

Challenges in Technical Education in Bolivia During COVID-19 Pandemic

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This research delves into the profound effects of the COVID-19 pandemic on technical and technological education within Bolivia’s Higher Education sub-sector, particularly focusing on Technical and Technological Training Institutes. The interruption of practical teaching, inherent in the curriculum of these institutes, due to stringent containment measures imposed by the Bolivian State since 2020, has presented significant challenges for both educators and students. Through a comprehensive examination employing interviews, surveys, and focus groups, the study identifies key concerns such as limited internet access, insufficient ICT proficiency, and pedagogical hurdles specific to technical subjects. The transition to virtual learning has widened the pedagogical gap in technical education, exacerbated by disparities in technological resources, particularly impacting rural educators and those teaching practical courses. Economic vulnerability among technical professionals, especially in the informal sector, underscores the necessity for financial literacy and access to credit. As Bolivia moves towards resuming in-person classes, the study advocates for sustained teacher training in ICTs, development of virtual labs for practical subjects, and targeted social programs to support vulnerable technical professionals.

Keywords: technical education, virtual learning, digital gap, COVID-19, Bolivia

INTRODUCTION AND OBJECTIVES

Company’s Background

APPEXBOLIVIA SRL is a Bolivian technology company dedicated to software development, assistance, business consulting, and implementation of social projects nationwide, in times of pandemic designed and developed a mobile application called **Uorkcity**, with the main objective of connecting technical service providers with potential customers, and thus shorten the technological gap between the two, caused mainly by the conditions of physical distance and confinement after the COVID-19 health emergency, a situation that has generated in the country, in the fourth quarter of 2020, an urban unemployment rate of 8.34% according to National Institute of Statistics (2020).

Uorkcity is a mobile application that seeks to contribute to the reduction of poverty and the improvement of the quality of life of families in La Paz and Santa Cruz, whose main target market is technical workers in the following areas: carpentry, plumbing, masonry, hairdressing, beauty, health care, gastronomy, courier services, education services, and other services in general. Thus, this project captured the attention and interest of the Swedish and Swiss Cooperation in Bolivia, with whom APPEXBOLIVIA formed a collaborative work platform in search of the joint development of projects and programs that strengthen the employability of the sectors of Bolivian society that have been most affected by the pandemic.

Uorkcity aims to become a strategic tool to help eradicate digital illiteracy in the country. To this end, in 2020 APPEXBOLIVIA has worked hard to link Higher Education Institutions (Technical and Technological Training and University Training), Non-Governmental Organizations, International Organizations, Crowdfunding, Chambers of Exporters, Guilds, and Youth Associations to build a collaborative platform of stakeholders to improve the employability of Bolivians, especially those belonging to the *informal economy*¹, one of the sectors most affected by the pandemic.

Uorkcity has approximately 715 authorized technical service providers from the Departments of La Paz and Santa Cruz, who provide their services through this platform. Although the application is being used in both cities, the ratio of affiliates is 7:3 (Santa Cruz, La Paz). Its official launch date in the Bolivian market was October 7, 2020. In addition to building this technological bridge between suppliers and demanders of technical services in the cities of La Paz and Santa Cruz, Uorkcity has also arranged for its members to be covered by a life and personal accident insurance provided by an insurance provider, which includes death due to the COVID-19 coronavirus.

We are convinced that it is possible to help connect people to generate decent work with the assistance of digital bridges that build efficient and convenient solutions for thousands of people at home (Leonardo Rosas, Co-founder APPEX BOLIVIA, 2020).

Background of Technical-Technological Higher Education in Bolivia

The Political Constitution of the Plurinational State of Bolivia establishes Education as one of the fundamental rights of all Bolivians, which is based on an open, humanistic, scientific, technical and technological, productive, territorial, theoretical and practical, liberating and revolutionary, critical and supportive education [Chap.6, Art.78-III] (Asamblea Constituyente de Bolivia, 2009). The State is responsible for guaranteeing vocational education and humanistic technical education for men and women, related to life, work, and productive development.

For such an effect, the Plurinational Educational System is shaped by a set of subsystems, which are: 1) Regular Education, 2) Alternative Education and Special Alternative Education, 3) Higher Education Professional Training (Cap 6, Art. 77). In the particular case of the Higher Vocational Education subsystem, this is provided through Universities, Teacher Training Colleges, and Technical, Technological and Artistic Institutes, both public and private [Chap. 6, Art. 91-III] (Asamblea Constituyente de Bolivia, 2009). On the other hand, according to the Education Law “Avelino Siñani - Elizardo Pérez” (Poder Legislativo, 2010), one of the main objectives of Technical and Technological Education is to “train professionals with productive, research and innovation capacities to respond to the socioeconomic and cultural needs and characteristics of the regions and the Plurinational State” [Chap.3, Art. 29-2] [Chap.3, Art. 29-2].

The Technical Institutes [ITS], Technological Institutes [ITT], Alternative Training Centers [CEA], and Special Training Centers [CEE] offer professional opportunity and training that responds to the dynamics of local work and production within the framework of the implementation of the socio-community-productive educational model. However, according to the general characterization of Education in Bolivia carried out in 2012 by the Ministry of Education, the Bolivian work field tends to overvalue humanistic training over technical training, which has generated a proliferation of “licensed” professionals and a devaluation of technical trades (Ministerio de Educacion, 2012), which generates a series of impacts, including lower economic income and low self-esteem of technical professionals, to mention a few.

The new Productive Sociocommunity Educational Model proposed in 2012 by the Ministry of Education aims to shorten these gaps between humanistic and technical training, thus focusing on the transformation of the country’s productive system (from primary industry to secondary and tertiary industry). For this purpose, the development of capacities, abilities, and skills in students (in all subsystems of the educational system) is encouraged, which contributes to the production of tangible and intangible goods in a sustainable manner, whose intellectual property is Bolivian and allows for the technological sovereignty of the State (Ministerio de Educacin, 2012).

In the current context of the SARS-CoV-2 pandemic, Technical Vocational Training [TVET] should become even more relevant, given that it is the first link in the Educational System that seeks rapid labor

METHODOLOGY

Phenomenological research design has been defined as an inquiry strategy where the perspectives of the users and potential users of the **Uorkcity** application will be obtained. From these, the common needs that this group of people have will be explored, discovered and understood. The common phenomenon that has affected not only these users of the Uorkcity application but in general the entire world population, has been the SARS-Cov-2 pandemic, this study aims to explore the main effects and new needs of this group of users from this disruptive event in their lives.

The subject of study of this research is the students and teachers of Technical and Technological Institutes located in the cities of La Paz and Santa Cruz de la Sierra with which APPEXBOLIVIA has an agreement (specifically: CECAP, FE y ALEGRÍA, ESAE). On the other hand, it should be noted that teachers/facilitators from these Technical and Technological Higher Education Centers/Institutes were included, with the main objective of triangulating the information provided by the students, and simultaneously identifying their primary needs. Although **Uorkcity** is an application that can be used by any person offering technical services, the data collection focused on the students and teachers of these institutes, given the proximity and ease of access that the company APPEXBOLIVIA has.

Considering the operational capacity of the research group to collect and analyze data, the understanding of the study phenomenon and its nature, an **inquiry sampling (non-probabilistic)** has been defined, which means that, unlike quantitative studies, the sample size is not essential from a probabilistic perspective, but what will be valued in this study is the deep understanding of the user and his environment.

As a tool for data collection, a questionnaire was first constructed to collect the main characteristics (demographic, socioeconomic, education level, etc.) of the population under study. Subsequently, focus groups with a small group of these users have been selected as a complementary data collection instrument, with open and semi-structured questions, to collect robust primary information that will allow us to understand each user profile better. The following is a more detailed description of each data collection instrument used.

Design of the Instrument for Data Collection

In Table 2 are the variables that have been defined to characterize this group of people, which have been grouped into six areas or dimensions: demographics, available technological infrastructure, work area, socioeconomic profile, and educational level. Note 2 contains the questionnaire used to collect the information from the survey participants. It was conducted online through the APPEX company's communication networks with its users².

TABLE 2
OPERATIONALIZATION OF THE VARIABLES TO BE INVESTIGATED

RESEARCH QUESTION	AREA	DESCRIPTION	VARIABLES
Q.1. What are the general <u>characteristics</u> of the user of the Uorkcity mobile application?	1. Demographic profile	Characteristics describing the population under study.	Age; gender; current residence; migration
	2. Available technological infrastructure	General characteristics of the mobile telephone equipment used.	Brand; length of service; equipment limitations.
	3. Labor profile	General characteristics about its primary and secondary use (if applicable).	Type of service offered; temporary/permanent; years of experience; personnel in charge; marketing of the service.
	4. Socioeconomic profile	General characteristics describe the user from a social and economic perspective.	Several economic dependents; average income, average primary and secondary job; AFP contributions; life insurance; type of insurance; economic credits or loans; financial counseling, and telemedicine.
	5. Educational profile	General characteristics describing the educational level of the users.	Highest level of studies; the ratio of studies vs. work performed; form of apprenticeship; potential areas of development; degree of knowledge

Planning and Organization of Focus Groups

The purpose of a focus group is to gather information by bringing together a group of people who share similar characteristics about the objective of interest that brought them together. Two or more focus groups are conducted with to delve into a given topic.

To identify the primary needs that these users face due to the COVID-19 crisis (second research question), it has been applied the “**empathy map**” as a tool to empathize with these users and thus achieve a better understanding of their main barriers, limitations, and difficulties that they experience.

In this context, eight focus groups were formed according to the common characteristics of the users in relation to the study’s objective (for more details, see Table 3). The focus groups were formed with the participation of 2 to 12 people. All participations were recorded, with the prior consensus of all participants (See Annex 2. Questions guide).

TABLE 3
ORGANIZATION AND EXECUTION OF FOCUS GROUPS

N°	Focus Group Target	Characteristics of participants	Date of its execution
1.	<u>Centro de Capacitación Profesional (CECAP)</u> Location: Santa Cruz	Early Childhood Education students N° participants: 3	02/02/2021 Duration: 1Hr 09min
2.	<u>Fe y Alegría</u> Location: Santa Cruz	Teachers of Integral beauty, gastronomy careers. N° participants: 11	02/02/2021 Duration: 1Hr 11min
3.	<u>Fe y Alegría</u> Location: Santa Cruz	Students integral beauty, business administration, and gastronomy careers. N° participants: 37	02/02/2021 Duration: 1Hr 03min
4.	<u>Centro de Capacitación Profesional (CECAP)</u> Location: Santa Cruz	Teachers of automotive mechanics and early childhood education careers. N° participants: 2	04/02/2021 Duration: 41min
5.	<u>Fe y Alegría</u> Location: La Paz	Students of physiotherapy, informatics, gastronomy, mechanics Number of participants: 6	05/02/2021 Duration: 1Hr 08min
6.	<u>Escuela Superior de Administración de Empresas (ESAE)</u> Location: La Paz	Teachers from Business Administration N° participants: 5	05/02/2021 Duration: 1Hr
7.	<u>Fe y Alegría</u> Centro de Educación Alternativa Location: La Paz	Facilitators of the careers of physiotherapy, computer science, gastronomy, automobile mechanics N° of participants: 9	05/02/2021 Duration: 1Hr 24min
8.	<u>Instituto Técnico Marcelo Quiroga Santa Cruz</u>	Facilitators of the automotive mechanic's career	06/02/2021 Duration: 44min

Finally, the statistical analysis of the quantitative data collected was carried out in Excel. For the qualitative data, a content analysis of the information collected by the participants in the focus groups was carried out.

