Analysis of the Use of Videoconferencing in the Learning Process During the Pandemic at a University in Lima

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Abstract—Due to the health emergency situation, which forced universities to stop using their centers as a means of teaching, many of them opted for virtual education. Affecting the learning process of students, which has predisposed many of them to become familiar with this new learning process, making the use of virtual platforms more common. Many educational centers have come to rely on digital tools such as: Discord, Google Meet, Microsoft Team, Skype and Zoom. The objective of the research is to report on the impact of student learning through the use of the aforementioned videoconferencing tools. Surveys were conducted with teachers and students who stated that 66% were not affected in their educational development. Most of them became familiar with the platforms; however, less than 24% qualified that their academic performance has improved, some teachers still have difficulties at a psychological level due to this new teaching modality. In conclusion, teachers and students agree that these tools are a great help for virtual classes.

Keywords—Digital tools; health emergency; universities; video conferencing; virtual education

I. INTRODUCTION

Globally, due to the new pandemic SARS-CoV-2 or known as COVID-19, the use of different softwares for student education is increasing. Less than a decade ago, videoconferencing was only used to avoid unnecessary expenses on business trips, thus reducing savings on lodging and time.

There was an abrupt change with the arrival of this new virus. This has led to a growing need for all students (from kindergarten to university level) to establish and become familiar with this new teaching and learning process, making the frequent use of these platforms more common.

Online class imbalance learning is a new problem that is happening in the real world [1]. In Indonesia, there are two problems that inhibit its education system, namely, transportation and distance. As a first solution, they applied the use of information and communication technologies (ICT). To reach a large mass of students, they created the Virtual Class Box (VCB) 5.0 device to support digital distance learning between teachers and students [2].

On the other hand, China rushed and experimented for a two-month trial period by forcing its universities to work remotely [3], obtaining as a result of their ICT, acceptable academic performance. However, he also stated that online platforms are not explicitly for student purposes.

Latin American countries such as Uruguay, created a digital program designed exclusively for the quality of teaching and learning in students due to the shortage of teachers [4].

One of the ways of interactivity is the so-called Discord application [5], normally used for video games. In their latest updates they added the trend of video calls, based on this, the student-teacher activities improved, consolidating the educational synergy.

In this day and age, conventional education is having gaps when it comes to teaching. Because, due to factors beyond their control, the immobilization of people decreed by many governments worldwide has left them alone at home, unable to go out, much less to places where there is a conglomeration of people. Education at any level has been affected in the delivery of classes [6].

Currently, the need for Peruvian students has increased by 80% the use of online classes. Because virtually the entire 100% of their houses of study will be disabled in person to prevent the spread of the virus from March 16, 2020 to date. By carrying out virtual meeting platforms such as Zoom or Google meet.

Today, they are the most innovative and adaptable means of telecommunication to our new national lifestyle. Since, it allows to establish a more real and visual connection between teachers and students. Helping also not to delay education. A study in 2019 [7], demonstrates that online learning helps university students improve their academic performance.

As it is in one of the Peruvian professional study houses, Universidad de Ciencias y Humanidades, in which the pandemic forced all its teachers to use videoconferencing without having previous knowledge of these, making a sudden change in the teaching methodology, since the virtual meeting platforms such as zoom and google meet had a time limit. Therefore, by having unique videoconferencing platforms, students will be able to receive instructions as if they were in person, and maintain the synergy of real-time intercommunication. However, these habits are not well received by some courses that require mandatory explanations by the physical presence of a teacher; discarding the disadvantages that some may have due to the quality of the network in their homes.

By carrying out this work we will make a research contribution and, above all, we will see that each person has a different learning pace, which leads us to question, with the
excellent quality of the platforms, are videoconferences really effective for university teaching and learning?

The objective of this article is to know the impact of different videoconferencing tools that have been used in the teaching and learning process at a University in northern Lima in times of pandemic.

The structure of the article is as follows: Section II, Literature Review, the antecedents will be explained; in Section III, Methodology, the steps to be followed will be detailed; in Section IV Results are discussed; in Section V, Discussions and in Section VI Conclusions and Future Work are discussed.

