Research Article

Students' Perception About the Incorporation of Technological Tools in the Educational Field During the COVID-19 Pandemic

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ARTICLE INFO	ABSTRACT
	Currently, teachers are changing the planning and organization of the courses due to the appearance of the SARS-CoV-2 virus. This mixed research analyzes the perception of students about the use of Google Classroom, smartphones, and Google Meet through machine learning and decision tree techniques (data science). The participants are 76 students from the National Preparatory School No. 6 "Antonio Caso" who took the universal literature course in the 2021 school year. The incorporation of Google Classroom allowed that these students reviewed the contents, consulted the multimedia resources, sent the tasks and established a communication from anywhere. Also, smartphones allowed the communication in the virtual classes, search for information on the Internet and review of the school contents at any time. Lastly, these students used Google Meet to answer their questions, understand the school topics and actively participate. The machine learning technique indicates that the use of Google Classroom, smartphones, and Google Meet positively influence the active role of the students during the realization of the school activities. The decision tree technique determines 3 predictive models about the use of these technological tools considering the profile of the students. In conclusion, technological tools such as Google Classroom, smartphones, and Google Meet play a fundamental role to plan, organize and carry out new educational activities and practices in the distance modality. **Keywords:** ICT, education, learning management systems, mobile devices, videoconferencing systems

INTRODUCTION

Currently, the SARS-CoV-2 virus is causing that universities, preparatory, secondary, and primary schools modify their teaching and learning practices to meet the demands of the students (Rehm et al., 2021; Roig-Vila et al., 2021; Van-Leeuwen et al., 2021). Consequently, the strategic planning of educational institutions includes the appropriation and use of technological advances (Díaz-Sainz et al., 2021; Gouseti, 2021; Goodyear, 2020). For example, educators use videoconferencing systems, learning management systems (LMS) and mobile devices to update the courses and improve the teaching-learning process (Xu, 2022).

Technological tools are used in the face-to-face and distance modalities to capture the attention and increase the interest of the students during the educational process (Altakhayneh, 2022; Bernacki et al., 2020; Díaz-Sainz et al., 2021). Also, educators organize activities that promote the autonomy of the students through the use of information and communication technologies (ICTs) and educational strategies (Chen et al., 2021; Navarro-Morales & Londoño, 2019; Yuen et al., 2019). In particular, videoconferencing systems facilitate the communication from anywhere, LMS allows the realization of the school activities at any time and mobile devices allow the use of technological applications and tools (Altakhayneh, 2022).

The COVID-19 pandemic radically modified the behavior of the teachers during the organization and implementation of the school activities (Gouseti, 2021; Hu et al., 2021; Maity et al., 2021). In fact, LMS, mobile devices and videoconferencing systems acquire a fundamental role to face the challenges of the 21st century because these technological tools facilitate the assimilation of knowledge, develop the skills and increase the motivation of the students from the home, classroom and office (Chen et al., 2021; Raghunathan et al., 2021; Roig-Vila et al., 2021).

In Mexico, the teacher of the universal literature course incorporated Google Classroom, smartphones, and Google Meet to update the school activities in the distance modality and facilitate the learning process during the COVID-19 pandemic. The use of Google Classroom in this course allowed the consultation of multimedia resources and sending of the school activities from anywhere. Also, smartphones improved the communication in the virtual classes, search for information and review of the information at any time. Lastly, Google Meet facilitated the understanding of the school topics and promoted the active participation of the students. Therefore, the research questions are, as follows:

1. How do Google Classroom, smartphones, and Google Meet influence the active role of the students during the realization of the school activities in the universal literature course?

2. What are the predictive models about the use Google Classroom, smartphones, and Google Meet in the universal literature course considering the decision tree technique?

3. What is the perception of the students about the use of Google Classroom, smartphones, and Google Meet in the educational field?

LITERATURE REVIEW

During the COVID-19 pandemic, educational institutions modified the teaching-learning process in the face-to-face and distance modalities through the incorporation and use of ICTs (Maity et al., 2021; Rehm et al., 2021; Van-Leeuwen et al., 2021). In particular, LMS, mobile devices and videoconferencing systems are technological tools that facilitate the performance of the school activities from anywhere (Gouseti, 2021; Van-Leeuwen et al., 2021).

Mobile Devices

The incorporation of mobile devices in the educational context favors the attention, proactivity and participation of the students during the realization of the school activities (Bernacki et al., 2020; Chen et al., 2021). For example, the use of tablets and smartphones in the classroom favors the critical thinking and teamwork (Raghunathan et al., 2021). Even, Ortiz and Green (2019) explain that smartphones facilitate the teaching-learning process because these mobile devices allow the communication between students and teachers, use of technological applications and consultation of information inside and outside the classroom.

In the chemical engineering course, the use of Kahoot on smartphones promoted the active role of the students and facilitated the exchange of ideas through the question and answer games (Díaz-Sainz et al., 2021). Similarly, the students of medicine increased their academic performance, satisfaction and motivation through the use of technological applications on smartphones (Chen et al., 2021). In Thailand, the incorporation of smartphones in the educational field facilitated the active role of students, personalization of learning and development of writing skills (Wilang & Garcia, 2021).

