



Blended learning in higher education: Students' perceptions and their relation to outcomes

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ABSTRACT

New information and communication technologies (ICTs) provide educators and learners with an innovative learning environment to stimulate and enhance the teaching and learning process. In this context, novel educational concepts such as blended learning are being developed. In the present paper, we present the results obtained from a blended learning experience carried out at the University of Granada. A total of 17 groups took part, with 1431 students registered for the 2009–2010 academic year. In this study, we use objective outcomes and the students' perceptions regarding the blended learning activities performed. The study shows that the use of blended learning has a positive effect in reducing dropout rates and in improving exam marks. Moreover, the students' perceptions on blended learning are interrelated, with their final marks depending on the blended learning activities, and on the students' age, background and class attendance rate.

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1. Introduction

A persistent concern in teaching is the aim to achieve a better outcome and to reduce the number of students dropping out from the course, and it is recognised that achieving these goals might require a change in the teaching methods employed. With respect to higher education, improvements could be gained from the use of new information and communication technologies (ICTs); these offer a new way of producing, distributing and receiving university education (Orton-Johnson, 2009), and complement traditional teaching and learning methods. Educational institutions are currently making considerable efforts in this field. In Spain, according to data from the Spanish Conference of University Rectors (CRUE, 2009), 71.8% of university teaching and research staff make use of the institutional virtual teaching platform and 92.5% of students make use of this platform. University students are knowledgeable regarding Internet technologies and, in general, recognize the utility of this resource.

The current trend to complement face-to face (FTF) classes with web-based materials is known as “blended learning” (Garrison & Kanuka, 2004). This style of learning is normally defined as the integration of traditional classroom methods with online activities (termed “e-learning”) (Garrison & Kanuka, 2004; Graham, 2006; Macdonald, 2008). According to the Centre for Educational Research and Innovation (CERI, 2005), blended learning courses are becoming increasingly significant, with ICTs being developed to complement, not replace, traditional forms of learning (Mitchell & Forer, 2010: 78).

The success of blended learning is not only the result of the simple integration of ICTs with the FTF approach (De George-Walker & Keffe, 2010). In situations where student numbers are high, this type of resource provides greater opportunities to comprehend and extend the knowledge presented (Osguthorpe & Graham, 2003; Singh, 2010). The use of blended learning resources may produce changes in learning patterns and practices. They are widely applied in large-scale classes, such as the first year of undergraduate study courses, which represents an important year in determining the student's commitment to university learning (Huon, Spehar, Adam, & Rifkin, 2007).

Little research has been done into blended learning in undergraduate studies, and published work has tended to focus on the different methods of teaching and on the innovations introduced; however, no serious examination has been reported of the students' experiences (Sharpe & Benfield, 2005) or of the outcomes obtained with this type of learning (Alexander, 1999; Dowling, Godfrey, & Gyle, 2003; Lim & Morris, 2009). The use of ICTs in higher education requires an evaluation of the contribution of these tools to students' learning, especially

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when they are used as a complement to FTF methods (Ginns & Ellis, 2009). Therefore, the first goal of our paper is to analyse the effect of a blended learning experience on the outcomes obtained. Specifically, we examine the dropout rate in the classes in question, together with the proportion of exam passes. This experience was carried out with first-year undergraduate students in business studies courses.

According to Ginns & Ellis (2009), another central aspect of teaching and learning is the students' own experience of the process. Therefore, we sought to analyse three aspects concerning their perceptions: 1) the benefits gained; 2) how it affected their learning motivation; 3) the degree of satisfaction derived. In the present study, two types of outcome measure were obtained from the blended learning experience: on the one hand, an objective measure constituted of the final exam mark awarded; and on the other, a subjective one, based on the student's perception of the blended learning experience. This latter measure is grounded on the three aspects mentioned above: utility, motivation and satisfaction. Prior studies (Crawford, Gordon, Nicholas, & Prosser, 1998) have referred to the existence of a relation between students' perceptions of the education received and the objective outcome obtained from it. We believe further studies should be made of this relation. Therefore, in the present study, our second aim was to examine the extent to which the blended learning experience created such a relation between the students' perception (the subjective measure) and the final mark awarded (the objective measure). Finally, we sought to contribute additional evidence regarding the blended learning experience, studying how students' perception of its use may impact upon the final exam mark obtained. In addition, we analysed the possible influence on this final mark of other variables that are commonly taken into account, such as the students' age, gender, background and class attendance rate.

