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E-Learning Web-Apps Use Acceptance: A Way to Guide Perceived Learning Outcomes in Blended Learning

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Abstract: This study empirically examines the effects of the acceptance of e-learning Web-apps by student on the learning outcomes achieved with their use. With this objective, two theoretically recognized purposes for use these apps were tested in a blended learning model, as a way to change the traditional face-to-face classrooms activities (apps we called ICTf) and as a virtual evaluation platform in learning (ICTv apps). The data was collected through online surveys from university students of a blended Master' degree, enrolled in different specialties. PLS-SEM analysis of the data was performed. A proportion of the variance of student learning outcomes was explained by the level of ICTv acceptance. However, the positive effect of the ICTf acceptance on this performance was not significant. Heterogeneity was observed in students' ratings on the acceptance of the Web-apps by different master's specialties, and it was higher in ICTf than in ICTv. Our research highlights the important role that the acceptance of use of electronic learning resources plays in boosting their effective learning performance.

Keywords: blended learning; e-learning Web-apps; acceptance model; learning outcomes; university students

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1. Introduction

The incorporation of information and communication technologies (ICTs) in the teaching-learning process has modified the traditionally teacher-centred educational context [1], connecting the student to a barrier-free learning network [2]. As a result, the blended learning model, which combines face-to-face and online education, is replacing traditional learning [3] and increasing the number of university studies offered under this combined method [4] as the literature has shown that ICTs are adaptable to a variety of educational needs, including higher education [5].

The blended teaching-learning model is based on constructivist theory, whereby students construct their own knowledge and actively participate in the learning process, with ICTs as a resource to achieve communication and exchange of ideas between students and teachers [6]. The role of the teacher in this model must be an active one, generating content and managing the available resources so that the student perceives the usefulness of the ICTs used, their ease of use, as well as feel capable of reaching the so-called flow state [7].

One of these technology resources is e-learning Web-apps which have been used for many years in the University. In recent years, game features have been added and it turned into a concept known as game-based Web-apps. Socrative and Kahoot, which are game-based platforms, are some of the best-known examples of these resources. They can be used for different purposes [8] such as assessing student' performances or as a new way to change traditional classrooms activities. Studies focused on the effects of these type of platforms on classroom atmosphere demonstrated that it can encourage active student participation and increase student motivation towards learning the subject [9,10].

Furthermore, their use has been shown [11,12] to enhance collaborative learning during the learning process, which is linked in some way [9] to overall student academic performance.

Given the wide range and variety of e-learning Web apps, in terms of the form of use, format and didactic elements, that teachers have at their disposal, making the right choice is key to successfully achieving learning objectives. It has been pointed out that teachers may lack confidence in their digital competencies, which is considered an essential factor in achieving teaching objectives [13]. Likewise, the acceptance of the use of these platforms by the student is a necessary factor to achieve the objectives of education [14].

Despite the growing interest of this topic, to date, very little research has been conducted on the benefits of students' intentions to use Game-based Web-apps in a blended learning model. In e-learning environments, it has been shown that learner acceptance of technology resources use is influenced by the performance expectations that the learner creates about its use [15], where performance expectation [16] is understood as the degree to which the learner understands that the use of technology will be useful for their performance. The objective of this study is to examine the level of acceptance of the use of e-learning Web-apps by students, and test if it affects to outcomes perceived by them in a Blended Model. Further, we tested two theoretically recognized utilities for these apps, as a path to approach the face-to-face classrooms activities aiming to enhance the student learning experience, and as a virtual evaluation platform in their learning. Thus, two types of apps were considered the game-based Web-aps and other virtual assessment platforms. For both types of apps, which we called ICTf and ICTv respectively, their acceptance for using and the effects on performance from its real use were compared in this research.

It was not until 2015 that the study of the usefulness of ICTs in the teaching-learning process in a university blended learning model was studied in greater depth [17]. Through an exploratory analysis, some authors demonstrated the relationship between the satisfaction of university students and the use of the virtual learning environment by concluding that useful knowledge had been acquired [17]. To date, no study has been found that differentiates the various results that can be derived from the type of technology resources used. Then, this study responds to the need to identify the value of e-learning Web-apps in blended learning at university, as the effect of their real use on learning outcomes due to the level of acceptance of these at different environments are clarified.

2. Research Framework

Learning theories for the digital era [18–20] have shown that training actions must integrate the appropriate digital media to allow students to construct and transmit knowledge from a critical point of view.

The acceptance of Blended Learning by students, with the integration of e-learning Web-apps in training activities to facilitate interaction between teachers and students, has been demonstrated in previous studies [17]. However, so far, no study exists that analyses the acceptance of Blended Learning in a disaggregated way according to the different acceptance of the use of each type of digital resource. In this research, as novelty we take in account different types of e-learning Web-apps according to their applicability in Blended Learning.

