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SCHOOLOGY: A WEB PLATFORM CAPABLE OF IMPROVING THE TEACHING-LEARNING PROCESS AT THE HIGHER EDUCATIONAL LEVEL

SCHOOLOGY: PLATAFORMA WEB CAPAZ DE MEJORAR EL PROCESO DE ENSEÑANZA-APRENDIZAJE EN EL NIVEL EDUCATIVO SUPERIOR

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ABSTRACT

The objective of this quantitative and qualitative research is to analyze the impact of Schoology in the Research Workshop course, during the creation of a scientific article considering data science. Schoology is a free web platform that allows the creation and dissemination of the course contents, lesson design, communication between the participants, and evaluation of the school activities. The sample is composed of 27 students who took the Bachelor of Administration, Commerce, Accounting, and Marketing at a private university in Mexico City during the 2017 school year. The results of machine learning (linear regression) indicate that the ease of use and interaction in this platform positively influence the communication, collaboration, and active role of the students, during the creation of the scientific article. Data science identifies 6 predictive models about the use of Schoology in the educational field.

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The qualitative approach indicates that their discussion forums have a fundamental role during the teaching-learning process. Furthermore, the advantages of Schoology are the delivery of tasks on the platform, conducting online evaluations, and consulting the information of the courses at any time and place. Finally, teachers have the opportunity to build new educational virtual spaces through Schoology.

KEYWORDS: Technology – higher-level education – ICT – learning – data science – machine learning – distance education

RESUMEN

El objetivo de esta investigación cuantitativa y cualitativa es analizar el impacto de Schoology en la asignatura Taller de Investigación, durante la creación de un artículo científico considerando la ciencia de datos. Schoology es una plataforma web gratuita que permite la creación y difusión de los contenidos de los cursos, el diseño de las lecciones, la comunicación entre los participantes y la evaluación de las actividades escolares. La muestra está compuesta por 27 estudiantes que cursaron las Licenciaturas en Administración, Comercio, Contaduría y Mercadotecnia en una universidad privada de la Ciudad de México durante el ciclo escolar 2017. Los resultados del aprendizaje automático (regresión lineal) indican que la facilidad de uso y la interacción en esta plataforma influyen positivamente la comunicación, la colaboración y el rol activo de los estudiantes, durante la creación del artículo científico. La ciencia de datos identifica 6 modelos predictivos sobre el uso de Schoology en el campo educativo. El enfoque cualitativo indica que sus foros de discusión tienen un papel fundamental durante el proceso de enseñanza-aprendizaje. Además, las ventajas de Schoology son la entrega de las tareas en la plataforma, realización de evaluaciones online y consulta de la información de los cursos en cualquier momento y lugar. Por último, los docentes tienen la oportunidad de construir nuevos espacios virtuales educativos por medio de Schoology.

PALABRAS CLAVE: Tecnología – enseñanza superior – TIC – aprendizaje – ciencia de datos – aprendizaje máquina – educación a distancia

SCHOOLOGY: PLATAFORMA WEB CAPAZ DE MELHORAR O PROCESSO DE ENSINO-APRENDIZAGEM NO NÍVEL SUPERIOR EDUCACIONAL.

RESUMO

O objetivo desta pesquisa quantitativa e qualitativa é analisar o impacto de *Schoology* na disciplina de *Taller de Investigación*, durante a criação de um artigo científico considerando a ciência de dados. *Schoology* é uma plataforma web gratuita que permite a criação e difusão dos conteúdos dos cursos, a estrutura das aulas, a comunicação entre os participantes e a avaliação das atividades escolares. A mostra é composta por 27 estudantes que fizeram as Licenciaturas em Administração, Comércio, Contabilidade e Marketing em uma universidade privada da Cidade de

México no ciclo letivo de 2017. Os resultados do aprendizado automático (regressão linear) indicam que a facilidade de uso e a interação nesta plataforma influenciam positivamente a comunicação, a colaboração e o papel ativo dos estudantes, durante a criação do artigo científico. A ciência de dados identifica 6 modelos preditivos sobre o uso de Schoology no campo educativo. O foco qualitativo indica que seus fóruns de discussão têm um papel fundamental durante o processo de ensino-aprendizagem. Além disso, as vantagens de Schoology são a entrega dos deveres de casa na própria plataforma, realização de avaliações online e consulta da informação dos cursos em qualquer momento e lugar. Por último, os professores têm a oportunidade de construir novos espaços virtuais educativos por meio de Schoology.

PALABRAS CHAVE: Tecnología – ensino superior – TIC – aprendizado – ciencia de dados – aprendizado de máquina – educação a distância

Translation by **Paula González** (Universidad Católica Andrés Bello, Venezuela)

1. INTRODUCTION

Today, educational institutions need to develop new study plans, didactic strategies, and pedagogical models that facilitate the teaching-learning process through technology (Aldalalah, Ababneh, Bawaneh, and Alzubi, 2019; Deng and Tavares, 2013; Salas-Rueda, 2019). Information and Communication Technologies (ICTs) facilitate the performance of school activities and homework, increase participation among students, and improve understanding of course topics (Yundayani, Kardijan, and Herawan, 2019). For example, Tazouti, Boulaknadel, and Fakhri (2019) explain that the use of applications and web platforms in the educational field allows the development of skills in students.

To achieve efficient use of technology inside and outside the classroom, teachers need to identify and establish course objectives and plan instructional activities (Dewi, Lengkanawati, & Purnawarman, 2019). In particular, the Technology, Pedagogy, and Content Knowledge (TPACK) model allows the integration of digital tools in school activities and the use of educational web platforms through disciplinary, technological, and pedagogical knowledge (Dewi, Lengkanawati, and Purnawarman, 2019).

