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ICT COMPETENCIES IN VIRTUAL EDUCATION IN RURAL CONTEXTS: A STUDY WITH HIGH SCHOOL STUDENTS IN PEDAGOGY AND SOCIAL SCIENCES AT UNIVERSIDAD PANAMERICANA.

COMPETENCIAS TIC EN EDUCACIÓN VIRTUAL EN CONTEXTOS RURALES: UN ESTUDIO CON ESTUDIANTES DE ENSEÑANZA MEDIA EN PEDAGOGÍA Y CIENCIAS SOCIALES DE LA UNIVERSIDAD PANAMERICANA

Sandy Johana García Gaitán[a]
Universidad Panamericana, Guatemala
(sjgarcia@upana.edu.gt) (https://orcid.org/0009-0003-0482-1009)
Ana Cristina García Pérez
Isabel I University, Spain
(anacristina.garcia@ui1.es) (https://orcid.org/0000-0003-3961-5021)

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ABSTRACT

The objective of the research was to analyze the ICT competencies, in the modality of virtual education in rural contexts of the students from Secondary School Teacher Training in Pedagogy and Social Science of the Faculty of Education Science of Universidad Panamericana. With a quantitative approach and an exploratory/descriptive design, collecting data through a questionnaire applied to 120 students of the Faculty, of which 75% are women and 25% men. The results of the analysis show that most students perceive themselves as having an intermediate level of ICT skills, abilities, and knowledge. The findings show that the means of communication used in virtual learning environments are WhatsApp and email, students recognize the support for the development of ICT, abilities and knowledge provided by Universidad Panamericana. The form of Internet connectivity by students is through Wifi at home and mobile data on their own devices. Based on the results, it can be inferred that the use of ICT supports educational environments that involve activities in virtual mode, such as receiving online classes through educational platforms, as well as the management of receiving and sending homework electronically and virtually. It is important that, at the time of applying ICT in the classroom, the planning, content, activities, and evaluation phases are developed to meet the stated educational objectives in the teaching and learning processes with an inclusive approach in virtual environments for students.

[a] Corresponding author.

Palabras clave:
competencias TIC, educación virtual, entornos educativos, modalidad virtual, plataformas, ruralidad.

RESUMEN

El objetivo de la investigación fue analizar las competencias TIC, en la modalidad de educación virtual en contextos rurales de los estudiantes del Profesorado de Enseñanza Media en Pedagogía y Ciencias Sociales de la Facultad de Ciencias de la Educación de Universidad Panamericana. Con un enfoque cuantitativo y un diseño exploratorio/descriptivo, recolectando datos a través de un cuestionario aplicado a 120 estudiantes del Profesorado, de los cuales el 75% son mujeres y el 25% hombres. Los resultados en el análisis muestran que los estudiantes en su mayoría se perciben con un nivel intermedio en habilidades y conocimientos TIC. Los hallazgos muestran que los medios de comunicación utilizados en los entornos de aprendizaje virtual son WhatsApp y correo electrónico, los estudiantes reconocen el apoyo para el desarrollo de habilidades y conocimientos TIC que proporciona Universidad Panamericana. La forma de conectividad a internet por parte de los estudiantes es por Wifi en casa y datos propios en sus dispositivos móviles. Con base a los resultados, se puede inferir que el uso de las TIC apoya los entornos educativos que implican actividades en modalidad virtual, como recibir clases a través de plataformas educativas, así como, la gestión de tareas por medios electrónicos y virtuales. Es importante que, al momento de la aplicación de las TIC en el aula, se desarrollen las fases de planificación, contenidos, actividades y evaluación para cumplir con los objetivos educativos planteados en los procesos de enseñanza y aprendizaje con un enfoque inclusivo en entornos virtuales para el estudiantado.

Introduction

Currently, there is a demand for a change in the traditional educational model. This change emphasizes a competency-based approach that develops social, personal, academic and professional practices in human beings. Particularly, in university education, processes of updating towards this competency-based educational model are being followed. The concern for using a competency-based approach in the different universities in Latin America is based on offering society human resources capable of managing effective knowledge for the performance of their functions in the different work environments, which in turn has an impact on the economic, political, social and cultural development of the different societies.

This competency-based approach to education requires that the teaching and learning process be of high quality and rigorous, while taking into account the incursion and impact of technological trends and the rise of digital or virtual education tools.