II. LITERATURE REVIEW

Currently, in times of pandemic, teaching is at a distance where the use of different means of videoconferencing is relevant in education. Since, it has a very significant role in the learning experience of the students [8].

The author [9], indicates that ICT has contributed to the new educational reforms. Google meet was mostly used by students in work meetings as opposed to teachers who preferred to zoom in on class meetings.

The use of the Zoom Videoconferencing platform helps both teachers and students in their work, teaching and learning, which allows both parties to interact and learn about the benefits of the platform, in addition to creating a socially positive learning environment [10]. The author [9], [10] coincide in their methodologies, since both apply a quantitative approach, having as statistical results, where a good percentage of Zoom videoconferences are accepted by students and teachers.

On the other hand, the author [11] mentions in the results of his studies that students do not have problems related to virtual education using videoconferencing platforms, however, there is a latent concern about issues related to the laboratory since, in it, they needed instruments that only the University could provide and that the vast majority of students do not have the possibility of acquiring.

In similar instances, a university student group, in their article [12], emphasized that it is not only in the professional field that institutions use videoconferencing for teaching.

In a study of e-learning, the modern form of online learning, the following benefits were found [13], such as cost-effectiveness, learning flexibility and, above all, the independent part.

In an investigation [14], explains that students have learning effectiveness during their online classes using Discord, as it allows access to requested activities and availability. However, what is detrimental to its reinforcement is the low quality of its network speed and the self-conscious behavior on the part of the students when they do not contribute opinions by activating their microphones.

Students in Indonesia, however, refuted that answer [15], he mentioned that when his students use videoconferencing tools in their classes, the behavior of the students is different, assuring that many of them have managed to overcome the shyness of speech, in which, virtually, they have more courage to contribute their opinions.

III. METHODOLOGY

The following will describe the most influential points of Videoconferencing platforms that contribute to virtual education, such as: Discord, Google Meet, Microsoft Teams, Skype, Zoom.

A. Survey

In this work 2 surveys were applied to: 25 university students and 10 teachers of the University of Sciences and Humanities of the career of Systems and Computer Engineering, using the Google Form tool to carry out these surveys. These surveys will help us to collect data from both students and teachers.

-Link to the survey for teachers:

docs.google.com/forms/d/176ZFX6Forz4UQhLkxHAILyA1ityQ69si0ug8oAY0Vc

Table I, lists the questions on the form for teachers.

| No. | Question |
|-----|----------|
| 1   | At what level do you consider you are psychologically and pedagogically qualified to work with virtual videoconferencing tools? |
| 2   | How many hours have you increased your workload to develop your online classes? |
| 3   | From your perspective, do you feel that stress has built up during the new teaching methodology? |
| 4   | Do you think you need to improve your digital skills to face the new teaching and learning processes in virtual environments? |
| 5   | Nowadays, the use of different videoconferencing platforms has diversified. On a scale of 1 to 5, indicate your knowledge of each of them, where 1 is none and 5 is total. |
| 6   | Rate the following tools, indicating the level of use in your online classes. |
| 7   | From your point of view, do you feel comfortable with the new teaching modality? |
| 8   | Based on the academic performance of your students, consider: |

-Link to student survey:

docs.google.com/forms/d/1oI7CqXYVTBzJdEorSS-8W9LmyA1co5IlB1gQQ2aJU

In Table II, we will mention the questions in the survey focused on students.

B. Zoom

Zoom is a tool used for synchronous online teaching, which allows you to work efficiently. It includes several functions such as: annotation tools, polls, meeting rooms and video and screen sharing. These functions facilitate learning [16]. Below in Table III, the most important tools of the Zoom platform will be detailed.