The fast development of ICTs is causing the planning and construction of new scenarios for learning and teaching (Bhagat, Wu, and Chang, 2019; Zhang and Li, 2019). In particular, web platforms allow innovating the teaching-learning process by consulting the information at any time and place, the communication of the participants, the delivery of school activities, and the use of technological tools (Boloudakis, Retalis, and Psaromiligkos, 2018).

In the 21st century, teachers are incorporating several web platforms such as Moodle (Chung and Ackerman, 2015; Hendra-Divayana, 2019; Zou, Liu, and Yang,

2012), Blackboard (Elmaadaway, 2017), Edmodo (Cao and Liu, 2019; Hendra-Divayana, 2019), and Kelase (Hendra-Divayana, 2019) in school activities, to improve and innovate the teaching-learning process and develop students' skills.

Schoology is a web platform that allows the creation and dissemination of course content, lesson design, communication between participants, and evaluation of school activities. Therefore, this mixed research aims to analyze the impact of Schoology in the Research Workshop subject, during the creation of a scientific article considering data science. The research questions were:

- What is the impact of Schoology (ease of use and interaction) on the teaching-learning process?
- What are the predictive models on the use of Schoology during the educational process (communication, collaboration, and active role of students)?
- What are the students' perceptions about the use of Schoology in the Research Workshop subject?

1.1. Use of ICTs in the educational field

Teaching-learning strategies are undergoing modifications at all educational levels due to the incorporation of technology, inside and outside the classroom (Hendra-Divayana, 2019; Parsons, Inkila, and Lynch, 2019). For example, the use of mobile devices is increasing in face-to-face and distance courses because students can access applications and web platforms at any time and place (Byrne, 2019).

Even smartphones and laptops facilitate the implementation of the flipped classroom in the educational context (Byrne, 2019). In particular, Elmaadaway (2017) organized and carried out several activities before, during, and after the face-to-face session (flipped classroom) on the Blackboard web platform, to facilitate the teaching-learning process about electronics.

The use of technological tools in the educational field improves quality and allows the creation of innovative spaces for teaching and learning (Dewi, Lengkanawati, and Purnawarman, 2019). In particular, Aldalalah, Ababneh et al. (2019) propose the use of technology (e.g., augmented reality, web platforms, and simulators) to improve students' academic performance and visual thinking during mathematics courses.

In fact, advances in technology allow the creation of new spaces for learning and teaching (Salas-Rueda, 2018). In particular, web platforms make it possible to improve the educational process through content consultation, online questionnaires, and participation in discussion forums (Li, Ouyang, & Yang, 2019).

1.2. Use of educational web platforms

Today, web platforms such as Moodle and Edmodo facilitate the planning, organization, and implementation of activities in courses under the Blended learning

modality (Hendra-Divayana, 2019). Blended learning is a modality that promotes the performance of various activities at a distance and in the classroom through the use of web platforms (Hendra-Divayana, 2019).

The incorporation of the Edmodo web platform in English courses increases motivation, improves academic performance, and facilitates student communication (Cao and Liu, 2019). Likewise, Hendra-Divayana (2019) proposes the use of the Kelase platform in the Blended learning modality to share the contents of the courses, carry out collaborative activities, improve communication between students, and facilitate participation in discussion forums.

On the other hand, the use of Moodle as a support tool during the teaching-learning process improves the academic performance of students at the basic educational level (Zou, Liu, and Yang, 2012). Moodle even positively influences the assimilation of knowledge and facilitates collaborative work (Dias, Hadjileontiadou, Diniz, and Hadjileontiadis, 2017).

Currently, universities are increasing the use of web platforms (e.g., Moodle) to develop students' skills (Cerezo, Sánchez-Santillán, Paule-Ruiz, & Núñez, 2016). In fact, teachers can build new virtual educational environments simply and efficiently through web platforms (Costello, 2013; Elmaadaway, 2017; Yalcin and Kutlu, 2019). For example, Moodle facilitates interaction and communication between students and the teacher (Chung and Ackerman, 2015). This web platform even allows the development of skills in students (Boloudakis, Retalis, and Psaromiligkos, 2018).

In the 21st century, web platforms are transforming course planning by carrying out various school activities inside and outside the classroom (Hendra-Divayana, 2019; Li, Ouyang, and Yang, 2019). Even the use of web platforms in the educational field favors the development of skills in students and improves the teaching-learning process (Boloudakis, Retalis, and Psaromiligkos, 2018; Cerezo et al., 2016; Dias et al., 2017).

2. OBJECTIVES

The particular objectives of the research are (1) to analyze the impact of Schoology (ease of use and interaction) in the teaching-learning process (2) to identify predictive models on the use of Schoology during the educational process (communication, collaboration, and active role of students), and (3) analyze students' perceptions about the use of Schoology in the Research Workshop subject.

3. METHODOLOGY

This mixed research aims to analyze the impact of Schoology on the Research Workshop subject during the creation of a scientific article considering data science. The quantitative approach allows to analyze the impact of Schoology in the teaching-learning process and the qualitative approach allows to analyze the perceptions of

the students about the use of Schoology in the Research Workshop subject. The advantages of using Schoology in the educational field are the ease of use, simplicity of its interface, and availability of information at any time and place.

3.1. Participants

The sample is made up of 27 students who completed Bachelor's degrees in Administration, Commerce, Accounting, and Marketing at a private university in Mexico City, during the 2017 school year.