As a precedent for the priority given to a competency-based model in the different universities around the world, reference is made to the Tuning Project initiated in Europe in 1999. In the case of Latin America, the Alfa Tuning Latin America project was created. As a result of the Tuning LA project, a final report of the Tuning LA Project (2004-2007) was prepared, establishing four lines of action: generic and specific competencies, teaching and assessment approaches, academic credits, and quality and transparency: international comparability of degrees.

In correspondence with the line of generic competencies established in the Tuning AL project, two are directly related to ICT. Firstly, competencies related to skills in the use of information and communication technologies and, secondly, those related to the skills to search for, process and analyze information from different sources.

However, in order to adopt competency-based models for education, it is important to consider the socioeconomic environment of society and, in the case of ICT competencies, the existence of a technological and digital infrastructure. In this sense, it is a political, economic and sociocultural challenge for societies such as the Guatemalan society to establish a competency-based model in higher education. Pérez, Mena and Elicerio (2020) argue that "it is evident that technology builds and opens opportunities for inclusion in the new contemporary educational models. The potential of their implementation has been a milestone in the history of education and has contributed to significant improvements in the pedagogical approach" (p. 24), i.e., the implementation of technology and the development of ICT competencies are necessary in modern social education systems.

Godoy and Calero (2018), emphasize that it is important to distinguish, between students who are digital natives and students who are digital immigrants, since these should be considered with different teaching and learning strategies, in which specific competencies are required for both teachers and students with flexible methodologies that strengthen ICT knowledge, skills and abilities.

Islas (2017) states that ICTs and the internet are undisputed protagonists of the changes experienced by society, in daily activities, work and human behavior. The level of importance reached by ICTs and their transversality mean a series of transitions and changes for citizens, which fundamentally affect how relationships are established in the different social networks and also in the way personal, academic and professional activities are carried out.

In addition, due to the change brought about by ICT and as a consequence of the COVID-19 pandemic, educational models necessarily introduce digital and virtual

processes, although in countries such as Guatemala, in public or private educational institutions the transition to hybrid or virtual models of education is limited in terms of technological infrastructure, knowledge and mastery of ICT skills and abilities for educational environments.

However, despite the limitations related to technological infrastructure or factors such as access to technologies for education, especially in rural areas, by students, universities in Guatemala seek to develop programs that link the use of technologies and digital tools. Regarding the use of technology in higher education, Godoy and Calero (2018) published the study "Critical thinking and technology in university education. A theoretical approach" in which they conclude that in the field of higher education the use of technology corresponds to a meaningful learning strategy having a positive impact on the development of knowledge and skills for its application in the academic and professional training of students.

In Guatemala, according to data, from the I Digital Divide survey, published by FONDETEL (2019, p. 41) the simple digital divide for Guatemala is 72%. The I survey established that "52% of the surveyed households correspond to urban areas and 48% to rural areas" it was also established that "77% of the respondents self-identified as mestizos while 21% considered themselves of Mayan origin and 2% in other groups". It was established that only 4% (3,756 people surveyed) have a university education.

The data provided by FONDETEL (2019, p. 41) refer to an approximation of the Guatemalan reality in which educational environments take place. In addition, given that Guatemala is a multilingual and multicultural country, access to connectivity, internet use and technological integration for higher education is different for an urban sector compared to the rural sector, as a consequence of the country's planning in aspects of technological and digital infrastructure, quality and access to connectivity services and digital tools that impact on the knowledge and technological skills that university students develop.

One of the difficulties that some students have is the difficulty in downloading audios and videos to their digital devices. Other difficulties, depending on the geographic characteristics of the communities, are the lack of Internet connectivity, the cost of equipment, technical limitations and communication barriers.

The incorporation of new technologies has led to a drastic transformation in what is now known as an information society and since the emergence of technological media, the learning process has improved, however, there are limitations for teachers and students, for example, situations in which Internet connection is a problem that mainly generates a social, generational and, to a lesser extent, geographic gap; not all the applications used by each student to learn are freely available; in addition, the electronic devices used, such as computers, laptops, tablets or cell phones are usually low-end due to economic limitations, Montenegro Conce et al., (2020) cited by Perez and Reeves (2023).

It is important to mention that there are innovative teachers who adapt to new educational trends that respond to an inclusive approach, where ICT are essential in a transformative technological education, although some still use a traditional paradigm. Based on this information, it is important to highlight the commitment to a modern education that addresses values of inclusion, such as equality, equity and justice Perez and Reeves (2023).

Therefore, it must be ensured that the application of ICTs is developed as a pedagogical activity within the classroom, in order to reduce the uncertainty spaces developed through planning, content, activities and evaluation to meet the educational objectives set out in the teaching and learning processes of the student body.