The methodological aspects used with Blended Learning based on the use of e-learning Web-apps to develop both the virtual activities and the face-to-face activities, allow a dynamic and adjustable learning process making it a pioneer in educational environments for its great efficiency and interaction [21]. Most of the platforms generally aim to mediate in the Blended Learning as virtual platforms, virtual forums, and learning and collaborative work teams, among others [22,23], helping so to promote autonomous, self-regulating and collaborative learning [24]. Additionally, some of the applications can be run during the face-to-face learning environment using a website browser through tablets or smartphones, which have great acceptance of use among students [14]. Among them, game-based Web-apps are useful by providing student responses in real-time, creating a dialogue space

where the teacher may take advantage of them by detecting difficulties when understanding the content while the students themselves carry out a self-assessment [25].

The distinction between platforms integrated in Blended Learning training actions which act as mediators of learning by facilitating interaction and carrying out activities in the virtual environment, and platforms integrated to facilitate the development of face-to-face activities is the starting point for this study, the aim of which is to clarify how the two types of platforms affect self-efficacy and knowledge acquisition as learning outcomes in Blended Learning from the student's perception.

Given that the level of acceptance of each type of digital resource may differ according to the expectations that performance that the learner creates about its use, we set out to explore the value of both types of platforms in blended learning by answering the following research questions:

RQ1: How does the acceptance of ICTv apps use to develop virtual activities affect learning outcomes perceived by students in blended learning?

RQ2: How does the acceptance of ICTf platforms use to develop face-to-face activities affect learning outcomes perceived by students in blended learning?

Therefore, this study tests the research questions: RQ1 and RQ2, based on a model of cause-effect relationships between the variables (Figure 1). In addition to the acceptance of e-learning Web-apps use by students, other methodological aspects used with Blended Learning affect the teacher's role, such as seeking the best way to transmit fundamental content and to train in the established competencies, the planning and organisation of activities, and the selection of the most appropriate techniques to facilitate the student's development of skills [26]. In this research, these aspects are referenced with the term teaching methodology (TM), which is understood as a way of organising teaching activity in order to achieve previously formulated objectives [27]. Moreover, personal innovativeness (PI) represents the student's tendency to adopt new technologies. Individual students are known to differ in this tendency. Personal innovativeness in ICT has been shown to be a reliable predictor of users' beliefs about the ease of use and usefulness of new technologies [28].

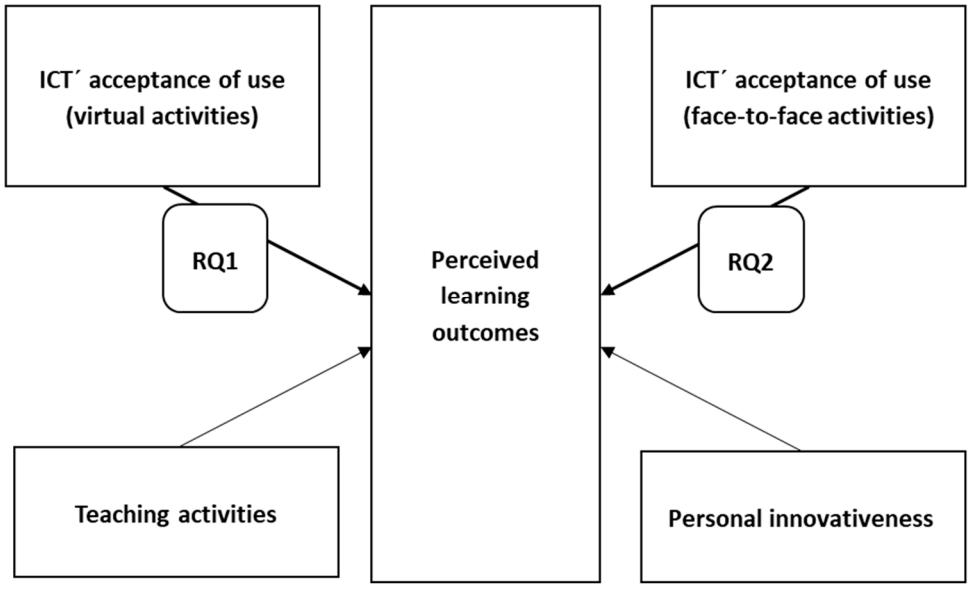

Figure 1. Research questions model.

3. Materials and Methods

3.1. Design and Sample

Data was collected through online surveys for two months during the 2017–2018 academic year. Data collection was carried out with the help of teachers, who provided

students with a web address from which they could access the questionnaire, using their own mobile terminals (smartphones, tablets, etc.). The universe consisted of Masters students who were completing their teacher training for primary and secondary education. The questionnaire was completed by a total of 93 students from the seven specialisations in which the Master's Degree in Teaching is taught (Table 1).

Table 1. Sample description.