3.2. Procedure

During 10 weeks, the students of the Bachelor's degrees in Administration, Commerce, Accounting, and Marketing used Schoology, to facilitate the elaboration of a scientific article.

Schoology is a web platform that allows the creation and dissemination of course content, lesson design, communication between participants, and evaluation of school activities. This technological application is available at the following web address: https://www.schoology.com/

Figure 1 shows the technological-acceptance model on the use of Schoology in the educational field.

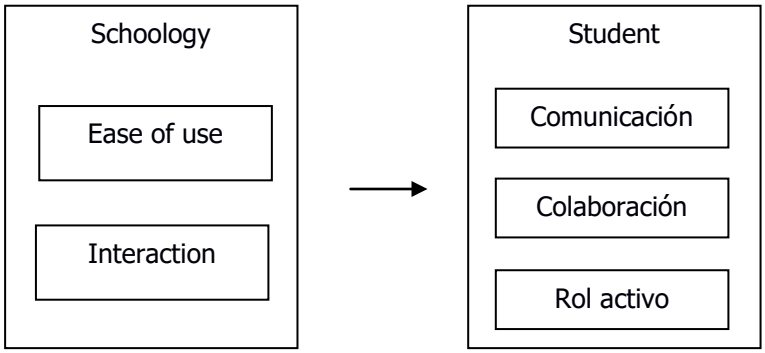

Figure 1. Acceptance model on the use of Schoology.
Source: Self-made.

Ease of use refers to the efficiency in the management of technological tools and applications, and interaction refers to the exchange of information between programs and people. On the other hand, communication refers to the creation of discussion forums and the consultation of materials, collaboration refers to the development of activities, and the active role refers to the participation of students during the educational process.

The hypotheses about the use of Schoology and the communication of the students are:

- Hypothesis 1 (H1): The ease of use in Schoology positively influences the communication of the students during the creation of the scientific article
- Hypothesis 2 (H2): The interaction in Schoology positively influences the communication of the students during the creation of the scientific article

The hypotheses about the use of Schoology and the collaboration of the students are:

- Hypothesis 3 (H3): The ease of use in Schoology positively influences the collaboration of the students during the creation of the scientific article
- Hypothesis 4 (H4): The interaction in Schoology positively influences the collaboration of the students during the creation of the scientific article

The hypotheses about the use of Schoology and the active role of the students are:

- Hypothesis 5 (H5): Ease of use in Schoology positively influences the active role of students during the creation of the scientific article
- Hypothesis 6 (H6): Interaction in Schoology positively influences the active role of students during the creation of the scientific article

Data science identified the following predictive models using the decision tree technique:

- Predictive model 1 about the ease of use in Schoology and the communication of the students during the creation of the scientific article
- Predictive model 2 about the interaction in Schoology and the communication of the students during the creation of the scientific article
- Predictive model 3 about the ease of use in Schoology and the collaboration of the students during the creation of the scientific article
- Predictive model 4 about the interaction in Schoology and the collaboration of the students during the creation of the scientific article
- Predictive model 5 about the ease of use in Schoology and the active role of the students during the creation of the scientific article
- Predictive model 6 about the interaction in Schoology and the active role of the students during the creation of the scientific article

3.3. Data analysis

The Rapidminer tool allowed to perform the machine learning calculation (linear regression) to evaluate the hypotheses about the use of Schoology in the Research Workshop subject. Machine learning allowed calculating the linear regression through the training section (60%, 70%, and 80% of the sample) and identifying the accuracy of the linear regression through the evaluation section (40%, 30%, and 20% of the sample).

Likewise, the decision tree technique (data science) allowed the identification of predictive models about the use of Schoology in the educational field, through the Rapidminer tool (See Figure 2).

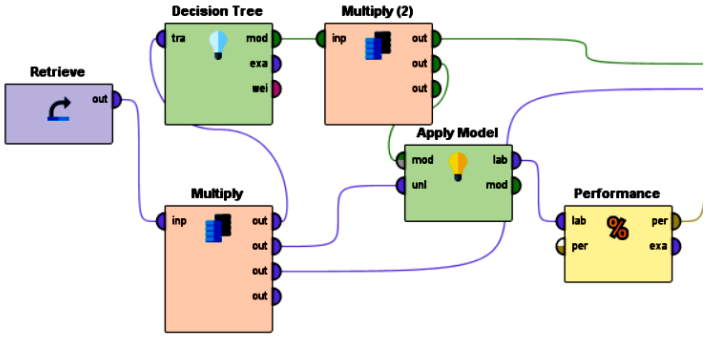

Figure 2. Use of the Rapidminer tool.
Source: Self-made using the Rapidminer tool.

Furthermore, the Maxqda software allowed the construction of the word cloud about the use of Schoology in the teaching-learning process.

3.4. Data collection

Table 1 shows the measurement instrument (questionnaire) used to collect information on the impact of Schoology on the Research Workshop subject.

Table 1. Questionnaire.