For this reason, it is crucial for universities in Latin America to identify the ICT competencies required for e-learning in rural contexts. In this regard Islas (2017, p. 867) highlights the transcendence of ICT for universities and that in the educational field it is important to investigate digital competencies, due to the fact that, "...the students' perception of ICT management is overvalued to face the integration of technological tools in the learning processes. Somehow these are integrated mostly in a social sense and only as a consultation, they are little used in collaboration, construction and exhibition of knowledge". In other words, the use of ICT for virtual education requires students to develop specific competencies, since the more ICT knowledge, skills and abilities they have, the more significant the impact on the teaching and learning process will be. A student who has an adequate level in relation to the use of ICT, for the academic environment, is predisposed to successfully manage the knowledge and learning of what he/she studies and intends to internalize, understand and apply as part of his/her technical and professional training.

It is important to consider that the Internet, as an informatics and digital structure, represents a benefit for technological development and for educational processes because education is decentralized and allows participants in the educational process to access education with advantages such as: immediate access to data and information, flexibility in study schedules, minimizing geographical barriers (moving from one place to another to study), a recursive educational system because the student has the possibility of consulting the study material and its contents as many times as necessary, among others.

In contrast to the positive aspect of the Internet and its benefits for the development of virtual education, there are also disadvantages of virtual education to be developed in cyberspace because the amount of information that circulates digitally, exceeds the ability of people to process it, in addition, other disadvantages such as: that students incur in practices such as copying and pasting information, that automated processes are carried out without internalizing and understanding the contents (answering an exam by intuition or guessing the answers), that students do not correctly manage artificial technology, tools and virtual platforms.

These disadvantages or adverse scenarios are the ones that should be reduced or diminished and strengthen everything that represents benefits for the technical, professional and human formation of the students. To achieve this goal, it is essential to recognize or identify and guide students' ICT knowledge, skills and abilities for the benefit of educational processes that form people capable of participating in the labor system of a society and, at the same time, recognize and manage the use of ICT for the benefit of educational and social development.

In relation to ICT competencies, Basantes-Andrade, Cabezas-González and Casillas-Martín (2020) in the published study "Competencias digitales en la formación de tutores virtuales en la Universidad Técnica del Norte, Ibarra-Ecuador" identify 5 types of basic competencies for virtual tutors: academic, organizational, guiding, technical and social.

These same basic competencies can also be developed by students; among the academic competencies are: researching and managing reference sources, analyzing content, developing practices and exercises, among others. Organizational skills include: planning and defining the study agenda, organizing subject information. The guiding competencies for students are a function of the skills to interact in a digital environment to complement their academic training. Technical competencies in relation to the use of digital devices, platforms, communication mechanisms and social competencies that are oriented to the ability of students to interact, socialize and moderate their interpersonal relationships in virtual educational environments.

Basantes-Andrade, Cabezas-González and Casillas-Martín (2020, p. 280) emphasize that the formation of ICT competencies in an oriented and strategic manner "is visible in the development of skills, knowledge, attitudes and strategies with the efficient and safe use of information and communication technologies in online education".

In this scenario, it is not only important for education to have the introduction of Information and Communication Technologies, but also for educational activities to be designed with relevance to these technologies and to the social, political and economic context of society and of the key actors in the teaching and learning process (teachers and students).

ICT competencies require that the actors in the teaching and learning process participate in a digital environment and its constant transformation that impacts on the strategies for the development of education. For societies, digital transformation and its impact on the areas of personal and professional life represent challenges in relation to ensuring digital societies that are sustainable, inclusive and secure. In this context, the XXVIII Ibero-American Summit of Heads of State and Government (including Guatemala) was held in 2023 and one of its main results was the Ibero-American Charter of Principles and Rights in Digital Environments. The purpose of this declaratory charter is to promote strategic and common principles for States to consider when adopting or adapting the domestic legal framework, public or private policies in relation to digital environments.

The Ibero-American Member States, through the Ibero-American Charter of Principles and Rights in Digital Environments, reached commitments on 10 issues, one of which is focused on digital inclusion, with the goal of promoting "inclusive policies that recognize and address the situations of vulnerability of different groups and social groups in digital environments and that protect fundamental rights". In addition, under the theme of Centrality of the individual, one of the principles is "Fostering structural conditions, practices, tools and regulatory frameworks that promote universal, equitable and affordable access to ICT infrastructure and services, without discrimination of any kind"

In this sense, education through virtual environments should apply these principles and strengthen pedagogical competencies impacting the teaching and learning processes, since these are the central axis of the teaching exercise and the mechanism for young people, especially in rural areas, to develop ICT competencies.