According to Raghunathan et al. (2021), the consultation of multimedia resources and use of applications on smartphones facilitated the assimilation of knowledge about clinical cases and allowed the communication in the nursing course. In the field of psychology, the incorporation of this mobile device increased the

students' academic performance and facilitated the collaborative activities during the face-to-face sessions (Bernacki et al., 2020).

Consequently, mobile devices such as smartphones allow innovating the school activities of the courses through the consultation of information, review of multimedia resources and use of technological applications (Bernacki et al., 2020; Chen et al., 2021; Raghunathan et al., 2021).

Learning Management Systems

Actually, LMS encourages the participation of the students during the educational process because these tools allow the submission of tasks, communication, feedback of the activities, and consultation of the school contents (Marachi & Quill, 2020; Tezer & Cimsir, 2018; Yuen et al., 2019). In fact, Moodle, Blackboard, Canvas, and Google Classroom facilitate the active role of the students before, during and after the classes (Tarango et al., 2019).

At Giresun University, the students of computer science used mobile devices to review the activities, consult the multimedia resources and submit the assignments through Moodle (Tezer & Cimsir, 2018). The use of this LMS increased the academic performance and interest of the students during the educational process (Tezer & Cimsir, 2018).

Several authors (e.g., Albashtawi & Al-Bataineh, 2020; Martin, 2021) have used Google Classroom to improve the teaching-learning conditions and promote the personalized learning. In the marketing course, the incorporation of Google Classroom facilitated the development of skills on effective communication, collaboration and creativity (Martin, 2021). In the same way, the students of the English as a foreign language course developed their reading and writing skills by carrying out activities in Google Classroom (Albashtawi & Al-Bataineh, 2020).

Educators use LMS together with pedagogical models such as blended learning to facilitate the understanding of the topics in the face-to-face and distance modalities (Abuzant et al., 2021; Yuen et al., 2019). For example, the use of Google Classroom in the blended learning modality facilitated the understanding of computer science topics and allowed the development of programming skills (Abuzant et al., 2021). In the United States, the use of Canvas and Google Meet in the educational context is increasing due to the fact that these LMS are easy to use and allow carrying out the school activities of the course from anywhere (Marachi & Quill, 2020).

In the English course, the use of Moodle improved the academic performance and developed the grammatical and verbal skills of the students by taking the online exams and consulting the educational materials (Tsai, 2021). Similarly, the use of Google Classroom in Indonesia was very useful during the organization of courses in universities under the distance modality (Sudarsana et al., 2019). Finally, LMS encourages the active role of the students outside and inside the classroom (Marachi & Quill, 2020; Sudarsana et al., 2019; Yuen et al., 2019).

Videoconferencing Systems

Today, videoconferencing systems such as Google Meet, Zoom, and WebEx are essential to carry out the teaching-learning process during the COVID-19 pandemic because these technological tools allow the interaction and exchange of ideas between the participants of the educational process from anywhere (Maity et al., 2021; Roig-Vila et al., 2021). According to Ospina-García et al. (2021), Google Meet is a technological tool that favors the learning process because students and teachers can communicate in real time.

In secondary schools, educators used videoconferencing systems to communicate with their students and facilitate the teaching-learning process in the distance modality (Rehn et al., 2017). In the same way, the students of the Alicante University used Google Meet to facilitate the learning in the master's degree of primary education during the COVID-19 pandemic (Roig-Vila et al., 2021). Also, Google Meet favors the active participation of students through the resolution of doubts in real time and exchange of ideas between the participants of the educational process (Ospina-García et al., 2021).

On the other hand, the students of the law course used Zoom to facilitate the assimilation of knowledge about the justice system and actively participate in the distance modality (Roth et al., 2020). In addition, the use of Google Meet in the dentistry course increased the students' motivation and facilitated the learning
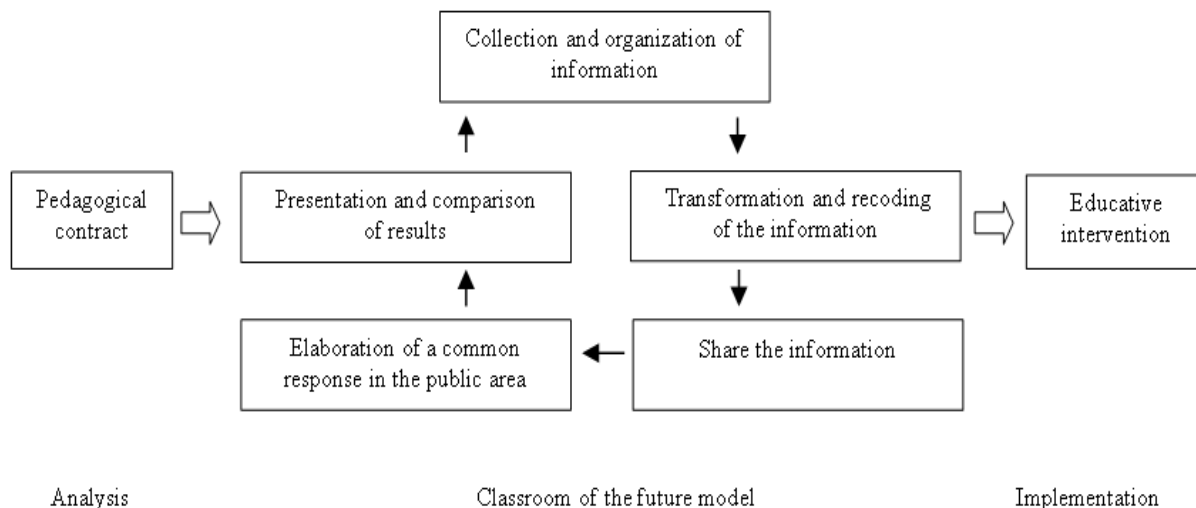
Figure 1. "Innovation in university teaching 2021" diploma

process about oral immunology (Sette-de-Souza, 2021). Finally, videoconferencing systems such as Google Meet, Zoom, and WebEx allow the realization of the teaching-learning process from anywhere and establish an efficient communication to discuss the topics of the courses (Maity et al., 2021; Roig-Vila et al., 2021; Roth et al., 2020).

