USE AND ANALYSIS OF THE COLLABORATIVE WALL IN THE TEACHING-LEARNING PROCESS ON HISTORY CONSIDERING DATA SCIENCE

USO E ANÁLISE DA PAREDE COLABORATIVA NO PROCESSO DE ENSINO-APRENDIZAGEM EM HISTÓRIA CONSIDERANDO A CIÊNCIA DOS DADOS

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ABSTRACT

This mixed research analyzes the use of the collaborative wall in the teaching-learning process on History considering data science and machine learning (linear regression). The sample is made up of 74 students from the National Preparatory School No. 7 "Ezequiel A. Chávez" who took the History course during the 2019 school year. The collaborative wall is a web application that facilitates the participation of students during the face-to-face sessions through the dissemination and organization of information on the Internet. During the face-to-face sessions, the students used mobile devices to share images and text through this web application. The results of machine learning indicate the dissemination and organization of information on the collaborative wall positively influence the participation of the students in the classroom, motivation and learning process on the characteristics of society during the sixteenth to eighteenth centuries. Data science identifies 6 predictive models on the use of the collaborative wall through the decision tree technique. Finally, the collaborative wall facilitates the construction of new educational spaces where students have the main role during the learning process on History.

Keywords: Collaborative wall. Educational technology. Learning. Data science, Machine learning.

RESUMO

Esta pesquisa mista analisa o uso da parede colaborativa no processo de ensino-aprendizagem em História considerando a ciência de dados e o aprendizado de máquina (regressão linear). A amostra é composta por 74 alunos da Escola Preparatória Nacional nº 7 "Ezequiel A. Chávez" que fizeram o curso de História durante o ano letivo de 2019. O mural colaborativo é uma aplicação web que facilita a participação dos alunos durante as sessões presenciais através da divulgação e organização da informação na Internet. Durante as sessões presenciais, os alunos usaram dispositivos móveis para compartilhar imagens e texto por meio deste aplicativo da web. Os resultados do aprendizado de máquina indicam que a disseminação e organização das informações na parede colaborativa influenciam positivamente a participação dos alunos em sala de aula, a motivação e o processo de aprendizagem nas características da sociedade durante os séculos XVI a XVIII. A ciência de dados identifica 6 modelos preditivos sobre o uso da parede colaborativa por meio da técnica de árvore de decisão. Por fim, a parede colaborativa facilita a construção de novos espaços educacionais onde os alunos têm o papel principal durante o processo de aprendizagem da História.

Palavras-chave: Parede colaborativa. Tecnologia Educacional. Aprendendo. Ciência de dados, aprendizado de máquina.

1 INTRODUCTION

Educational institutions are incorporating technological tools, educational platforms and web applications in the teaching-learning process in order to facilitate the assimilation of knowledge, improve the learning process and develop the skills of students (ADANAN et al., 2020; REJÓN-GUARDIA et al., 2020; SMITH et al., 2019). In fact, universities and high schools are updating the activities of the courses through technological advances and pedagogical models (GARIOU-PAPALEXIOU et al., 2017; HE et al., 2020; OYINLOYE; IMENDA, 2019).

Technology enables the construction of new educational spaces where students actively participate before, during and after the face-to-face sessions (ADAM; SUPRAPTO, 2019; PAN; ZHANG, 2020; SALAS-RUEDA, 2020). In the high schools, teachers organize creative activities inside and outside the classroom with the support of Learning Management Systems (BARDAKCI et al., 2018).

The benefits on the use of Information and Communication Technologies (ICTs) in the educational field are the personalization of the learning process (LIM; NEWBY, 2020), flexibility of time and space (WU et al., 2020; XU et al., 2020), communication (BARDAKCI et al., 2018; ZHAO; HUANG, 2020), active role of students (SALAS-RUEDA et al., 2020; SCHWARZENBERG et al., 2020) and development of skills (AL-SAMARRAIE et al., 2020; LIU et al., 2020).