An exploratory/descriptive research was carried out at the Universidad Panamericana with students of the Secondary School Teacher Training Program in Pedagogy and Social Sciences, on ICT competencies in virtual education in rural contexts. Universidad Panamericana is a private university in Guatemala and has a complete higher education system. It contributes to the development of the country, since it is projected in twelve campuses and 106 branches, located in Guatemala City and in the interior of the country. It serves more than 17,000 students enrolled in more than 45 technical, teaching, bachelor's, master's and doctoral programs, in classroom, blended and virtual modalities.

It is important to note that one of the cross-cutting themes of Universidad Panamericana is Information and Communication Technology, which applies to all degree programs, with on-site and virtual courses in the different faculties. The ICT axis responds to the need to seek answers to improve the quality of virtual and face-to-face education in rural higher education contexts.

Method

Design

This is a cross-sectional research developed as part of the studies of the Doctorate in Education of the Universidad Internacional Iberoamericana (UNINI), which was applied with students of the Secondary School Teaching Program in Pedagogy and Social Sciences of the Faculty of Education Sciences of Universidad Panamericana in the rural area; the design was exploratory because it constitutes a first approach to the aspects related to ICT competencies and descriptive because it seeks to characterize the study population taking into account variables such as age, use of electronic devices, forms of connectivity, as well as to know their perception of ICT competencies and the limitations of virtual education in rural contexts.

Participants

The objective of the research was to describe the ICT competencies in the modality of virtual education in rural contexts of the students of the Secondary School Teacher Training Program in Pedagogy and Social Sciences of the Faculty of Education Sciences of Universidad Panamericana in the departments of Petén, Huehuetenango, Zacapa, Alta Verapaz, Baja Verapaz, Sololá, Quiché, Huehuetenango, Quetzaltenango and Guatemala. In October 2022, at the time of applying the research instrument, 120 students participated, of which 25% were from Petén, 23% from Huehuetenango, 16% from Zacapa, 15% from Alta Verapaz and Baja Verapaz, 11% from Sololá and Quiché, 8% from the department of Guatemala (municipality of San Raymundo) and 3% from Quetzaltenango.

Instrument

Corresponding to the survey as a research technique, a Google questionnaire with 21 multiple-choice questions was generated in order to record ICT data and information related to competencies, factors, rural context, access, age, gender and region of the students surveyed.

For the validation of the research instrument, a pilot test was carried out with a sample that met similar characteristics to the selected population. It was applied in the departments of Sololá and Quiché, which are rural areas where the High School Teacher Training program is offered. The sample for the pilot test consisted of 41 students, enrolled for the 2022 cycle. As a result, a validated instrument was obtained. The Board of Universidad Panamericana authorized the application of the instrument; a requirement that was requested by the Ethics Committee of Universidad Iberoamericana (UNINI) in order to carry out the fieldwork.

Procedure

For the collection of data, the population was located in the area where Universidad Panamericana had, in 2022, a secondary school teaching program in Pedagogy and Social Sciences of the School of Education Sciences, specifically in rural areas. For this reason, the metropolitan region was not taken into account because it does not have the same characteristics as rural contexts.

The inclusion criteria are male and female students enrolled in the first year of the Secondary School Teacher Training Program in Pedagogy and Social Sciences located in the rural area of Universidad Panamericana. A total of 120 students participated.

Since the population of students enrolled in the faculty is 150 people, the application of the research instrument to the total number of students enrolled was considered; however, due to circumstances such as technological access or permanence

of students in the faculty, the participation of 120 students (81% of the total number of students enrolled) was achieved.

Data analysis

The processing of the information involved two stages, the first refers to the capture of the information provided by the students through the application of a questionnaire of multiple answers through a Google form which generates databases in files compatible with .xlsx (Excel) and graphs in relation to the results to describe the ICT competencies in the modality of virtual education in rural contexts of the students of the Secondary School Teacher Training in Pedagogy and Social Sciences of the Faculty of Education Sciences of Universidad Panamericana.

In a second stage, we proceeded to generate databases and process information through the statistical package SPSS (Statistical Package for Social Sciences) with which we obtained descriptive statistics such as frequencies, percentages; in addition to processing cross tables and graphs in order to establish the behavior of the study variables related to ICT competencies.