RESULTS

This section presents the main results found after implementing both quantitative and qualitative tools for data collection. First, the specific characteristics of the users and potential users of the Uorkcity

application who responded to the online survey will be presented. It should be noted that the implemented questionnaire has been designed and validated by a team of researchers and technicians from both the Universidad Catolica Boliviana San Pablo and the company APPEXBOLIVIA, once validated and digitized this instrument through a Google form, it has been distributed to Uorkcity users through formal communication channels between APPEXBOLIVIA and the Technical and Technological Institutes of agreement. The survey has been applied from January 29 to February 6 of the current year, obtaining 85 responses. A database of 85 x 47 data has been collected, systematized, and quantitatively analyzed, which has allowed the understanding of the main characteristics of the users and potential users of this mobile application, from the demographic, economic, social, labor, and educational levels, among others.

Subsequently, the results obtained from the analysis of 8 hours and 33 minutes of recordings corresponding to the eight focus groups conducted will be presented. Using content analysis and mind mapping techniques, we were able to investigate the specific needs of users and potential users of the application. As a result, we identified certain technical careers that are more vulnerable than others.

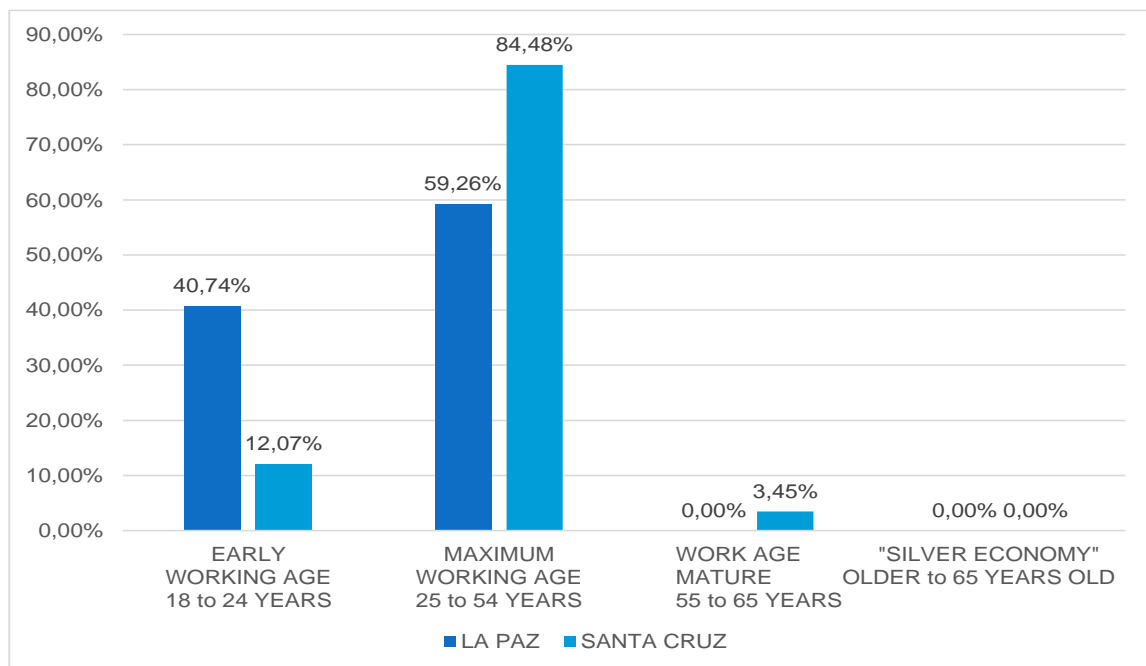
General Characteristics of Users and Potential Users of Uorkcity

Although the results presented below give a general understanding of the main characteristics of users and potential users of the Uorkcity application, they should not be used to generalize to the population of users and potential users of this mobile application, remembering that the sampling carried out is by inquiry and not probabilistic, where the priority is to understand in depth certain phenomenon, rather than generalize from the population under study.

Demographic Characteristics of the Population

From the sampling, 68% of the participants are from Santa Cruz and 32% from La Paz City. Figure 1 shows population distribution ranges according to working age used by the National Institute of Statistics, which are: 1) early working age [18 to 24 years old], 2) maximum working age [25 to 54 years old], 3) mature working age [55 to 65 years old] and 4) silver economy [over 65 years old].

FIGURE 1
AGE DISTRIBUTION OF SURVEY RESPONDENTS BY CITY



Regardless of the city where they reside, Uorkcity users (or potential users) are between 25 and 54 years of age (peak working age), followed by young people between 18 and 24 years of age (early working age). These results are related to Uorkcity’s total user base, where people between the ages of 25 and 54 also prevail (65.5%), followed by young users between the ages of 18 and 24 (32.5%). It should be noted that Uorkcity has users over 55 years old (approximately 2%) who did not participate in this survey.

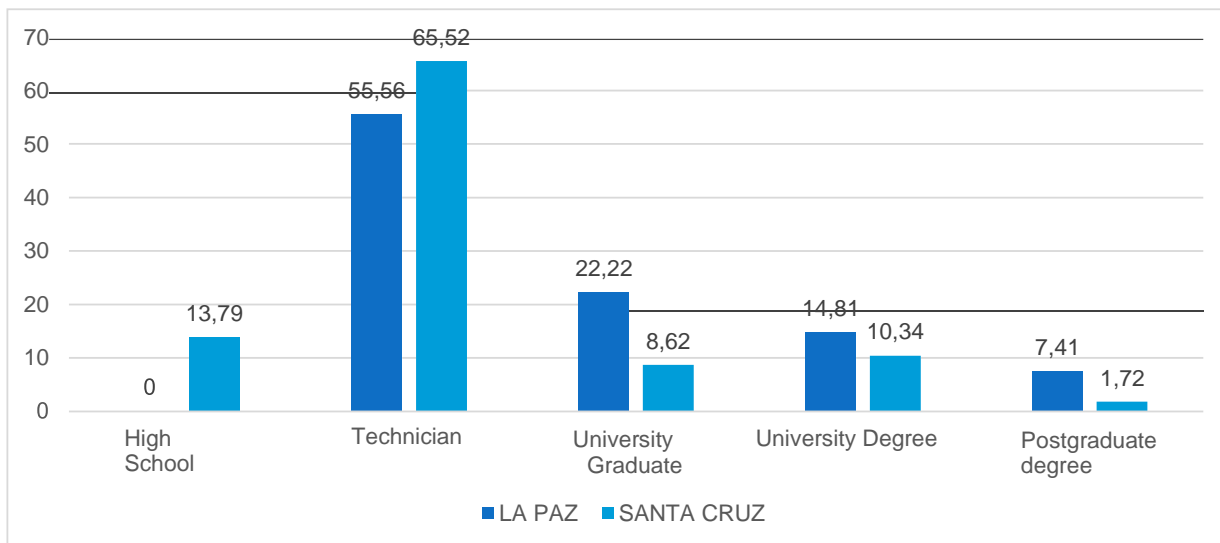
This age distribution of the users (and potential users) of Uorkcity makes sense, given that this group of people is students (or graduates) of the Technical and Technological Training Institutes, the main target group of the APPEXBOLIVIA company. On the other hand, and considering that Uorkcity is a mobile application, the age distribution of users is consistent with other types of studies, where it has been identified that tasks related to writing and numerical skills, the use of new technologies, and physical effort decrease with age (SAGE,2017).

In terms of migration, 21% of those surveyed in Santa Cruz are migrants from other departments, such as Tarija (25%), Cochabamba (17%), and Sucre (17%). Regarding migration from rural areas to the city, 16.6% come from provinces within the department of Santa Cruz. In the particular case of La Paz, only one person migrated from rural areas to the city. These results are consistent with the study on Internal Migration in Bolivia, where it was identified that the Municipality that receives 12.5% of the total *recent migrants*³ generated in the country is Santa Cruz de la Sierra (UDAPE; INE; IOM; UMSA, 2018).

Educational Level of the Population Under Study

Regarding the educational level of the population under study, of the total number of respondents in La Paz, 100% have entered the Higher Education System, either in Technical/Technological Training (55.56%) or in University Training (37.03%). In contrast, in the case of the city of Santa Cruz, 86.21% of those surveyed have entered the Higher Education System, 65.52% in Technical/Technological Training (65.52%) and in University Training (18.96%) respectively (see Figure 2).

FIGURE 2
LEVEL OF EDUCATION ACHIEVED BY USERS, BY CITY



The survey also asked about the source of acquisition of knowledge related to the services offered by the users. The purpose of this was to identify users who use formal sources of access to knowledge (technical or university studies), or informal sources such as independent studies or the practice itself (see Figure 3).

From these data 48% of the users surveyed in the city of La Paz obtained their knowledge formally and 52% informally. In the city of Santa Cruz, we have an inverse situation, where 55% of the surveyed users

obtained their knowledge formally and 45% informally. However, in general, there is no significant difference in the user’s knowledge acquisition source for offering their services.

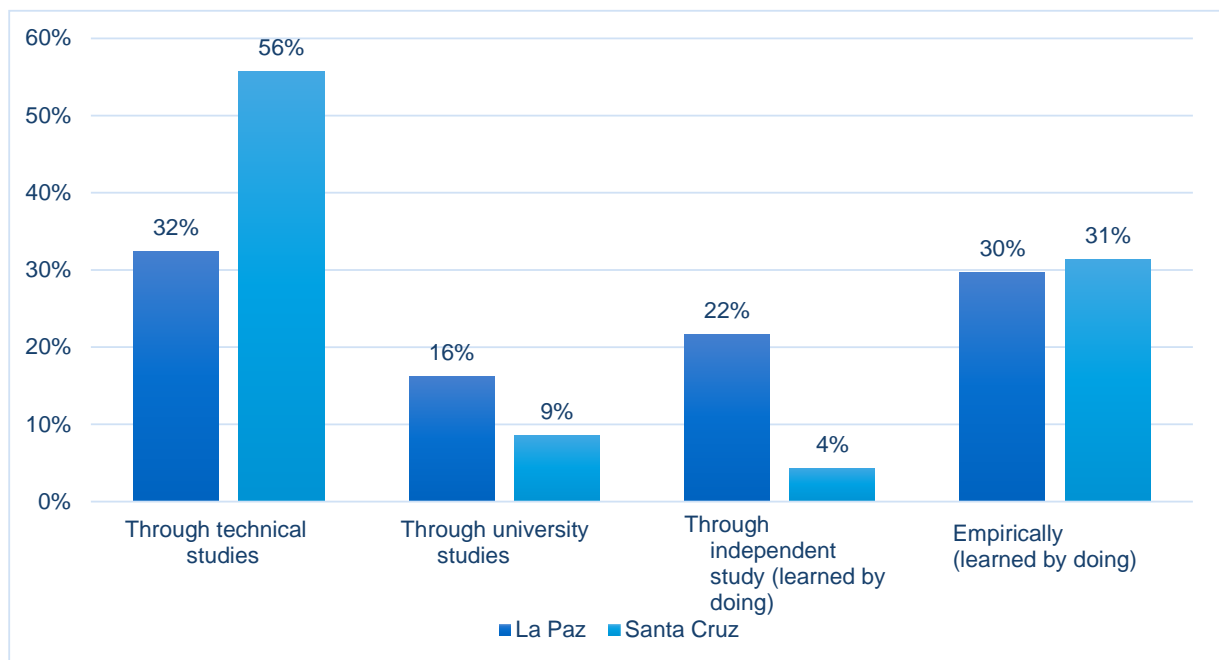
In the case of users (potential users) whose highest level of education is secondary school, 62.5% of the respondents indicate that they have learned their trade through practice, the remainder having entered a technical or technological training institute for that purpose. 62.5% of these people are interested in supporting their years of experience in their trades through certificates/degrees issued by technical/technological training institutes.

In the case of users (potential users) whose highest level of education is Technical, only 7% indicate that they learn about their abilities in a self-taught manner (in addition to what they have learned at the Technical Institute or years of practice in the field).

On the other hand, regarding the users (potential users) whose highest level of studies is University (graduates or graduates), 24.7% indicate that their university studies have no relation whatsoever with the work they do. 76% of these participants have a permanent job, and the type of service offered by Uorkcity is directly related to their main job. On the other hand, 19% of the respondents offer services that are not related to their main job.