METHOD

The particular aims of this mixed research are, as follows:

1. To analyze how Google Classroom, smartphones, and Google Meet influence the active role of the students during the realization of the school activities through the machine learning technique.
2. To identify the predictive models about the use of Google Classroom, smartphones, and Google Meet through the decision tree technique.
3. analyze the students' perception about the use of Google Classroom, smartphones, and Google Meet in the universal literature course.

Participants

The participants are to 76 students (40 men and 36 women) from the National Preparatory School No. 6 "Antonio Caso", National Autonomous University of Mexico, who took the universal literature course in the 2021 school year. The average age is 16.07 years.

Procedure

The National Autonomous University of Mexico offered the "innovation in university teaching 2021" diploma in order to facilitate the planning and implementation of courses in the distance modality. In this diploma, teachers carry out a pedagogical contract to analyze how they are organizing their school activities. Subsequently, these educators use the pedagogical and technological model called "classroom of the future" to update their educational practices with the support of technological tools and use of didactic strategies (**Figure 1**).

This pedagogical and technological model consists of five stages that promote the realization of collaborative activities through the incorporation of ICTs, collaborative virtual walls (Padlet), and web games (Kahoot) in the school activities. After the educational intervention, these educators analyze how the teaching-learning process was modified. In particular, the teacher of the universal literature course used Google Classroom, smartphones, and Google Meet to innovate educational process during the COVID-19 pandemic.

Figure 2 shows the model used by this research to analyze the use of Google Classroom, smartphones, and Google Meet in the active role of the students during the realization of the school activities.
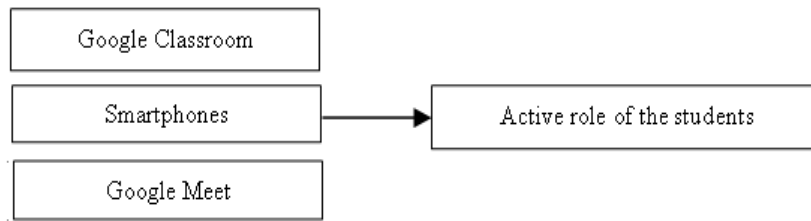
Figure 2. Model proposed for this research

In the universal literature course, the students used Google Classroom to review the information, establish the communication, submit the assignments, and consult the multimedia resources at any time. In addition, these students actively participated in the virtual classes through the search for information and review of the school contents on smartphones. Finally, Google Meet facilitated the understanding of the school topics, interaction and communication in the distance modality.

LMS promotes the active role of the students during the COVID-19 pandemic (Hu et al., 2021; Tsai, 2021; Yuen et al., 2019). Therefore, the hypothesis about this technological tool is, as follows:

Hypothesis 1 (H1): The use of Google Classroom positively influences the active role of the students during the realization of the school activities.

The incorporation of mobile devices such as smartphones allows the active participation of the students from anywhere (Díaz-Sainz et al., 2021; Hu et al., 2021; Raghunathan et al., 2021). Therefore, the hypothesis about this technological tool is, as follows:

Hypothesis 2 (H2): The use of smartphones positively influences the active role of the students during the realization of the school activities.

During the COVID-19 pandemic, videoconferencing systems favor the exchange of ideas in the distance modality (Gouseti, 2021; Maity et al., 2021). Therefore, the hypothesis about this technological tool is, as follows:

Hypothesis 3 (H3): The use of Google Meet positively influences the active role of the students during the realization of the school activities.

The predictive models about the use of Google Classroom, smartphones, and Google Meet are, as follows:

1. Predictive model 1 (PM1) about the active role of the students and Google Classroom,
2. Predictive model 2 (PM2) about the active role of the students and smartphones, and
3. Predictive model 3 (PM3) about the active role of the students and Google Meet.

Data Collection

In November 2021, the questionnaire about the use of Google Classroom, smartphones, and Google Meet was applied in the universal literature course (**Table 1**). These students from the National Preparatory School No. 6 "Antonio Caso" anonymously responded to a Google form. In addition, this digital questionnaire consists of two closed questions about characteristics of the students (age and sex), four closed questions about technology (Google Classroom, smartphones, Google Meet, and active role), and three open questions about students' perception (LMS, mobile device, and videoconferencing system).

Table 2 shows validation of the questionnaire about the use of LMS, mobile devices and videoconferencing system. According to Aguilar-Díaz et al. (2020), a value of Cronbach's alpha>0.6 is acceptable.

