



# WhatsApp and Google Drive Influence on Pre-service Students' Learning

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### Specialty section:

This article was submitted to  
Digital Education,  
a section of the journal  
Frontiers in Education

**Received:** 16 June 2020

**Accepted:** 29 July 2020

**Published:** 18 August 2020

### Citation:

Moreno-Guerrero A-J,  
Rodríguez-Jiménez C,  
Ramos-Navas-Parejo M,  
Soler-Costa R and López-Belmonte J  
(2020) WhatsApp and Google Drive  
Influence on Pre-service Students'  
Learning. *Front. Educ.* 5:152.  
doi: 10.3389/feduc.2020.00152

The use of technology and all that it entails, such as applications and social networks, has led to a transformation of education in all aspects. Communication and the monitoring of training processes are being transformed through these new elements gradually incorporated into the classrooms. The aim of the study is to analyze the impact of WhatsApp and Google Drive on the monitoring of training practices among pre-service students using a traditional, face-to-face methodology. A quasi-experimental design was carried out on a sample of 123 Spanish pre-service students. The data were collected by means of a questionnaire. The results show that the follow-up of external practices of future teachers using WhatsApp and Google Drive is effective in comparison with the face-to-face follow-up, although no significant differences are shown in the students' grades. Conclusions show that applying a monitoring method with these technological tools leads to an increase in students' motivation mainly as it allows a more direct interaction between the teacher and the student. It is important to select the monitoring method and the target student in the didactic development. Hence, these educational applications enable active learning where the learner is the main protagonist and can be supported and monitored.

**Keywords:** ICT, education innovation, WhatsApp, Google Drive, quantitative

## INTRODUCTION

### ICT in Education

The continuous transformations the world is experiencing, among many other things, caused by technology, do not leave the educational field unmoved. The irruption of social networks and different applications that, generally, are used in the leisure area of people's lives, have entered the classrooms in the same way, changing the way in which people learn and conceive the teaching-learning process (T-L) (Tondeur et al., 2016).

The knowledge and information society in which we find ourselves is undergoing a constant digital revolution through the well-known Information and Communication Technologies (ICT) (López-Belmonte et al., 2019a), which are completely established in our daily lives (Hernández, 2017; Maldonado et al., 2019). The presence of these ICTs causes new and different ways of doing and approaching things, including everything related to the area of education (Soler et al., 2018).

The introduction of technological resources into education has led to the generation of a large volume of research in this area, which sets out the advantages of this presence at any level, as an interdisciplinary element. Thus, the advantages of ICT are:

- Students' increased motivation and interest (Nikolopoulou et al., 2019).
- Promotion of more innovative T-L processes (Hinojo-Lucena et al., 2019).
- Increased access to educational resources, materials and multimedia tools (Aznar et al., 2018).
- Creation and dissemination of content (Rodríguez-Jiménez et al., 2019a).

ICTs, understood as technological tools, have meant an increase in the degree of educational significance, thus creating new models, spaces, dynamics, tools and resources, among many other things (Aznar et al., 2019a). Therefore, the presence of ICTs in education and in society means a contribution of flexibility and adaptation to the changing environment in which we find ourselves.

## Using WhatsApp in Education

The emergence and growth of various social networks including Facebook, Instagram, Twitter, WhatsApp and many others (Tang and Hew, 2017; Komninou, 2018), are currently very successful, so much so that it is becoming a fundamental element of many parts of society (Takkac, 2019).

All of this has meant the gradual introduction of these in classrooms at all educational levels, as a way of boosting digital competence (Rodríguez et al., 2018; Rodríguez-Jiménez et al., 2019c). Similarly, introducing all of their areas within the classroom (Instefjord and Munthe, 2017; Van Laar et al., 2017; Hatlevik et al., 2018), as well as to take advantage of all their potential for connectivity and interaction among different users (Kapoor et al., 2018). The scientific literature in recent times investigates and proposes social networks as tools for support and promotion within education (Roblyer et al., 2010; Pervaiz, 2016; López-Belmonte et al., 2020).

The focus is on WhatsApp, due to its popularity and widespread use not only in the field of games but also in teaching. This application is integrated into the T-L processes. This means promoting active learning among the agents involved, where motivation is increased. This is due, among other reasons, to the fact that it mixes elements of instruction with stimulating elements, such as visual, auditory and interactive aspects (Magde et al., 2019). In addition, the students themselves consider WhatsApp to be simple, fun and useful for their training (Gasaymeh, 2017).