“I graduated from systems engineering, and I am currently in the gastronomy field. Because I realized that my passion was not in the engineering field”

FIGURE 3
SOURCE OF KNOWLEDGE ACQUISITION FOR THE PROVISION OF TECHNICAL SERVICES



These results merit further investigation since the disconnection between educational training and the labor market may be due to the difficult labor market insertion of the career studied, a deficient vocational orientation in high school, or the social pressure exerted by the family and the environment in terms of university studies vs. technical training.

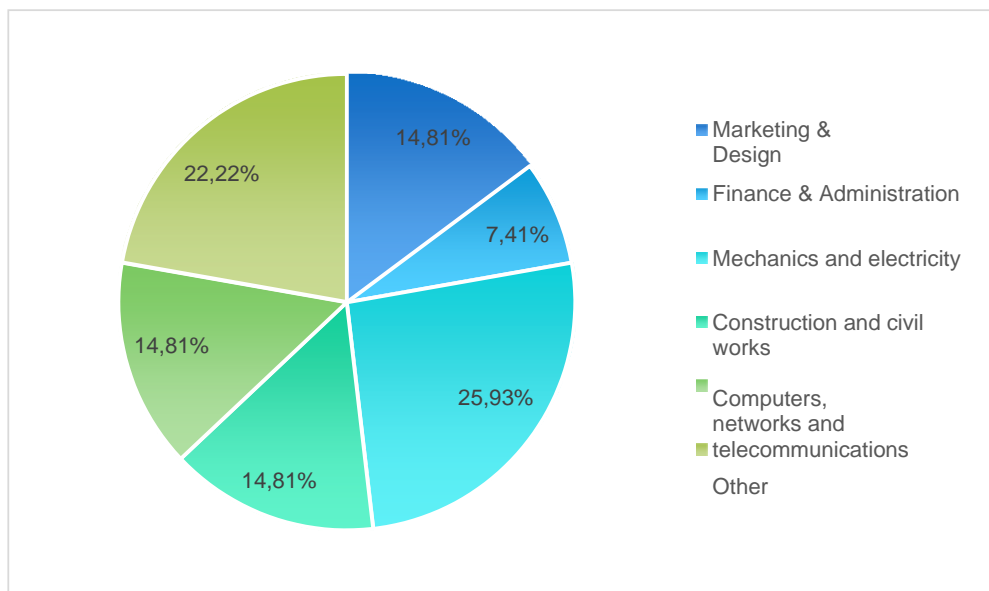
In Bolivia, there exists a prevalent societal pressure for young high school graduates to pursue a university degree rather than considering technical education. According to Sagárnaga (2023), 47% of graduates fail to secure employment within 18 months, and only half of those who do find work in fields

related to their profession. This discrepancy is further exacerbated by an oversupply of university graduates in comparison to the limited demand. Despite this, traditional Bolivian families often confer higher societal status upon university graduates. Paradoxically, in reality, a skilled automotive technician or construction worker may frequently earn a higher income than a professional with 4.5 years of university education. Acknowledging this stark reality can lead to profound frustration among university graduates regarding their chosen career paths.

It should be noted that a minority of users (3.5%) have postgraduate studies. These users use the Uorkcity application to offer additional services to their main source of employment (66.66%). These users have specific abilities such as Computer Systems and Digital Marketing. In general, these users express knowledge and/or mastery of applications such as WhatsApp, WhatsApp Business, Facebook, Facebook Market, Zoom, office automation, mobile banking, among others.

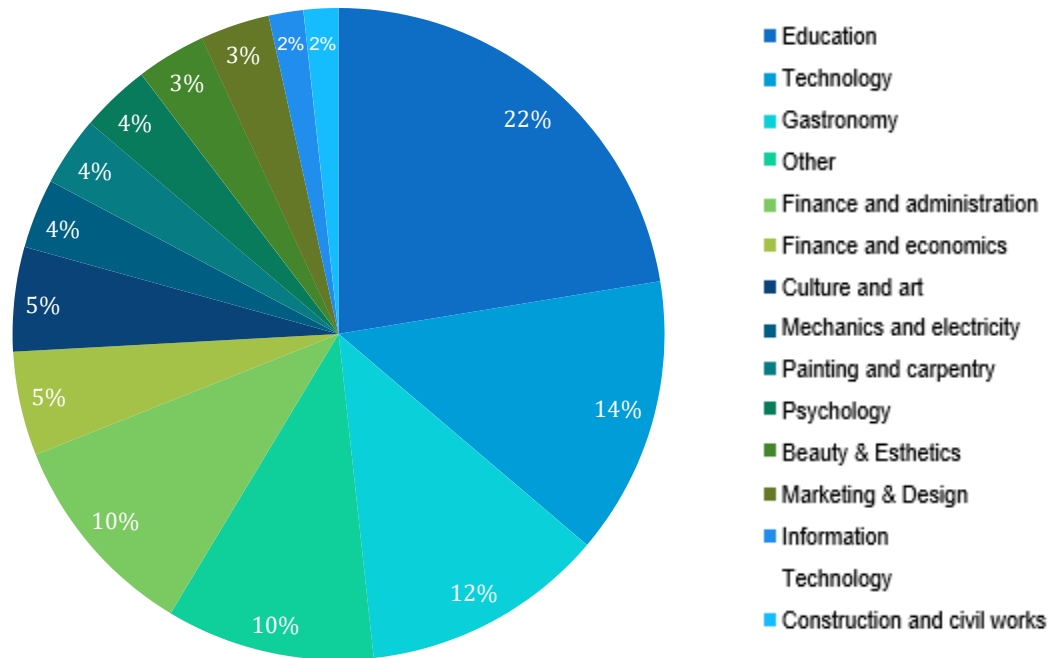
Regarding the areas in which users would like to acquire and/or strengthen their knowledge (see Figure 4), in the city of La Paz, the following areas stand out: mechanics and electricity (26%), marketing and design (15%), information technology, networks and telecommunications (15%), construction and civil works (7%) and the area of finance and administration (7.41%). There are very specific and diverse needs which correspond to the category of others, such as nursing, psychology, etc.

**FIGURE 4
OTHER TRAINING AREAS REQUIRED BY LA PAZ USERS**



In the case of the city of Santa Cruz, a greater diversity of requirements can be seen, ranging from education, technology and gastronomy, to psychology, cosmetology, and marketing/design (see Figure 5).

FIGURE 5
OTHER TRAINING AREAS REQUIRED BY SANTA CRUZ USERS



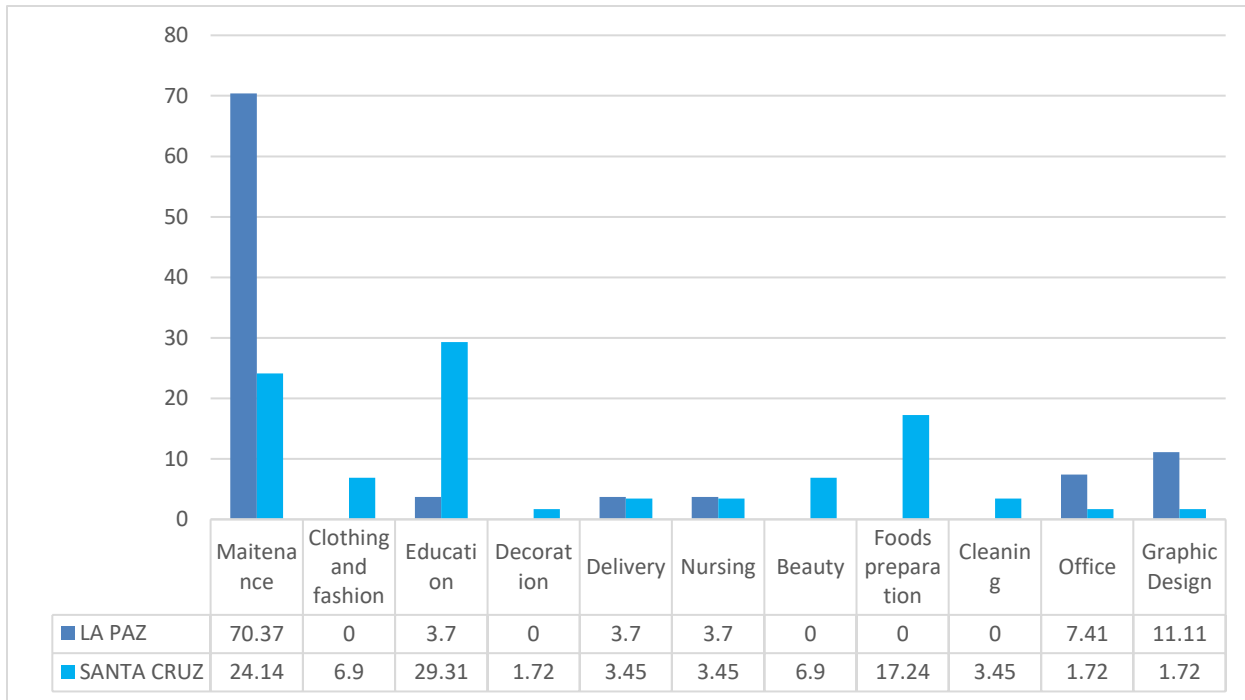
Within the preference in user's from Santa Cruz, the demand in the area of education stands out (22%), specifically training courses in the areas of early education and psychopedagogy. On the other hand, in the area of technology (14%), specific requirements include capacity building in the areas of home automation, electronics, and virtual platforms. In gastronomy (13%) the demand for knowledge is oriented to the areas of baking and healthy eating.

Employment Characteristics of the Population Under Study

With respect to the employment status of the respondents, it is noteworthy that a substantial majority engage in permanent work arrangements, with 72.4% in Santa Cruz and 59.3% in La Paz, as opposed to occasional work, which is reported by 27.6% in Santa Cruz and 40.7% in La Paz. Additionally, a significant proportion of the respondents, accounting for 68.24%, reveal that they hold a secondary job. There is a noticeable disparity in the incidence of second jobs between La Paz and Santa Cruz. In La Paz, 44.4% of respondents report having secondary employment, whereas in Santa Cruz, this figure is lower at 25%

Of the main services offered by users (see Figure 6), it can be seen that in the city of La Paz, the predominant users offer installation and repair services in general, such as: painters, masons, mechanics, etc. (70.3%), followed by graphic designers (11.1%) and office services, such as: business administration assistants, human resources and accountants (7.4%).

**FIGURE 6
TYPE OF SERVICE OFFERED BY CITY**



The primary services offered by users from Santa Cruz are education services (29.3%), followed by those offering installation and repair services in general, such as air conditioning, masons, mechanics, and welders (24.1%), followed by those offering food (17.24%) and beauty (6.9%). For 82% of the users, their main job came from the services requested by the mobile application.

In general, the average years of experience of the users is around 4.7 years, where professionals with more years of experience stand out within the category of installs and repairs (11 years approx.) and professionals with less years of experience within the categories of delivery, decoration, beauty and physiotherapy (1 year approx.).

60% of the respondents indicated that they do not have personnel in charge of the service offered, the primary professions with these characteristics are: early childhood education, cleaning, messenger service, office, beauty, nursing, graphic design and some corresponding to installation and repair. On the other hand, 24.7% of those surveyed indicate that, depending on the demand for their services, they subcontract personnel (an average of three people), these professionals belong to the areas of gastronomy, construction and computer repair. The remainder (15.2%) have personnel in charge (at least 3 people) and work in the areas of mechanics, construction, masonry and air conditioning repair/installation.