No.	Variable	Dimension	Question	Answer	n	%
1	Student profile	Gender	1.- What is your gender?			
				Male	16	59.26%
				Female	11	40.74%
		Career	2.- What is your career?			
				Administration	5	18.52%
				Commerce	8	29.63%
				Accounting	8	29.63%
				Marketing	6	22.22%
		Age	3.- How old are you?			
				17 years old	1	3.70%
				18 years old	13	48.15%
				19 years old	8	29.63%
				20 years old	2	7.41%
				21 years old	3	11.11%
2	Technology	Schoology	4.- The ease of use in Schoology influences learning			
				Very much (1)	12	44.44%
				Much (2)	10	37.04%
				Little (3)	4	14.81%
				Very little (4)	1	3.70%
			5.- Interaction in Schoology influences learning			
				Very much (1)	14	51.85%
				Much (2)	8	29.63%
				Little (3)	4	14.81%
				Very little (4)	1	3.70%
3	Teaching-	Communication	6.- Schoology facilitates			

	learning process		student communication during the creation of the scientific article	Very much (1)	12	44.44%
				Much (2)	10	37.04%
				Little (3)	4	14.81%
				Very little (4)	1	3.70%
		Collaboration	7.- Schoology facilitates student collaboration during the creation of the scientific article.			
				Very much (1)	11	40.74%
				Much (2)	10	37.04%
				Little (3)	3	11.11%
				Very little (4)	3	11.11%
		Active role	8.- Schoology facilitates the active role of students during the creation of the scientific article			
				Very much (1)	12	44.44%
				Much (2)	8	29.63%
				Little (3)	5	18.52%
				Very little (4)	2	7.41%

Source: Self-made.

Furthermore, the measurement instrument consists of 4 open questions about the impact, advantages, usefulness, and use of Schoology in the educational field.

4. RESULTS

Next, the results obtained on the use of Schoology in the educational process of the Research Workshop subject are presented, considering data science. Table 2 shows the results of machine learning (linear regression) with 60%, 70%, and 80% of training.

Table 2. Results of the linear regression**.**

No.	Hypothesis	Training	Evaluation	Lineal function	Conclution
1	H1: Ease of use in Schoology → communication	60%	40%	y = 0.326x + 1.240	Accepts: 0.326
		70%	30%	y = 0.302x + 1.354	Accepts: 0.302
		80%	20%	y = 0.257x + 1.394	Accepts: 0.257
2	H2: Interaction in Schoology → communication	60%	40%	y = 0.326x + 1.240	Accepts: 0.326
		70%	30%	y = 0.368x + 1.236	Accepts: 0.368
		80%	20%	y = 0.336x + 1.235	Accepts: 0.336
3	H3: Ease of use in Schoology → collaboration	60%	40%	y = 0.749x + 0.875	Accepts: 0.749
		70%	30%	y = 0.649x + 1.049	Accepts: 0.649
		80%	20%	y = 0.542x + 1.105	Accepts: 0.542
4	H4: Interaction in Schoology → collaboration	60%	40%	y = 0.903x + 0.605	Accepts: 0.903
		70%	30%	y = 0.847x + 0.694	Accepts: 0.847
		80%	20%	y = 0.679x + 0.824	Accepts: 0.679
5	H5: Ease of use in Schoology → active role	60%	40%	y = 0.711x + 0.817	Accepts: 0.711
		70%	30%	y = 0.739x + 0.729	Accepts: 0.739
		80%	20%	y = 0.521x + 1.052	Accepts: 0.521
6	H6: Interaction in Schoology → active role	60%	40%	y = 0.634x + 0.951	Accepts: 0.634
		70%	30%	y = 0.607x + 0.965	Accepts: 0.607
		80%	20%	y = 0.602x + 0.876	Accepts: 0.602

Source: Self-made using the Rapidminer tool.

4.1. Communication during the creation of the scientific article

Schoology facilitates very much (n=12, 44.44%), much (n=10, 37.04%), a little (n=4, 14.81%), and very little (n=1, 3.70%) student communication during the creation of the scientific article (See Table 1).

The results of machine learning with 60% (0.326), 70% (0.302), and 80% (0.257) of training indicate that hypothesis 1 is accepted (See Table 2). Therefore, the ease of use in Schoology positively influences the communication of the students during the creation of the scientific article.

Figure 3 shows predictive model 1 on the impact of Schoology in the educational context. For example, if the student thinks that the ease of use in Schoology influences very much during the learning and is male, then Schoology facilitates very much the communication of the students during the creation of the scientific article.

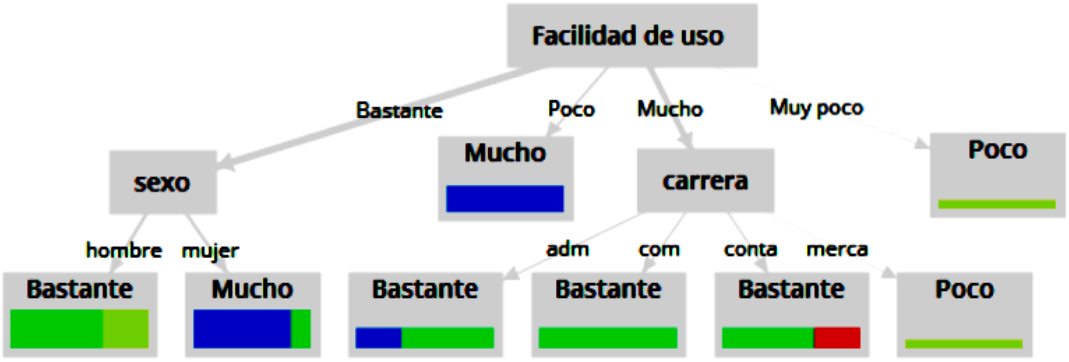

Figure 3. Predictive model 1 on the use of Schoology.
Source: Self-made using the Rapidminer tool.

Predictive model 1 has an accuracy of 81.48% and presents 8 conditions on the ease of use in Schoology and communication (See Table 3). For example, if the student thinks that the ease of use in Schoology influences very much during learning and is pursuing a degree in Administration, then Schoology facilitates very much the communication of the students during the creation of the scientific article.

