford and Damşa, 2020)
Teaching-learning environment	-Adaptation to the environment	(Rusdiana et al., 2020)
	-Resources	(Hernandez, 2017)
	-Effectiveness of the environment	(Rusdiana et al., 2020)
	-Availability of the environment	(Ratheeswari, 2018)
Information	-Access to information	(Lanuza et al., 2018)
	-Reliability of the information	(Ratheeswari, 2018)
	-Fast access	(Al Lily et al., 2020)
Infrastructure	-Variety of hardware	(Pandey and Sharma, 2020)
	-Variety of software	(Yulia, 2020)
Communication and Collaboration	-Communication channel	(Arshad, 2020)
	-Collaboration tools	(Langford and Damşa, 2020)

Table 1 shows the indicators for measuring the impact of ICT in virtual education, taken from the reviewed literature.

METHODS

A quantitative descriptive study and a documentary investigation of primary and secondary sources of the subject were carried out, to then apply the deductive method for the analysis

of information.

PARTICIPANTS

The population of this study is the students of the Salesian Polytechnic University of the Guayaquil campus. The inclusion criteria include those students who are taking any of the 13 undergraduate courses offered by the university at this venue, those students who have been enrolled in the presidential modality before the pandemic, and maybe from the first to tenth cycle. Both men and women aged 17 and over are considered, with addresses within or outside the city of Guayaquil.

INSTRUMENT

A structured questionnaire was designed as a data collection instrument. Based on the review and analysis of the literature, indicators were adapted whose measurement was carried out using a 5-point Likert scale, with measures ranging from 1 for 'Totally disagree' to 5 for 'Totally agree'. The validation of the structure and content of the questionnaire was carried out by a group of 3 experts from the technological and educational areas, who analyzed each item to ensure the validity of the subsequent results. The final version of the questionnaire was made up of 17 items that evaluated 17 indicators distributed in 7 dimensions. Sociodemographic information was also collected on the age, gender, location, career, and the current semester in which the students enrolled.

The questionnaire was prepared on the Google Form web platform, then it was disseminated and administered by institutional mail to students of the Universidad Politécnica Salesiana, Guayaquil headquarters. 5432 validated responses were obtained that constituted the study sample

The data were analyzed with the statistical software SPPS v.25. A pilot test was carried out on a sample of 30 students from the 3 branches of the Salesian Polytechnic University and to ensure the reliability of the instrument, an analysis of internal consistency of the items was carried out, obtaining a coefficient of Cronbach's Alpha $\alpha = 0.95$ and $\alpha = 0.98$ for the pilot test and the actual application stage of the instrument, with a standard deviation of 0.84, a mean of the statistical data scores of 4.26 and an approximate error of 0.05.

RESULTS

It was found that the percentage of students enrolled for the current period (N = 5,432), decreased by 38% compared to the previous period (N = 7,890). The highest percentage of students enrolled in the last period is between the ages of 20 and 22. The percentage of male students was slightly higher, 53.57% compared to 46.43% of the female. The majors with the most demand were Communication, Electronics, and automation, Accounting and

Psychology; those with the least demand, Environmental Engineering, and Mechatronics. There are more students from the seventh to ninth cycle.

Regarding the dimension Teaching-learning process, 92% of the students consider that ICT helps them to be self-taught, 97% that they have allowed them to carry out their tasks satisfactorily, 90% that they have facilitated them to carry out their evaluations of learning, 92% that they have allowed them to receive feedback from their teachers, 92% that ICT has helped them to improve their knowledge, however, only 67% consider that receiving virtual classes has allowed them to achieve the necessary knowledge to pass their subjects.

In the Teaching-learning environment dimension. 78% of students consider that ICT provides an easily adaptable environment that allows them to carry out learning, 96% that it provides sufficient resources for their learning, however, only 57% consider that Virtual education is as effective as the face-to-face modality, and 59% that ICT provides a means of learning that is always available.

Regarding information, 97% of the students consider that ICT has facilitated access to a variety of information to carry out their study, 87% that ICT has allowed access to reliable study information, 97 % believe that they can access study information faster thanks to TIC.

Regarding the items of the infrastructure dimension, 97% of the students consider that there are different hardware equipment, as well as software that they can use to connect to virtual classes.

While for the Communication and collaboration dimension. 96% of students consider that ICT provides them with different tools that they can use to communicate with their peers and with their teachers. Also, 98% believe that ICT allows them to carry out homework and group workshops through online collaboration tools such as Google drive.

CONCLUSIONS

This work evaluated the impact generated by the use of ICT in the virtual education of the students at the Salesian Polytechnic University, due to the pandemic.

The impact of ICT must be evaluated within the teaching-learning process: the knowledge acquired by the students, whether facilitated by teachers or by self-learning, the effectiveness of the teaching-learning process, the opportunity to receive feedback and carry out evaluations. and self-evaluations, the accomplishment of tasks satisfactorily. Within the teaching-learning environment, the adaptation of students to the environment where the process will be developed, the availability of resources, and whether they are sufficient to ensure learning, the effectiveness, and availability of the environment, must be taken into account. Regarding information, access to information, its reliability and speed of access

must be evaluated. In infrastructure, a variety of hardware equipment, programs, and software platforms are available to make virtual education possible. In communication and collaboration, the tools that can be used to enable communication between classmates and teachers in hours outside the virtual class, also the online collaboration tools that are available and that can be used for homework and group workshops.

Quantitative studies have been carried out that assess the impact of ICT in virtual university education as a challenge due to the current pandemic. The impact has been evaluated based on the ease of access to information, the variety of information available, reliability and speed of information and data processing, variety of communication channels, space-time barriers, inter-activity, and feedback capacity, the flexibility of the learning space, capacity for personal autonomy, and the development of collaborative work (Gomez et. al., 2016). Form of interaction, content flexibility, work combination (Sinha and Lamba, 2016).

The impact of ICT has been studied from the professional development of instructors as the main component for the quality of virtual educational systems, where the technological knowledge of teachers, the didactic methodology, and the context regarding the duration and intensity of the use of technology, are related to the impact of ICT (Schildkamp et al., 2020).

Other studies have evaluated ICT from the didactic construction, consolidation of meaningful learning based on technology, technological use in education, teaching function, student role, methods based on current requirements, educational context, electronic literacy as a key competence of students and teachers (Hernandez, 2017).

TICs generate a positive impact on the virtual education of university students, which is largely due to the previous digital skills and competencies developed by students that have allowed them to easily adapt to the new learning environment, applying both methodologies based on self-learning and collaborative work, with a wide variety of ICT resources for accessibility to the virtual environment. However, the effectiveness of virtual education is discussed as a challenge due to the pandemic compared to the traditional face-to-face environment, given the tendency of screens to make virtual classes more static and with the difficulty for teachers to maintain and control the attention of their students.

Virtual education as a challenge due to the pandemic is not presented on an equal footing as virtual distance education without the occasion of a pandemic, because the latter is planned with enough time before being executed (Al Lily et al., 2020).

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