Finally, the main way to get new clients (for both La Paz and Santa Cruz users) is through “word-of-mouth marketing” (49% Santa Cruz, 38% La Paz), followed by Facebook promotions (27% La Paz, 21% Santa Cruz) and WhatsApp (25% Santa Cruz, 20% La Paz). It should be noted that there are still people who offer their services in person “face to face” and also through the newspaper (2% Santa Cruz, 10% La Paz). In general, 55% of those surveyed indicated that they have not experienced any problems when offering their services through the aforementioned means. On the other hand, 42.3% indicate that they have experienced at least some of the following difficulties:

- Lack of knowledge regarding the management of social networks to promote their services.
- Low coverage, given that the environment where they publish has a limited and/or saturated target audience.
- Excessive competition at low prices, hard to beat.

- Poor and/or slow response from customers.

“People tend to underestimate the work of a graphic designer; they want everything at a bargain price or even for free”

Socioeconomic Characteristics of The Population Under Study

Of the total surveyed, only 9% do not have any economic dependents in their families; these people are between 22 and 28 years old. The remainder (91%) have 1 to 6 economic dependents in their families, namely children and/or elderly individuals.

The daily income is higher and more diverse in Santa Cruz than in La Paz (see Figure 7). In Santa Cruz city a technician can earn from 70 [Bs/day] to 950 [Bs/day], depending on the type of service that offer. In contrast, in La Paz a technician can earn at maximum 200 [Bs/day] which it represent 28 USD.

FIGURE 7
DAILY INCOME BY CITY. MAIN EMPLOYMENT [BS/DAY]

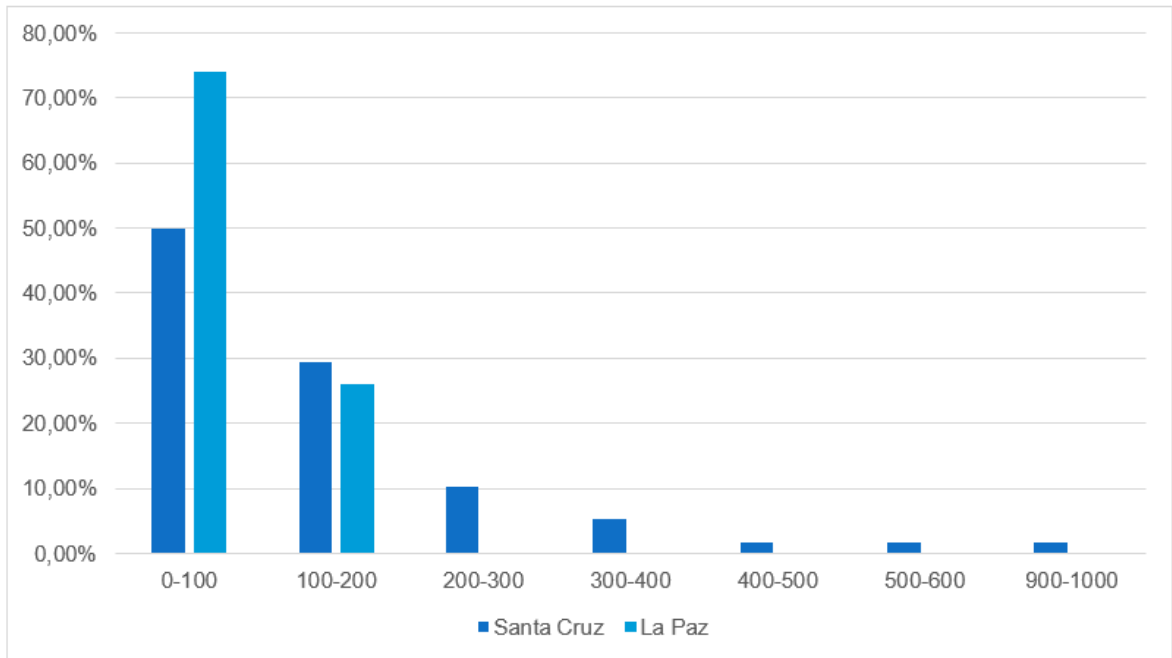


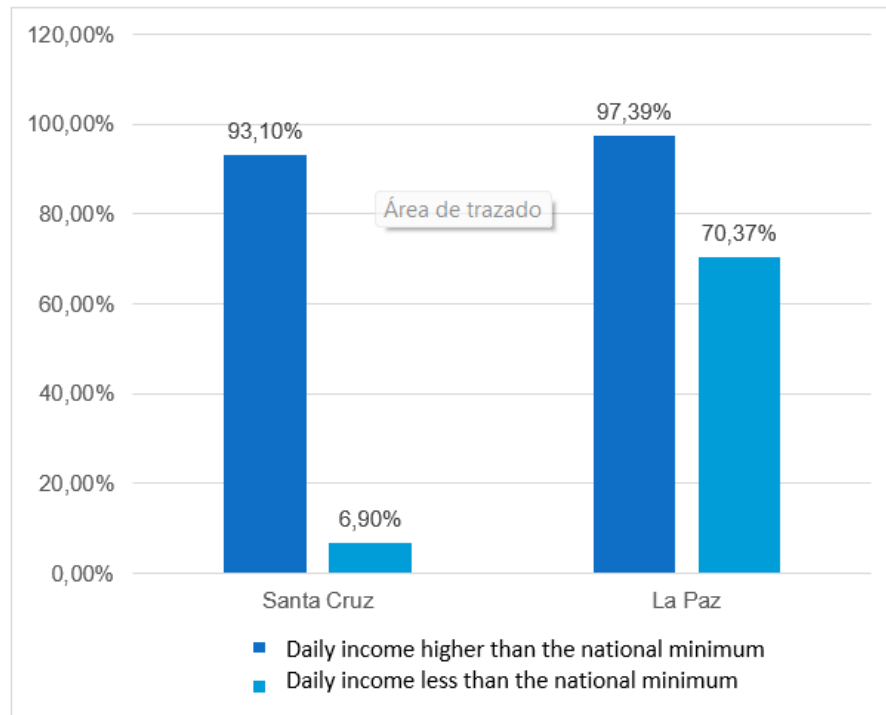
Table 4 below indicates the average income by type of service offered by respondents residing in both cities. Given that the national minimum income set by the Bolivian Government in 2020⁴ is 2,122.00 [Bs/month], equivalent to a daily income of 88.42 [Bs/day] or 12.70 [USD/day], the cells highlighted in red indicate users whose daily income falls below the minimum stipulated by the State.

TABLE 4
AVERAGE DAILY INCOME BY TYPE OF SERVICE OFFERED AND CITY

TYPE OF SERVICE	Dairy income average [Bs]		Dairy income average [USD]	
	La Paz	Santa Cruz	La Paz	Santa Cruz
Air Conditioning tech.		633.33		91.00
Masons - construction	119.05	200.00	17.10	28.74
Craftspeople		70.00		10.06
Clothing and fashion		95.56		13.73
Childcare	10.00	58.06	1.44	8.34
Decoration		104.17		14.97
Delivery	50.00	60.00	7.18	8.62
Courier		200.00		28.74
Child education		76.61		11.01
Electrician	84.00	104.17	12.07	14.97
Nursing		67.08		9.64
Hairdresser		70.00		10.06
Gastronomy		82.78		11.89
Gas instalation		300.00		43.10
Cleaning		225.00		32.33
Manicure/pedicure		100.00		14.37
Automotriz mechanics		200.00		28.74
Mechanics and welding	90.00	80.00	12.93	11.49
Office assistent	75.00	83.33	10.78	11.97
Painting		225.00		32.33
Computer tech.	100.00	175.00	14.37	25.14
Bakery		16.67		2.40
Graphic Design	78.33	70.00	11.25	10.06
Fiber optic tech	50.00		7.18	
Physical Therapy	83.33		11.97	
Miscellaneous	70.00	83.33	10.06	11.97

Figure 8 below shows a summary by city of users with incomes below and above the basic salary stipulated by the stipulated basic salary.

FIGURE 8
DAILY INCOME BY CITY. MAIN EMPLOYMENT [BS/DAY]



As can be seen in the Figure, the economic situation between the two cities is totally opposite. While in Santa Cruz more than 90% of the people offering their technical services have daily incomes above the national minimum (88.45 [Bs/day]), in La Paz, more than 95% of participants do not have daily incomes that meet at least the national minimum stipulated by the State. Despite the fact that in the city of La Paz most of the participants belong to the installation and repair category (which is the highest-paying type of service), let us not forget that the city of Santa Cruz de la Sierra has the highest national index of basic needs satisfied (28.1%)⁶, which indicates a better economic income for its population in general, one of the main reasons for internal migration to this department.

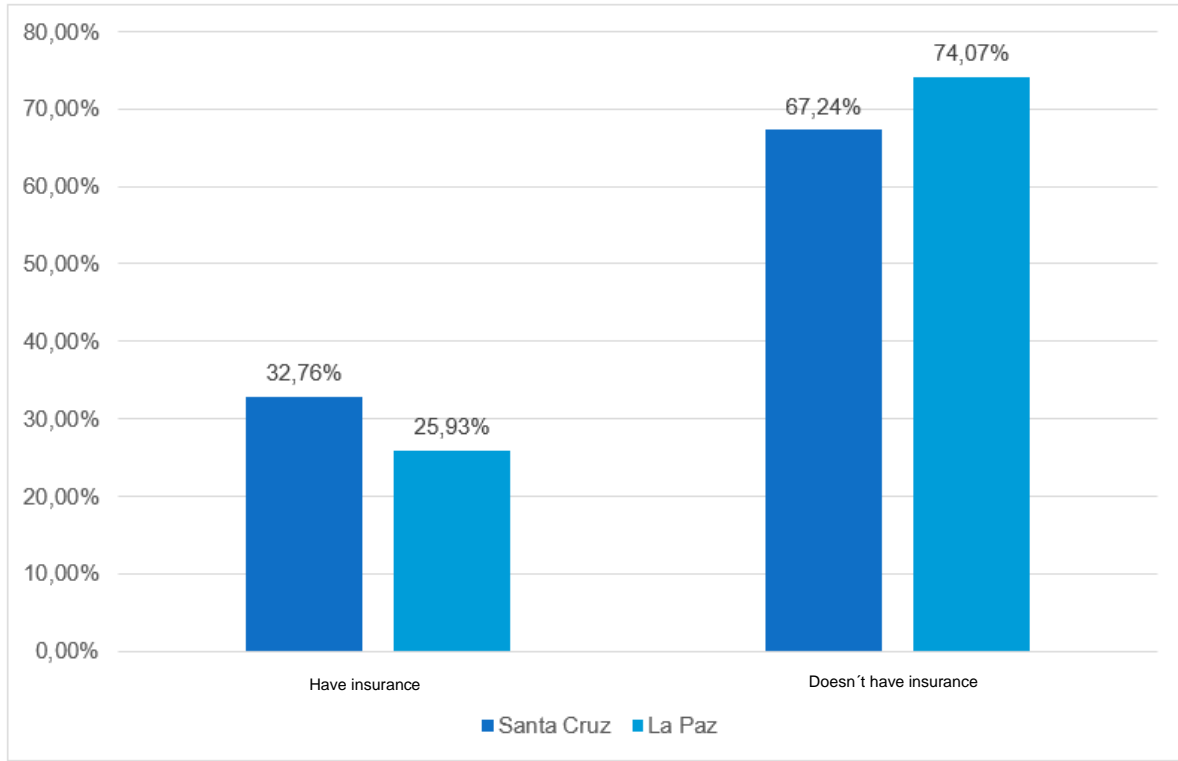
It is due to this situation (insufficient income) that 59.25% of users in the city of La Paz have a second job, in the case of Santa Cruz this percentage increases to 74.14%. However, again in La Paz 56.25% of those surveyed earn less than the minimum wage established by the state, and in Santa Cruz 44.19% respectively.

Considering that the vast majority of respondents have economic dependents, and at least two jobs that try to cover basic household needs, 25.9% of respondents in the city of La Paz have contracted a loan from a banking entity. In the case of Santa Cruz, 32.8% of respondents have a loan or credit from various sources (from cooperatives, banks or moneylenders). In both cases, and under the current situation, the repayment of these loans/credits has been seriously interrupted by the pandemic.