The rest of this paper is organized as follows: the next section discusses previous studies, and formulates our hypotheses regarding the blended learning experience carried out. Section 3 describes the data used and the methodology followed. The results and discussion are then presented, followed by the main conclusions drawn from this study.

2. Theoretical background and the formulation of hypotheses

Blended learning is a recent development in education, combining face-to-face classes with e-learning modules (Voos, 2003), which makes it possible to enjoy the advantages of both teaching methods (Graham, 2004; Harding, Kaczynski, & Wood, 2005). Other advantages obtained include its greater flexibility (Graham, 2004; Macedo-Rouet, Ney, Charles, & Lallich-Boidin, 2009) and reduced costs (Harding et al., 2005) in comparison with traditional classes (Woltering, Herrler, Spitzer, & Spreckelsen, 2009), especially when a large number of students are to be taught. This type of learning presents a series of advantages over the exclusive use of technology-based learning. Previous studies have reported that the quality and results of learning are affected when students utilize only such methods, possibly due to: a) the lack of interaction with the teacher and other students (Laurillard, 1993); b) procrastination in asynchronous learning (Lim, 2002); c) the reduced motivation to read learning materials online (Lim & Kim, 2003). Blended learning may be capable of improving, expanding and even transforming FTF learning (Alexander, 1999; Donnelly, 2010). Blended learning involves a paradigm change in which the emphasis shifts from teaching to learning (Nunan, George, & McCausland, 2000). According to prior studies, complementing traditional classes with online materials: a) has positive effects on student performance (Boyle, Bradley, Chalk, Jones, & Pickard, 2003; Lim & Morris, 2009; O'Toole & Absalom, 2003); b) enables the promotion of a flexible learning environment that reinforces the student's autonomy, reflection and powers of research (Chambers, 1999; Lebow, 1993; Radford, 1997; Tam, 2000); c) facilitates the review and control of learning (Osguthorpe & Graham, 2003). On the basis of this background, we propose the following Hypothesis 1.

Hypothesis 1: The application of blended learning has positive effects on students' outcomes (lower dropout rate and higher exam marks)

The experience of blended learning can be measured with respect to various aspects. Those most commonly adopted are utility, motivation and satisfaction. One measure of efficiency is the perceived utility (Ozkan & Koseler, 2009). Through their perception of the utility derived, students can express their preferences, the difficulty they encounter with the learning media proposed, or their perception of the advantages provided by the various learning tools made available. According to Cooner (2010), blended learning improves students' learning experience by developing their capacity for reflection. Students often view very positively courses in which ICTs are incorporated (Huon et al., 2007). The use of different teaching and learning methods: a) enables students to acquire a deeper understanding of the subject; b) promotes positive perceptions of the teaching received; c) clarifies goals and rules; d) provides students with a higher level of independence in the learning process (Crawford et al., 1998; Ginns, Prosser & Barrie, 2007). Students may consider these extra resources or activities as additional, or external to the principal activity (the one to be evaluated), but also as elements that assist in the construction of academic understanding (Orton-Johnson, 2009). Accordingly, the perceived utility of blended learning may be considered a subjective measure of students' outcomes, but it may also influence the final marks received.

The motivation to learn is one of the variables that has most often been studied in the field of education (Lim & Morris, 2009). Motivation can be said to constitute a set of goals, beliefs and emotions derived from the diverse tasks performed (Ford, 1992). Motivated students are characterised by their greater involvement in the class subject and by greater perseverance in carrying out assignments. Wlodkowski (1985) defined motivation in the learning process as a force that determines the direction to be taken and the choice of a particular attitude to learning. Students' motivation increased during certain experiments in which blended learning was implemented. The possibility of having more types of interaction has proved to be a factor that increases motivation, creating positive attitudes towards learning and leading to higher marks being awarded (Donnelly, 2010; Woltering et al., 2009). Additional learning materials provide reinforcement to the understanding acquired in class and motivate students, improving and supporting their learning process (Lei, 2010). Blended learning enables the student to become more involved in the learning process (Wang, Shen, Novak, & Pan, 2009). This improvement in the student's attitude towards learning may be considered a result in itself, but it also has repercussions on the final marks achieved.