Specialisation	Male		Female	
	No.	%	No.	%
Economy	6	16.7%	9	15.8%
Physics and Chemistry	4	11.1%	7	12.3%
Geography and History	5	13.9%	8	14.0%
English	2	5.6%	18	31.6%
Spanish Language and Literature	2	5.6%	4	7.0%
Mathematics	7	19.4%	8	14.0%
Technology	10	27.8%	3	5.3%
No (% of total)	36 (38.7%)		57 (61.3%)	
Weighted Average Age	28.3		29.1	

The results of the descriptive analysis showed that 75.3% of the students had used the online modality for the first time in this master's degree. This lack of experience in the use of an online modality could be the reason why 62.4% of the students stated that they needed more explanation from the teacher about the technical aspects of the platform used, Blackboard Collaborate Ultra, at the beginning of the course, mainly in the specialisations of Spanish Language and Literature (83.3%) and Geography and History (76.9%).

3.2. Measurement Instruments

For the development of the questionnaire, questions used in previous studies were adapted (Table 2). Specifically, the measurement of each of the variables of the research questions model was carried out through multi-item scales that allowed the measurement to be approximated as closely as possible according to the attributes of each concept. Each item in the questionnaire was measured on a 0–5-point Likert scale, where 0 means low acceptance and 5 means high acceptance.Dependent variable:

Learning Outcomes (LO). This study referred to scales of learning outcomes [29], and two questions items were derived: "learning self-efficacy with the Blended Learning was developed" and "knowledge acquisition with the Blended Learning was developed".

Independents variables:

E-learning Web-apps acceptance of use. Regarding the acceptance of platforms use, which includes both the platforms to develop virtual activities (ICTv) and the platforms to develop face-to-face activities (ICTf), this study referred to question items of the Technologies Acceptance Model, namely TAM model [30]. The TAM model, based on the theory of reasoned action [31] and the theory of planned behaviour [32], expresses the way to understand both intentions of use and behaviours of use of individuals from cognitive and normative factors. Two question items of each Web-apps were derived from previous studies [30], such as "assuming that the teacher proposed learning with this Web-app, I would try to use it" and "assuming the possibility of learning with this Web-app, I foresee that I would use it". Eighteen questions items were asked, two for each of the nine ones (five ICTv and four ICTf). The ICTv resources analysed in this study are available through the Blackboard Collaborate Ultra platform accessible from the university in which the Master's degree is offered, specifically discussion boards (forum), content folders, work teams, drop boxes and grade centre, and videoconferences. Among the ICTf resources analysed were the applications Edpuzzle, Socrative, Kahoot, and Moviemaker.

Teaching methodology (TM) with regard to this variable, three-question items, "TM facilitates the achievement of learning milestones", "TM promotes more productive learning"

and "TM as a whole facilitates the development of skills", were asked through referring to previous studies [16,33]. In the questionnaire, the concept of "teaching methodology" was explained to the participants as an integral part of the organisation of teaching activity as a whole, in relation to the work of the teaching staff, the planning and organisation of activities, and learning techniques.

Personal Innovativeness (PI) was measured through one single question item referred from previous studies [28,34,35], which was "I stand out from the crowd because I like to experiment and try out new technologies".

Table 2. Measurement Instruments.

Construct (Scale)	Items		
Learning Outcomes (LO) [29]	LO1	Learning self-efficacy with Blended Learning was developed	Likert 0-5
	LO2	Knowledge acquisition with Blended Learning was developed	Likert 0-5
Acceptance of use of ICTv (ICTv) [4,36–38]	ICTv1	Assuming the teacher proposes that I learn through this Web-app, I would try to use it.	Likert 0-5
	ICTv2	Assuming the possibility of learning with this Web-app, I expect that I would use it	Likert 0-5
Acceptance of use of ICTf (ICTf) [4,36–38]	ICTf1	Assuming the teacher proposes that I learn through this Web-app, I would try to use it.	Likert 0-5
	ICTf2	Assuming the possibility of learning with this Web-app, I expect that I would use it	Likert 0-5
Teaching methodology (TM) [4,17,33,39–42]	TM1	The teaching methodology as a whole facilitates the achievement of learning milestones	Likert 0-5
	TM2	The teaching methodology as a whole promotes more productive learning.	Likert 0-5
	TM3	The teaching methodology as a whole facilitates the development of skills	Likert 0-5
Personal Innovativeness (PI) [28,34,35,39,43]	IP1	I stand out from the crowd because I like to experiment and try new technologies.	Likert 0-5

A partial least squares structural equation model (PLS-SEM) was used to analyse the cause-effect relationships between the variables described. By examining the relevance of path coefficients, the effects of student acceptance of Web-apps use on perceived learning outcomes were assessed. These effects were measured by type of Web-app.

In the analysis of the data, we follow a sequential statistical process. First, validity of the observed variables that constituted the four latent variables shown in the research questions model was verified (the innovative personality variable is formed with one question item). Second, PLS-SEM using the remaining variables was conducted to validate the research questions model. The analysis of path coefficients allows us to assess the effect of student acceptance of Web-apps use on perceived learning outcomes. Moreover, these effects have been measured for both types of platforms, ICTv and ICTf. Statistical analysis was performed with SmartPLS 3.0 software.