Regarding Pension Fund Contributions (AFPs), 59% of those surveyed in the city of La Paz and 55% of those surveyed in Santa Cruz indicate that **they do not contribute** to this pension fund, or are unaware of this benefit (7% in La Paz). On the other hand, 33% of those surveyed in La Paz and 45% in Santa Cruz indicate that they contribute to this pension fund. It is worth noting that almost all of these cases, the contribution is made by the employer (all except one) because these users have a permanent job.

On the other hand, 74% of users in La Paz and 67% in Santa Cruz indicate that they do not have any type of insurance (accident, health, life, vehicle or property insurance, among others), as opposed to a smaller proportion of those surveyed who do have some type of insurance (see Figure 9).

**FIGURE 9
USERS WITH SOME TYPE OF INSURANCE BY CITY**



It is worth noting that 34.6% of the users who do have some type of insurance have temporary jobs, which may indicate that these insurances have been acquired on their own account and are not assumed by the employer.

Finally, users who do not have any type of insurance are interested in acquiring the following products:

- Health insurance.
- Accident insurance.
- Theft insurance.
- Vehicle or home insurance.

Available Technological Infrastructure

Regarding the technological infrastructure available, a quick survey of the users showed that more than 65% of them access their Technical/Technological Training classes through their cell phone equipment. Thus, the questionnaire questions were oriented to understand the type of cell phone and the main limitations that users experienced with this equipment.

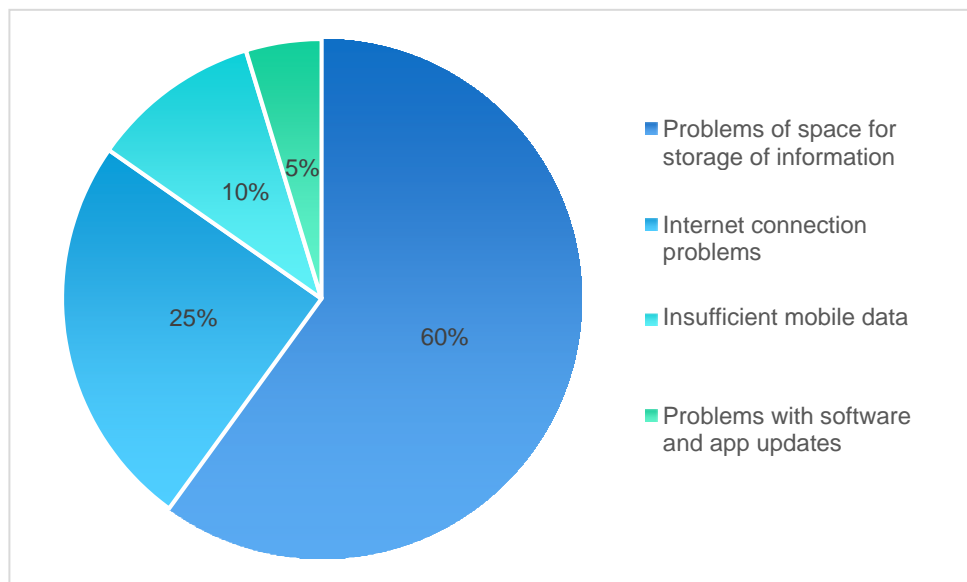
Comparing the main brands preferred by users, we can identify a difference between users in La Paz, who prefer Xiaomi (37%), followed by Huawei (29%) and Samsung (26%), and users in Santa Cruz, since a large proportion of these users prefer the Samsung brand (63%), over Huawei (22%) and Xiaomi (11%). Regarding the age of the equipment, more than 70% of users in both cities have relatively new equipment (less than 2 years old⁵).

While in both Santa Cruz (72%) and La Paz (44.4%) users expressed that they had no problems with their mobile telephony equipment. When the focus groups were conducted, all participants (teachers and students) expressed having difficulties with their mobile telephony equipment, particularly with access to the Internet, and with the use of certain applications and communication technologies. The research team has considered the following hypothesis in this sense, which still needs to be validated: users with better

cell phone equipment and ICT management could answer the online survey and, therefore, expressed not having problems with their cellular equipment.

Finally, Figure 10 summarizes the main limitations that users have in terms of mobile telephony equipment.

FIGURE 10
MAIN LIMITATIONS OF USERS REGARDING THEIR MOBILE TELEPHONE EQUIPMENT



At this point, the quantitative analysis of the 85 surveys collected has been carried out, again clarifying that these results should not be used to generalize the population under study, but rather it is recommended to carry out a more extensive data collection, which allows identifying more specific characteristics of users both in the city of La Paz and in Santa Cruz, it is suggested to include the gender variable to identify differentiated patterns between men and women. Finally, and considering these preliminary results, using the virtual survey for primary data collection, focused on populations with limited access to internet and use of technologies is not the most pertinent or effective; this methodology has been selected considering the restrictions imposed by the pandemic.

Main Limitations of the Uorkcity Mobile Application Users - Students

To complement the quantitative analysis carried out in the previous section, the focus group technique has been defined, whose guiding questions are oriented to “put ourselves in the user’s shoes”, for which eight focus groups have been carried out with students and teachers from different technical institutes both in the city of La Paz and Santa Cruz. This exploratory inquiry about the main needs (in different areas) that this study group has, and that may have increased with the pandemic, has been carried out based on a guide of questions and the empathy map; this has required previous training by the research team, definition of roles (moderator/observer) and design of key questions that may allow to reveal the basic needs of the users. Each focus group had an average duration of 1 hour. It was conducted by Zoom, and the recording was made after the consensus of all the participants.

The following is an analysis and synthesis of the information gathered. First, the main perceptions detected in all the focus groups conducted with students are presented, followed by an emphasis on some “student profiles” with more specific needs, as a result of the careers they study.

An “average” student of these Technical and Technological Training Centers and Institutes is a person who opts for this type of education given various factors, from the need for quick labor insertion to the

limitations (economic or otherwise) that he/she may have had to access the University. The vast majority of these students are fathers and mothers who, in addition to studying, work to support their households economically. One of the main impacts of COVID-19 in this study group has been on the economic aspect since the vast majority of the interviewees indicated that the pandemic left them (themselves and/or their partners) without work, which has had a strong impact on the household economy, causing several participants to abandon their professional studies.

“What is the main need you have right now? -- moderator

*-The truth is that my priority is the economy of my home. My studies take a back seat”
(Early childhood assistant student, La Paz).*

On the other hand, the vast majority of the students interviewed have expressed the difficulty they have in accessing the Internet, in most cases due to an economic issue (purchase of mobile data), poor service from the provider company, and/or, the limitations of the equipment used (cell phone in 63% of cases). It should be noted that a percentage of students live in rural areas, where Internet service is even worse. On the other hand, there is a second digital gap, which refers to the knowledge and use of Information and Communication Technologies. Several of the students (regardless of the career they are studying) expressed the need to strengthen their knowledge in terms of ICT management, particularly applications such as Facebook Market, WhatsApp business, Electronic Invoicing and Office Skills⁶, stand out among the basic training requirements that this group of users have.

Those students who are pursuing careers that require practice to demonstrate the acquisition of procedural and attitudinal competencies, such as: gastronomy, integral beauty, computer science, mechanical technician, physiotherapy assistant, have been more affected, since students perceive that virtual education is not the appropriate learning strategy, both for teaching and for evaluation.

The following section present two student profiles, allowing for a more in-depth exploration of their needs and limitations.

Early Childhood Assistant Student Profile

This technical program is designed to train preschool assistants with disciplinary and pedagogical knowledge, skills, and attitudes to contribute to the educational processes of early childhood (children under 6 years of age).

The students of this career, the vast majority are women, whose average age is approximately 38 years, have at least 1 to 4 economic dependents whose income is around 80 [Bs/day]. Approximately 86% of the users have a second source of income. When asked about their motivation for studying this career, many of the mothers indicated that it was one of the best ways they found to reconcile work and childcare.

“In the kindergarten where I worked, I took care of other children and also took care of my children” – (Interviewee).

“That is a great blessing; we do not all have that opportunity to work and care for our children simultaneously” – (Moderator – a mother facing challenges in balancing motherhood and work).

It should also be noted that there is a minority group of early childhood assistant students who are dedicated exclusively to studying, are single, have no economic dependents or major family responsibilities. For this group, their priority is to finish their degree. However, the main fear they have is that the career will be closed given the high dropout rate of their peers (mothers/fathers) who have been most affected by the pandemic.

The following is a storytelling that exemplifies the general profile of these students.

Ana is 36 years old; she worked as an early childhood assistant in a kindergarten, and at night, she studied to become an early childhood assistant at a Technical Institute in her community until the pandemic hit. The arrival of COVID-19 made her give up her dream of studying; she lost her job (since all the kindergartens closed), which was her main source of income to pay for her studies. Her husband also lost his job, leading the entire family to move to her mother-in-law's house. She has two children, one six years old and the other fourteen years old. Currently, she dedicates her time to household chores and supports her children's education in virtual classes.

"Coronavirus has affected my family a lot. With the disease, you can't even go out to look for work"

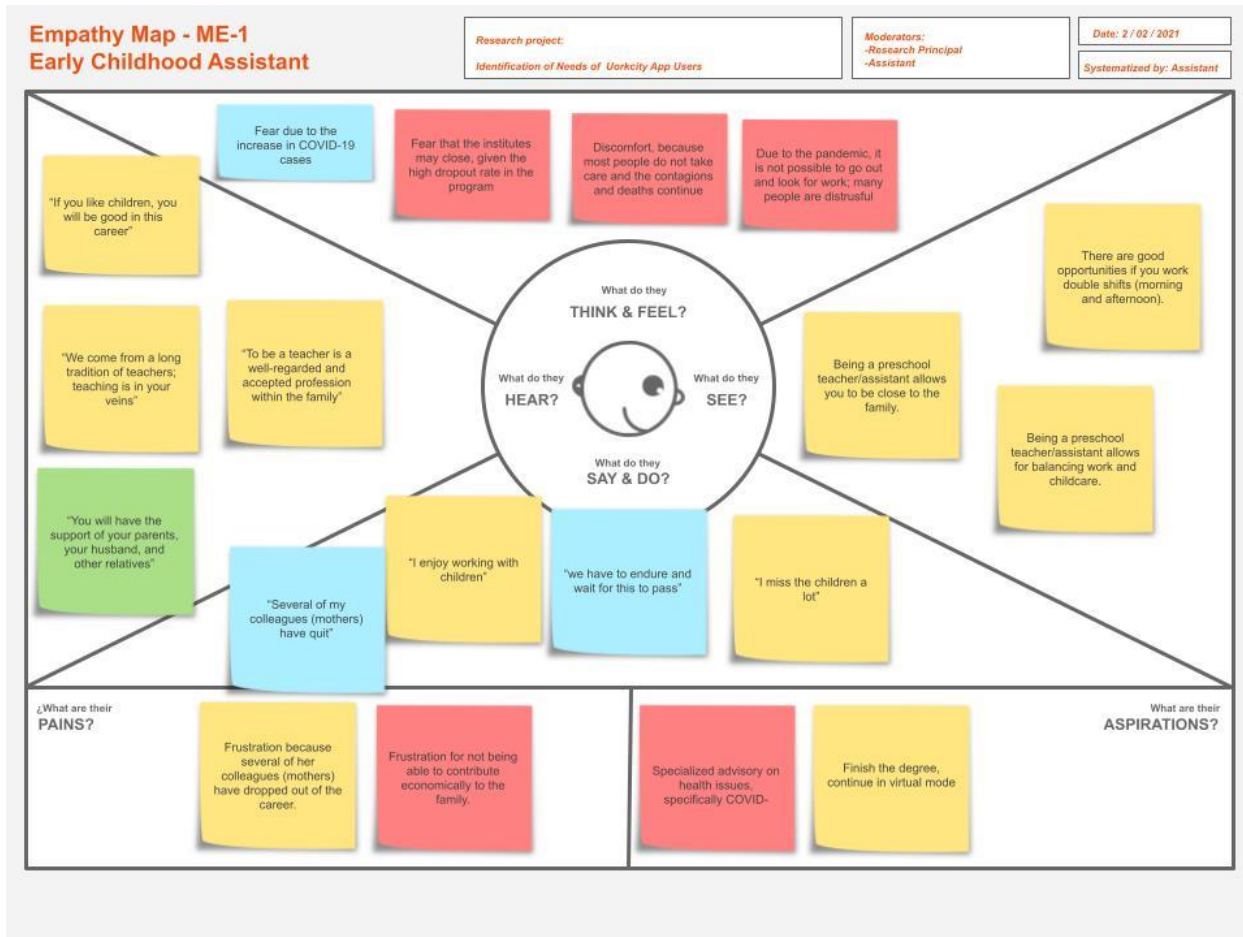
KINDERGARTEN ASSISTANT STUDENTS



Taken from: CECAP Institute classes, (October 19, 2019).