Ethical considerations were taken into account in the research with students. Some of these considerations were: confidentiality of the information, anonymity of the students' responses, voluntary participation, technical and respectful language in the instruments, and no economic cost to the students.

Results

The results of the application of the questionnaire to students of the Pedagogy and Social Sciences High School Teacher Training Program of the Faculty of Education Sciences are presented. There was a participation of 120 students in the rural area, of which the group was mostly women, representing 75% compared to 25% men. Based on the enrollment of students from previous years, the trend of female enrollment is evident.

Summary of the number of students per site

Table 1 summarizes the frequency of students per Universidad Panamericana campus where the Secondary School Teacher's Degree in Pedagogy and Social Sciences is taught.

Table 1
Frequency and percentage of students per site

Region	Frequency	Percentage
Petén	*30*	*25.1*
Huehuetenango	*27*	*22.4*
Zacapa	*19*	*15.8*
Alta and Baja Verapaz	*18*	*14.9*
Sololá and Quiché	*13*	*10.7*
Guatemala (San Raymundo)	*9*	*7.6*
Quetzaltenango	*4*	*3.4*
Total	*120*	*100*

Note. N=120. Field work - SPSS (Statistical Package for Social Sciences) 2022 software.

Since the research was carried out in rural areas of the departments listed in Table 1, it is important to mention that the application of the instrument in the department of Guatemala was specifically carried out in the municipality of San Raymundo, which has rural characteristics.

Age and perceived ICT literacy level

The crossover between the variable age of first-year students in the Secondary School Teacher Training Program in Pedagogy and Social Sciences at Universidad Panamericana and the perception in relation to their level of knowledge of ICT is summarized.

Table 2
Crosstabulation with the opinion on the category of ICT knowledge and the age of the students.

Age	Beginner	Intermediate	Advanced	Total
From 18 to 20 years old	*5*	*21*	*4*	*30*
From 21 to 30 years old	*8*	*51*	*8*	*67*
From 31 to 40 years old	*2*	*15*	*1*	*18*
From 41 to 50 years old	*1*	*2*	*1*	*4*
From 51 to 55 years old	*0*	*1*	*0*	*1*
Total	*16*	*90*	*14*	*120*

Note. N=120. Field work - SPSS (Statistical Package for Social Sciences) 2022 software.

It compares the options in which students consider their knowledge in relation to ICT. The category of intermediate knowledge stands out, that is, they consider themselves competent in relation to ICT for the educational environment.

This study does not assess the quality with which the different ICT competencies are developed, but rather the presence of ICT skills, knowledge and abilities in the students of the faculty. The beginner category refers to the minimum knowledge, skills and abilities in the use of ICT. In the Intermediate level category, it refers to basic academic, technical, organizational, counseling and social competencies. The advanced category refers to the knowledge, skills and abilities developed in a technical manner in the use of ICT.

Communication, electronic devices and learning processes

Table 3

Electronic communication media frequently used in learning processes

Electronic communication	Frequency	Percentage	Percentage of cases
E-mail address	97	27.6	80.8
Text messaging	28	8.0	23.3
Digital social networks	59	16.8	49.2
WhatsApp	109	31.0	90.8
Telegram	6	1.7	5.0
Videoconferencing platforms	53	15.1	44.2
Total	352	100.0	293.3

Note. N=120. Fieldwork - SPSS (Statistical Package for Social Sciences) 2022 software.

The frequency of use of electronic communication systems in the learning process is presented. This question allowed the student to select 3 of what he/she uses the most. In general, the responses were centered on: WhatsApp (91%), email (81%) and digital social networks (49%). Telegram was one of the least used communication tools.

Table 4

Cross table in relation to the electronic devices from which academic tasks are performed and on which online classes are received.

		Electronic device on which you receive your classes online			
		Smartphone	Laptop computer	Desktop computer	Total
Electronic device on which it performs academic tasks	Smartphone	6	1	0	7
	Laptop computer	33	61	1	95
	Desktop computer	10	1	7	18
	Total	49	63	8	120

Note. N=120. Field work - SPSS (Statistical Package for Social Sciences) 2022 software.

It is important to mention that when asking the student about the devices from which they receive their online classes they were presented with the option of "Tablet" same that is absent from the frequency table because this device is not used by any of the 120 students surveyed.

Table 5
Summary of the technological resources provided by Universidad Panamericana to student teachers.