4. Results

As reflected in Figure 2, a high percentage of the students (40.21%) expressed their satisfaction with learning outcomes in the blended learning model, specifically that learning self-efficacy with the Blended Learning was developed, scoring 3 (20.62%), 4 (9.28%) or 5 (10.31%) in response to this question. More than half of the students stated that (58.76%) knowledge acquisition with the Blended Learning was developed.

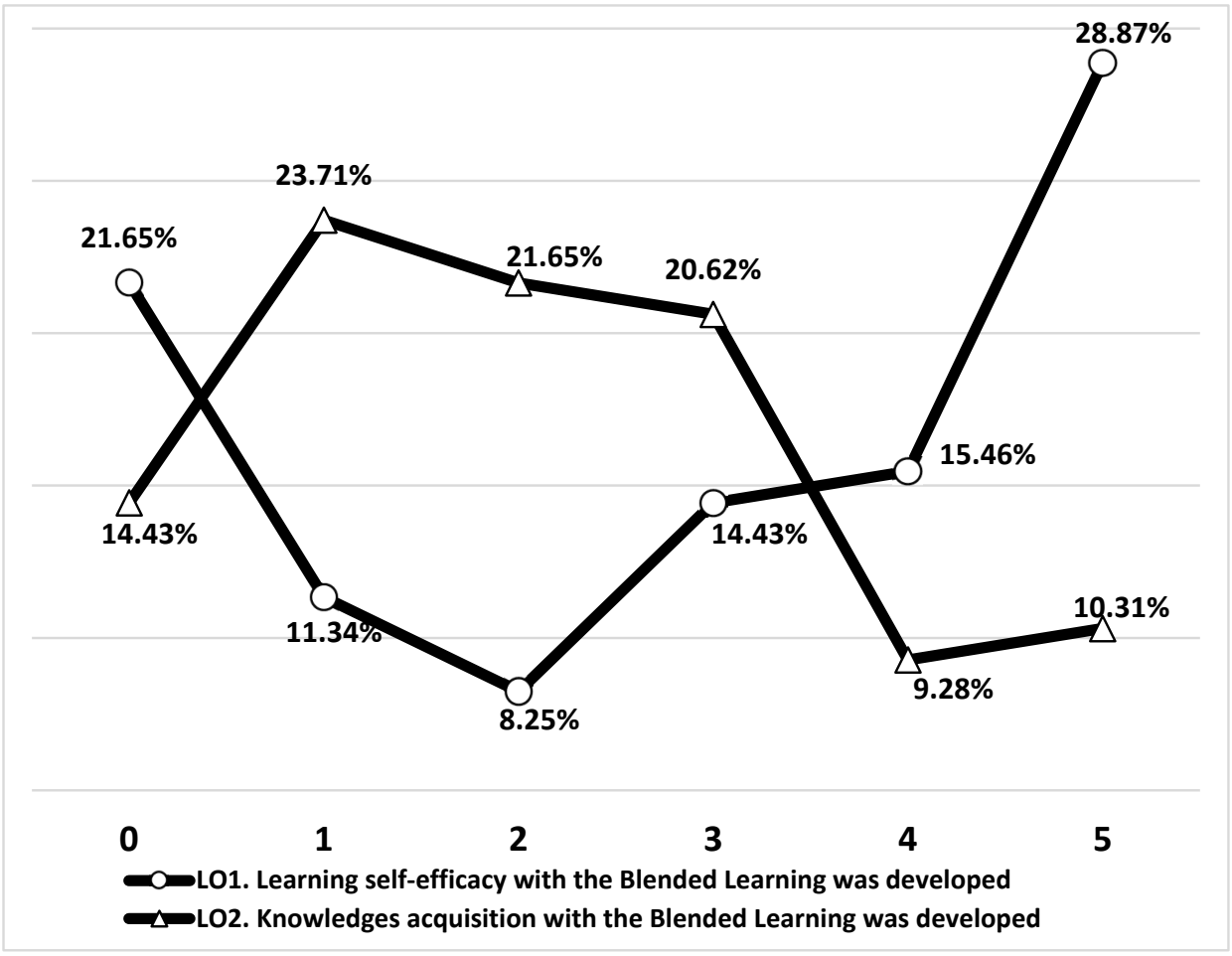

Figure 2. Perceived learning outcomes.

Students positively evaluated the learning methodology used, scoring values of 3 or higher in all three question items (Figure 3), recognising its potential to stimulate the development of skills and abilities (44.33% of the total number of students) and to facilitate the achievement of the learning milestones of the Master's degree (34.02%). The vast majority of students (92.78%) recognise the ability of the methodology to foster more productive learning.