Table 3. Conditions of the predictive model 1.

No.	Ease of use in Schoology	Gender	Age	Career	Communication
1	Very much	Male	-	-	Very much
2	Very much	Female	-	-	Much
3	Much	-	-	Administration	Very much
4	Much	-	-	Commerce	Very much
5	Much	-	-	Accounting	Very much
6	Much	-	-	Marketing	Little

7	Little	-	-	-	Much
8	Very little	-	-	-	Little

Source: Self-made using the Rapidminer tool.

On the other hand, the results of machine learning with 60% (0.326), 70% (0.368), and 80% (0.336) of training indicate that hypothesis 2 is accepted (See Table 2). Therefore, the interaction in Schoology positively influences the communication of the students during the creation of the scientific article.

Figure 4 shows predictive model 2 on the impact of Schoology in the educational context. For example, if the student thinks that the interaction in Schoology influences very much during the learning and studies the career of Commerce, then Schoology facilitates very much the communication of the students during the creation of the scientific article.

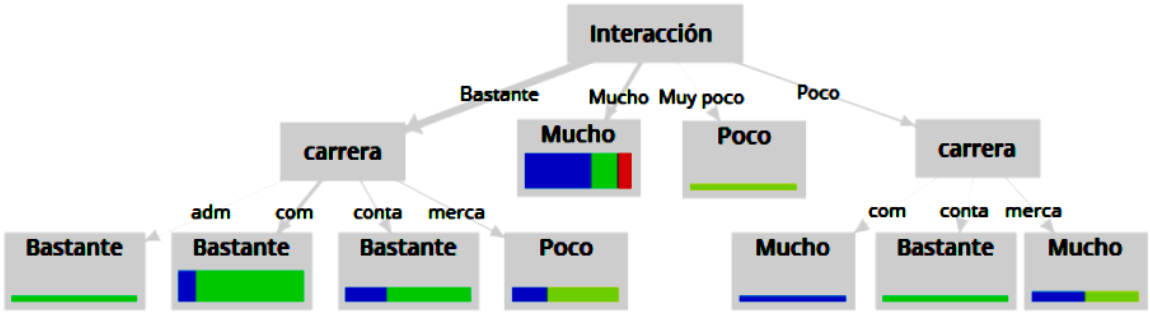

Figure 4. Predictive model 2 on the use of Schoology.
Source: Self-made using the Rapidminer tool.

Predictive model 2 has an accuracy of 74.07% and presents 9 conditions on interaction in Schoology and communication (See Table 4). For example, if the student thinks that the interaction in Schoology influences very much during the learning and studies the career of Accounting, then Schoology facilitates very much the communication of the students during the creation of the scientific article.

Table 4. Conditions of the predictive model 2.

No.	Interaction in Schoology	Gender	Age	Career	Communication
1	Very much	-	-	Administration	Very much
2	Very much	-	-	Commerce	Very much
3	Very much	-	-	Accounting	Very much
4	Very much	-	-	Marketing	Little
5	Much	-	-	-	Much
6	Very little	-	-	-	Little
7	Little	-	-	Commerce	Much
8	Little	-	-	Accounting	Very much
9	Little	-	-	Marketing	Much

Source: Self-made using the Rapidminer tool.

4.2. Collaboration during the creation of the scientific article

Schoology facilitates very much (n = 11, 40.74%), much (n = 10, 37.04%), a little (n = 3, 11.11%), and very little (n = 3, 11.11%) student collaboration during the creation of the scientific article (See Table 1). The results of machine learning with 60% (0.749), 70% (0.649), and 80% (0.542) of training indicate that hypothesis 3 is accepted (See Table 2). Therefore, the ease of use in Schoology positively influences the collaboration of the students during the creation of the scientific article.

Figure 5 shows the predictive model 3 on the impact of Schoology in the educational context. For example, if the student thinks that the ease of use in Schoology influences very much during the learning and studies the career of Marketing, then Schoology facilitates much the collaboration of the students during the creation of the scientific article.

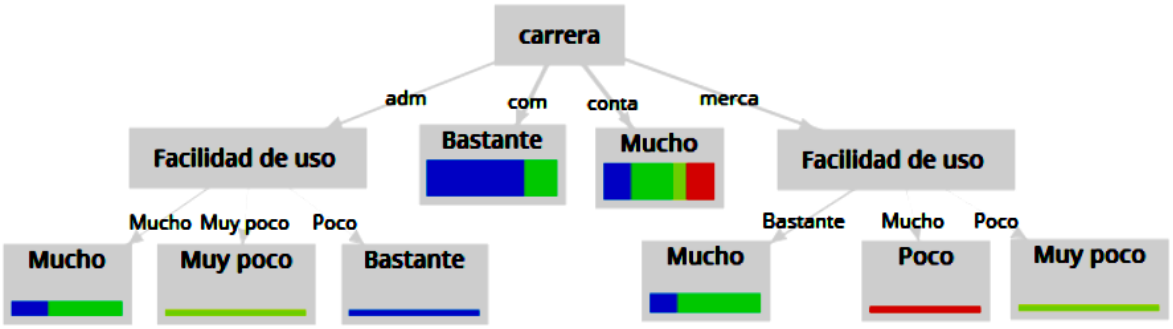

Figure 5. Predictive model 3 on the use of Schoology.
Source: Self-made using the Rapidminer tool.