The results derived from the application of blended learning may also be related to students' satisfaction with the process. One indicator of the quality of learning activities is their degree of satisfaction with the programmes that are developed. Some authors have reported that student satisfaction increases when blended learning is adopted (Lim & Morris, 2009). Satisfaction may refer to the teacher, the educational activities or the course materials employed, among other aspects (Sanderson, 1995). It may also be related to the marks obtained, although these might not necessarily be higher as a result of blended learning (Macedo-Rouet et al., 2009). In this respect, we wished to study the extent to which students were satisfied with the use of blended learning, taking this satisfaction as a subjective measure of the outcome. We also sought to examine the effect of the degree of satisfaction achieved from blended learning on the final marks awarded to the students.

The subjective outcome variables mentioned above (perceived utility, satisfaction and motivation) are sometimes used as proxies for the objective results (Broad, McDonald, & Matthews 2000; Freeman, 1996). To validate this approximation, with respect to the blended learning experience carried out, we analyse the extent to which subjective and objective variables for the results achieved are correlated and whether there is any association between them. Accordingly, Hypothesis 2 is proposed:

Hypothesis 2: The objective outcome (final marks) derived from a blended learning experience is correlated with the subjective outcome (perception of utility, satisfaction and motivation).

In addition, we wished to study the extent to which the students' perceptions regarding the blended learning experience (utility, satisfaction and motivation) are explanatory variables of their final marks, i.e. whether there is a causal relation between them. According to prior studies, greater motivation, the perceived utility and the degree of satisfaction are variables that account for learning outcomes, insofar as they represent greater involvement by the student and a higher degree of commitment (Włodkowski, 1985). Therefore, we propose.

Hypothesis 3: The utility perceived by students, their motivation and degree of satisfaction, are explanatory variables of the objective results (final marks) achieved by students in a blended learning experience.

3. Methodology and data

3.1. Sample selection

The blended learning experience was carried out in the General Accounting subject offered by the University of Granada, for first year undergraduate courses. The model adopted combines traditional FTF (face-to-face) learning with activities that students can complete by consulting a website. The e-learning activities proposed were of various types, aimed at consolidating the content of FTF lessons. On the one hand, there were individual activities intended to achieve a better understanding of concepts (crosswords, matching, gap filling, multi-choice tests), while others reinforced accounting procedure skills (on line exercises). A second group of activities was of a participative, cooperative nature (wikis aimed at strengthening the grasp of concepts, and forums to underpin aspects concerning accounting representation or procedures). These activities were evaluated online.

In introducing this experience, the teachers, in the first place, encouraged the performance of online activities, highlighting the objectives of this approach and its relation to FTF lessons. Secondly, they had access to the results of the online activities, and were able to review, during the lesson, the concepts or processes that were found to be more complex or which had caused students difficulty. Finally, the teachers coordinated the forums and the discussion of the most significant contributions made in the wikis.

This model of blended learning has been implemented during the last three academic years. It was developed following a teaching innovation project carried out by the teachers concerned, who were responsible for choosing the activities to be performed and for generating the content, and who have taught the subject during the last four academic years. Each year, before classes begin, a coordination meeting is held to refresh the teachers' understanding of the model and to review the complete schedule both of FTF learning and of online activities, together with the time points for the performance of each element of the programme. During the year, the subject coordinator, via informal meetings with each of the teachers, checks that the model is being correctly and uniformly applied. Finally, to buttress the whole process and to avoid possible bias, the students' exams are distributed randomly among the teachers for marking, irrespective of the particular group in which classes were given.