Data Analysis

This mixed research used the RapidMiner tool and Word-Cloud application to analyze the information about the use of Google Classroom, smartphones, and Google Meet in the universal literature course. According to Salas-Rueda et al. (2022), the machine learning technique is used in the educational field to analyze the impact of the independent variable (technological tools) on the dependent variable (teaching-learning process) through linear regression. Anderson et al. (2012) mention that the statistical value T allows checking if the regression between an independent and dependent variable is significant.

Table 1. Questionnaire

No	Variable	Dimension	Question	Answer	n	%
1	Characteristics of students	Age	1. What is your age?	15 years	11	14.47
				16 years	49	64.47
				17 years	15	19.74
				18 years	1	1.32
		Sex	2. What is your sex?	Man	40	52.63
				Woman	36	47.37
2	Technology	Google Classroom	3. The use of Google Classroom facilitates the learning process	Very much (1)	27	35.53
				Much (2)	35	46.05
				Little (3)	13	17.11
				Very little (4)	1	1.32
		Smartphones	4. The use of smartphones facilitates the learning process	Very much (1)	35	46.05
				Much (2)	34	44.74
				Little (3)	6	7.89
				Very little (4)	1	1.32
		Google Meet	5. The use of Google Meet facilitates the learning process	Very much (1)	26	34.21
				Much (2)	41	53.95
				Little (3)	7	9.21
				Very little (4)	2	2.63
		Active role	6. Technological advances increase the active role during the realization of the school activities	Very much (1)	11	14.47
				Much (2)	25	32.89
				Little (3)	23	30.26
				Very little (4)	17	22.37
3	Students' perception	Learning management system	7. What is your opinion about the use of learning management systems?	Open	-	-
		Mobile device	8. What is your opinion about the use of mobile devices?	Open	-	-
		Videoconferencing system	9. What is your opinion about the use of videoconferencing systems?	Open	-	-

Table 2. Validation of the questionnaire

Variable	Dimension	Load factor	Cronbach's alpha	Average variance extracted	Composite reliability
Technology	Google Classroom	0.648			
	Smartphones	0.738	0.693	0.532	0.818
	Google Meet	0.796			
	Active role	0.728			

In the machine learning technique, 70%, 80%, and 90% of the sample (training section) was used to calculate the linear regressions and evaluate the hypotheses. On the other hand, this study used 30%, 20%, and 10% of the sample to identify accuracy of these linear regressions by means of the squared error.

Figure 3 shows the use of the RapidMiner tool for this data science technique. The "retrieve" component allows loading the information about Google Classroom, smartphones, and Google Meet, "split data" component allows dividing the sample in the training and evaluation sections, "linear regression" component allows calculating the linear functions, "multiply" component duplicates the output obtained, "apply model" component allows evaluating the accuracy of the linear regressions and "performance" component shows the results obtained from the machine learning technique.

On the other hand, Terry et al. (2021) propose the use of variables such as gender, age and education to create predictive models about the behavior of the participants. In addition, Salas-Rueda (2021) used the decision tree technique to identify the conditions about the use of technological tools in the educational field considering the profile of the students. In this study, the decision tree technique allowed the construction of predictive models about the use of Google Classroom, smartphones, and Google Meet considering the sex and age of the students. **Figure 4** shows the use of the RapidMiner tool for this data science technique. The "decision tree" component allows identifying the predictive conditions about Google Classroom, smartphones, and Google Meet considering the sex and age of the students.

Finally, the Word-Cloud application allowed analyzing the perception of the students about the use of these technological tools through the identification of the words that have the highest frequency.
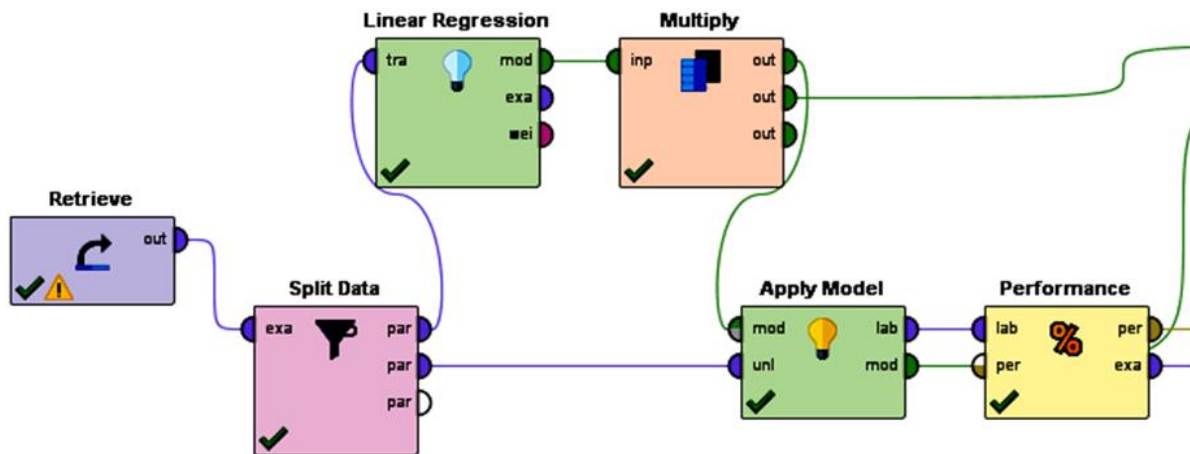
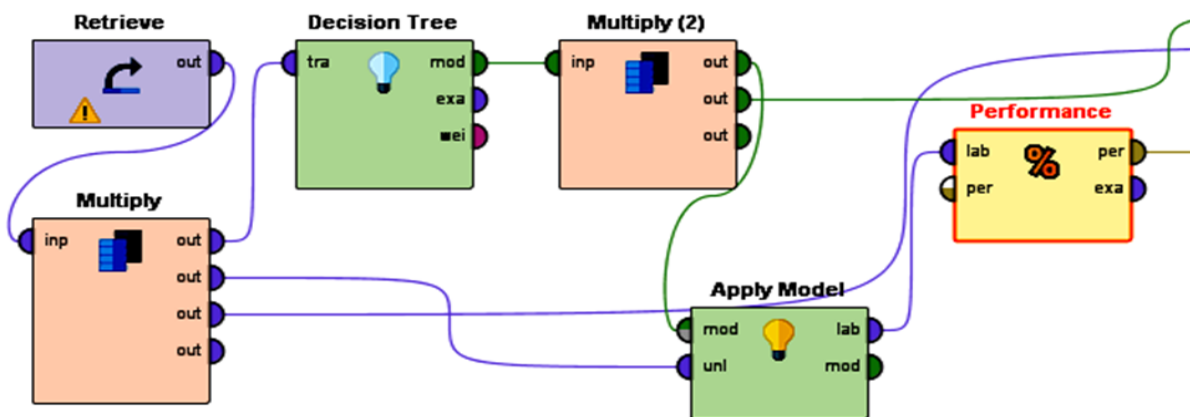**Figure 3.** Use of the RapidMiner tool for the machine learning technique