Research on the use of WhatsApp (Raiman et al., 2017) shows that this application improves learning by using messages linked to images (Cetinkaya, 2017). Its advantages include allowing almost constant and continuous contact between the agents involved in the T-L processes (Bottentuit et al., 2016), encouraging collaborative work (Güler, 2017), and promoting individual assessment of students (Petitjean and Morel, 2017).

This application can also have disadvantages, such as distracting students (Rosenberg and Asterhan, 2018).

## The Use of the Google Drive Application in Cooperative Learning

Since current methodological trends in teaching-learning have a constructivist approach based on teacher-led interaction in the classroom, there is talk of peer learning in a context of guided cooperative interaction. And for this there are within the ICT applications, tools that facilitate this cooperative work (Hinojo-Lucena et al., 2017; Pozo-Sánchez et al., 2020a).

Google, in general, offers a series of very useful applications for learning in formal collaborative educational contexts, which allow students to design their own PLE (Personal Learning Environment) using components such as: Google Docs (version of Microsoft Word of Google), Google Slides (version of Microsoft Power Point of Google), Google Sheets (version of Microsoft Excel) and Google Forms, for collaborative work, Google Sites, Google Group Forums and Google Hangouts, to facilitate connection and Google Drive and Google Calendar, to share and organize (Heinze-Martin et al., 2017; Rejón-Guardia et al., 2020).

Google Drive is a very useful application for sharing information among students and with the teacher in a simple way, providing better monitoring of learning, through the recovery of the different versions, which in turn means improving teaching efficiency (Sadik, 2017). This is a tool designed to serve as a cooperative working method. It emerged as such on 24th April 2012, encompassing other documents that already existed such as: Google Docs and Spreadsheets2. This last product belongs to a set of free software that was created in 2005, which serves to make and share documents online, with the possibility of collaborating in groups on the same document, even simultaneously (Álvarez-Ferrón and Sánchez-Cañizares, 2014).

This free application, although with limited functions, does not require prior installation of software, is easy and intuitive to use and offers the following possibilities to its users (Martín-Roda and Sassan-Luiz, 2016): it has an automatic backup service in the cloud, it allows synchronization of files with the user's computer or mobile device with version control, it has the option of uploading or downloading files en masse while respecting the folder structure, it has the ability to share folders or documents and to work on them simultaneously, allows to create documents in a similar way to any other word processor in the market, develops spreadsheet functions, edits slides and presentations, makes possible the creation of surveys in a form editor and the realization of visual elements (Alqahtani, 2019; Pazos et al., 2019).

For all these characteristics, Google Drive has become a fundamental instrument for cooperative learning in university classrooms, managing to connect users and work together from anywhere in an easy and effective way (Marra et al., 2016).

This pedagogical form of online and collaborative active teaching is adapted to the needs and characteristics of the digital society in which we find ourselves and has few limitations. It is simply necessary that both students and teachers change their role in the teaching and learning process,

have access to the necessary devices and internet connection (Castellanos-Sánchez and Martínez-De la Muela, 2013).

## The University Environment in the Twenty-First-Century

Since the constitution of the European Higher Education Area, the role of university teachers has undergone a radical change, since teachers have gone from being the protagonists and transmitters of knowledge to being passive planners and guides, leaving the active role of their own learning to students (Chawinga, 2017; Marín-Marín et al., 2019). So that today's pre-service students must learn in a way that is very different from the traditional way, they have other characteristics and needs (Berenguer-Albaladejo, 2016). Teaching processes and methodologies have evolved toward other more autonomous and participatory ones, where teamwork takes on great relevance (Reidsema et al., 2017; Thai et al., 2017; Kahu and Nelson, 2018; Peña-Flores and Pollán-Moreno, 2019).

This approach transforms the entire classroom (Aznar et al., 2019b), since students must acquire significant learning through assisted and autonomous discovery, with collaboration among peers. Numerous authors, such as Fernández (2012); Robledo et al. (2015) and Rodríguez-Jiménez et al. (2019b), state that active and cooperative methodologies increase student motivation and performance, favor the development of critical thinking, improve the social climate of the classroom and respect learning rhythms, among the most outstanding aspects.