It offers innovative learning opportunities and tools, integrating video conferencing and teacher-student communication.
TABLE II. STUDENT SURVEY QUESTIONS

| No | Student Survey                                                                 |
|----|---------------------------------------------------------------------------------|
| 1  | ¿Do you consider that your level of learning has increased in the new virtual learning environment? |
| 2  | ¿Does teaching teachers via videoconferencing help you learn?                    |
| 3  | According to the aforementioned. Give a brief explanation of your answer.         |
| 4  | ¿Do you think you need to strengthen your digital skills to adapt to new learning processes in virtual environments? |
| 5  | Currently, the use of the different Videoconferencing platforms has diversified. On a scale of 1 to 5, mention the knowledge of each of them, where 1 is nil and 5 is total. |
| 6  | Please rate the following tools, indicating the level of use in your online classes |
| 7  | ¿From your point of view, do you feel comfortable with the new learning modality? |
| 8  | ¿How often do you have trouble concentrating during your online classes?          |
| 9  | Based on your academic performance, consider:                                    |

TABLE III. MAIN ZOOM TOOLS

| TOOLS                      | USAGE                                                                 |
|----------------------------|------------------------------------------------------------------------|
| Start a meeting            | Create a videoconference.                                              |
| Schedule a meeting         | Allows you to schedule a specific day and time for the meeting.        |
| Use of the calendar        | Gives the option to use Google calendar, to receive notifications of meetings already scheduled. |
| Screen sharing             | Allows all participants to have the option to choose what to share with other meeting participants |
| Screen Recorder            | It is useful to replay the meeting as many times as you want, it is very helpful to take notes and remember some details. |
| Virtual whiteboard         | Allows you to draw, write or carry out explanations in an easier way.   |
| Chat                       | Participants have the option to interact both directly and privately.   |
| Live Broadcasting          | It is used to make live broadcasts using applications such as Facebook or Youtube. |
| User management            | You have the option to enable and disable the audio and video of the participants, as well as manage which user enters the meeting. |

In Table IV, some advantages and disadvantages of the platform are mentioned.

TABLE IV. TABLE ADVANTAGES AND DISADVANTAGES OF ZOOM

| Advantages                                      | Disadvantages                                                                 |
|------------------------------------------------|-------------------------------------------------------------------------------|
| The pc version and mobile application          | Despite being an easy to use tool, it can be confusing for some people who are not adapted to this new technology. |
| has a relatively easy, comfortable and intuitive interface. | It has a 40 minutes limit for the free version.                               |
| It has a free version                           | As it is a synchronous application the use of internet or a stable connection is important. |
| Allows screen sharing in real time             | It collects data and emails from all connected devices exposing the user.     |
| No need to be registered to join a meeting, nor download the application | It is no necessary to download and install the application to use it.          |
| A permanent ID will be assigned to the user    |                                                                              |

In Fig. 1, the main and basic Zoom tools are shown.

C. Google Meet

Google Meet is a relatively recent application [17], was launched in April 2020 to all users, free of charge. It was previously known as Hangouts. It is mainly focused on companies and educational centers.

Below in Table V, the most important tools of the Meet platform will be detailed.

TABLE V. MAIN MEET TOOLS

| TOOL                        | USE                                                                 |
|-----------------------------|----------------------------------------------------------------------|
| Create a video call         | Allows you to create the video call, by logging in with your Google account. |
| Invite other users to join a meeting | Gives you a meeting link or code that you can send to other users. |
| Screen sharing              | Allows you to share your screen or the window of an application.       |
| Screen Recording            | Allows you to record the sessions so that the student has all the information at hand. |
| Chat                        | Users can interact by sharing files and views.                         |
| Controls for hosts          | The host can mute, set or delete a user.                               |

In Table VI, some advantages and disadvantages of the Meet platform are mentioned.

TABLE VI. ADVANTAGES AND DISADVANTAGES OF MEET

| Advantages                                      | Disadvantages                                                                 |
|------------------------------------------------|-------------------------------------------------------------------------------|
| Allows you to create meetings with more than 200 participants | 60 minutes limit for the free version.                                      |
| Facilitates real-time captioning during conversation | Has few mechanisms to control user audio.                                   |
| It has a simple and deductible interface        | Each participant must be registered or have a Google account.               |
| The security of the videoconference is guaranteed due to the encryption of the transmissions | It is a synchronous application, this means that the internet connection is indispensable. |

Google Meet is closely connected to Google Suite, this makes it possible to add meetings through Event Calender.