To test the first hypothesis, we analysed the evolution of students' outcomes (Arquero, Jimenez, & Joyce, 2004; Woltering et al., 2009), using two types of data: 1) the non-dropout rate, represented by the percentage of students sitting the final exam (number of students taking the exam with respect to the total number of students registered in the subject); 2) the pass rate achieved for the subject (the number of students awarded a final mark of 5–10 points, with respect to the number of students taking the exam). To evaluate these results, we used data corresponding to a period prior to the blended learning experience (the year 2007) and the following years, during which blended learning was incorporated (2008, 2009 and 2010). To test the other hypotheses, a questionnaire was designed, constituted of 13 items, structured into four blocks. The first block contained four items, addressing the following general data regarding the students: age, gender, university entrance pass mark and level of class attendance. The age and university entrance pass mark were asked on an open-ended scale. For gender, possible answers were 'male' or 'female', and the level of class attendance was measured according to the five-level scale employed by the University of Granada (<20%, 21–40%, 41–60%, 61–80% and >80%). The three remaining blocks in the questionnaire were focused on students' perceptions of the blended learning experience. Specifically, the second block was aimed at determining the utility of blended learning for students to understand and learn the subject content. Block number three investigated the extent to which blended learning contributes to increasing students' motivation to study the subject. The fourth and final block was intended to identify the students' degree of satisfaction with blended learning. Each of these three blocks was made up of three items, in which students were asked about the different activities carried out in the blended learning experience: one regarding FTF teaching and two regarding e-learning (one focused on the activities aimed at consolidating the understanding of basic concepts, while the other was intended to reinforce the practice of accounting procedures). The answers were measured on a 5-point Likert scale, where 1 indicated "lowest degree of interest or of agreement" and 5 indicated "highest degree of interest or of agreement". Two e-learning variables were included in the questionnaire in order to determine, separately, the perception of different types of activities, to highlight possible differences in this respect. However, the Cronbach alpha results (0.7 for utility, 0.76 for motivation and 0.73 for satisfaction) lead us to believe that these two items constitute a single construct. Accordingly, the model includes just one variable to account for the effects of e-learning.

Of the total of 1431 students registered for this subject, in the four courses that offered it (Business Administration and Management, Economics, Business Studies and the Business Administration/Law double course) during the 2009–2010 academic year, the questionnaire was addressed to the 1133 students who took the year-end exam. Replies were received from 1004 students, but 148 were rejected because the answers were incomplete. Thus, the final sample comprised 985 valid, completed questionnaires (sampling error of 1.1%), and the sample was considered to be representative of the population.

3.2. Magnitudes and variables

Learning outcomes are of a multi-dimensional nature; they may reflect acquired skills and competences, and knowledge received, or be measured by students' experiences or by their degree of satisfaction. In the present study, the students' learning outcomes were measured, objectively, by their final marks awarded (FINAL MARK) (Broad et al., 2000; Dowling et al., 2003; Drennan & Rohde, 2002; Farley & Ramsey, 1988; Freeman & Capper, 1999). Although this measure fails to evaluate other skills and competences that may be acquired, its use is justified by the fact that passing the subject requires the student to acquire specific academic knowledge that is evaluated by the exam. The various e-learning activities carried out by each student were taken into consideration in the final mark, and were awarded up to 10% of the total marks possible, depending on the activities in question and the marks obtained for each one.

Other measures that are used as proxies for the outcome are the subjective outcome variables (perceived utility, satisfaction and motivation) (Broad et al., 2000; Freeman, 1996). Initially, several different variables were analysed to determine the influence of the two types of activity related to blended learning (i.e. FTF and e-learning). Thus, we measured the perceived utility of face-to-face learning (UTILITY FTF) and that of online learning activities (UTILITY eLEARNING) (Goodyear, Jones, Asensio, Hodgson, & Steeples, 2005; Macedo-Rouet et al., 2009). We also measured the satisfaction derived from face-to-face classes (SATISFACTION FTF) (Macedo-Rouet et al., 2009) and that from online activities (SATISFACTION eLEARNING) (Lu & Chiou, 2010; Woltering et al., 2009). Finally, we measured the motivation to attend face-to-face classes (MOTIVATION FTF) and the motivation to participate in online activities (MOTIVATION eLEARNING), measured through their interest, influence and reinforcement value (Lim & Morris, 2009; Wagner, 1994; Woltering et al., 2009). Subsequently, another variable was constructed to reflect the overall effect of blended learning; thus, we measured the utility perceived from blended learning activities (UTILITY BLENDED), the satisfaction derived from the blended learning experience (SATISFACTION BLENDED) and the motivation produced by blended learning (MOTIVATION BLENDED).