Various authors (e.g., PABRUA-BATOON et al., 2018; WU et al., 2020) have used technological advances in the high schools in order to improve the organization and realization of activities. In particular, this research analyzes the use of the collaborative wall in the teaching-learning process on History considering data science and machine learning.

The research questions about the use of the collaborative wall in the History course are:

- What is the impact about the use of the collaborative wall in the participation of the students?
- What is the impact about the use of the collaborative wall in the motivation of the students?
- What is the impact about the use of the collaborative wall in the learning process on the characteristics of society during the sixteenth to eighteenth centuries?
- What are the predictive models about the use of the collaborative wall?
- What is the students' perception about the use of the collaborative wall in the History course?

2 USE OF TECHNOLOGY IN THE HIGH SCHOOLS

Today, educational platforms, digital tools and web applications are transforming the organization of the school activities in the high schools (ADANAN et al., 2020; PAN; ZHANG, 2020). In fact, the students

actively participated in the courses of Biology (GARIOU-PAPALEXIOU et al., 2017), English Language (BARDAKCI et al., 2018; PAN; ZHANG, 2020), Science (SMITH et al., 2019), Physics (ADAM; SUPRAPTO, 2019) and Life Basics (PABRUA-BATOON et al., 2018) through the use of technology.

High schools are using pedagogical models and technology to facilitate the assimilation of knowledge and develop the skills of students (GARIOU-PAPALEXIOU et al., 2017; SMITH et al., 2019). In the Biology course, the teacher used Flipped Classroom to improve the participation of the students inside and outside the classroom (GARIOU-PAPALEXIOU et al., 2017). Before the class, the students consulted the videos and digital readings about photosynthesis. During the face-to-face session, the students held the discussion forums and worked collaboratively. Subsequently, the students of the Biology course solved the online exams after the class (GARIOU-PAPALEXIOU et al., 2017).

In the English Language course, the students used Edmodo to facilitate the communication between the participants of the educational process and access to the information at any time (BARDAKCI et al., 2018). In addition, this Learning Management System facilitated the active participation of the students through discussion forums (BARDAKCI et al., 2018).

Technological advances facilitate the active role of students in the high schools (SMITH et al., 2019). In the Science course, the students used the digital games to facilitate the assimilation of knowledge about climate change and develop the skills (SMITH et al., 2019). Likewise, the incorporation of the digital games in the school activities provoked the active participation of the students inside and outside the classroom (SMITH et al., 2019).

In the Life Basics course, e-books facilitated the assimilation of knowledge and developed the reading, writing and technological skills of the students (PABRUA-BATOON et al., 2018). The benefits about the use of e-books in the high schools are the increase of the academic performance and motivation of the students (PABRUA-BATOON et al., 2018).

Audiovisual content improves the teaching-learning conditions in the high schools (PAN; ZHANG, 2020). In the English Language course, the teacher used the digital presentations and videos to improve the grammar skills of the students (PAN; ZHANG, 2020). The results about the use of technology in the English Language course are the increase of the academic performance and satisfaction of the students during the learning process (PAN; ZHANG, 2020).

In the Physics course, the students consulted the videos and animations to facilitate the assimilation of knowledge about fluids (ADAM; SUPRAPTO, 2019). Likewise, the use of web simulators on fluids led to the development of skills (ADAM; SUPRAPTO, 2019). After the face-to-face sessions, the students actively participated through the realization of the online exams (ADAM; SUPRAPTO, 2019).

Finally, ICTs are changing the behavior of teachers and students in the high schools (ADANAN et al., 2020; WU et al., 2020). In fact, educational institutions promote the organization and implementation of student-centered activities through technology (HE et al., 2020; OYINLOYE; IMENDA, 2019).

3 METHODOLOGY

The general objective of this mixed research is to analyze the use of the collaborative wall in the teaching-learning process on History considering data science and machine learning (linear regression). The collaborative wall is a web application that facilitates the participation of students during the face-to-face sessions through the dissemination and organization of information on the Internet (See Figure 1). During the face-to-face sessions, the students used mobile devices to share images and text through this web application.