In addition, students must finish their training by being competent in the effective use of ICTs, which have become the great protagonists of twenty-first century society in all areas: educational, labor, social and personal (Rodríguez et al., 2019). The use of its advantages to facilitate the T-L process is also a fundamental characteristic of today's higher education (Trujillo et al., 2011; Rodríguez et al., 2018; Pozo-Sánchez et al., 2020b).

In short, digital resources provide feedback the application of the TPACK (Technological Pedagogical Content Knowledge) model in the teaching and learning processes (Tseng et al., 2019). In this sense, the effectiveness and scope of innovative practices depend largely on the different components or knowledge that articulate this model: Technological Knowledge (TK), Pedagogical Knowledge (PK), Content Knowledge (CK), Technological Pedagogical Knowledge (TPK), Technological Content Knowledge (TCK), and Pedagogical Content Knowledge (PCK) (Mishra, 2019).

WhatsApp applied to the field of education has revealed a positive perception in students as it is considered an effective tool for communication and interaction between educational agents. In addition, its use is enhanced by the great familiarity they have with the tool, which contributes to the incorporation of the TPACK model in training activities (Mpungose, 2020).

Likewise, all the applications that Google Drive integrates allows the development of instructional practices and collaborative work among students, as well as teacher supervision anytime, anywhere. This favors the ubiquity of the TPACK model in today's education (Setiawan and Phillipson, 2020).

## Study Dimensions

Through the analysis of the study dimensions of other impact research on the state of the art, those of the present research have been carried out taking into account the incidence of the use of WhatsApp and Google Drive. The dimensions have been described, with the aim of facilitating the understanding of the results, and their choice is based on that of other previous studies, which have already verified their suitability and relevance in order to achieve greater scientific rigor (López-Núñez et al., 2020a,b; Moreno-Guerrero et al., 2020a,b; Parra-González et al., 2020):

- Social-educational: refers to issues of gender, age, city, nationality, religion, course, learning difficulties, training methodology and use of digital resources.
- Motivation: it has to do with the degree of motivation that the students acquire during their learning.
- Interactions: it gathers all the interaction typologies that are manifested in the learning process: interaction between students, students and teacher and contents and students.
- Autonomy: it measures the level of independence of the students in the didactic tasks of T-L that they carry out.
- Collaboration: determines the level of teamwork achieved by students in their learning process.
- Deepening of contents: shows the level of projection of the contents, depending on the dedication of the teaching staff and the didactic methodology applied.
- Problem solving: defines the level of competence shown by students when solving the problems proposed in their training process.
- Class time: referring to the sense of time of the agents involved in the T-L process to prepare, teach and reinforce the contents.
- Qualifications: results of the students' evaluations in the different tests to check the acquisition of the contents. Conducted through the questionnaire items: What is your average mark in general, what is your overall average mark in the subject of physical education, and what has been the mark you have obtained in the subject of physical education after the development of the experience? The importance of this dimension is justified by previous research that advocates its use to determine the degree of learning acquisition.
- Teacher qualifications: this includes the different qualifications of the students according to the teacher who has taught the class, without varying the techniques or the instruments of evaluation. In both cases, the final report on the work placement (40%) and the qualification of the work placement tutor (60%) have been taken into account.

## Study Objective and Research Questions

As it has been exposed in the state of the question addressed above, technology turns out to be an effective ally in the professional development of teachers carried out in the T-L processes. All these technological advances in society, transferred to the educational field, provide a benefit in academic aspects such as motivation, the interaction of educational agents, as well as other factors of an attitudinal nature.

This research focuses on analyzing the incidence of a training action through the use of WhatsApp and Google Drive to monitor the T-L processes in pre-service students regarding practical activities, compared to a more traditional training based on tutoring face-to-face and telematics by email. Following this general objective, the following research questions (RQ) are articulated:

- RQ1: Does the medium used by teachers in the monitoring of tasks influence the motivation of students?
- RQ2: Does the medium used by teachers influence the monitoring of tasks in the interaction of students with the teacher?
- RQ3: Does the medium used by teachers influence the monitoring of tasks in the interaction of students with didactic contents?
- RQ4: Does the medium used by teachers influence the monitoring of tasks in the interaction between students?
- RQ5: Does the medium used by teachers influence the monitoring of tasks in the autonomy of students?
- RQ6: Does the medium used by teachers influence the monitoring of tasks in the collaboration of students?
- RQ7: Does the medium used by teachers influence the monitoring of tasks at the level of deepening of the content?
- RQ8: Does the medium used by teachers in the monitoring of tasks influence the degree of problem solving of students?
- RQ9: Does the medium used by the teachers influence the monitoring of tasks in the degree of class time by the students?
- RQ10: Does the medium used by teachers influence the monitoring of assignments in the ratings obtained by students?