Figure 11 presents the empathy map based on interviews conducted with early childhood assistant students, which summarizes the information mentioned above.

FIGURE 11
EMPATHY MAP – EARLY CHILDHOOD ASSISTANT STUDENTS



Gastronomy Student Profile

This career is focused on training professionals in the culinary art, elaborating exquisite food based on ingredients, recipes and culinary techniques that keep intact the Bolivian gastronomic heritage, as well as introducing new techniques of international cuisine.

Although there is also a significant presence of male students, the majority in this career are females. This particular technical program involves a relatively high investment cost compared to other technical fields, as students are advised to have specific kitchen equipment and utensils for practice at home. However, each kitchen practice involves students purchasing the necessary ingredients for a particular recipe, and these costs are shared as a team, making it more affordable for each student. Prior to the pandemic, students could recoup their investment by selling the products they prepared. However, due to the COVID-19 pandemic, it is currently impossible to buy ingredients as a team, let alone practice in the institute kitchens or sell the prepared products.

Students in this program face uncertainties regarding the quality of their training due to their inability to attend the workshops in institutes where specialized equipment and materials for cooking are available. Furthermore, those who manage to prepare recipes at home using personal materials and equipment (with varying economic resources) are left uncertain about the quality of their dishes. Normally, professors conduct tastings to assess the quality of the cooked products. However, with the current circumstances, the evaluators are now limited to household members who consume what the students cook. The teacher's ability to provide accurate ratings and feedback is constrained since they can only assess the student's work

through photos or videos (if provided during synchronous classes). Students find themselves relying on the opinions of family members who lack the qualifications to teach this type of class, and the feedback received may even be counterproductive.

“I am a gastronomy teacher, and the pandemic has complicated things a lot for us, to make a simple cake each student must invest at least 100 [Bs], I had to go to my sister’s house, because I don’t have an oven at home”

(gastronomy teacher, Fe y Alegría-La Paz).

“The gastronomy career is self-sustainable, I used to cook, sell and pay the institute with the income from the sales. Now it is not possible to do that, I would ask that we be allowed to return to face-to-face classes, even in small groups with all the biosafety measures”

(gastronomy student, Fe y Alegría – La Paz).

The following storytelling exemplifies the general profile of these students.

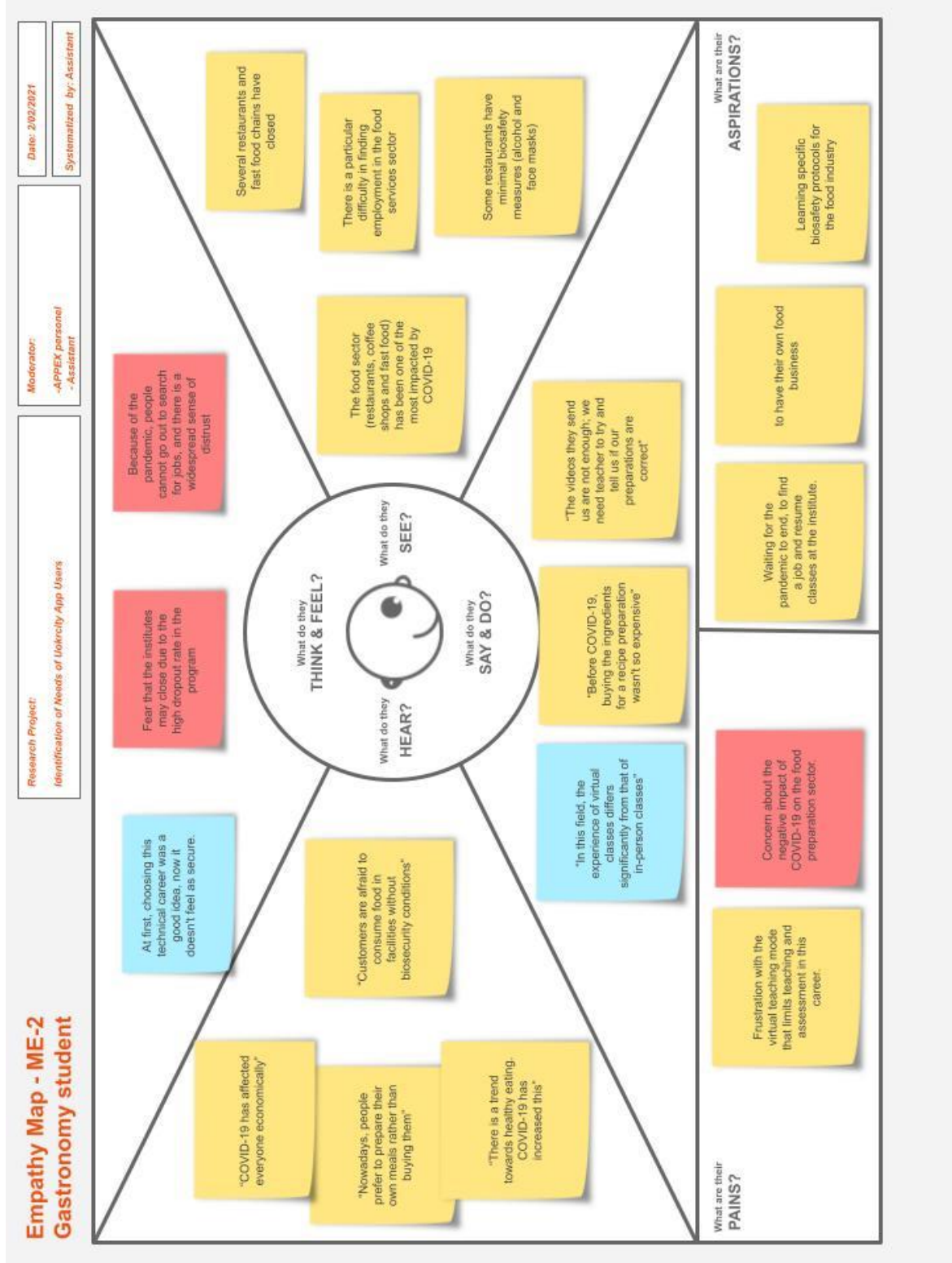
Raquel is 22 years old, she studies and works in her free time to help with the household economy. Due to the health emergency her father lost his job. This has impacted the whole family financially. Now it is difficult for Raquel to pass virtual classes and to elaborate her recipes, because of the new budget she has to consider for the internet connection and that now she cannot reduce the costs of the supplies for her studies, because she can no longer make the purchases of the ingredients in group with her other classmates. A cake costs more than 14.37 USD in materials, before that money could be recovered by selling what she made in class to cover these costs. Raquel is hesitant to continue studying virtual gastronomy because it is not the same as the feedback she gets from the facilitator if she cannot feel the flavors through a screen. Raquel sees that, in general, the restaurant-food sector has been seriously affected by COVID-19. Before the pandemic, she used to think that gastronomy was a career with easy job insertion; now she has her doubts.



Gastronomy students Taken from: Pagina Siete, “Manq’a gastronomic creations with ancestral ingredients” (November 24, 2016)

Figure 12 shows the empathy map based on interviews with gastronomy students, which summarizes the aforementioned information.

FIGURE 12
EMPATHY MAP - GASTRONOMY STUDENTS



Main Limitations of the Users of the Uorkcity Mobile Application - Teachers of Technical/Technological Training Institutes

Advancing with the qualitative analysis, the following outlines present the primary perceptions identified in the focus groups held with teachers affiliated with institutes and technical and technological training centers that have established agreements with APPEXBOLIVIA.

An “average” teacher/facilitator in these Technical and Technological Training Centers and Institutes is an individual committed to educating students who have chosen technical/technological training to enhance both their personal and family growth. Despite facing common challenges encountered by educators at different subsystems (Regular Education, High Education System – Universities), the particular case of teachers at Technical/Technological Training Institutes is that their group of students faces more adversities than those in the regular education subsystem and/or university students (public or private). Among the main adversities that these students face, the following stand out: dropout from training programs due to the economic impact of the pandemic, learning difficulties, inadequate internet access for students, hindering their ability to access resources and materials provided by teachers, and limited infrastructure and technology at the training center/institute itself.

One of the primary repercussions of COVID-19 within this study group has centered on teaching methodologies and strategies. The majority of interviewees highlighted that the pandemic compelled them to shift all their classes to virtual platforms, necessitating teachers to independently acquire the essential materials and technological infrastructure for conducting virtual lessons from their homes. This adaptation varied in ease among different educators. Notably, teachers residing in rural areas faced more pronounced challenges due to the inadequate internet connectivity prevalent in these regions.

“I have a lot of difficulty connecting by Zoom to my classes; the internet connection in my area is deficient” - Sewing teacher, Province of Colquiri-Oruro (rural area).

In addition to the first digital gap, Internet Access, a limitation expressed by all the teachers interviewed (regardless of the area where they live and the service provider of the Internet that they have), there is a second digital gap, which refers to the use of Information and Communication Technologies. Although the teachers interviewed expressed that they received classes from the Ministry of Education and the Institutes and Centers where they work, they also expressed the need to strengthen their knowledge regarding the use of these technologies, they emphasized the use of virtual platforms for the exchange of content with their students (for example: MOODLE, GOOGLE CLASSROOM) as well as Telegram type applications that do not involve large data storage, given that this is the main limitation of the equipment (cell phone or laptop) used by both teachers and their students.

“And tell me, where did you acquire the skills for Zoom or other technologies that you use in your classes?” – Moderator

“We have received training sessions from the Ministry of Education and the Institute where I work. However, ultimately, it is the responsibility of each teacher to self-train. Today, we have no other option” - Industrial Mechanics Teacher, ESAE Institute.

As the analysis of this study group deepened, it was identified that teachers who teach “more practical” classes, requiring the use of workshops, laboratories, and other equipment, where the student must prove the acquisition of a procedural competence, were even more vulnerable to the new reality than teachers who teach “more theoretical” classes, who do not necessarily require physical infrastructure for teaching and evaluating student performance. These two teacher profiles are presented below.

Profile of the Technical and Technological Training Teacher. “Theoretical” Subjects

This profile was identified from the teachers who teach in the areas of: business administration, computer systems, general accounting, communication, international trade and customs administration,

computer programmer, networks and telecommunications, graphic designer. These subjects have the advantage that, from a good multimedia and bibliographic material, accompanied by a clear and concrete explanation, it is possible to transmit the knowledge to the students.

These subjects do not require a specific workshop or laboratory to demonstrate students' competencies. The teacher can have all its digital material pre-developed and distribute them in advance to students (asynchronous class). In virtual meetings (synchronous classes), the teachers addresses and solves students' doubts that arose from the material previously sent. For this purpose, the Institutes participating in the study have different Learning Management Systems (LMS) for the exchange of material (student-teacher), ranging from MOODLE (paid) to Google Classroom (free). However, in all cases the student must have adequate technological equipment (desktop computer or laptop), to effectively visualize contents and perform tasks, in addition to a stable internet connection. There is no comparison between creating an Excel spreadsheet on a cell phone, and on a computer - the reduced screen, and fewer optimized applications or tools for phones are the main limitations of these devices.