Figure 1 - Collaborative wall
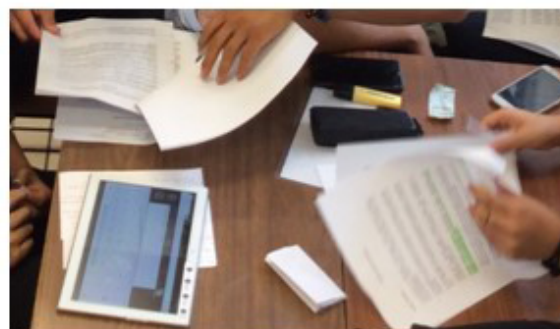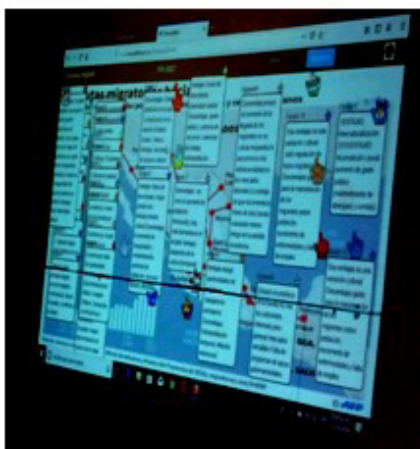
Source: Authors

The particular objectives of this research are (1) analyze the impact on the use of the collaborative wall in the participation of the students in the classroom, motivation and learning process on the characteristics of society during the sixteenth to eighteenth centuries (2) identify the predictive models on the use of the collaborative wall and (3) analyze the perceptions of the students about the use of the collaborative wall in the History course during the 2019 school year.

3.1 PARTICIPANTS

The sample is made up of 74 students from the National Preparatory School No. 7 "Ezequiel A. Chávez" who took the History course during the 2019 school year. The average age of the participants is 15.16 years.

3.2 PROCEDURE

The teacher of the History course took the "Classroom of the Future 2019" Diploma at the National Autonomous University of Mexico (UNAM) in order to develop their pedagogical and technological skills. Module 3 of this diploma promotes the incorporation of the collaborative wall in the school activities.

Before the class, the students of the National Preparatory School No. 7 "Ezequiel A. Chávez" investigated the characteristics of society during the 16th to 18th centuries. During face-to-face sessions, the students used the mobile devices to share images and text through this web application. The teacher of the History course guided the discussion forum with the support of the information presented on the collaborative wall.

The research hypotheses on the use of the collaborative wall during the teaching-learning process are:

- Hypothesis 1 (H1): The dissemination of information on the collaborative wall positively influences the participation of the students in the classroom
- Hypothesis 2 (H2): The dissemination of information on the collaborative wall positively influences the motivation of the students
- Hypothesis 3 (H3): The dissemination of information on the collaborative wall positively influences the learning process on the characteristics of society during the sixteenth to eighteenth centuries
- Hypothesis 4 (H4): The organization of information on the collaborative wall positively influences the participation of the students in the classroom
- Hypothesis 5 (H5): The organization of information on the collaborative wall positively influences the motivation of the students
- Hypothesis 6 (H6): The organization of information on the collaborative wall positively influences the learning process on the characteristics of society during the sixteenth to eighteenth centuries

The predictive models on the use of the collaborative wall in the History course are:

- Predictive Model 1 (PM1) about the dissemination of information on the collaborative wall and participation of the students in the classroom
- Predictive Model 2 (PM2) about the dissemination of information on the collaborative wall and motivation of the students
- Predictive Model 3 (PM3) about the dissemination of information on the collaborative wall and learning process on the characteristics of society during the sixteenth to eighteenth centuries
- Predictive Model 4 (PM4) about the organization of information on the collaborative wall and participation of the students in the classroom
- Predictive Model 5 (PM5) about the organization of information on the collaborative wall and motivation of the students
- Predictive Model 6 (PM6) about the organization of information on the collaborative wall and learning process on the characteristics of society during the sixteenth to eighteenth centuries

3.3 DATA COLLECTION

Table 1 shows the questionnaire on the use of the collaborative wall. Data collection was carried out at the National Preparatory School No. 7 "Ezequiel A. Chávez" during the 2019 school year.