With regard to Web-apps, students had to evaluate a list of nine digital resources, specifically the acceptance of using each of them for blended learning. The heterogeneity of the evaluation for each speciality of the Master's degree was highlighted (Figure 4). Taking into account the average overall score for the Blackboard Collaborate Ultra resources, the content portfolios achieved the highest scores, higher than the overall average, in the specialisations of Economics and Mathematics. The discussion boards (forum) scored above average in Technology, Spanish and Mathematics. Drop boxes and the Grade Centre were outstanding in English, Physics and Chemistry, Mathematics and Economics. Wikis in English, Mathematics and Economics, and Working Groups in English, Mathematics, Geography and History, and Technology. Concerning ICTs for the development of face-to-face activities, the applications that stood out, with above-average scores in these specialities were as follows: Edpuzzle, in English and Economics; Moviemaker in Spanish, English, Economics, and Physics and Chemistry; Socrative in English and Economics, and Kahoot in Economics, Mathematics, and Physics and Chemistry.

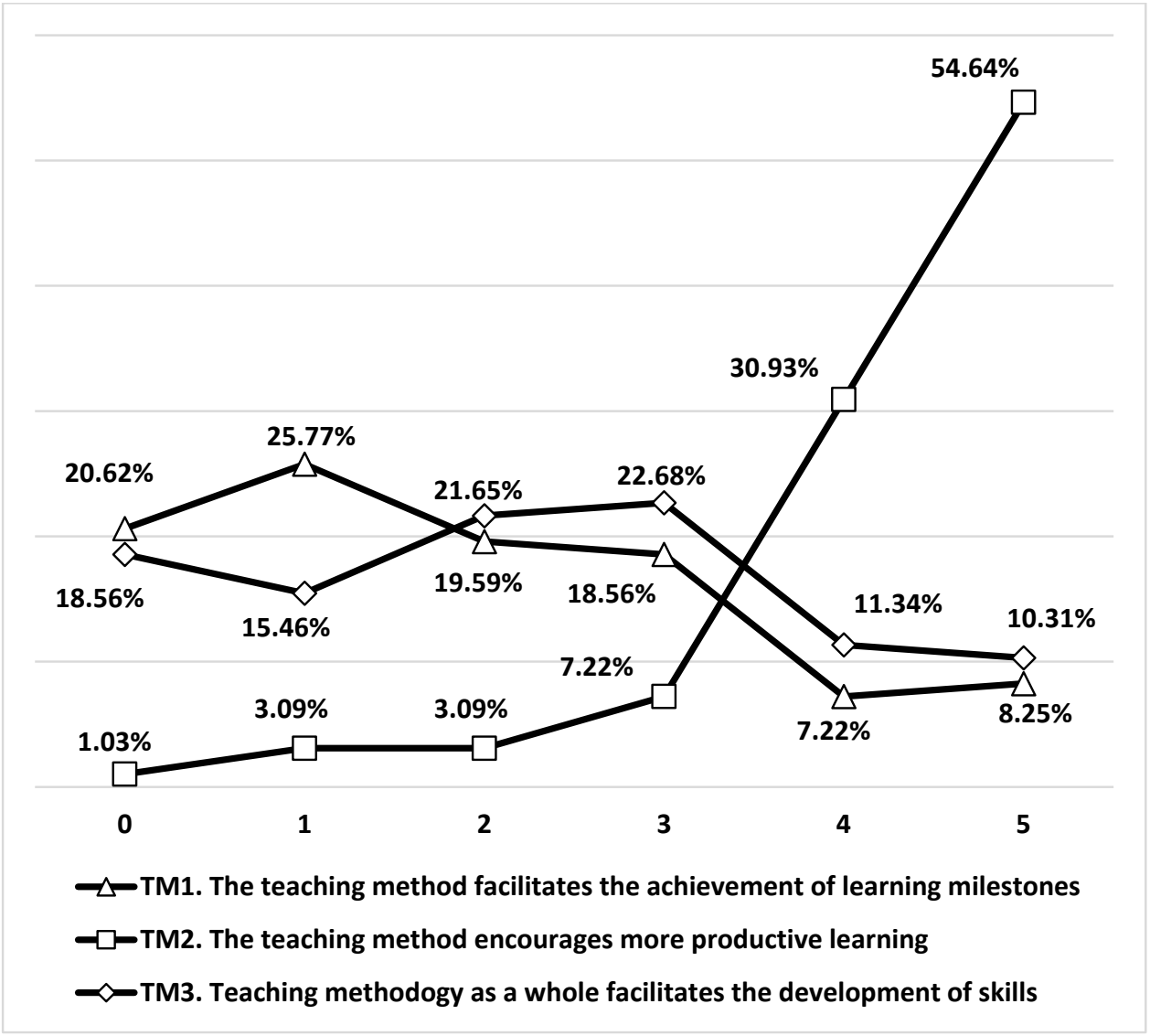

Figure 3. Teaching methodology.