The degree of knowledge and management of technological communication and information tools varies from institute to institute, as well as from teacher to teacher, within the same institute, given that there has been no prior consensus on the standardization of pedagogical methods and technological tools (educational platform, pedagogical video editing). This can be even more counterproductive, given that the student, who already has limited access to the Internet, the use of ICTs and the cell phone equipment used, must now learn to handle two or more different LMS for information exchange, learn two or more softwares for videocalls.

It is worth mentioning some technical/technological training institutes where an administrative person was assigned to learn how to operate the ICT tools to be used (standardizing them to a certain degree), training their teachers in their use and then disseminating this knowledge to the students. This institution adopted this way of working in order to mitigate the high dropout rate of its students.

The following storytelling summarizes the profile of this type of teacher.

Juan, 42 years old, is a business administration teacher at a Technical Institute, he comes from a family of teachers, so since he was a child he has seen how his parents and uncles have educated other people, for him there is no nobler job than teaching, and even more, teaching people with limited resources and who need to improve themselves. The pandemic has impacted Juan in all areas of his life. Although he does not have children or a wife, COVID-19 has allowed him to spend more time with his nephews and nieces, and to value his family and his immediate environment. In terms of his work, it has totally changed the way he teaches and evaluates his students. Juan has had to learn new technologies to teach his classes, which has involved time, money and effort, but he has done it with pleasure, because he loves what he does. However, Juan feels very frustrated to see the limitations that his students have, from economic problems that have caused them to drop virtual classes, to problems of access to the Internet, use of technologies, in addition to the learning difficulties they already had. For Juan, virtual classes will never be able to replace face-to-face classes; given that in the face-to-face classes he felt he could motivate his students in a better way.

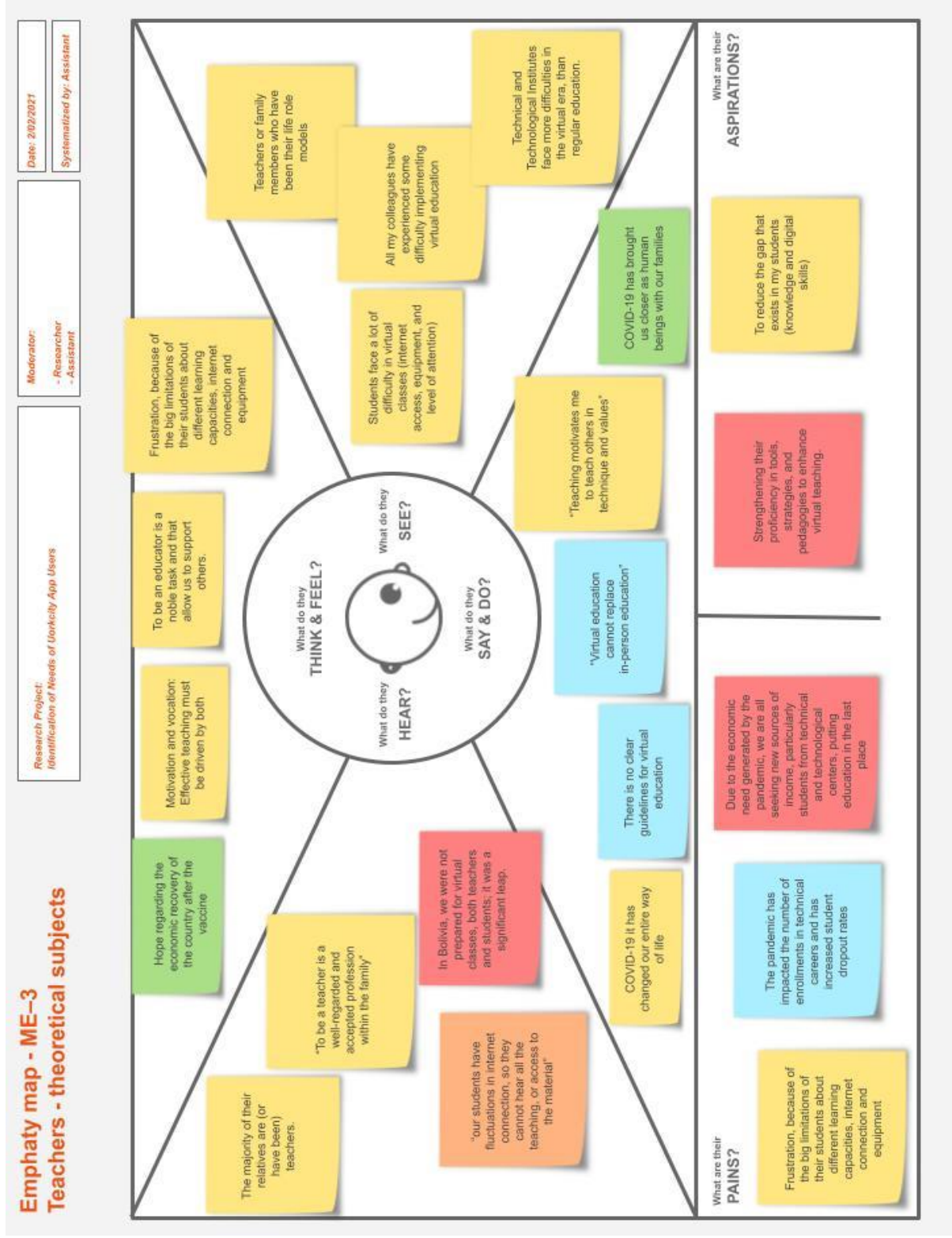
TEACHER AT THE TECHNICAL INSTITUTE



Taken from: Página siete, "For no one it is easy: virtual education forces teachers, students and parents to reinvent themselves" (June 10, 2020).

Figure 13 shows the empathy map based on interviews with teachers of theoretical subjects, which summarizes the above-mentioned information.

FIGURE 13
EMPATHY MAP - TEACHERS OF THEORETICAL SUBJECTS



Profile of the Alternative Education Teacher. “Practical” Subjects

The following profile was constructed from an analysis of teachers whose subjects are distinguished by having a high practical component, and therefore spend a high percentage of class hours in workshops or laboratories where they practice with equipment and materials that they will use in real work practice. The following subjects are an example of this: civil construction, industrial electricity, dressmaking, gastronomy, computer repair, nursery assistant, automotive mechanics, industrial mechanics, physiotherapy, gas installations, and carpentry.

Although these educators have expertise in their respective areas, very few of them had the necessary technological knowledge to navigate the virtual landscape, as this proficiency was not a prerequisite for teaching before the pandemic. Consequently, these teachers faced, and continue to face, a dual challenge. The first involves acquiring the basic Information and Communication Technologies skills required for conducting virtual classes. The second challenge entails adapting their pedagogical techniques and strategies to effectively convey the practical aspects of their subjects through virtual mediums such as videos, slides, and photos. Additionally, they need to assess the procedural competencies acquired by their students throughout the training process.

In delivering the theoretical content required by these academic programs, despite the challenges of transitioning to the virtual mode, these teachers successfully conducted their classes online. However, the practical component faced significant obstacles, particularly for programs requiring expensive equipment—machinery like lathes, welding machines, milling machines, sewing machines, industrial ovens, stretchers, and radiotherapy equipment, among others. To address this issue, some teachers opted to send instructional YouTube videos to their students, allowing them to observe the procedural aspects of the subject.

“I prefer that the teacher sends videos that he makes, because when he sends us videos from YouTube, many times they show materials that are not even available here”

(electronics student, CECAP).

Beyond the challenges of teaching, there lies the complexity of evaluation. Assessing students’ performance in practical subjects traditionally involves using the senses—seeing, hearing, smelling, touching, experiencing, and, in some cases, tasting a tangible product or an intangible service. Consequently, both educators and students share the sentiment that both teaching and evaluating these specific subjects in a virtual setting are not equivalent to the in-person experience.

“I would suggest that the Institute allow us to go to the workshops and laboratories (only the professors), so that I could teach my class from there, or record videos with real examples, where the students can see me operating the machines and equipment”

(Automotive mechanics professor, CECAP)

“I used to teach gastronomy, but due to the high dropout rate I now teach some classes in secretarial work as well, it is more difficult to teach gastronomy than secretarial work”

(gastronomy professor, Fe y Alegria).

“I would like that in addition to all these ICTs that exist and applications that you propose, that you think of strategies to help special education students, they have a lot more barriers than technical education students because they have learning problems”

(CEA teacher, Fe y Alegria).

“I would like the government to worry more about technical and technological education, because in the end we are the ones who produce the country’s labor force, they only worry about regular education, we are always the fifth tire of the car”

(ESAE teacher).

The participation of teachers has been so diverse and rich that it is difficult to summarize its characteristics in a single profile.

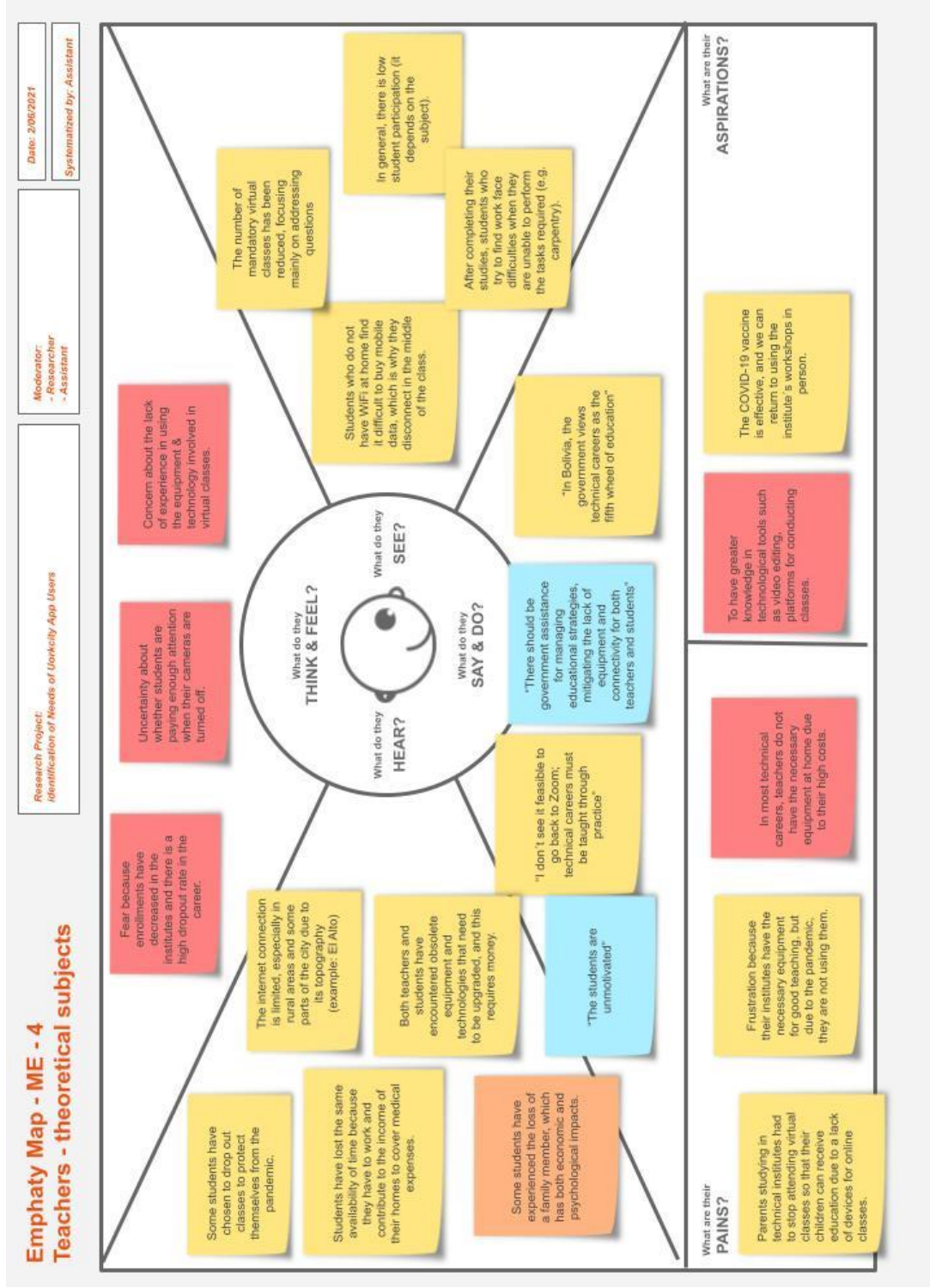
CARPENTRY TEACHER (RURAL AREA) TEACHING A VIRTUAL CLASS



Adapted from: Wapa.pe “Piura: Profesor cumpliendo con sus clases virtuales pese a limitaciones” (sf)

Figure 14 shows the empathy map based on interviews with teachers of practical subjects, which summarizes the above-mentioned information.