## MATERIALS AND METHODS

### Research Design

For the development of this study, a quasi-experimental design derived from a quantitative research methodology has been carried out. The methodological considerations of the experts for this type of study have been taken into account (Rodríguez, 2011; Hernández et al., 2014). In addition, to achieve a relevant research model, the analytical pattern carried out by previous reported studies of impact databases that have focused their studies on this type of analysis has been followed (López-Belmonte et al., 2019b; Hinojo-Lucena et al., 2020; López-Núñez et al., 2020a,b; Moreno-Guerrero et al., 2020b).

In this research, the configuration of two types of groups has been necessary. On the one hand, a control group has been created that has followed a tutoring and monitoring of the teachers in person and by email. On the other hand, an experimental group has been established whose teaching activity has been carried out through WhatsApp groups and through collaborative work in the cloud using the Google Drive tool, so the methodology followed has been b-learning, which means a combination of attendance with the virtual aspect, in this model

students have control over the time, space and rhythm in which he or she works on the contents.

Likewise, two study variables have been defined. The independent variable is connected to the type of medium used for student monitoring and tutoring. The dependent variable is linked to the effect caused in the different academic indicators established in this research.

In the intervention carried out, only one measurement was made that occurred at the end of the instructional process, postulating this research design as a post-test only.

### Participants

The study sample reaches the figure of 123 Spanish students belonging to the University of Granada, who are studying the Master's Degree in Compulsory Secondary Education and Baccalaureate, Vocational Training and Language Teaching. These participants have been chosen through intentional sampling. On the sample size, as experts establish in this type of experiments, it is not necessary a large volume of subjects to be able to carry out the analysis and achieve relevant results (Chou and Feng, 2019; Yılmaz and Soyer, 2018).

The participants in this study are 27.64% men and the rest women with a mean age of 26 years ( $SD = 2.73$ ). Students have been classified into two study groups (Control and Experimental). The treatment carried out for each group has been established in a random way and has focused on the way of proceeding by the teachers for the follow-up of the students (Table 1).

### Instrument

A questionnaire was used to collect the student data. This instrument has been elaborated from other validated instruments found in the scientific literature (López-Núñez et al., 2020a,b; Moreno-Guerrero et al., 2020b). The designed questionnaire is made up of the various dimensions detailed above. Most of them follow a 4-point Likert scale response pattern (1-most negative opinion and 4-most positive opinion).

This instrument has been validated by a panel of six experts from different universities that articulated a Delphi method. These judges analyzed the different items in the questionnaire and offered a positive evaluation ( $M = 4.61$ ;  $SD = 0.52$ ;  $\min = 1$ ;  $\max = 6$ ), as well as various observations to improve the tool. To know the degree of relevance and agreement of the experts' feedback, the Kappa tests by Fleiss (K) and W by Kendall (W) were used, which revealed adequate values ( $K = 0.85$ ;  $W = 0.86$ ).

In addition, an exploratory factor analysis was performed using the principal component method. The Bartlett's test of sphericity reflected that the study variables were dependent (2183.52;  $p < 0.001$ ) and the Kaiser-Meyer-Olkin test determined an adequate sample adequacy ( $KMO = 0.84$ ).

TABLE 1 | Groups composition.

Group	n	Composition	Pretest	Treatment	Post-test
1- Control	59	Natural	-	X	O <sub>1</sub>
2- Experimental	64	Natural	-	X	O <sub>2</sub>



The reliability of the questionnaire was determined by various tests (Cronbach's alpha,  $\alpha = 0.86$ ; Compound reliability = 0.84; Average variance extracted = 0.82) that revealed the internal consistency of the different elements of the designed tool.