To analyse whether there were significant differences in the mean resource scores between the different specialities, ANOVA analyses of variance were applied. In addition, the Bonferroni test was applied to check between which specialities such differences occurred. Regarding the Blackboard Collaborate Ultra resources, only for one of them (discussion boards or forums) the results of the analyses showed statistically significant differences in the mean scores (F = 2.35; sig. = 0.037). The results of the Bonferroni test indicated for this variable that significant differences were observed between the scores for Technology (3.07) and English (1.6).

With regard to the game-based Web-apps, greater heterogeneity was observed in the ratings by speciality, specifically in three of the four multimedia applications, Edpuzzle (F = 6.69; sig. = 0.000), Socrative (F = 7.36; sig. = 0.000), and Moviemaker (F = 3.08; sig. = 0.009), statistically significant differences were observed in the mean scores given by the students of the different specialities. The highest Edpuzzle scores were obtained for Economics (3.47) compared to Physics and Chemistry (1.92), History and Geography (1.38), Spanish Language and Literature (1.50) and Mathematics (1.56). Edpuzzle also achieved higher scores in English (3.10) than in Geography and History (1.38), and Mathematics (1.56). Significant differences in the mean scores given to Socrative were observed in

Economics (4.20), higher than in Technology (2.47), History and Geography (1.92) and Mathematics (1.94); as well as in English (4.15) compared to Technology (2.47) and History (1.92). Significant differences in the mean scores given to Moviemaker were observed between History and Geography (1.38) and English (1.60).

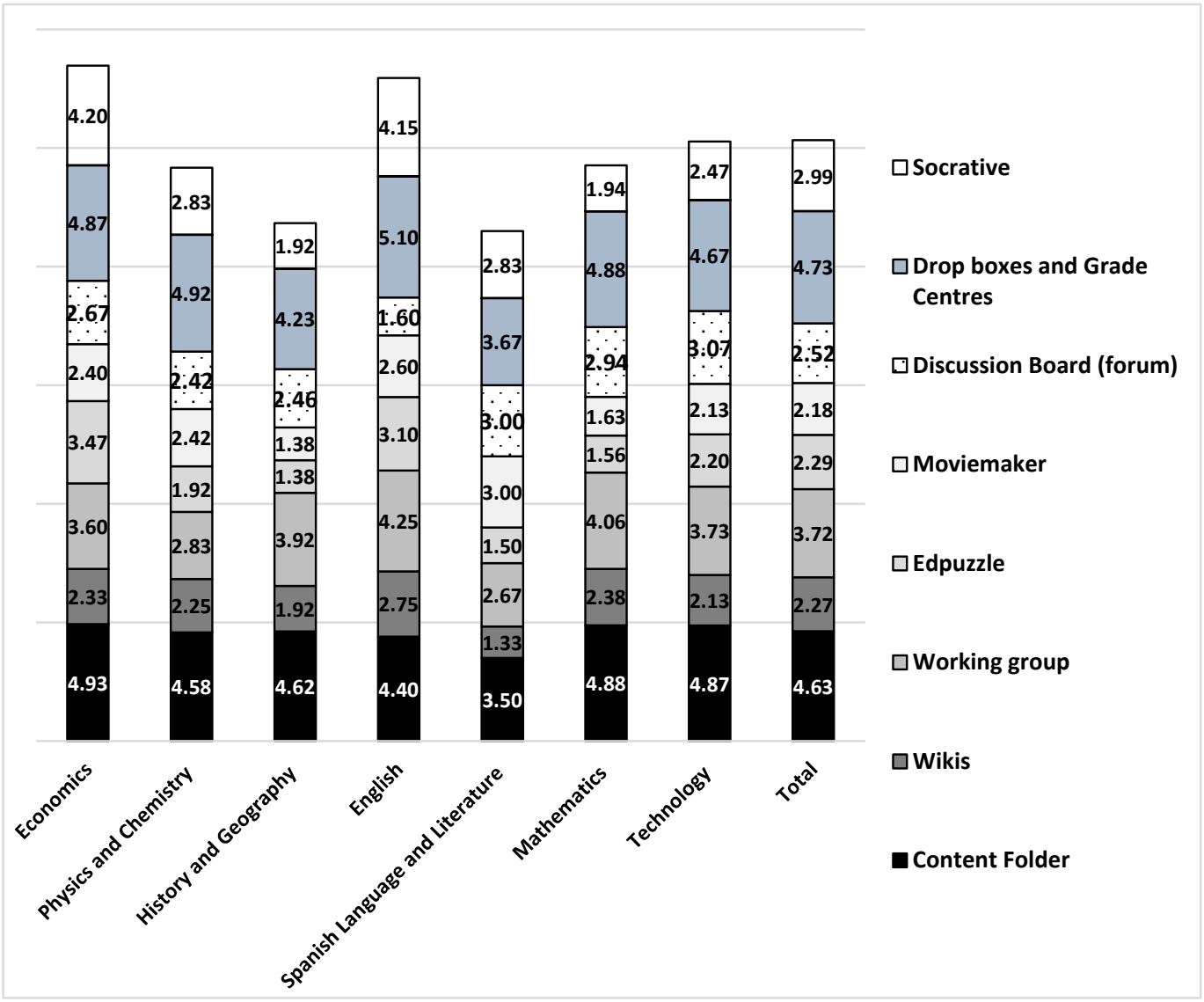

Figure 4. Assessment of digital resources by speciality of the Master's programme.