Table 1 - Questionnaire on the use of the collaborative wall

No.	Variable	Dimension	Question	Answer	n	%
1	Profile of the students	Sex	1. Indicate your sex	Man	32	43.24%
				Woman	42	56.76%
		Age	2. Indicate your age	14 years	9	12.16%
				15 years	48	64.86%
				16 years	13	17.57%
				17 years	4	5.41%
2	Collaborative wall	Dissemination of information	3. The collaborative wall facilitates the dissemination of information	Too much (1)	37	50.00%
				Much (2)	13	17.57%
				Little (3)	7	9.46%
				Too little (4)	17	22.97%
		Organization of information	4. The collaborative wall facilitates the organization of information	Too much (1)	45	60.81%
				Much (2)	15	20.27%
				Little (3)	6	8.11%
				Too little (4)	8	10.81%
		Participation of the students	5. The collaborative wall improves the participation of the students in the classroom	Too much (1)	41	55.41%
				Much (2)	13	17.57%
				Little (3)	9	12.16%
				Too little (4)	11	14.86%
		Motivation of the students	6. The collaborative wall increases the motivation of the students	Too much (1)	32	43.24%
				Much (2)	16	21.62%
				Little (3)	14	18.92%
				Too little (4)	12	16.22%
		Learning process	7. The collaborative wall improves the learning process on the characteristics of society during the sixteenth to eighteenth centuries	Too much (1)	29	39.19%
				Much (2)	19	25.68%
				Little (3)	13	17.57%
				Too little (4)	13	17.57%
3	Perception of the students	Benefits of the collaborative wall	8. Indicate the benefits of the collaborative wall	Open question	-	-

Source: Authors

3.4 DATA ANALYSIS

The Rapidminer tool allows calculating machine learning to evaluate the research hypotheses about the use of the collaborative wall in the History course and building the predictive models through the decision tree technique.

In machine learning, the training section (60%, 70% and 80% of the sample) allows calculating the linear regressions and evaluation section (40%, 30% and 20% of the sample) identifying the accuracy of linear regressions by means of squared error.

The information about the profile of the students and use of the collaborative wall allows building the predictive models through the decision tree technique (data science). Likewise, the NubedePalabras application allows the analysis of information for the qualitative approach.

4 RESULTS

The collaborative wall facilitates too much (n = 37, 50.00%), much (n = 13, 17.57%), little (n = 7, 9.46%) and too little (n = 17, 22.97%) the dissemination of information. Likewise, this web application facilitates too much (n = 45, 60.81%), much (n = 15, 20.27%), little (n = 6, 8.11%) and too little (n = 8, 10.81%) the organization of information (See Table 1).

The results of machine learning indicate the dissemination and organization of information on the collaborative wall positively influence the participation of the students in the classroom, motivation and learning process on the characteristics of society during the sixteenth to eighteenth centuries (See Table 2).

Table 2 - Results of machine learning

Hypothesis	Training	Linear regression	Conclusion	Squared error
H1: Dissemination of information on the collaborative wall → participation of the students	60% 70% 80%	$y = 0.196x + 1.410$ $y = 0.149x + 1.492$ $y = 0.171x + 1.462$	Accepted: 0.196 Accepted: 0.149 Accepted: 0.171	1.171 1.450 1.501
H2: Dissemination of information on the collaborative wall → motivation of the students	60% 70% 80%	$y = 0.307x + 1.319$ $y = 0.290x + 1.385$ $y = 0.274x + 1.471$	Accepted: 0.307 Accepted: 0.290 Accepted: 0.274	1.267 1.258 1.294
H3: Dissemination of information on the collaborative wall → learning process	60% 70% 80%	$y = 0.355x + 1.446$ $y = 0.305x + 1.491$ $y = 0.294x + 1.462$	Accepted: 0.355 Accepted: 0.305 Accepted: 0.294	1.242 1.068 1.009
H4: Organization of information on the collaborative wall → participation of the students	60% 70% 80%	$y = 0.367x + 1.200$ $y = 0.312x + 1.271$ $y = 0.262x + 1.373$	Accepted: 0.367 Accepted: 0.312 Accepted: 0.262	1.385 1.441 1.346
H5: Organization of information on the collaborative wall → motivation of the students	60% 70% 80%	$y = 0.217x + 1.587$ $y = 0.141x + 1.728$ $y = 0.146x + 1.787$	Accepted: 0.217 Accepted: 0.141 Accepted: 0.146	1.419 1.418 1.505
H6: Organization of information on the collaborative wall → learning process	60% 70% 80%	$y = 0.282x + 2.657$ $y = 0.294x + 2.583$ $y = 0.334x + 2.629$	Accepted: 0.282 Accepted: 0.294 Accepted: 0.334	1.286 1.248 1.406