Resources provided by the University	Frequency	Percentage	Percentage of cases
Educational platforms	96	37.4	80.0
Laboratories	5	1.9	4.2
Internet	6	2.3	5.0
Tutorials	33	12.8	27.5
Web applications	26	10.1	21.7
Virtual library	89	34.6	74.2
None	2	0.8	1.7
Total	257	100.0	214.2

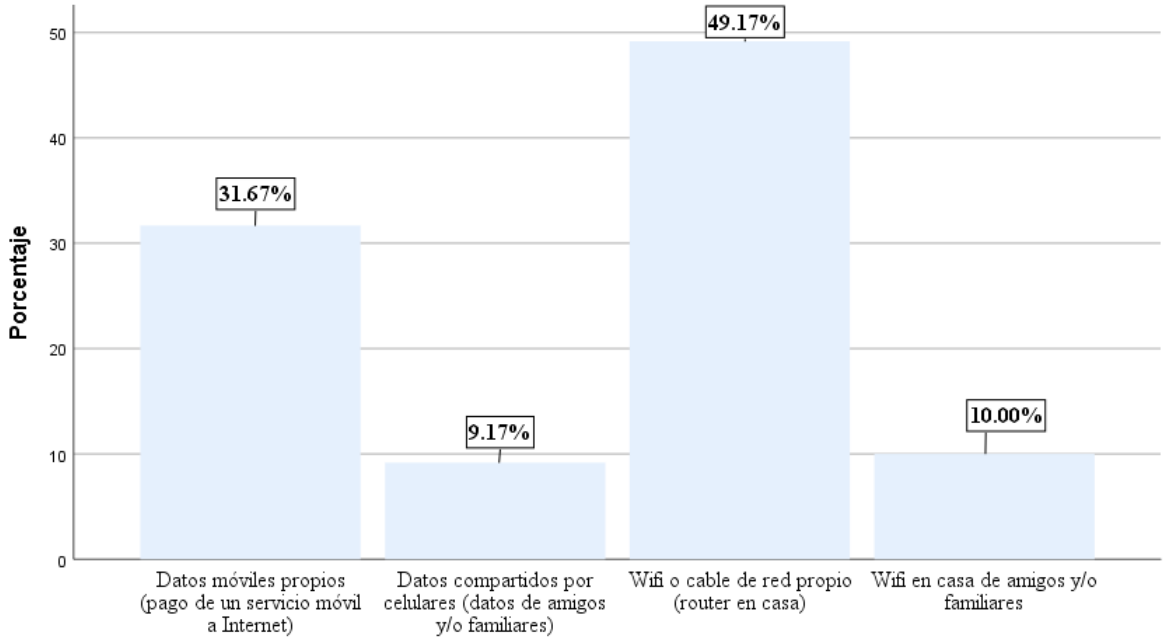
Note. N=120. Field work - SPSS (Statistical Package for Social Sciences) 2022 software.

In the case of the technological resources provided by the university for the virtual courses, it is observed that 80% of the students think that they are provided with access to an educational platform to receive their courses. 74.2% of respondents identify access to the virtual library as another resource provided. The least frequently used resources are Internet access (5%) and access to laboratories (4.2%).

Internet connectivity, advantages and disadvantages of virtual education

Figure 1

Percentages in relation to the form of Internet connectivity by the students



Note. N=120. Fieldwork - SPSS (Statistical Package for Social Sciences) 2022 software.

The ways in which students access the Internet are compared, the label in each bar is the total for each category and in relation to a sample of 120 students.

49% of respondents use internet connectivity via wifi or their own network cable through their own service from home. 32% do so through their own data. It is important to highlight that the results show a percentage of 9% of students who use data shared by cell phones (data from friends or relatives) and 10% use wifi at friends' or relatives' homes. These percentages, although lower in comparison with students who have their own resources for Internet connectivity, are significant categories from the perspective of guaranteeing student connectivity to virtual environments in rural areas.