To test Hypotheses 2 and 3, we used the variables that addressed the students' objective outcome (final marks) and the variables that may be associated with the results. For Hypothesis 2, we analysed the correlations found between the variables, while for Hypothesis 3, the following regression models were created:

$$FINAL\ MARK = b_1 + b_2UTILITY\ FTF + b_3MOTIVATION\ FTF + b_4SATISFACTION\ FTF + b_5UTILITY\ eLEARNING + b_6$$

$$MOTIVATION\ eLEARNING + b_7SATISFACTION\ eLEARNING + b_8GENDER + b_9AGE + b_{10}BACKGROUND + b_{11}CLASSES + e$$

$$FINAL\ MARK = b_1 + b_2UTILITY\ BLENDED + b_3MOTIVATION\ BLENDED + b_4SATISFACTION\ BLENDED + b_5GENDER + b_6AGE + b_7BACKGROUND + b_8CLASSES + e$$

These regression models were complemented with a series of control variables: the students' age (AGE), gender (GENDER), previous knowledge (BACKGROUND) and class attendance rate (CLASSES). Student age has been used as a variable in previous studies, in which it has been correlated with their performance (Lim & Morris, 2009; Paechter, Maier, & Macher, 2010; Tanewski, deLange, & Wyatt, 2001). Dowling et al. (2003) reported that younger students had a greater incentive to improve their performance. In other studies it has been concluded that female and older students are less comfortable with the technology used than are males and younger students (Kramarae & Taylor, 1993). Furthermore, it has been suggested that gender is a variable that has a significant influence on the satisfaction derived from e-learning systems (Huon et al., 2007; Paechter et al., 2010), although other studies have failed to observe this effect (Goodyear et al., 2005). In the present study, we analysed the extent to which the variable 'gender' affected students' final marks following a blended learning experience. This variable was measured by means of a dummy variable given a value of 0 for males and a value of 1 for females. According to previous studies, students' prior academic results (BACKGROUND) can be a good predictor of future academic performance (Doran, Bouillon, & Smith, 1991; Farley & Ramsey, 1988; McKenzie & Schweitzer, 2001; Rohde & Kavanagh, 1996), although it has not always been found to be a significant variable (Huon et al., 2007). This variable was measured using the average mark obtained by the student to enter the degree course (as this was a first-year subject). Finally, the class attendance rate variable (CLASSES) was included in order to see whether this was a determinant factor in the final marks obtained. According to some authors, a low rate of class attendance has a negative effect on outcomes (Paisey & Paisey, 2004; Sugahara & Boland, 2006). This variable was measured via the percentage of class attendance, measured on the 5-point scale described above.

4. Results and discussion

Firstly, as shown in Fig. 1, the inclusion of the blended learning experience in the course made a notable contribution to increasing the percentage of students taking the subject exam. The year 2008, when blended learning was introduced, constituted a turning point. In that year, the percentage of students taking the exams was somewhat lower than that for 2007, but the rate of exam passes was much higher. By the period 2009–2010, when the introduction of the blended learning experience was complete, there was a clearer view of the favourable evolution of the percentage of exam takers and passers in the subject. In the latest session, 79% of registered students took the final exam; moreover, the incorporation of the blended learning experience, during the period 2007–2010, was seen to have contributed to a positive evolution and trend in the results achieved, with the pass rate rising to 73%. In view of the non-dropout rate observed (i.e., the percentage of exam takers), and the improved exam pass rate achieved, Hypothesis 1 is accepted.

Table 1 presents the descriptive statistics for the above variables concerning the blended learning experience applied, together with those for the students' final marks and the control variables.

Table 1 shows that for all the items related to the blended learning experience, an average score of over 3.5 is obtained. Therefore, the students consider this to be a useful experience for understanding and learning the subject content; they were satisfied with it and, moreover, considered that it contributed to increasing their motivation to study the subject. These results are in line with those reported by Alexander (1999), Donnelly (2010) and Woltering et al. (2009). Specifically, the items that received the largest number of replies were those related to motivation, followed by those concerning utility and satisfaction, respectively.