Source: Authors

4.1 PARTICIPATION OF THE STUDENTS

The collaborative wall improves too much (n = 41, 55.41%), much (n = 13, 17.57%), little (n = 9, 12.16%) and too little (n = 11, 14.86%) the participation of the students in the classroom (See Table 1). The results of machine learning with 60% (0.196), 70% (0.149) and 80% (0.171) of training indicate that H1 is accepted. Therefore, the dissemination of information on the collaborative wall positively influences the participation of the students in the classroom (See Table 2).

Table 3 shows the PM1 on the use of the collaborative wall. For example, if the student thinks that the collaborative wall facilitates much the dissemination of information and has an age > 16 years then the collaborative wall improves much the participation of the students in the classroom.

Table 3. Conditions of the PM1

No.	Collaborative wall → dissemination of information	Sex	Age	Collaborative wall → participation of the students
1	Too much	-	-	Too much
2	Much	-	> 16 years	Much
3	Much	-	≤ 16 years	Too much
4	Little	Man	-	Too little
5	Little	Woman	-	Too much
6	Too little	-	> 16.5 years	Too little
7	Too little	-	≤ 16.5 years	Too much

Source: Authors

Also Table 3 shows the 7 conditions of the PM1. For example, if the student thinks that the collaborative wall facilitates too much the dissemination of information then the collaborative wall improves too much the participation of the students in the classroom.

The results of machine learning with 60% (0.367), 70% (0.312) and 80% (0.262) of training indicate that H4 is accepted (See Table 2). Therefore, the organization of information on the collaborative wall positively influences the participation of the students in the classroom.

Table 4 shows the PM4 on the use of the collaborative wall. For example, the collaborative wall facilitates much the organization of information and is a woman then the collaborative wall improves much the participation of the students in the classroom.

Table 4 - Conditions of the PM4

No.	Collaborative wall → organization of information	Sex	Age	Collaborative wall → participation of the students
1	Too much	-	> 16.5 years	Too little
2	Too much	-	≤ 16.5 years	Too much
3	Much	Man	-	Too little
4	Much	Woman	-	Much
5	Little	-	-	Little
6	Too little	-	> 15.5 years	Much
7	Too little	-	≤ 15.5 years	Too much

Source: Authors

Also, Table 4 shows the 7 conditions of the PM4. For example, the collaborative wall facilitates too much the organization of information and has an age ≤ 16.5 years then the collaborative wall improves too much the participation of the students in the classroom.

4.2 MOTIVATION OF THE STUDENTS

The collaborative wall increases too much (n = 32, 43.24%), much (n = 16, 21.62%), little (n = 14, 18.92%) and too little (n = 12, 16.22%) the motivation of the students (See Table 1). The results of machine learning with 60% (0.307), 70% (0.290) and 80% (0.274) of training indicate that H2 is accepted (See Table 2). Therefore, the dissemination of information on the collaborative wall positively influences the motivation of the students.

Table 5 shows the PM2 on the use of the collaborative wall. For example, if the student thinks that the collaborative wall facilitates much the dissemination of information and is a woman then the collaborative wall increases much the motivation of the students.