Table 6

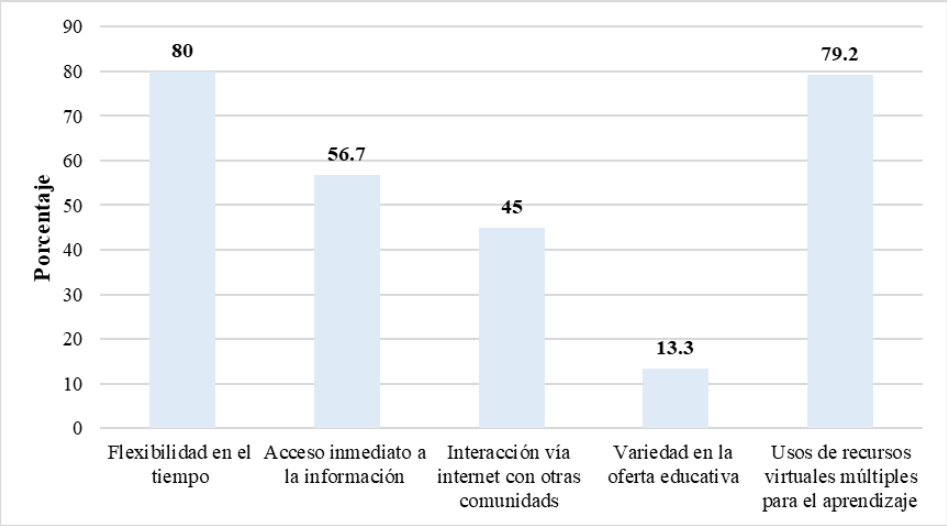
Student's opinion regarding the disadvantages of virtual education

		Technical limitations	Connectivity failures	Cost of equipment	Barriers to communication	Total
through what device do you receive your online classes?	Smartphone	18	43	19	16	49
	Laptop computer	16	61	20	20	63
	Desktop computer	3	7	5	1	8
Total		37	111	44	37	120

Note. N=120. Field work - SPSS (Statistical Package for Social Sciences) 2022 software.

It is evident that the devices most used by students to receive online classes is the telephone and laptop, however, 93% (111 students) highlight as a disadvantage for virtual education the aspect of Internet connectivity failures. Students also identified other disadvantages such as: cost of equipment, communication barriers and technical limitations.

Figure 2
Advantages of virtual education



Note. N=120. Field work - SPSS (Statistical Package for Social Sciences) 2022 software.

79% of the students surveyed see the variety of virtual resources that accompany them in the learning process as an advantage. Fifty-seven percent consider immediate access to information important in the development of their virtual courses and 80% identified flexibility in time as an advantage.

Discussion and conclusions

Based on the results, it is evident that students in rural areas, in the academic context, use Information and Communication Technologies (ICT) such as smartphones, laptops and desktop computers. The findings show that the perception of most students is that their category of knowledge in relation to ICT is Intermediate. On the other hand, it was identified that the students of the Secondary School Teacher Training Program in Pedagogy and Social Sciences are young and 75% are women.

In relation to the use of electronic devices, the findings show that 52.5% use the laptop computer and 6.66% use the desktop computer to receive their online classes. In addition, 79.16% use a laptop computer and 15% use a desktop computer to perform their academic tasks. However, it was identified that 5.8% of students use the smartphone for academic assignments and 40.8% use it to receive virtual classes. Regarding the use of electronic devices, the Inter-American Development Bank (IDB), (2022) citing (Arias Ortiz et al., 2020) in the publication with the title ¿Cómo reconstruir la educación

postpandemia? Solutions to fulfill the promise of a better future for youth, they mention that: lessons learned show that the delivery of educational content in a virtual environment involves working with accessibility, content curation focused through a strategy that allows interaction, enabling learning effectively through different devices such as cell phones and computers.

The use of a specific device suggests certain scenarios that can be inferred: as a first point that the phone is a multifunctional tool for students, because in addition to personal use, they also use it for their activities in the academic environment; it is inferred that virtual classes are accessed from the mobile device or laptop, not only because of the ease offered by the applications and platforms through these devices, but also because they represent an economical option.

As a second point, for each device that is used in virtual environment, it requires the formation of specific competencies. For example, to access online virtual classes, applications from different educational platforms are regularly used, while accessing them from a laptop or desktop computer does not necessarily require the installation of applications from these educational platforms. Another example is that the mobile device or phone is not ideal for performing tasks compared to the laptop or desktop computer.

The use of electronic devices for virtual environments represents a possibility of access to virtual education, but there are limitations for students in rural areas, specifically in relation to connectivity. In opposition to the disadvantages, the students of the faculty of the Universidad Panamericana and according to the geographical characteristics of each of the communities where the student belongs, see as an advantage the flexibility of time since the virtual courses are developed asynchronously, where the student must respond to their pace and time according to the schedule of activities to be developed in the course of the scheduled weeks. However, a geographical disadvantage of the region or rural communities are the constant failures of Internet connectivity, a triggering factor that often limits the monitoring and in some cases the abandonment of virtual courses. In Guatemala, and specifically in rural areas, the difficulties related to internet access and virtual resources for education stem from the low rural connectivity offered by the telephone companies that provide internet access services.