In order to analyse the effect of the use' acceptance of Web-apps on student satisfaction, as well as to measure the effects of the different types of resources, and thus answer the research questions, the PLS analysis was conducted in two phases. Firstly, the measurement model was analysed, confirming the reliability and validity of the measurement scales of the variables Learning Outcomes (LO), Teaching methodology (TM), Acceptance of use of ICTv (ICTv), and Acceptance of use of ICTf (ICTf). Secondly, cause and effect relationships were analysed between the dependent variable LO and the independent variables: TM, ICTv, ICTf, and PI.

Validity of the Latent Variables

Table 3 summarises the reliability and validity of the latent variables LO, TM, ICTv, ICTf, as well as the descriptives of the observed variables that form each of them. For all

the observed variables, the standardised factor loadings reach significant and acceptable values, greater than 0.7 or very close to this value. All constructs show very high values for the composite reliability index, above 0.7. The values achieved for the average variance extracted (AVE) are greater than 0.5 in all cases, thus verifying the convergent validity of the model.

Table 3. Reliability and validity of constructs.

	Average	Standard Deviation	Factorial Loadings	Reliability (CR) Validity (AVE)
Learning Outcomes (LO)				
LO1 learning self-efficacy with the Blended Learning was developed	3.77	1.94	0.845 ***	CR = 0.86
LO2 knowledge acquisition with the Blended Learning was developed	3.18	1.52	0.891 ***	AVE = 0.76
Teaching methodology (TM)				
TM1 The teaching methodology facilitates the achievement of learning milestones	3.23	1.57	0.884 ***	
TM2 The overall teaching methodology promotes more productive learning.	5.28	1.06	0.674 ***	CR = 0.78
TM3 The teaching methodology stimulates the development of skills	2.91	1.52	0.701 ***	AVE = 0.55
Acceptance of use of ICTv (ICTv)				
Content Folder	4.63	1.32	0.782 ***	
Discussion Board (forum)	2.51	1.42	0.683 ***	
Working group	3.72	1.71	0.735 ***	CR = 0.85
Drop boxes and Grade Centres	4.73	1.23	0.749 ***	AVE = 0.53
Videoconferences Black Board Collaborate Ultra	4.42	1.35	0.763 ***	
Acceptance of use of ICTf (ICTf)				
Edpuzzle	2.29	1.41	0.834 ***	
Socrative	2.99	1.65	0.856 ***	
Moviemaker	2.18	1.16	0.733 ***	CR = 0.87
Kahoot	3.89	1.53	0.744 ***	AVE = 0.63
Personal Innovativeness (PI)	3.19	0.92	-	

Note: *** $p < 0.01$.

Analysing discriminant validity involves assessing the significant differences of each of the latent variables with respect to the rest of them. The discriminant validity criterion has also been met in the data, as it has been shown that the square root of the AVE of each latent variable is higher than its correlation with the others (Table 4).

Table 4. Correlation matrix of latent variables.

	LO	TM	ICTv	ICTf	PI
Learning Outcomes (LO)	0.869				
Teaching methodology (TM)	0.758	0.740			
Acceptance of use of ICTv (ICTv)	0.524	0.508	0.726		
Acceptance of use of ICTf (ICTf)	0.181	0.147	0.399	0.794	
Personal Innovativeness (PI)	0.293	0.188	0.265	−0.052	1

Results of PLS-SEM are shown in Table 5. To assess the significance of the path coefficients of the structural model, bootstrapping has been used with 5000 resamples. (Hair, Sarstedt & Ringle, 2011). The path coefficient from the ICTv variable to LO variable

shows that the acceptance of use of ICTv affects to learning outcomes perceived by the student (0.15), while the same is not true for the ICTf variable as no statistical significance of the path coefficient of ICTf on the LO variable is observed at 5% significance level (Panel A). Furthermore, when analysing the effects of acceptance of use of all resources, through a latent variable ICT constructed as a second-order factor of the variables ICTv and ICTf (Panel B), the ICTv variable is also the one that accounts for the highest percentage of the variance of the ICT variable (0.71 > 0.47).

Table 5. Results of the structural analysis.