## Procedure

Firstly, a meeting of the teaching staff with the students is held before starting the practices in the educational centers. The students are then randomly divided into two groups (Control and Experimental). The students of the experimental group are informed that a WhatsApp group will be created to establish communication at all times. Also, this digital resource will allow creating a space where ideas, reflections and ubiquitous problem solving can be shared. In addition, the creation of two folders in the cloud with Google Drive was reported. One, shared with all the classmates, where they are offered all the information related to the development of their training practices and the guidelines for preparing the final memory; and another shared folder in which only the teacher appears with each student individually. In this folder is a Google Docs document, which allows the student to prepare their work from anywhere and at any time. In this way, the teacher can carry out a more personalized follow-up with each student, giving them guidelines and guidelines for improvement during the preparation of the work. On the contrary, the control group is indicated that they will maintain contact with their internship coordinator, by email and in person in the spaces provided for this, once a week.

After the monitoring and tutoring process, the questionnaire was applied to collect student data. The study was approved by an educational technology specialist ethics committee. All participants gave their consent to participate in the research. The data was collected anonymously. The data were entered into the statistical program in order to carry out an exhaustive analysis to reach the stated objective and answer the different research questions.

## Data Analysis

Statistical Package for the Social Sciences (SPSS) v25 has been the software used for the statistical analysis of the collected data, with a significance level of  $p < 0.05$ . Statistics such as mean ( $M$ ) and standard deviation ( $SD$ ) have been used. Tests to determine the distribution trend [skewness ( $Skw$ ) and kurtosis ( $Kme$ )]. The average results obtained in both groups have been compared using the Student's  $t$ -test ( $t_{n1+n2-2}$ ) and the size of the effect achieved has been determined with Cohen's  $d$  and the biserial correlation ( $r_{xy}$ ).

## RESULTS

According to the data obtained in the descriptive analysis, specifically in the students of the University Master's Degree in Compulsory Secondary Education and Baccalaureate, Vocational Training and Language Teaching, the averages presented by the

**TABLE 2 |** Results obtained for the variables of study in GC and ME of Master of Teaching Staff.

	Variables	Likert scale $n$ (%)				Parameters			
		None	Few	Enough	Completely	$M$	$SD$	$S_{kw}$	$K_{me}$
Control group	Motivation	29 (49.2)	15 (25.4)	10 (16.9)	5 (8.5)	1.85	0.997	0.857	-0.451
	Teacher-student	28 (47.5)	17 (28.8)	9 (15.3)	5 (8.5)	1.85	0.979	0.887	-0.301
	Student-content	30 (50.8)	16 (27.1)	9 (15.3)	4 (6.8)	1.78	0.948	0.965	-0.126
	Student-student	29 (49.2)	15 (25.4)	9 (15.3)	6 (10.2)	1.86	1.02	0.878	-0.458
	Autonomy	28 (47.5)	18 (30.5)	7 (11.9)	6 (10.2)	1.85	0.997	0.966	-0.147
	Collaboration	30 (50.8)	14 (23.7)	7 (11.9)	8 (13.6)	1.88	1.08	0.915	-0.528
	Deepening	29 (49.2)	17 (28.8)	7 (11.9)	6 (10.2)	1.83	1.01	0.990	-0.138
	Resolution	30 (50.8)	15 (25.4)	6 (10.2)	8 (13.6)	1.86	1.07	0.970	-0.387
	Classtime	32 (54.2)	10 (16.9)	7 (11.9)	10 (16.9)	1.92	1.16	0.849	-0.859
	Ratings <sup>a</sup>	5 (8.5)	6 (10.2)	27 (45.8)	21 (35.6)	3.08	0.896	-0.915	0.322
Experimental group	Teacher-ratings <sup>a</sup>	3 (5.1)	6 (10.2)	28 (47.5)	22 (37.3)	3.17	0.813	-0.923	0.704
	Motivation	6 (9.4)	13 (20.3)	8 (12.5)	37 (57.8)	3.19	1.06	-0.873	-0.734
	Teacher-student	8 (12.5)	10 (15.6)	7 (10.9)	39 (60.9)	3.20	1.11	-0.984	-0.607
	Student-content	7 (10.9)	13 (20.3)	6 (9.4)	38 (59.4)	3.17	1.10	-0.860	-0.839
	Student-student	6 (9.4)	11 (17.2)	10 (15.6)	37 (57.8)	3.22	1.04	-0.972	-0.473
	Autonomy	7 (10.9)	8 (12.5)	16 (25)	33 (51.6)	3.17	1.03	-0.983	-0.281
	Collaboration	8 (12.5)	8 (12.5)	13 (20.3)	35 (54.7)	3.17	1.07	-0.983	-0.431
	Deepening	6 (9.4)	10 (15.6)	12 (18.8)	36 (56.2)	3.22	1.03	-0.996	-0.350
	Resolution	5 (7.8)	11 (17.2)	12 (18.8)	36 (56.2)	3.23	1.01	-0.979	-0.353
	Classtime	6 (9.4)	11 (17.2)	12 (18.8)	35 (54.7)	3.19	1.03	-0.919	-0.513
Ratings <sup>a</sup>	5 (7.8)	8 (12.5)	25 (39.1)	26 (40.6)	3.12	0.917	-0.892	0.059	
Teacher-ratings <sup>a</sup>	3 (4.7)	7 (10.9)	27 (42.2)	27 (42.2)	3.22	0.826	-0.957	0.545	