Predictive model 3 has an accuracy of 66.67% and presents 8 conditions on the ease of use in Schoology and student collaboration (See Table 5). For example, if the student thinks that the ease of use in Schoology influences much during learning and is studying Administration, then Schoology facilitates much the collaboration of the students during the creation of the scientific article.

Table 5. Conditions of the predictive model 3.

No.	Ease of use in Schoology	Gender	Age	Career	Collaboration
1	Much	-	-	Administration	Much
2	Very little	-	-	Administration	Very little
3	Little	-	-	Administration	Very much
4	-	-	-	Commerce	Very much
5	-	-	-	Accounting	Much
6	Very much	-	-	Marketing	Much
7	Much	-	-	Marketing	Little

8	Little	-	-	Marketing	Very little

Source: Self-made using the Rapidminer tool.

On the other hand, the results of machine learning with 60% (0.903), 70% (0.847), and 80% (0.679) of training indicate that hypothesis 4 is accepted (See Table 2). Therefore, the interaction in Schoology positively influences the collaboration of the students during the creation of the scientific article.

Figure 6 shows the predictive model 4 on the impact of Schoology in the educational context. For example, if the student thinks that the interaction in Schoology influences very much during the learning and studies the career of Commerce, then Schoology facilitates very much the collaboration of the students during the creation of the scientific article.

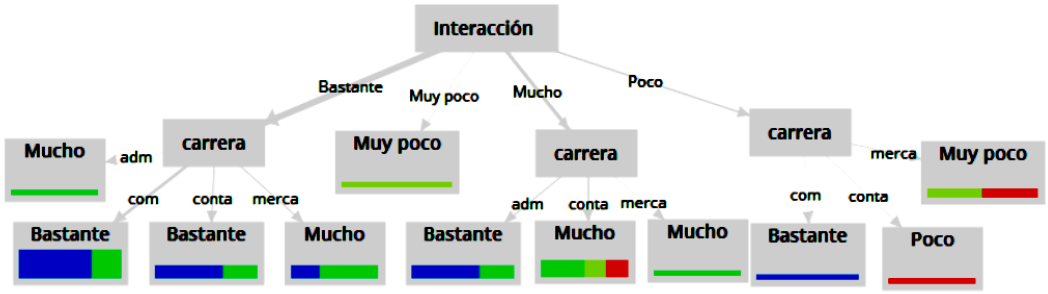

Figure 6. Predictive model 4 on the use of Schoology.
Source: Self-made using the Rapidminer tool.

Predictive model 4 has an accuracy of 70.37% and presents 11 conditions on the interaction in Schoology and the collaboration of the students (See Table 6). For example, if the student thinks that the interaction in Schoology influences much during the learning and studies the career of Administration, then Schoology facilitates very much the collaboration of the students during the creation of the scientific article.

Table 6. Conditions of the predictive model 4.

No.	Interaction in Schoology	Gender	Age	Career	Collaboration
1	Very much	-	-	Administration	Much
2	Very much	-	-	Commerce	Very much
3	Very much	-	-	Accounting	Very much
4	Very much	-	-	Marketing	Much
5	Much	-	-	Administration	Very much
6	Much	-	-	Accounting	Much
7	Much	-	-	Marketing	Much
8	Little	-	-	Commerce	Very much
9	Little	-	-	Accounting	Little

10	Little	-	-	Marketing	Very little
11	Very little	-	-	-	Very little

Source: Self-made using the Rapidminer tool.

4.3. Active role during the creation of the scientific article

Schoology facilitates very much (n=12, 44.44%), much (n=8, 29.63%), little (n=5, 18.52%), and very little (n=2, 7.41%) the active role of students during the creation of the scientific article (See Table 1). Likewise, the results of machine learning with 60% (0.711), 70% (0.739), and 80% (0.521) of training indicate that hypothesis 5 is accepted (See Table 2). Therefore, the ease of use in Schoology positively influences the active role of the students during the creation of the scientific article.

Figure 7 shows the predictive model 5 on the impact of Schoology in the educational context. For example, if the student thinks that the ease of use in Schoology influences much during learning and studies the Marketing career, then Schoology facilitates much the active role of the students during the creation of the scientific article.

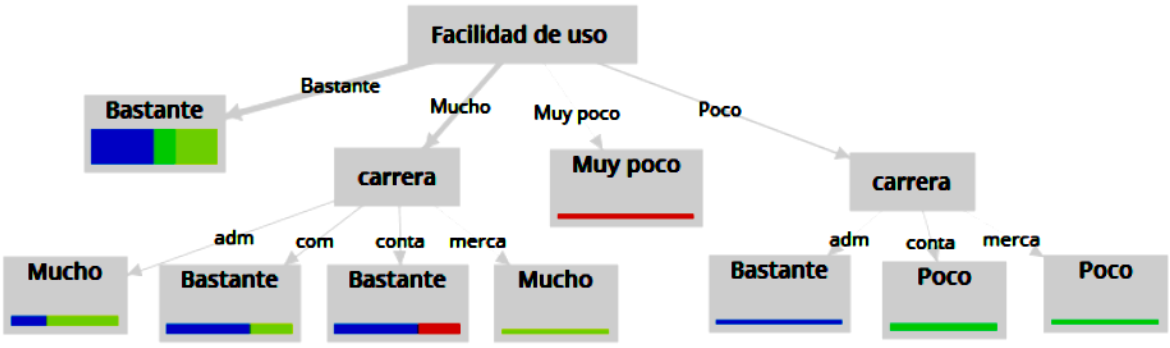

Figure 7. Predictive model 5 on the use of Schoology.
Source: Self-made using the Rapidminer tool.