Table 5 - Conditions of the PM2

No.	Collaborative wall → dissemination of information	Sex	Age	Collaborative wall → motivation of the students
1	Too much	–	–	Too much
2	Much	Man	–	Too much
3	Much	Woman	–	Much
4	Little	–	> 14.5 years	Little
5	Little	–	≤ 14.5 years	Much
6	Too little	–	> 15.5 years	Too much
7	Too little	–	≤ 15.5 years	Too little

Source: Authors

Table 5 shows the 7 conditions on the PM2. For example, if the student thinks that the collaborative wall facilitates too much the dissemination of information then the collaborative wall increases too much the motivation of the students. The results of machine learning with 60% (0.217), 70% (0.141) and 80% (0.146) of training indicate that H5 is accepted (See Table 2). Therefore, the organization of information on the collaborative wall positively influences the motivation of the students.

Table 6 shows the PM5 on the use of the collaborative wall. For example, if the student thinks that the collaborative wall facilitates much the organization of information and is a woman then the collaborative wall increases much the motivation of the students.

Table 6 - Conditions of the PM5

No.	Collaborative wall → organization of information	Sex	Age	Collaborative wall → motivation of the students
1	Too much	-	-	Too much
2	Much	Man	-	Little
3	Much	Woman	-	Much
4	Little	-	> 14.5 years	Too much
5	Little	-	≤ 14.5 years	Little
6	Too little	-	-	Little

Source: Authors

Also Table 6 shows the 6 conditions on the PM5. For example, if the student thinks that the collaborative wall facilitates too much the organization of information then the collaborative wall increases too much the motivation of the students.

4.3 LEARNING PROCESS

The collaborative wall improves too much (n = 29, 39.19%), much (n = 19, 25.68%), little (n = 13, 17.57%) and too little (n = 13, 17.57%) the learning process on the characteristics of society during the sixteenth to eighteenth centuries (See Table 1). The results of machine learning with 60% (0.355), 70% (0.305) and 80% (0.294) of training indicate that H3 is accepted (See Table 2). Therefore, the dissemination of information on the collaborative wall positively influences the learning process on the characteristics of society during the sixteenth to eighteenth centuries.

Table 7 shows the PM3 about the use of the collaborative wall. For example, if the student thinks that the collaborative wall facilitates much the dissemination of information and has an age ≤ 16 years then the collaborative wall improves much the learning process on the characteristics of society during the sixteenth to eighteenth centuries.

Table 7 - Conditions of the PM3

No.	Collaborative wall → dissemination of information	Sex	Age	Collaborative wall → learning process
1	Too much	-	-	Too much
2	Much	-	> 16 years	Too much
3	Much	-	≤ 16 years	Much
4	Little	-	> 14.5 years	Too much
5	Little	-	≤ 14.5 years	Much
6	Too little	-	> 15.5 years	Too little
7	Too little	-	≤ 15.5 years	Little

Source: Authors

Also Table 7 shows the 7 conditions on the PM3. For example, if the student thinks that the collaborative wall facilitates too much the dissemination of information then the collaborative wall

improves too much the learning process on the characteristics of society during the sixteenth to eighteenth centuries.

The results of machine learning with 60% (0.282), 70% (0.294) and 80% (0.334) of training indicate that H6 is accepted (See Table 2). Therefore, the organization of information on the collaborative wall positively influences the learning process on the characteristics of society during the sixteenth to eighteenth centuries.

Table 8 shows the PM6 on the use of the collaborative wall. For example, if the student thinks that the collaborative wall facilitates much the organization of information and is a woman then the collaborative wall improves much the learning process on the characteristics of society during the sixteenth to eighteenth centuries.

Table 8 - Conditions of the PM6

No.	Collaborative wall → organization of information	Sex	Age	Collaborative wall → learning process
1	Too much	–	> 16.5 years	Little
2	Too much	–	≤ 16.5 years	Too much
3	Much	Man	–	Too much
4	Much	Woman	–	Much
5	Little	–	> 15.5 years	Much
6	Little	–	≤ 15.5 years	Too much
7	Too little	Man	–	Much
8	Too little	Woman	–	Too much

Source: Authors

Also Table 8 shows the 8 conditions of the PM6. For example, if the student thinks that the collaborative wall facilitates too much the organization of information and has an age ≤ 16.5 years then the collaborative wall improves too much the learning process on the characteristics of society during the sixteenth to eighteenth centuries.