<sup>a</sup>Established grade group (None: 1-4.9; Few: 5-5.9; Enough: 6-8.9; Completely: 9-10).

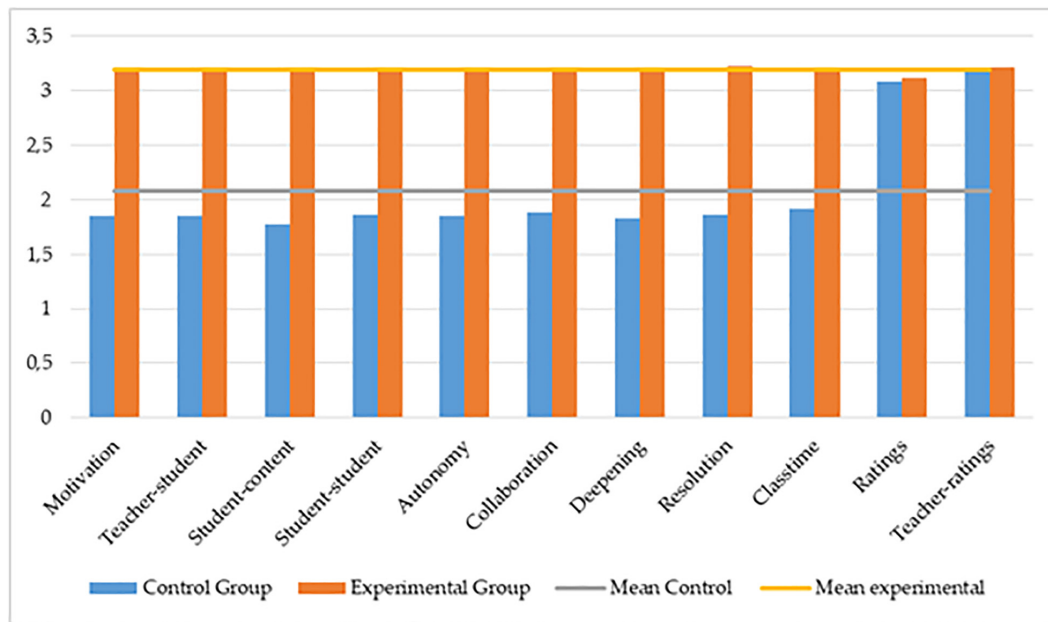


FIGURE 1 | Comparison between control group and experimental group.

GC are disparate. In the dimensions ratings and teacher-ratings, the average is 3, but in the rest of the dimensions, the average is below 2, which generates a great contrast between the scores obtained in the module of practices with regard to the rest of the dimensions, which influence for an adequate development of the T-L process. On the other hand, the EG, all the dimensions are above 3. It should be taken into account that the values offered, both by the control group and the experimental group, show a normal distribution (Jöreskog, 2001). The standard deviation also shows disparate results. The dimensions motivation, teacher-student, student-content, autonomy, ratings and teacher-ratings, of the control group, and the dimensions rating and teacher-ratings show an equal distribution in the answers given by the students. On the other hand, in the rest of the dimensions, the response distribution is more disparate. The kurtosis of the dimensions is mainly platycuric, except in the dimension's ratings and teacher-ratings, of the control group, and the teacher-ratings dimension of the experimental group, which is leptocuric. The ratings of the control group dimension are mesocuric (Table 2).

The comparison of means between the control group and the experimental group of the students of the University Master's Degree in Compulsory Secondary Education and Baccalaureate, Vocational Training and Language Teaching, shows very disparate means in all the dimensions of the study, except in ratings and teacher-ratings, where the measures are even, being slightly higher in the experimental group than in the control group (Figure 1).