Figure 4. Use of the RapidMiner tool for the decision tree technique

Table 3. Results of the machine learning technique

Hypothesis	Training	Linear regression	Conclusion	t-value	p-value	Squared error
H1: Google Classroom→Active role of the students	70%	y=0.199x+2.332	Accepted: 0.199	1.089	0.281	0.813
	80%	y=0.179x+2.339	Accepted: 0.179	1.048	0.298	0.935
	90%	y=0.168x+2.280	Accepted: 0.168	1.015	0.313	0.844
H2: Smartphones→Active role of the students	70%	y=0.399x+2.070	Accepted: 0.399	1.681	0.099	0.724
	80%	y=0.532x+1.833	Accepted: 0.532	2.580	0.012	0.633
	90%	y=0.508x+1.766	Accepted: 0.508	3.064	0.002	0.555
H3: Google Meet→Active role of the students	70%	y=0.688x+1.438	Accepted: 0.688	3.669	0.000	0.652
	80%	y=0.722x+1.334	Accepted: 0.722	4.426	0.000	0.620
	90%	y=0.647x+1.416	Accepted: 0.647	4.444	0.000	0.344

RESULTS

The results of the machine learning technique indicate that the use of Google Classroom, smartphones, and Google Meet positively influence the active role of the students during the realization of the school activities (**Table 3**).

LMS

The use of Google Classroom facilitates very much (n=27, 35.53%) much (n=35, 46.05%), little (n=13, 17.11%), and very little (n=1, 1.32%) the learning process (**Table 1**). Likewise, the results of the machine learning technique with 70% (0.199, t-value=1.089, p-value=0.281), 80% (0.179, t-value=1.048, p-value=0.298), and 90% (0.168, t-value=1.015, p-value=0.313) indicate that H1 is accepted (**Table 3**). Therefore, the use of Google Classroom positively influences active role of the students during realization of the school activities.
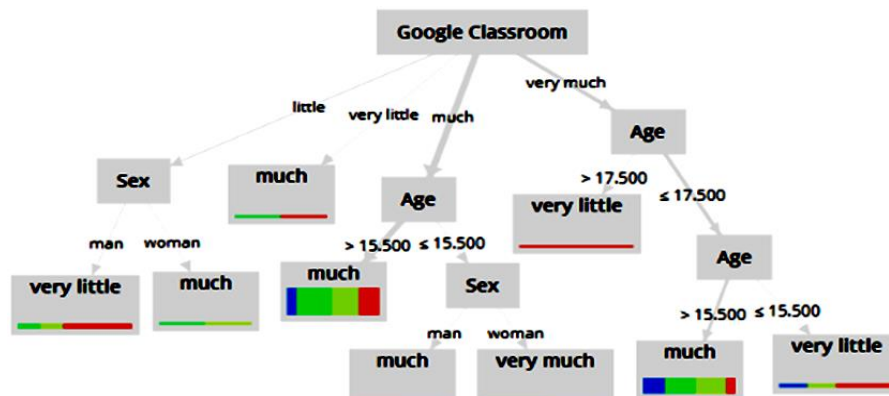
Figure 5. PM1 about the use of Google Classroom

Figure 5 presents nine conditions of the PM1. For example, if the student considers that the use of Google Classroom facilitates much the learning process, has an age≤15.50 years and is a man then technological advances increase much the active role during the realization of the school activities.

The sex of the students determines four conditions of the PM1. For example, if the student considers that the use of Google Classroom facilitates much the learning process, has an age≤15.50 years and is a woman then technological advances increase very much the active role during the realization of the school activities. Likewise, the age of the students establishes 6 conditions of the PM1. For example, if the student considers that the use of Google Classroom facilitates much the learning process and has an age>15.50 years then technological advances increase much the active role during the realization of the school activities.