4.4 PERCEPTION OF THE STUDENTS

Technology is transforming the organization and realization of the activities in the classroom. In particular, the collaborative wall facilitated the teamwork during the teaching-learning process on History.

"I work with my team and we discuss the information" (Student 6, man, 15 years old).

"We work on the same platform" (Student 41, woman, 14 years old).

"Teamwork and organization of information" (Student 45, man, 15 years old).

Teachers can improve the planning of the courses through the incorporation of technology in the school activities. For example, the collaborative wall allowed the construction of new educational spaces. Even, the use of this web application in the educational field is fun.

"It is a lot of fun and I learn better" (Student 9, man, 15 years old).

"It helps us to work as a team and I learn in a better fun way" (Student 23, woman, 16 years old).

"It is a fun way to learn the topic" (Student 39, woman, 15 years old).

The use of technology in the educational field allows that students acquire an active role during the teaching-learning process. According to the students of the History course, the collaborative wall facilitated the debates in the classroom.

"It is interactive and allows the debate" (Student 18, man, 16 years old).

"The application made a very dynamic class through the discussion" (Student 20, man, 17 years old).

"Everyone gives their opinion" (Student 48, man, 15 years old).

The collaborative wall facilitated the learning process on the characteristics of society during the sixteenth to eighteenth centuries because this web application allowed the dissemination and organization of information.

"We can work, compare the ideas on the web platform and learn at the same time" (Student 30, woman, 15 years old).

"We learn and exchange the ideas collaboratively" (Student 33, man, 15 years old).

"Team participation, the application was a good way to share the ideas" (Student 52, man, 16 years old).

Likewise, the students of the History course actively participated in the classroom through the collaborative wall.

"Everyone participates and we discuss interesting things" (Student 37, woman, 14 years old).

"Interactivity and collaboration between the classmates" (Student 55, man, 15 years old).

"Participation and learning" (Student 59, woman, 14 years old).

Figure 2 shows the word cloud about the use of the collaborative wall during the teaching-learning process. The words that have the most frequency are understand, ideas, better, work, easier, use, way, team and learning.

Figure 2 - Word cloud about the use of the collaborative wall
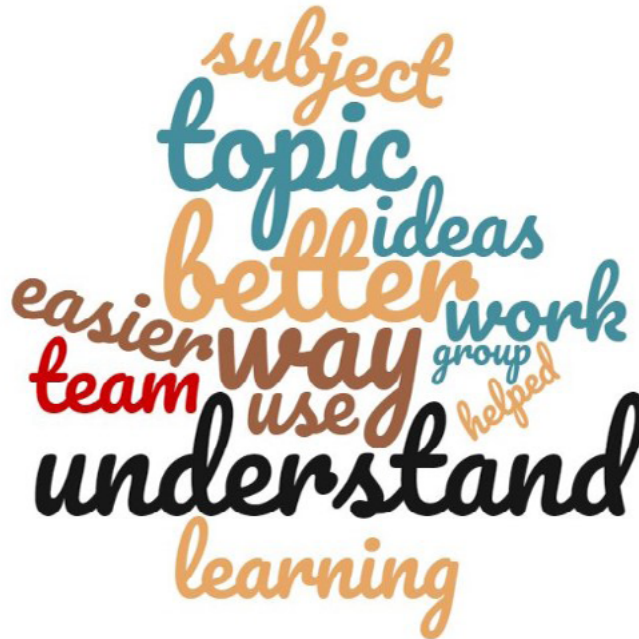
Source: Authors

5 DISCUSSION

Technological advances are transforming the role of students and teachers in the high schools (BARDAKCI et al., 2018; GARIOU-PAPALEXIOU et al., 2017; SMITH et al., 2019). Most of the students think that the collaborative wall facilitates too much the dissemination (n = 37, 50.00%) and organization of information (n = 45, 60.81%) in the History course.