In order to identify the value of independence of the results obtained in the development of the control group monitoring method, through weekly face-to-face meetings, and the experimental group monitoring method, through the use of

WhatsApp and Google Drive, the Student t statistic was applied for independent samples. The data obtained show that all the dimensions of the study, except for ratings and teacher ratings, were significant, with a mean strength of association, according to the statistic given by the biserial correlation, which marks a considerable difference between the use of one method and another. Moreover, Cohen's index also shows a low effect size in motivation, student-content, student-student, resolution and classtime dimensions. In the other dimensions the effect size was very low (Table 3).

TABLE 3 | Study of the value of independence between control group and experimental group.

Variables	$\mu(X1-X2)$	$t_{n1+n2-2}$	df	d	$r_{xy}$
Motivation	-1.340 (1.85-3.19)	-7.180**	121	0.116	0.547
Teacher-student	-1.356 (1.85-3.20)	-7.138**	121	0.073	0.544
Student-content	-1.392 (1.78-3.17)	-7.464**	121	0.113	0.561
Student-student	-1.354 (1.86-3.22)	-7.224**	121	0.104	0.550
Autonomy	-1.324 (1.85-3.17)	-7.227**	121	0.061	0.549
Collaboration	-1.291 (1.88-3.17)	-6.617**	121	0.089	0.515
Deepening	-1.388 (1.83-3.22)	-7.560**	121	0.089	0.566
Resolution	-1.370 (1.86-3.23)	-7.312**	121	0.115	0.554
Classtime	-1.272 (1.92-3.19)	-6.410**	121	0.148	0.503
Ratings <sup>a</sup>	-0.040 (3.08-3.13)	n.s.	121	0.008	0.022
Teacher-ratings <sup>a</sup>	-0.049 (3.17-3.22)	n.s.	121	0.003	0.030

\*\*The correlation is significant at the 0.01 level.

\*Correlation is significant at the 0.05 level.

n.s. Not significant.

<sup>a</sup>Established grade group (None: 1-4.9; Few: 5-5.9; Enough: 6-8.9; Completely: 9-10).

## DISCUSSION AND CONCLUSION

The T-L processes at any stage of the educational system have undergone great changes at the methodological, didactic and pedagogical level, mainly as a result of the expansion of educational technology. An endless number of technological resources are now available to students; society has become digitalized and the "school" must assume and integrate these socio-educational needs into the citizens' training. To this end, the knowledge and information society offers many possibilities (López-Belmonte et al., 2019b), from an increase in motivation and interest in students (Nikolopoulou et al., 2019), to the promotion of educational processes in an innovative way (Hinojo-Lucena et al., 2019). They also facilitate access to educational resources, materials and multimedia tools and allow the creation of contents even in a personalized way (Aznar et al., 2019b). Therefore, the technological tools have a clear objective: to provide flexibility and adaptation to the needs of each student within the new educational scenario.

Similarly, this development of ICT has also affected social networks. Applications such as WhatsApp, Twitter, Instagram, Facebook, etc. are increasingly being introduced in classrooms to exemplify content, encourage data visualization, promote learning behaviors, increase motivation... In other words, the so-called digital competence is becoming a transversal issue. Recent research considers social networks as supporting tools in the educational field (Roblyer et al., 2010; Pervaiz, 2016; Gasaymeh, 2017; Raiman et al., 2017; López-Belmonte et al., 2020). Google Drive also contributes to the teaching processes as a tool that allows for the sharing of information between teacher and student, facilitates the monitoring of learning and enables cooperative learning. This tool facilitates learning through its simplicity and effectiveness. Therefore, WhatsApp and Google Drive are two technological supports that allow active, social and participative learning. Even more these technological resources can also be implemented when using other Google tools, to enhance basically the students' motivation and try to integrate better content acquisition. For example, Wikipedia can be greatly used to clarify concepts with our students and help them get the entire meaning specially when they show not self-confident enough. Roughly speaking, the amount of possibilities that Google offers us is huge even considering those can somehow be applied to Education.