Cause-Effect Relationship	Path Coefficients	t-Value	Percentile Bootstrap 95% Confidence Level	
			Lower	Upper
Panel A				
TM ⇒ LO	0.637	9.417 ***	0.508	0.775
ICTv ⇒ LO	0.152	2.039 **	0.026	0.314
ICTf ⇒ LO	0.054	0.709 ns	−0.171	0.171
PI ⇒ LO	0.136	2.064 **	0.004	0.262
Variance explained R2		R2 (LO) = 68.2%		
Stone-Geisser's Q2		Q2 (LO) = 0.428		
Panel B				
TM ⇒ LO	0.663	10.587 ***	0.546	0.793
ICTv ⇒ ICT	0.714	12.321 ***	0.564	0.783
ICTf ⇒ ICT	0.470	10.631 ***	0.424	0.625
ICT ⇒ LO	0.156	2.082 **	0.003	0.296
PI ⇒ LO	0.146	2.274 ***	0.017	0.269
Variance explained R2		R2 (LO) = 61.9%		
Stone-Geisser's Q2		Q2 (LO) = 0.435		

Note: *** $p < 0.01$; ** $p < 0.05$; ns = non-significant.

The path coefficients from both the TM variable and the PI variable on the LO variable, show, as we expected, the positive effect of each of them in explaining the variance of the dependent variable. The explanatory power of the model is high, as shown by the R2 (68%) of the model. The predictive relevance of the model has also been confirmed by the value reached by the Stone-Geisser cross-validation redundancy index Q2 > 0.

5. Discussion

In line with constructivist theories, which argue that all training action should focus on learning processes through the motivation and prior knowledge of the student [44], and according to the evidence shown in previous studies [5,45,46], the results of this study show that e-learning Web apps awaken positive student attitudes towards learning in both virtual and face-to-face learning environments.

This study has both practical and theoretical implications. From a theoretical perspective, it presents a new model to analyse the student' acceptance of the Blended Learning at University, especially in the case of various types of e-learning Web-apps used simultaneously for learning. The analyses performed obtained good adjustments expressed in factor loadings in line with scientific recommendations, as well as an acceptable composite reliability index and convergent validity of the measurement model. The main result of this study points to the fact that the analysed indicators allow to measure and explain student acceptance of the blended learning model in terms of perceived learning outcomes.The potential of each e-learning Web app for the achievement of competencies and learning objectives is perceived differently by students. This may be due to the nature of the subjects themselves, which vary from one speciality to another, and which are therefore not shared by all students. Other authors found that in general, the benefits perceived by students are not only based on subject-specific skills, but also on positive emotional changes in

relation to the subject [47]. Similar analyses were also carried out but taking into account the different income levels of students, they concluded that although the mastery of digital competence was heterogeneous among students, there was a general improvement not only in the understanding of the content but also in digital skills and motivation, leading to active learning [4].

Other authors compared the attitude of students in different learning environments, both face-to-face and distance learning, also acknowledging the positive effect of using technologic resources on students' learning by increasing their confidence in digital competence [5]. The results of the present study are in line with these conclusions as high scores were obtained on the question items on student satisfaction with the perceived learning outcomes in the blended model.

In the present study, medium-low ratings were found for the item related to the teaching method which facilitates the development of students' skills. Other authors conducted a quantitative analysis that studied the impact of ICT use on the motivation of undergraduate students, concluding that they did not feel motivated by the use of digital resources because they underestimated their actual knowledge level [48].

As a limitation of the study, it can be mentioned that no comparisons have been made between a control group (to which a traditional teaching model is applied) and an intervention group (to which the blended method is applied. Undoubtedly, this idea results in an interesting future line of research. Even without making this distinction between control-intervention groups, it has been possible to conclude differences in acceptance between different fields of science.

From a practical point of view, this study empirically examines the effects of student acceptance of e-learning web applications on the learning outcomes achieved with their use. It allows us to conclude which applications are most useful depending on the specialty of the student. This is important, as educators will not embrace web application unless there is clear evidence that through its implementation students can achieve returns, not only on their satisfaction but also on their outcomes learning. In line with the available literature, the research highlights the importance of acceptance of the use of e-learning to enhance learning. This study has also made it possible to obtain a measurement instrument that measures how the level of acceptance of ICT influences learning outcomes. As seen in the limitation sections, the survey could be used to extend the research in the future, making comparisons between control groups (traditional model) and intervention (innovative teaching model).

Concerning the analysis by resource, the heterogeneity of the assessment for each speciality was highlighted. To date, this is the first study that has carried out such an analysis considering a breakdown by speciality. Studies have been found in the literature that analysed the potential of ICT in the teaching of mathematics [49], languages [50], history [51] or science [52]. However, in the present study, it was possible to identify the main differences between specialisations. Blackboard Collaborate Ultra's resources, content portfolios, recorded higher scores in the specialisations of Economics and Mathematics; discussion boards (forum) in the specialisations of Technology, Spanish and Mathematics or Drop Boxes and the Grade Centre in English.

In short, the indicators created from the questionnaire specifically designed for this study made it possible to measure and explain student acceptance of the blended learning model, in terms of its perceived learning outcomes. 40.21% of the students expressed their acceptance of the blended learning model and more than half of the students stated that knowledge acquisition with the Blended Learning was achieved.

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