The smartphone is used in the rural area as a means of electronic communication, especially by the use of WhatsApp with 90.8%, email with 80.8% and social networks with 49.2%, because these mechanisms represent easy access. Regarding the use of WhatsApp in the academic environment, Melgarejo Noceda & Melgarejo Noceda (2022), mentioned that WhatsApp is one of the most used tools by students due to the practical functions such as making video calls, creating groups, sending multimedia file links that allow an immediate communicative and data transfer development.

The results linked to the use of devices and electronic media are congruent with the findings related to internet connectivity due to the fact that 31.67% connect to the internet with mobile data, 49.17% connect with wifi or their own network cable. However, there is a 20% that connects with data or wifi that correspond to third parties, this limits in some way the immediate connectivity and timely access for the development of their classes. In order to access the Internet, students need to have financial resources to purchase data packages or pay for Internet service.

Higher education in Guatemala is having a greater boom in the post-pandemic virtual environment due to the need to move from the face-to-face to the virtual modality, for which learning was required for teachers and students in the use of new educational platforms, technological tools, virtual media, so a curriculum was redesigned to correspond to ICT competencies and a methodology focused on virtual contexts. For this

reason, strategies aimed at strengthening ICT competencies, based on Tuning competencies, should be implemented, especially in rural regions of Guatemala.

ICT skills constitute a complex scenario in the education sector because they depend on several factors such as: socioeconomic level, technological development, quality of Internet service, age, among others. In relation to the age factor, this determines the development of competencies because young people are exposed to greater technological contact which strengthens skills such as: the use of mobile devices, digital tools, web browsing, use of applications for personal, work, leisure and entertainment. However, the training of technological skills is not necessarily related to an adequate and strategic use for the educational and training sector. Young people should be oriented towards the strategic use of ICT for the educational and professional environment. In this research, it was determined that it is the young people who, being students of the Secondary School Teacher Training in Pedagogy and Social Sciences of the Faculty of Education Sciences of the Universidad Panamericana, have intermediate skills that allow the development of the educational environment, but that these skills, abilities and knowledge can be strengthened, optimized and improved.

In this scenario, Universidad Panamericana provides different technological resources as tools for students. Among these supports that were recognized by the students (120) of the faculty are: 80% of cases identified educational platforms (Blackboard). In addition, Universidad Panamericana provides access to Teams since they use the institutional e-mail that enables them to use Microsoft licenses. In addition, 74.2% identified the Virtual Library, and Universidad Panamericana provides access to this service: eLibro, EBSCO and Digitalia.

Based on the results it can be inferred that Universidad Panamericana provides rural students with digital resources that contribute to strengthen their ICT skills in the learning process. It is inferred that the way in which the university can strengthen and contribute to the development of ICT competencies in rural Guatemala is by providing the technological and virtual structure for its students, but at the same time, training them to be managers of the skills and knowledge acquired, so that they are able to transfer the knowledge to other people or groups, according to their economic, social, political or cultural realities.

The area of influence of the High School Teacher Training Program has a greater demand in the regions of Petén, Huehuetenango and Sololá-Quiché. In Guatemala these regions are recognized as having a larger number of inhabitants, multiethnic and multicultural, areas that are remote and with high levels of poverty, which represents a challenge for Higher Education in Guatemala, especially in access to ICTs.

The development of ICT competencies in rural Guatemala, at an optimal level, represents a challenge that must be solved by having a strategic approach for the formation of skills and knowledge related to new technologies and that this is congruent or compatible with the value system, culture, and economy of the students of the Secondary School Teacher Training in Pedagogy and Social Sciences. This approach contributes to the development of ICT competencies based on a scenario of respect, tolerance, inclusion and ethics for the different actors in the educational process.

The ICT competencies of the students are functional for educational environments that involve elementary activities in a face-to-face model (use of technological devices, use of computers, projectors or others) and elementary activities in virtual modality such as: receiving online classes through educational platforms, management of receiving and sending assignments electronically, use of virtual media for communication, among others. However, it is inferred that the knowledge and application of ICT competencies still needs to be strengthened.

The present study constitutes a first approach to describe the aspects related to ICT competencies in virtual education in rural contexts. However, due to the complexity involved in verifying the development of ICT competencies in students, it is suggested that the research be expanded to verify the situation of the problem in the teaching sector and the follow-up of students, in order to propose congruent (with the rural context) and holistic lines of action linked to the educational process of Universidad Panamericana.

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