FIGURE 14
EMPATHY MAP - TEACHERS OF PRACTICAL SUBJECTS



Main Needs of Technical/Technological Training Institutes and Centers

Finally, in one of the focus groups, the authorities and administrative staff of one of the Technical and Technological Training Institutes participated, and through a brief interview, the main needs of these institutes and training centers were gathered from their experience as authorities and administrative staff of one of these centers.

- Procuring new computer equipment for teachers or upgrading existing devices. The authorities emphasize the necessity of laptops, as they enable teachers to work from any location.
- Guarantee a stable internet connection, both in the Training Centers and in the homes of each teacher and administrative staff of the institution.
- Capacity building for teachers and students regarding the use of Information and Communication Technologies [ICTs] for virtual classes. These technologies should be selected according to the needs and limitations of both students and teachers.
- Renewal of machines and equipment in workshops and laboratories that are in poor condition due to age and disuse.

MECHANICS STUDENTS PRESENTING THEIR WORK AT CECAP INSTITUTE



Mechanical automotive students taken from: Instituto Técnico Marcelo Quiroga Santa Cruz (October, 2023)

CONCLUSIONS AND RECOMMENDATIONS

The Technical and Technological Education System is often overlooked despite being one of the most vulnerable sectors in the Bolivian Higher Education System. Through this research project, we have been able to identify the different gaps faced by both students and teachers in technical and technological institutes when venturing into virtual education. In addition to the difficulties already identified by Baldelomar, Ruiz & Arancibia (2020) in previous studies which address issues such as limited internet access (gap 1), proficiency in using ICTs (gap 2), and the quality of ICT use (gap 3), there is also a very specific pedagogical gap in technical careers. Here, despite having access, usage, and good use of ICTs, teachers have not yet been able to effectively convey the theoretical-practical-valuative nature of technical

and technological formation through screens. Similarly, students, despite having access, usage, and good use of ICTs, have not been able to fully benefit from virtual teaching in these technical disciplines.

To comprehend the primary characteristics and requirements of users and potential users of the Uorkcity application, it's essential to go beyond mere data, such as age, average income, and education level. First-hand interactions with these individuals, including application users, students, teachers, and authorities of Technical and Technological Training Centers, have been crucial. Through the trust placed in the research team, they have shared their stories, narratives, and experiences. These interactions allowed us a deeper understanding of the urgent needs within this sector, transcending mere statistics.

Irrespective of background or academic level, the widespread perception among students that "I don't learn in virtual classes" remains a common thread. However, the disparity between not grasping the success of a mathematical procedure, easily validated through resources like books or online tutorials, and struggling to ascertain if a traditional Bolivian dish like "salteña" or "majadito" has been prepared correctly or whether the right electrode was used for a MIG⁷ welding task, is substantial.

The realm of virtual education exposes a significant contrast in teaching tools and methods. This distinction becomes particularly evident when comparing subjects with a theoretical emphasis to those requiring practical application. While virtual labs and simulators are emerging solutions to bridge the gap between theory and practice, they have primarily focused on humanistic disciplines such as mathematics, biology, chemistry, and thermodynamics.

However, there's a notable gap in addressing the specific needs of technical and technological training, where practical hands-on experience is crucial. This is an area that demands more attention and innovative solutions, including virtual labs tailored to disciplines like woodworking, welding, industrial mechanics, sewing. Such initiatives are imperative to ensuring a comprehensive and effective virtual learning experience, particularly for fields that heavily rely on practical skills.

After this brief reflection resulting from this research, we present below the main findings of this study, as well as some recommendations; these have been grouped into five categories, which are: 1) Information and Communication Technologies, 2) Pedagogical Practices; 3) Channel for the user's services offerings; 4) Insurance; 5) Financing.

Information and Communication Technologies [ICTs]

It was visualized and confirmed that the target group in general has difficulties in accessing a stable internet connection and scarce use of Information and Communication Technologies (ICTs), so there is a double digital gap (access-use), especially for vulnerable groups (youth, women and people in rural areas).

Internet coverage is one of the most important difficulties faced by both students and teachers. Despite various agreements that have been developed at the national level with the three services providers in the country (Entel, Telecel, Nuevatel) where mobile data rates have been reduced and special tele-educational packages have been created, the student dropout rate in Boliva has reached at least 20%, one of the highest in the region according to World Bank (Los Tiempos, 2021).

On the other hand, it was found that a high percentage of students have only a cell phone for the development of their educational activities. Several cases must share this device with other members of the family that also are in virtual classes (kids), being a limiting factor the acquisition of personal devices, and the scheduling of the use of the equipment.

Finally, the limited knowledge regarding the use of ICTs by both teachers and students is a constraint that does not allow for an effective development of virtual teaching.

Recommendations

- a) Generate training programs on the potential use of ICTs (advanced Facebook, WhatsApp business, telegram and other mobile applications) focused on the diagnostic target group.
- b) Develop proposals for family plans aimed at private and state telephone companies to improve the quality of internet access, especially in rural areas.
- c) Develop a "Continuous technological culture" training program that allows users to constantly search for and keep up to date with world news.

- d) Develop programs and applications adapted for people who only have a cell phone as a work tool. Software and app developers should consider that the mobile devices used by people are low and mid-range, with preferred brands being Xiaomi, Huawei, and Samsung.

Pedagogy for Teachers

Teachers face significant challenges due to insufficient technological resources in their homes, where virtual education is conducted. The primary barriers include limited internet connectivity and difficulties in utilizing ICT tools for virtual educational activities. Moreover, the need to adapt traditional pedagogical strategies used in their regular classes adds to the complexity. This situation has led to frustration and stress among colleagues.

Among professors, some encounter more challenges than others, particularly those teaching practical subjects or residing in rural areas. Given these obstacles, both teachers and students express uncertainty about whether virtual learning is the most suitable approach for these professions. Despite the training provided by the state and their institutes, teachers stress the importance of self-learning to effectively utilize ICT tools in their virtual classes. However, an additional gap exists concerning the new pedagogies required by these types of professors to implement an efficient teaching-learning process.

Recommendations

- a) Conduct research to delve into the pedagogical strategies necessary for effective virtual education in technical and technological teaching centers.
- b) Train teachers from technical and technological centers in the development of educational videos, enabling them to create their own educational materials for distribution to their students. It is important to consider the translation of these videos to different
- c) Software developers should create simulators for technical work centers, such as carpentry, clothing design, automotive mechanics, welding, civil construction, among others, that are easily accessible and user-friendly, considering the reality of developing countries like Bolivia. Examples of these already exist, such as the Spanish company VFRP, which has been developing these simulators using augmented reality since 2022.

Channel for the user's services offerings

In addition to the Uorkcity mobile application and Facebook Market, there are few digital platforms that allow technical professionals to offer their services to the Bolivian population in an accessible and/or free manner. The regular mean of communication of their services is by recommendations, some users use Facebook Marketplace and other mobile applications.

A large percentage of the target group, being considered in the vulnerable stratum (young people, women, people who did not enter university, migrants from rural to urban areas), they don't have a digital presence on social networks.

"I'm just a bricklayer (Respondent, La Paz, February 2021)

80% of individuals lean towards the informal sector, primarily influenced by factors such as limited understanding of the tax system, unfamiliarity with the procedures for starting a business, and a lack of knowledge about cash flows, among other considerations. That lack of knowledge is one of the main reasons why these technical professionals face difficulties in accessing bank credits.

Recommendations

- a) Expand the use of existing platforms for job connection (FB Marketplace, Uorkcity).
- b) Develop more easy-friendly use platforms to reduce the gap between technical professionals and customers.

- c) At Technical and technological institutes develop training programs to strengthen the self-esteem of the target group, specifically aimed at improving the digital image of the students, to teach them how to create a good digital professional image to increase their job and personal opportunities.
- d) At Technical and technological institutes develop aimed at complementing the technical training of students, allowing to structure a business based on the technical knowledge acquire in the institutes. This promotes the transition to a formal economy, which is much needed in Bolivia.

Insurance

The study participants had a total lack of awareness regarding the scope and benefits of different types of insurance (health, accident, life), with only a few exceptions. This deserves further investigation. Since part of the study group has formal employment, where, according to the General Social Security Law, employers are required to provide mandatory insurance coverage for their employees.

Recommendations

- a) Promote more social insurance programs focused on the most vulnerable population, as any illness or accident affecting a family member has a significant economic impact on the entire family
- b) Develop products that include coverage for COVID-19, not only for the worker but also for their family. These products should be targeted towards the most vulnerable population, they should be affordable.

Funding

Study participants have expressed that they are unaware of the existence of financial facilities aimed at the educational and training sector. Due to the informality of the work activities carried out by technical professionals, they lack the minimum documentation required by banking entities to apply for a loan (e.g. business plans, cash flows, among others).

Recommendations

- a) Loans with attractive interest rates for the renewal of technological equipment (computers, telephones and others) to be able to teach or receive virtual classes.
- b) For Technical and technological institutes, is important to develop training programs focus on financial education, so the students could have the tools to access to bank credits after they finish their studies. This training should include the develop of Business Plans, cash flows, electronic invoicing, taxes.
- c) For the private sector concentrating on the development of new technologies for this target group, it is crucial to persist in seeking international funding to continue creating technologies that can alleviate the digital gap experienced by technicians.

At the time of publishing this article, Bolivia, along with the others countries, has returned “to normal”, reintroducing in-person classes across all educational levels. Nevertheless, virtual education is now a permanent fixture. Despite being few in number, some educational institutions have capitalized on this crisis to undergo a transformative process. Notable examples include CEPEAD – Centro Plurinacional de Educación Alternativa a Distancia who is in charge of provide remote technical training⁸, and Franz Tamayo Private University who offers different bachelor’s degrees programs in virtual mode, recognized by Ministry of Education⁹.

ENDNOTES

1. Comprises all legal and illegal economic activity that is not recorded in the national accounts, nor is it subject to compliance with the provisions issued by the bolivian economic authority to regulate its operation (Centro de Estudios para el Desarrollo, 1986, p.183).
2. Digital questionnaire. <https://forms.gle/ARu4duRvdx1osEAH9>
3. Refers to the population movements between place of residency before and after the last Census of Bolivia in 2012
4. At the time this article was being written, the Bolivian national government had not yet announced the new 2% salary increase for the year 2021 (Ministerio de Economía y Finanzas Públicas, 2023)
5. The age of the equipment has been considered based on the general lifespan of a mobile phone (BBC NEWS, 2018).
6. Refers to the abilities related to the use of the following programs: Word, Excel, Power Point, Zoom
7. Metal Inert Gas. Shielded Metal arc welding with consumable electrode
8. More information. <https://cepead.minedu.gob.bo/>
9. More information. <https://unifranz.online/>

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