5.1 PARTICIPATION OF THE STUDENTS

This research shares the ideas of various authors (e.g., ADAM; SUPRAPTO, 2019; GARIOU-PAPALEXIOU et al., 2017; PABRUA-BATOON et al., 2018) about the fundamental role of technology during the realization of the school activities in the high schools.

Most of the students(n = 41, 55.41%) think that the collaborative wall improves too much the participation in the classroom. The results of machine learning on H1 are greater than 0.140, therefore, the dissemination of information on the collaborative wall positively influences the participation of the

students in the classroom. On the other hand, data science identifies 7 conditions of the PM1 through the decision tree technique.

The results of machine learning on H4 are greater than 0.260, therefore, the organization of information on the collaborative wall positively influences the participation of the students in the classroom. On the other hand, data science identifies 7 conditions on the PM4 through the decision tree technique.

5.2 MOTIVATION OF THE STUDENTS

The incorporation of technology in the school activities allows the construction of new educational spaces that favor the motivation of students during the teaching-learning process in the high schools (ADAM; SUPRAPTO, 2019; SMITH et al., 2019).

Most of the students(n = 32, 43.24%) think that the collaborative wall increases too much the motivation of the students. The results of machine learning on H2 are greater than 0.270, therefore, the dissemination of information on the collaborative wall positively influences the motivation of the students. On the other hand, data science identifies 7 conditions on the PM2 through the decision tree technique.

The results of machine learning on H5 are greater than 0.140, therefore, the organization of information on the collaborative wall positively influences the motivation of the students. On the other hand, data science identifies 6 conditions of the PM5 through the decision tree technique.

5.3 LEARNING PROCESS

Today, the use of web applications and technological tools in the high schools is improving the teaching-learning conditions (BARDAKCI et al., 2018; GARIOU-PAPALEXIOU et al., 2017; PABRUA-BATOON et al., 2018). Most of the students (n = 29, 39.19%) think that the collaborative wall improves too much the learning process on the characteristics of society during the sixteenth to eighteenth centuries.

The results of machine learning on H3 are greater than 0.290, therefore, the dissemination of information on the collaborative wall positively influences the learning process on the characteristics of society during the sixteenth to eighteenth centuries. On the other hand, data science identifies 7 conditions of the PM3 through the decision tree technique.

The results of machine learning on H6 are greater than 0.280, therefore, the organization of information on the collaborative wall positively influences the learning process on the characteristics

of society during the sixteenth to eighteenth centuries. On the other hand, data science identifies 8 conditions of the PM6 through the decision tree technique.

5.4 PERCEPTION OF THE STUDENTS

The collaborative wall facilitated the teamwork during the teaching-learning process on History and construction of new educational spaces. Even, the use of this web application in the educational field is fun.

According to the students of the History course, the collaborative wall facilitated the debates and active participation in the classroom. Lastly, the collaborative wall facilitated the learning process on the characteristics of society during the sixteenth to eighteenth centuries because this web application allowed the dissemination and organization of the information.

6 CONCLUSION

Technology allows the creation of new educational spaces where the student has an active role during the teaching-learning process. For example, the collaborative wall is a web application that facilitates the participation of the students in the classroom. The results of machine learning indicate the dissemination and organization of information on the collaborative wall positively influence the participation of the students in the classroom, motivation and learning process on the characteristics of society during the sixteenth to eighteenth centuries. Data science identifies 6 predictive models on the use of the collaborative wall through the decision tree technique.

This research recommends the incorporation of the collaborative wall in the educational field because this web application allows the planning and organization of creative activities during the face-to-face session. The limitations of this study are related to the use of the collaborative wall during the teaching-learning process on History. Therefore, future research can analyze the impact of the collaborative wall in the courses of Biology, Physics, Mathematics, Computing, Design and Engineering.

Finally, the collaborative wall is a web application that allows the updating of the school activities in the classroom, facilitates the active role of the students during the face-to-face session and creates new educational spaces.

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