D. Skype

In Fig. 2, the main Meet tools are shown.
Like the other virtual meeting platforms, this one offers its services at zero prices, i.e. free of charge, so that people can meet at a distance. Despite being an offspring of Microsoft’s own [18]. Table VII shows the features that Skype has.

**TABLE VII. SKYPE APPLICATION FEATURES**

| FEATURES                | USE                                                                 |
|-------------------------|----------------------------------------------------------------------|
| Speed per calls         | 24Kbps / 128Kbps.                                                    |
| Courier writing         | Unlimited for ongoing call.                                          |
| Call recording          | If in case the guests want to see the show again.                    |
| Shared screen           | It has the ability to transmit live presentations from the phone or computer. |
| Multi platform          | Phone, pc, laptops, tablets, has accessibility to Skype.             |

We continue with Table VIII, the advantages and disadvantages of this virtual meeting platform will be detailed.

**TABLE VIII. ADVANTAGES AND DISADVANTAGES OF SKYPE**

| ADVANTAGES                                                                 | DISADVANTAGES                                                                 |
|--------------------------------------------------------------------------|------------------------------------------------------------------------------|
| Skype has accessibility for the different Operating Systems such as: Windows, Mac, Linux, Android, iOS. | It is not used mainly for academic meetings, both university and school.     |
| Advanced Encryption Standard Security.                                   | Sometimes during video call, video and audio quality tends to drop, which is annoying for users. |
| It has the capacity of 50 people connected in real time.                 | If the time limit exceeds, the video transmission is cut off, however, the call continues as audio. |

In the Fig. 3, the tools of said platform are indicated by arrows.

**TABLE IX. APP FEATURES MICROSOFT TEAMS**

| TOOL              | USE                                                                 |
|-------------------|----------------------------------------------------------------------|
| Messenger service | Ability to communicate personally with one of the members.          |
| Time limit        | The platform can be used between users for 24 hours at a time.       |
| Setting           | Shows the time spent inside the room.                                |
| Leave             | By pressing that option, the member can exit the live session.        |
| Reactions         | Interaction of members, such as: raising your hand to give your opinion, then the host will respond to your request. |

disadvantages of the Microsoft Teams video conferencing platform.

**TABLE X. ADVANTAGES AND DISADVANTAGES OF MICROSOFT TEAMS**

| ADVANTAGES                                                                 | DISADVANTAGES                                                                 |
|--------------------------------------------------------------------------|------------------------------------------------------------------------------|
| PKI security Protect data used to encrypt transport layer connections.   | It has a paid version for the full use of its services.                      |
| Has resources at the time of live meetings                               | It does not allow more than 300 users working simultaneously.                 |
| It has a free plan, however, it restricts some tools                     | A large percentage of users do not feel conformism with the tools, that is, difficult adaptability without prior training. |
| Your files are stored in the cloud. (Drive)                              | Requires the mandatory use of the internet.                                  |

In Fig. 4, each of the parts that Microsoft Teams has during a live meeting are noted.

**E. Microsoft Teams**

This virtual meeting platform is also used by hundreds of students nationwide, launched since 2017 becoming better known by the education sector since the year 2019, as well as providing a good integrated teaching and learning space [19].

Next, it is detailed in Table IX, the characteristics that the platform carries within a videoconference on-line.

To achieve a distinction between the aforementioned platforms, it will be detailed in Table X, the advantages and
to convert a traditional class to a virtual class, a monotonous listening class into an engaging listening class. In Table XI, we will proceed to list some of its tools.

| TOOL        | USE                                                      |
|-------------|----------------------------------------------------------|
| Add contact | Be able to add a user to make the video call.            |
| Create video call | Lets create the video call.                            |
| Share screen | Allows video call participants to choose what to share. |
| Chat        | It serves to have a more direct communication.           |

The following is detailed in Table XII, some advantages and relevant disadvantages of the videoconferencing platform Discord.