This research shows the impact of a training action through the use of WhatsApp and Google Drive to monitor the teaching-learning processes in pre-service students in practical activities. Applying a monitoring method with these technological tools leads to an increase in students' motivation. Firstly, because it allows for more direct interaction between the teacher and the student, so that closer ties are established and this encourages a relaxed learning environment, in which interest and increased motivation prevail (Hinojo-Lucena et al., 2017; Pozo-Sánchez et al., 2020a). This relationship between teacher and student also allows for an improvement in the student's own relationship with the content, with the development and promotion of their autonomy in learning (Martín-Roda and Sassan-Luiz, 2016). All these issues have a positive impact on the creation of

a collaborative social learning environment, since it increases the deepening of contents and the resolution of problems. This allows for an improvement in the development time of educational practices.

As we have seen, the use of WhatsApp in the teaching-learning processes encourages active learning, increases motivation, and mixes elements of instruction with other such as visual, auditory and interactive elements (Magde et al., 2019). The greatest contribution it can make to the educational environment, to the student's learning, lies in the fact that it allows the introduction of messages with images and this implies constant contact between the agents involved in the teaching process (Pazos et al., 2019). Therefore, the methodological guideline will be based on the principles of collaborative, social, active and participatory learning. However, the evolution of the European Higher Education Area, assuming new training needs, the new teacher-student roles imply a radical change in the development of the teaching-learning processes. In fact, the implementation of these technological tools implies a more autonomous and participative learning, in which teamwork acquires a special importance and in which the student is the real protagonist. Significant learning is therefore encouraged through assisted and autonomous discovery, with collaboration between peers (Rodríguez et al., 2018).

However, there is no direct influence on the tracking method with Google Drive and WhatsApp on the scores given by the teachers in charge of evaluating the students and on the self-assessment. This may be due to the system followed in the evaluation of the students, since a rubric has been applied to all students equally. It can be seen that the evaluation instruments followed, bearing in mind the indicators marked by the University itself, are not adequate or do not capture the full essence of the student's own learning development.

It is important to select the monitoring method and the target student. As we have seen, using one tracking method or another has a very direct influence on the student in all dimensions, except for the grades given by teachers and those given in the self-assessment. Therefore, the versatility of the technological tools allows for a wide range of possibilities, without forgetting that for each educational stage the monitoring method should be a key issue.

This study conveys a set of theoretical implications because it provides information about WhatsApp and Google Drive in an attempt to enhance the development of these educational applications to promote an active and participatory learning in this new t-l scenario. Particularly, these educational tools also allow a supported learning as well as an individualized way of teaching, what clearly makes it more attractive for the learner. From the research side, the theories underlying this study show the advantages of applying these educational applications in Higher Education. On the other hand, this study also offers practical implications as far as it gives clear examples of how Google Drive and WhatsApp can be best used to get good results. When assessing it is even more interesting as the advantages it allows for are huge. The results of this research show how the development of assessment and evaluation tools and procedures. It also requires active and innovative t-l

processes what necessarily updates the teacher training and the necessary skills.

This research has shown the importance of selecting monitoring methods in didactic development. The educational applications of WhatsApp and Google Drive enable active learning where the learner is the main protagonist and can be supported and monitored. While planning is a key aspect before introducing these tools, they are a good follow-up method for hands-on activities. The advantages they bring with this group of students are numerous and facilitate the development of learning in the new framework of Higher Education in which digital competence has become an essential skill.

However, there are still issues that need to be refined more precisely. To what extent these tools are compatible with the prescriptions of the university syllabus designs in the new educational scenario; if it is necessary to make an individualized evaluation in order to have more influence on the tracking method with Google Drive and WhatsApp; what aspects of the didactic process should be more neutral in order not to influence some dimensions of the student's learning; at a methodological level what changes would be necessary to obtain better results from this technological implementation. To address these limitations, as a future line of research, the study could be conducted with undergraduate students to assess the advantages they can bring and the influence on the monitoring method.

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## DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation, to any qualified researcher.

## ETHICS STATEMENT

Ethical review and approval was not required for the study on human participants in accordance with the local legislation and institutional requirements. The patients/participants provided their written informed consent to participate in this study.

## AUTHOR CONTRIBUTIONS

A-JM-G and JL-B did the conceptualization. A-JM-G developed the methodology. JL-B worked with the software. RS-C did the validation and made the visualization and supervision. CR-J and MR-N-P did the formal analysis. A-JM-G and JL-B conducted the investigation. CR-J wrote the original draft preparation. MR-N-P did the review and editing. All authors revised the manuscript and approved the final version.

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**Conflict of Interest:** The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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