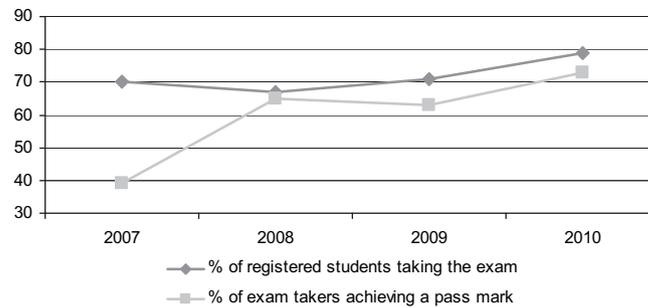


Fig. 1. Percentages of students taking and of students passing the February exam (period 2007–2010).

With respect to the two components of the blended learning experience, the students awarded higher average scores to FTF than to e-learning. Thus, they considered FTF classes to constitute a more useful teaching method than e-learning for understanding and learning the subject content, although the joint evaluation of the blended learning activities is very close to 4. Moreover, the FTF approach made a greater contribution to increasing the students' motivation to study the subject, as reflected in the score of 3.69 awarded for the overall evaluation of blended learning activities. Finally, the students were more satisfied with FTF than with e-learning, awarding a score of 3.84 overall. In this respect, we may conclude that in blended learning the students' perception is that the e-learning activities complement FTF activities but cannot replace them. This finding is in accordance with those of earlier studies (Lim & Morris, 2009; O'Toole & Absalom, 2003; Voos, 2003) in which the overall evaluation of the activities presented has been very positive.

Concerning the students' final marks, the average mark obtained by the students who took the exam was 6.18, on a scale of 0–10 points. With respect to the control variables, a majority (57%) of the students who took the exam were female. As this was a first-year subject, the average age of the students was 19 years. The students' average university entrance pass mark was almost 7 (of 10) and, on average, they attended over 80% of the classes.

Tables 2 and 3 show the results concerning the correlations found between the subjective variables for the blended learning experience (the students' perceptions of utility, motivation and satisfaction with FTF and with e-learning and their perception of the utility, motivation and satisfaction of blended learning, respectively), the objective variable of student outcomes (the final marks) and the control variables.

Table 2 shows that the highest such correlations corresponded to the relations between each of the e-learning variables (correlation variables ranging from 0.71 to 0.78) and to those between each of the face-to-face variables (ranging from 0.66 to 0.68), with all these values being statistically significant. These results show that the students' perception of the utility of e-learning is correlated with the motivation and satisfaction generated by this teaching tool. In turn, the satisfaction with e-learning is correlated with the motivation it generates. The same relationships are observed between the variables reflecting the students' perception of FTF classes; thus, the utility of these classes is related to motivation and also to the satisfaction derived from this teaching method. In the same way, the students' declared satisfaction with the FTF approach is related to the motivation it produces. In short, the variables concerning students' perceptions of e-learning, on the one hand, and those concerning FTF classes, on the other, are inter-related, thus indicating the existence of a relation among the various subjective measures of the experience.

The relations between the variables concerning the students' perceptions of FTF classes and those concerning e-learning are also statistically significant, although weaker. The strongest such relation is between the variables concerning the same type of experience, that is, between those for utility, for motivation and for satisfaction. This shows that the perceptions of greater utility, motivation and satisfaction in the e-learning experience are related to those of greater utility, motivation and satisfaction in the FTF experience, respectively. Thus it may be concluded that the greater motivation to study the subject achieved from the e-learning activities brings about a higher degree of motivation for the FTF activities. And the same could be said with respect to the utility and the satisfaction derived from the FTF and from the e-learning methods. In other words, one method supports and enhances the benefits derived from the other.

Table 1
Descriptive statistics of the variables utilized.