The students of the National Preparatory School No. 6 "Antonio Caso" mention that Google Classroom allowed the review of the contents, multimedia resources and activities from anywhere.

> "It is possible to consult the contents and documents of the class at any time and place" (student 11, 16 years old, woman).

> "There is greater accessibility to digital resources; facilitating the learning" (student 37, 16 years old, man).

Also, this LMS facilitated the assimilation of knowledge and understanding of the school topics through the consultation of materials.

> "In this tool, teacher can publish the information and materials that help me to understand the topics" (student 2, 16 years old, woman).

> "In my opinion, it is easier to provide the necessary material for a better understanding. At the same time, it is more accessible" (student 19, 16 years old, woman).

The benefits about the use of Google Classroom are the sending of the assignments, consultation of the information at any time and flexibility of time to carry out the school activities.

> "The flexibility to deliver the works and materials" (student 6, 15 years old, man).

> "We find the information of the course in a much faster and more efficient way" (student 10, 17 years old, woman).

In addition, this LMS plays a fundamental role in the distance courses because it facilitated the communication and interaction between the participants of the educational process.

> "The topics, tasks, or announcements are stored in one place in order to facilitate the work" (student 15, 16 years old, woman).

> "It facilitates the relationship between teachers and students" (student 25, 17 years old, woman).

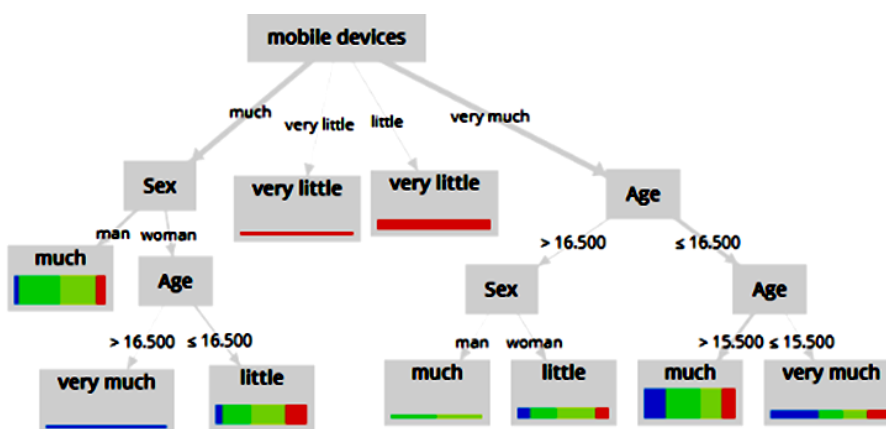**Figure 6.** Word cloud about the use of Google Classroom

Figure 7. PM2 about the use of smartphones

Figure 6 shows the word cloud about the use of Google Classroom where the most frequent words are tasks (n=14), activities (n=11), information (n=11), delivery (n=10), learning (n=10), work (n=10), better (n=9), and use (n=9).

Mobile Device

The use of smartphones facilitates very much (n=35, 46.05%), much (n=34, 44.74%), little (n=6, 7.89%), and very little (n=1, 1.32%) the learning process (**Table 1**). The results of the machine learning technique with 70% (0.399, t-value=1.681, p-value=0.099), 80% (0.532, t-value=2.580, p-value=0.012), and 90% (0.508, t-value=3.064, p-value=0.002) indicate that H2 is accepted (**Table 3**). Therefore, the use of smartphones positively influences the active role of the students during the realization of the school activities.

Figure 7 shows nine conditions of the PM2. For example, if the student considers that the use of smartphones facilitates much the learning process and is a man then technological advances increase much the active role during the realization of the school activities.

The sex of the student determines five conditions of the PM2. For example, if the student considers that the use of smartphones facilitates much the learning process, is a woman and has an age>16.5 years then technological advances increase very much the active role during the realization of the school activities.

Likewise, the age of the students establishes 6 conditions of the PM2. For example, if the student considers that the use of smartphones facilitates very much the learning process, is a man and has an age>16.5 years then technological advances increase much the active role during the realization of the school activities.

The incorporation of smartphones in the educational field allowed the communication between the educator and students during the teaching-learning process.
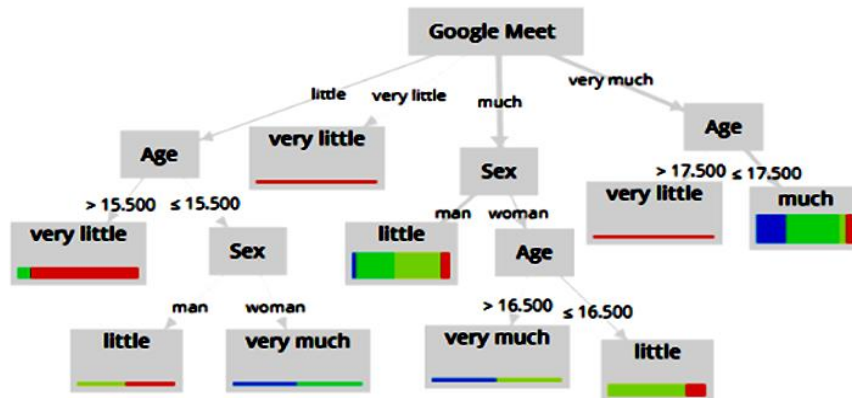
Figure 8. Word cloud about the use of smartphones

> "I can get more information quickly and can be in constant communication with other people" (student 2, 16 years old, woman).