The predictive model 5 has an accuracy of 66.67% and presents 9 conditions on the ease of use in Schoology and the active role of the students (See Table 7). For example, if the student thinks that the ease of use in Schoology influences much during learning and studies the career of Administration, then Schoology facilitates much the active role of the students during the creation of the scientific article.

Table 7. Conditions of the predictive model 5.

No.	Ease of use in Schoology	Gender	Age	Career	Active role
1	Very much	-	-	-	Very much
2	Much	-	-	Administration	Much

3	Much	-	-	Commerce	Very much
4	Much	-	-	Accounting	Very much
5	Much	-	-	Marketing	Much
6	Little	-	-	Administration	Very much
7	Little	-	-	Accounting	Little
8	Little	-	-	Marketing	Little
9	Very little	-	-	-	Very little

Source: Self-made using the Rapidminer tool.

The results of machine learning with 60% (0.634), 70% (0.607), and 80% (0.602) of training indicate that hypothesis 6 is accepted (See Table 2). Therefore, the interaction in Schoology positively influences the active role of the students during the creation of the scientific article.

Figure 8 shows the predictive model 6 on the impact of Schoology in the educational context. For example, if the student thinks that the interaction in Schoology influences very much during the learning and studies the career of Commerce, then Schoology facilitates very much the active role of the students during the creation of the scientific article.

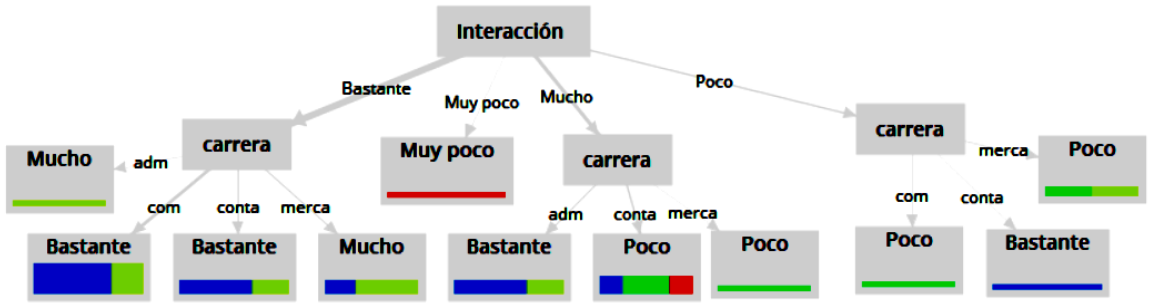

Figure 8. Predictive model 6 on the use of Schoology.
Source: Self-made using the Rapidminer tool.

Predictive model 6 has an accuracy of 70.37% and presents 11 conditions on the ease of use in Schoology and the active role of students (See Table 8). For example, if the student thinks that the interaction in Schoology influences much during learning and studies the career of Administration, then Schoology facilitates very much the active role of the students during the creation of the scientific article.

Table 8. Conditions of the predictive model 6.

No.	Interaction in Schoology	Gender	Age	Career	Active role
1	Very much	-	-	Administration	Much
2	Very much	-	-	Commerce	Very much

3	Very much	-	-	Accounting	Very much
4	Very much	-	-	Marketing	Much
5	Much	-	-	Administration	Very much
6	Much	-	-	Accounting	Little
7	Much	-	-	Marketing	Little
8	Little	-	-	Commerce	Little
9	Little	-	-	Accounting	Very much
10	Little	-	-	Marketing	Little
11	Very little	-	-	-	Very little

Source: Self-made using the Rapidminer tool.

4.4. Use of Schoology in the teaching-learning process

Schoology improves the teaching-learning conditions in the Research Workshop subject because this web platform allows information to be consulted and used at any time and place:

> "Schoology makes the creation and understanding of homework quite easy" (Student 13, female, 18 years old, Accounting).
> "Yes, because it is easier to obtain the contents" (Student 14, male, 18 years old, Marketing).
> "Yes, it makes it easier, since everything is uploaded there" (Student 16, female, 18 years old, Commerce).
> "It facilitated the assimilation of knowledge because it was easier to remember the activities and there were support works" (Student 18, female, 18 years old, Commerce).

The students of the Research Workshop subject consider that one of the advantages of Schoology in the educational field is the ease and speed of submitting assignments:

> "Yes, we no longer suffer from printing assignments" (Student 1, male, 21 years old, Marketing).
> "The delivery of homework was faster" (Student 6, female, 17 years old, Accounting).
> "It is easier to hand in assignments" (Student 7, male, 19 years old, Accounting).

Another advantage related to the use of Schoology in the educational field is the availability of the information:

> "Everything we saw stayed on the platform and that was a great help" (Student 3, male, 19 years old, Administration).
> "Yes, it makes it easier to assimilate knowledge because the information is always at your fingertips to review" (Student 5, female, 18 years old, Commerce).
> "We could search the content at any time" (Student 6, female, 17 years old, Accounting).

Students of the Bachelor's degrees in Administration, Commerce, Accounting, and Marketing consider that the discussion forums in Schoology facilitate the teaching-learning process:

> "I think so. With the discussion forums" (Student 1, male, 21 years old, Marketing).
>
> "Yes, it helped us understand the topics through the discussion forums" (Student 14, male, 18 years old, Marketing).

Likewise, Schoology is an educational web platform that facilitates carrying out school activities:

> "We are in a time where technology is essential" (Student 9, male, 18 years old, Commerce).
>
> "Yes, because platforms are not normally used in other subjects" (Student 13, female, 18 years old, Accounting).
>
> "Yes, it is very useful and practical" (Student 16, female, 18 years old, Commerce).
>
> "Yes, because nobody uses this platform" (Student 17, female, 19 years old, Accounting).