	M	SD	N
<i>Perception of blended learning</i>			
UTILITY FTF	4.18	0.82	994
UTILITY LEARNING	3.81	0.81	1004
UTILITY BLENDED	3.99	0.65	994
MOTIVATION FTF	3.86	0.97	999
MOTIVATION LEARNING	3.52	0.92	1001
MOTIVATION BLENDED	3.69	0.73	999
SATISFACTION FTF	4.08	0.94	985
SATISFACTION LEARNING	3.62	0.86	996
SATISFACTION BLENDED	3.84	0.71	985
<i>Objective results variable</i>			
FINAL MARK	6.18	2.41	1133
<i>Control variables</i>			
GENDER	0.57	0.46	1133
AGE	19.54	2.54	989
BACKGROUND	6.97	1.04	986
CLASSES	4.24	1.08	995

Table 2
Correlations among FTF, e-learning, student outcomes and control variables.

	1	2	3	4	5	6	7	8	9	10
1.FINAL MARK	1									
2.UTILITY FTF	.123**	1								
3.UTILITY LEARNING	.038	.228**	1							
4.MOTIVATION FTF	.158**	.661**	.179**	1						
5.MOTIVATION LEARNING	.044	.176**	.719**	.199**	1					
6.SATISFACTION FTF	.135**	.661**	.184**	.680**	.152**	1				
7.SATISFACTION LEARNING	.042	.187**	.712**	.193**	.780**	.222**	1			
8.CLASSES	.265**	.272**	.066*	.321**	.028	.282	.022	1		
9.BACKGROUND	.422**	-.006	.045	.093**	.086*	.032	.070*	.121	1	
10.GENDER	.013	.122**	.117**	.116**	.114	.068*	.117**	.070*	.156**	1
11.AGE	-.035	-.008	.034	-.045	.024	-.052	.004	-.241	-.248**	-.117**

* $p < 0.05$; ** $p < 0.01$ (Pearson's correlation coefficient).

With respect to the correlations with the students' final marks, it can be seen that significant correlations are only to be found for the FTF variables, while the correlations between the perceptions of e-learning and the students' final marks are not statistically significant. However, it was observed that the correlations among the variables reflecting the perceptions of e-learning and of the variables CLASSES (UTILITY E-LEARNING), BACKGROUND (MOTIVATION E-LEARNING and SATISFACTION E-LEARNING) and GENDER (UTILITY E-LEARNING and SATISFACTION E-LEARNING) are significant. These correlations may imply that the perception of e-learning is explanatory of class attendance, for example. In particular, the perceived utility of FTF and of e-learning, and the motivation and satisfaction derived from FTF learning, are associated with higher levels of class attendance. In other words, FTF learning is not only associated with higher levels of attendance, but also with the utility derived from e-learning. Moreover, students' greater prior knowledge of the subject is associated with greater motivation with respect to e-learning and with higher levels of satisfaction with e-learning activities. The problem, therefore, is a complex one in which the variables are all inter-related, and where, perhaps, the relations between the final marks and the e-learning variables are not produced in a direct way, but rather, indirectly, through other variables included in the model.

The results obtained led us to consider another construct, one expressing the joint effect of the two learning approaches (MOTIVATION BLENDED, UTILITY BLENDED and SATISFACTION BLENDED). In order to ensure the reliable measurement of this variable, Cronbach's alpha was calculated, producing results of 0.69 for motivation, 0.66 for utility and 0.67 for satisfaction, which were considered to be sufficient (Ozkan & Koseler, 2009). In this case, it can be seen that all the variables reflecting blended learning are correlated with the students' final marks. As with the previous model, the variables correlating most highly with final marks are CLASSES and BACKGROUND. Moreover, an association can be seen between these variables and those that are representative of blended learning (Table 3). In view of these results, Hypothesis 2 is accepted.

Finally, the results obtained in the regression analysis are shown in Table 4. This table presents three models. Model 1 only includes the control variables, in order to show their explanatory capacity. Model 2 incorporates the variables referring to FTF learning and to the perception of e-learning. Finally, Model 3 incorporates the blended learning variables.