| Advantages                                      | Disadvantages                                                      |
|------------------------------------------------|---------------------------------------------------------------------|
| Due to the optimized performance, you can communicate without losing call quality. | After the launch of the paid version (Discord Nitro), limited some features in version (Discord Classic), and much more in its free version. |
| The tool is cross-platform.                     | Requires previous training for its use.                            |
| The platform is free.                           | The video calling option is not optimized, so there is a chance it will fail. |
| It is customizable for a better user interface. | You do not have the option to record video calls.                  |
| Ability to provide class with up to a maximum of 50 people. | Discord is not available for the Linux Operating System.           |
| Technical support available to your users.     | He had complaints from scammers.                                   |

In Fig. 5, the main interface of the Discord tool is shown, in addition to having a good educational and group environment, with a knowledge of the application there will be no deficiencies in its use. Multiple options are displayed within the interface that can be performed during a call in progress, either by transmission or just aural.

Through the comparisons made, it can be clearly concluded that the platforms have similar characteristics as: Time in which the class takes place, interaction option, screen sharing, writing internal messages to a user as well as in public. Except for Discord, for not having the option of video recording.

Then, the videoconferences differ between them by one or another option of use, therefore, the student’s learning and the teacher’s teaching still remains to be analyzed. Therefore, the results of the survey carried out will be explained by means of graphics.

IV. RESULTS

A. Regarding the teachers surveyed:

- The 66.6% considers that he is highly trained physically and psychologically to work with videoconferencing tools, as well as the 33.4% consider it to be at an intermediate level. As shown in Fig. 6.

- The 50% dedicates more than 3 hours (than normal) a day to develop his class, meanwhile the 33.3% dedicate 3 hours a day and 16.7% he claims he only spends 2 hours. As shown in Fig. 7.

- The 66.4% of teachers assess that they have accumulated a medium stress with the new teaching methodology, while the 16.8% considers that he accumulated high stress, in the same way the 16.8% accumulated low stress. As shown in Fig. 8.

- The 100% consider that you need to keep learning the new digital tools. As shown in Fig. 9.
The vast majority of teachers have a very high knowledge of the Zoom and Meet platforms, however they have a medium-low knowledge of the Skype, Microsoft Teams and Discord tools. As shown in Fig. 10.

Almost all teachers confirmed that they use the Zoom and Google Meet tools more frequently to teach their classes, as shown in Fig. 11.

Only 16.7% considers that he feels very comfortable with this teaching modality; however, the 83.3% consider that you are comfortable with this mode of teaching. As shown in Fig. 12.

An 83.4% of teachers consider that students’ academic performance has remained on the sidelines and only 16.7% indicates that it has improved. As shown in Fig. 13.

B. Regarding the Surveyed Students:

The 60% of students rate that their learning level has remained in a normal state, the 20% estimates that it has improved, and 8% qualifies that he has learned little; however, the 8% he considers that he has learned very little. As shown in Fig. 14.
The 68% of the surveyed students rate that they agree that video conferencing tools help them learn; however, the 32% considers that they do not agree. As shown in Fig. 15.

The 72% of respondents believe that they need to continue strengthening their digital knowledge, although, 28% consider not.

The vast majority of students have a medium-high knowledge of the Zoom and Meet platforms, however, they have low-zero knowledge of the Skype, Microsoft Teams and Discord tools. As shown in Fig. 16.

Almost all students confirmed that they most frequently use the Zoom and Google Meet tools for their online classes. As shown in Fig. 17.

The 16% considers that he feels very comfortable regarding the new learning modality, a 20% rate that you feel comfortable, the 44% considers that it is normal, the 16% estimates that he feels uncomfortable, in the same way a 4% He rated that he is not comfortable. As shown in Fig. 18.

The 52% indicated that he very seldom has concentration problems during classes, only on the 32% who has problems often, and the 16% indicates constantly has problems. As shown in Fig. 19.

The 24% rated that their performance has improved considerably, the 60% considers that his performance has remained on the sidelines, and only the 16% indicates that its performance has decreased. As shown in Fig. 20.
The contribution of this research work is aimed at the educational environment, making the results known through online learning surveys. The academic community of the University, made up of students, teachers and authorities, benefit from this work.

Further research is expected later, adding the other departments and comparing little-known video conferencing platforms.

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