The students of the Bachelor's degrees in Administration, Commerce, Accounting, and Marketing think that Schoology is a useful web platform for the teaching-learning process:

> "Yes, because that way we can save paper and put technology to good use" (Student 14, male, 18 years old, Marketing).
>
> "Yes, because we can observe the support material" (Student 16, female, 18 years old, Commerce).
>
> "Yes, because from home we could get an idea of what we were going to see in each class" (Student 18, female, 18 years old, Commerce).

Figure 9 shows the word cloud on the use of Schoology in the teaching-learning process. The most common words are teaching, easy, educational, learning, facilitates, forums, assignments, information, platform, web, and discussion.

Figure 9. Word cloud on the use of Schoology.
Source: Self-made.

5. DISCUSSION

In the 21st century, teachers are using technology to update school activities inside and outside the classroom (Parsons et al., 2019; Salas-Rueda, Salas-Rueda, and Salas-Rueda, 2019; Tang and Hew, 2019). For example, Schoology is a free web platform that educational institutions can use to improve teaching-learning conditions.

5.1. Student communication

Most of the students (n=12, 44.44%) consider that Schoology facilitates very much communication during the creation of the scientific article. Likewise, the results of machine learning on hypotheses 1 and 2 exceed the value of 0.250, therefore, the ease of use and interaction in Schoology positively influence the communication of the students during the creation of the scientific article.

Predictive models 1 and 2 on the use of Schoology and student communication have an accuracy greater than 74.00%. The decision tree technique identifies 8 conditions in predictive model 1 and 9 conditions in predictive model 2. For example, if the student thinks that the ease of use in Schoology influences very much during learning and is male, then Schoology facilitates very much the communication of the students during the creation of the scientific article.

5.2. Student collaboration

Most of the students (n=11, 40.74%) think that Schoology facilitates very much the collaboration during the creation of the scientific article. Likewise, the results of machine learning on hypothesis 3 and hypothesis 4 exceed the value of 0.540, therefore, the ease of use and interaction in Schoology positively influence the collaboration of the students during the creation of the scientific article.

Predictive models 3 and 4 on the use of Schoology and student collaboration have an accuracy greater than 66.60%. The decision tree technique identifies 8 conditions in the predictive model 3 and 11 conditions in the predictive model 4. For example, if the student thinks that interaction in Schoology influences very much during learning and studies the career of Administration, then Schoology facilitates very much the collaboration of the students during the creation of the scientific article.

5.3. Active role of students

Most of the students (n=12, 44.44%) consider that Schoology facilitates very much the active role of the students during the creation of the scientific article. Likewise, the results of machine learning on hypotheses 5 and 6 exceed the value of

0.520, therefore, the ease of use and interaction in Schoology positively influence the active role of the students during the creation of the scientific article.

Predictive models 5 and 6 on the use of Schoology and the active role of students have an accuracy greater than 66.60%. The decision tree technique identifies 9 conditions in the predictive model 5 and 11 conditions in the predictive model 6. For example, if the student thinks that the interaction in Schoology influences much during learning and studies the career of Administration, then Schoology facilitates very much the active role of the students during the creation of the scientific article.

Schoology allows modifying the roles of teachers and students during the teaching-learning process. For example, the students of the degrees in Administration, Commerce, Accounting, and Marketing used this web platform to achieve the creation of the scientific article by consulting the information, discussing it in forums, and submitting assignments.

Web platforms play a fundamental role during the planning of courses and carrying out school activities inside and outside the classroom (Boloudakis, Retalis, and Psaromiligkos, 2018; Elmaadaway, 2017; Yalcin and Kutlu, 2019). In particular, educational institutions together with teachers have the opportunity to use Schoology during the teaching-learning process because this educational web platform is free and easy to use.

6. CONCLUSION

Technological advances such as educational web platforms are transforming the planning, organization, and delivery of courses in the 21st century. In particular, Schoology makes it possible to improve the teaching-learning process through the creation of new virtual spaces. The advantages of using Schoology in the educational field are the ease of use, simplicity of its interface, and availability of information at any time and place.

The results of machine learning (linear regression) indicate that the ease of use and interaction in Schoology positively influence the communication, collaboration, and the active role of the students during the creation of the scientific article. In fact, this educational web platform allows the consultation and use of school content at any time and place.

Likewise, students of Bachelor's degrees in Administration, Commerce, Accounting, and Marketing consider that Schoology facilitates the process of submitting assignments and improves participation through discussion forums. Data science establishes 6 predictive models on the use of this platform in the educational field with an accuracy greater than 66.50%. In fact, the decision tree technique identifies the relationships between the student's profile (gender, age, and career) and the use of Schoology during the educational process (communication, collaboration, and active role of students).

The limitations of this research are related to the size of the sample and the topics of the Research Workshop subject. Therefore, future research has the opportunity to analyze the impact of Schoology in various areas such as Mathematics, Medicine, Engineering, and Health.

This mixed research recommends the incorporation of Schoology into school activities to promote the active role of the student during the teaching-learning process. Likewise, this web platform facilitates the communication and collaboration of the students.

The implications of this research, drive teachers and educational institutions to use technology, such as web platforms, in school activities to achieve student-centered learning. In conclusion, Schoology is an educational web platform that facilitates access to information, communication between participants, and student collaboration during the teaching-learning process.

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