> "Ease of communication in different places" (student 5, 17 years old, woman).

In addition, this mobile device allowed the access to the videoconferences of the courses and search for information on the Internet.

> "They allow us the possibility of connecting to our classes. As well as, we access to the Internet" (student 9, 17 years old, woman).

> "Mobile devices can connect me to the classes. Homework can also be handed in" (student 21, 17 years old, woman).

According to the students of the National Preparatory School No. 6 "Antonio Caso", smartphones facilitated the consultation of the assignments and allowed the review of the school contents.

> "On mobile devices is easier to review the assignments and notices of our classes" (student 13, 16 years old, man).

> "They facilitate the access to the material provided at any time" (student 19, 16 years old, woman).

The benefits about the use of this mobile device are the flexibility of time and space during the teaching-learning process.

> "Accessibility to education no matter" (student 6, 15 years old, woman).

> "I can consult the content at home or at work" (student 10, 17 years old, woman).

Figure 8 shows the word cloud about the use of smartphones where the most frequent words are information (n=24), access (n=18), communication (n=13), devices (n=12), mobile (n=10), easier (n=9), the Internet (n=9), and learning (n=7).

Videoconferencing System

The use of Google Meet facilitates very much (n=26, 34.21%), much (n=41, 53.95%), little (n=7, 9.21%), and very little (n=2, 2.63%) the learning process (**Table 1**). The results of the machine learning technique with 70% (0.688, t-value=3.669, p-value=0.000), 80% (0.722, t-value=4.426, p-value=0.000), and 90% (0.647, t-value=4.444, p-value=0.000) indicate that H3 is accepted (**Table 3**). Consequently, the use of Google Meet positively influences the active role of the students during the realization of the school activities.

Figure 9. PM3 about the use of Google Meet

Figure 9 shows nine conditions of the PM3. For example, if the student considers that the use of Google Meet facilitates much the learning process, is a woman and has an age>16.5 years then technological advances increase very much the active role during the realization of the school activities.

The sex of the student determines 5 conditions of the PM3. For example, if the student considers that the use of Google Meet facilitates much the learning process, is a woman and has an age≤16.5 years then technological advances increase little the active role during the realization of the school activities. Likewise, the age of the student establishes seven conditions of the PM3. For example, if the student considers that the use of Google Meet facilitates very much the learning process and has an age≤17.5 years then technological advances increase much the active role during the realization of the school activities.

Videoconferencing systems are support tools for carrying out the teaching-learning process during the COVID-19 pandemic because the students resolve their doubts through these means of communication.

"It allows the resolution of doubts" (student 1, 16 years old, man).

"If doubts arise, the teacher can respond immediately and with more clarity" (student 2, 16 years old, woman).

Also, the students of the National Preparatory School No. 6 "Antonio Caso" mention that the use of Google Meet facilitated the understanding of school topics in the distance modality.

"We receive explanations directly from the teacher. Also, we ask the questions" (student 7, 15 years old, woman).

"From my own experience, videoconferencing systems improve the learning in the online modality since it is an easier way to clarify the doubts" (student 8, 16 years old, woman).

Even, the incorporation of this videoconferencing system in the educational field promoted the communication and active participation of the students during the virtual classes.

"Participation in class and explanation of certain topics that support us for homework" (student 9, 17 years old, woman).

"Videoconferences allow the communication between the participants" (student 26, 16 years old, woman).

Likewise, Google Meet allowed the interaction between the teacher and students from anywhere.

"Communication with the teacher is very similar to the communication in the classroom" (student 16, 17 years old, man).

"I consider that it is quite similar to the face-to-face modality, so it is easier to answer the questions at the moment" (student 29, 16 years old, woman).

Figure 10. Word cloud about the use of Google Meet

Table 4. Pearson's correlations

	Google Classroom	Smartphones	Google Meet	Active role
Google Classroom	1	-	-	-
Smartphones	0.400	1	-	-
Google Meet	0.391	0.356	1	-
Active role	0.171	0.397	0.524	1

Figure 10 shows the word cloud about the use of Google Meet where the most frequent words are teacher (n=17), doubts (n=15), questions (n=14), class (n=13), better (n=12), learning (n=12), way (n=11), classes (n=10), easier (n=9), and topics (n=9).

Pearson's Correlations

Table 4 shows the Pearson's correlations related to LMS, mobile devices and the videoconferencing system. The most significant correlation is located between Google Meet and Active role (0.524). On the other hand, the least significant correlation comes from Google Classroom and active role (0.171).

DISCUSSION

Technological advances allow that teachers organize and carry out new school activities from anywhere during the COVID-19 pandemic (Díaz-Sainz et al., 2021; Goodyear, 2020; Marachi & Quill, 2020). According to the students of the National Preparatory School No. 6 "Antonio Caso", Google Classroom allowed the review of the contents, multimedia resources and activities from anywhere. In addition, smartphones facilitated the communication between the educator and students during the teaching-learning process. Even, Google Meet promoted the communication and active participation of the students during the virtual classes.

Google Classroom

According to Yuen et al. (2019), LMS facilitates the assimilation of knowledge in the distance and face-to-face modalities. Most of the students (81.58%) consider that the use of Google Classroom facilitates very much and much the learning process. Therefore, these participants have a favorable opinion about the use of this technological tool. In addition, Google Classroom plays a fundamental role in the distance courses because it facilitates the communication and interaction between the participants of the educational process.

Various authors (e.g., Marachi & Quill, 2020; Tezer & Cimsir, 2018; Tsai, 2021) mention that educators use LMS to facilitate the learning process from home, classroom and office. For example, Google Classroom facilitated the assimilation of knowledge and understanding of the school topics through the consultation of materials. In particular, the results of the machine learning technique on H1 are higher than 0.160, therefore, the use of Google Classroom positively influences the active role of the students during the realization of the school activities.

The students of the universal literature course consider that Google Classroom facilitated the realization of school activities at any time. Data science identifies nine conditions of the PM1. In this predictive model, the sex and age of the students determine how Google Classroom influences the active role of the students during the realization of the school activities. The decision tree technique establishes five conditions where technological advances increase much the active role during the realization of the school activities.

Finally, the benefits about the use of Google Classroom are the sending of the assignments, consultation of the information at any time and the flexibility of time to carry out the school activities.

Smartphones

Various authors (e.g., Chen et al., 2021; Raghunathan et al., 2021; Tezer & Cimsir, 2018) explain that smartphones facilitate the planning of new activities and promote the interaction between the participants of the educational process at any moment. The majority of students (90.79%) consider that the use of smartphones facilitates very much and much the learning process. Therefore, these participants have a favorable opinion about this technological tool. Likewise, this mobile device allows the access to the videoconferences of the courses and search for information on the Internet.

Educators use mobile devices in the educational field to facilitate the learning and communication from anywhere (Díaz-Sainz et al., 2021; Raghunathan et al., 2021). The advantages of smartphones are the flexibility of time and space during the realization of the teaching-learning process. The results of the machine learning technique on H2 are higher than 0.390, therefore, the use of smartphones positively influences the active role of the students during the realization of the school activities.

According to the students at the National Preparatory School No. 6 "Antonio Caso", smartphones facilitated the consultation of the assignments and allowed the review of school contents. Data science identifies nine conditions of the PM2. In this predictive model, the sex and age of the students determine how smartphones influence the active role of the students during the realization of the school activities. The decision tree technique establishes three conditions where technological advances increase much the active role during the realization of the school activities.

Finally, the benefits about the use of smartphones are the communication between the educator and students, search for information on the Internet and flexibility of time and space during the teaching-learning process.

Google Meet

Similar to Maity et al. (2021), the use of videoconference systems allows the realization of the teaching-learning process through the interaction between the teacher and students in real time. In particular, the majority of students (88.16%) think that the use of Google Meet facilitates very much and much the learning process. Therefore, these participants have a favorable opinion about this technological tool. Likewise, Google Meet allows the interaction from anywhere.

Videoconferencing systems allow the exchange of ideas and discussions in the educational process (Maity et al., 2021; Rehn et al., 2017; Roth et al., 2020). During the COVID-19 pandemic, Google Meet is an ideal tool to carry out the teaching-learning process remotely. The results of the machine learning technique on H3 are higher than 0.640, therefore, the use of Google Meet positively influences the active role of the students during the realization of the school activities.

Even, the incorporation of this videoconferencing system in the educational field allowed that the students resolved their doubts during the virtual classes. Data science identifies nine conditions of the PM3. In this predictive model, the sex and age of the students determine how Google Meet influences the active role of the students during the realization of the school activities. The decision tree technique establishes two conditions where technological advances increase very much the active role during the realization of the school activities.

Finally, the students at the National Preparatory School No. 6 "Antonio Caso" mention that the use of Google Meet facilitated the understanding of the school topics in the distance modality.

CONCLUSION

Technological tools facilitate the realization of educational practices and activities in the distance modality. At the National Preparatory School No. 6 "Antonio Caso", the incorporation of ICTs improved the teaching-learning conditions in the universal literature course. The results indicate that the use of Google Classroom, smartphones, and Google Meet positively influence the active role of the students during the realization of the school activities.

Google Classroom allowed the updating of the school activities in the universal literature course because the students reviewed the contents, consulted the multimedia resources, sent the tasks and established a communication with the participants of the educational process from anywhere. In addition, smartphones allowed the communication in the virtual classes, search for information on the Internet and review of the school contents at any time. During the COVID-19 pandemic, these students used Google Meet to answer their questions, understand the school topics and actively participate.

The limitations of this research are the participants of the sample and analysis about the use of these technological tools considering the active role. Future research can analyze the use of Google Classroom to carry out collaborative activities such as discussion forums, smartphones to use web applications and Google Meet to exchange ideas during the virtual classes for the development of skills, assimilation of knowledge and motivation. Likewise, the sample could be made up of the students from different educational levels in order to analyze the impact of Google Classroom, smartphones, and Google Meet in middle schools, high schools and universities.

This research recommends the incorporation of LMS, mobile devices and videoconferencing systems to meet and satisfy the educational demands caused by the SARS-CoV-2 virus. In conclusion, technological tools such as Google Classroom, smartphones, and Google Meet play a fundamental role in planning, organizing and executing new educational activities and practices in the distance modality.

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