Model 2 shows that the incorporation of all the variables (independent and control) into the regression model better accounts for the final marks (adjusted R square = 0.250) than when only the control variables are considered (Model 1). From Model 2 it can be seen that the final marks are accounted for by the FTF motivation, while the remaining variables related to the perception of the blended learning experience (both FTF and e-learning) are not statistically significant; in other words, they do not influence the final marks. Thus, the student outcomes are significantly influenced ($p < 0.01$) by the motivation achieved in FTF classes. The students, in this learning situation, are more motivated, which has a favourable effect on their involvement in the subject and on the outcomes obtained. Thus, only the greater motivation derived by the students from FTF classes has an effect on the outcomes, in terms of the final marks obtained. The students considered in this experience were in their first year at university, and their previous studies were mainly FTF. However, it should be noted that this motivation is not independent of the e-learning activities, as during the development of the FTF class, the teacher sometimes makes use of the diverse possibilities of ICTs, as tools to aid the learning process (Lei, 2010). The teacher takes advantage of all available teaching aids in order to achieve greater commitment and involvement by the students, as observed above with respect to the correlations, which showed that class attendance was associated with e-learning. Thus, its influence on the final marks achieved would be indirect. The fact that the blended learning activities are inter-related led us to propose a new variable, to reflect this joint effect. This variable is included in Model 3, which shows that the motivation derived from the blended learning experience is explanatory of the final marks achieved. Therefore, Hypothesis 3 is accepted.

Table 3
Correlations among blended learning experience, student outcomes and control variables.

	1	2	3	4	5	6	7
1.FINAL MARK	1						
2.UTILITY BLENDED	.101**	1					
3.MOTIVATION BLENDED	.133**	.706**	1				
4.SATISFACTION BLENDED	.115**	.692**	.574**	1			
5.CLASSES	.265**	.214**	.227**	.204**	1		
6.BACKGROUND	.422**	.021	.118**	.068*	.121	1	
7.GENDER	.013	.152**	.148**	.115**	.070*	.156**	1
8.AGE	-.035	.019	.024	-.030	-.241	-.248**	-.117**

* $p < 0.05$; ** $p < 0.01$ (Pearson's correlation coefficient).

Table 4
Summary of multiple regression analysis for student outcomes and blended learning experience ($N = 985$).

Dependent variable	FINAL MARK		
	Model 1	Model 2	Model 3
CONSTANT TERM	-5.04 (0.000)**	-6.02 (0.000)**	-5.88 (0.000)**
Independent variables			
UTILITY FTF		0.054 (0.223)	
UTILITY LEARNING		0.014 (0.654)	
MOTIVATION FTF		0.098 (0.005)**	
MOTIVATION LEARNING		0.014 (0.676)	
SATISFACTION FTF		0.056 (0.204)	
SATISFACTION LEARNING		0.004 (0.910)	
UTILITY BLENDED			0.022 (0.632)
MOTIVATION BLENDED			0.065 (0.042)*
SATISFACTION BLENDED			0.034 (0.482)
Control variables			
AGE	0.114 (0.001)**	0.111 (0.001)**	0.126 (0.000)**
GENDER	-0.054 (0.101)	-0.063 (0.054)	-0.063 (0.052)
BACKGROUND	0.428 (0.000)**	0.424 (0.000)**	0.428 (0.000)**
CLASSES	0.245 (0.000)**	0.208 (0.000)**	0.237 (0.000)**
Adjusted R Square	0.243	0.250	0.247
F-Statistic	80.02	62.62	54.24
Probability	0.000	0.000	0.000
Root MSE	2.07	2.07	2.07

** $p \leq 0.01$; * $p \leq 0.05$.

The regression results shown in Table 4 show that the final marks depend on variables other than those related to the blended learning experience, i.e. the students' age, class attendance record and university entrance exam mark. If we compare the adjusted R square for Models 1, 2 and 3, it can be seen that the control variables are more explanatory of student outcomes than are the variables related to the students' perception of the blended learning experience. As deduced in earlier studies, therefore, the variables of background, class attendance record and age are explanatory of the model (Doran et al., 1991; McKenzie & Schweitzer, 2001; Rohde & Kavanagh, 1996; Sugahara & Boland, 2006; Tanewski et al., 2001), although in the present study these variables were found to be associated with the practices applied in blended learning. On the other hand, student gender had no influence on outcomes.

5. Conclusions

The present study shows that the implementation of blended learning has a positive effect on reducing dropout rates and in raising exam pass rates in the subject. Moreover, it is shown that the joint effect of the blended learning activities has a positive influence on the students' final marks. While their perception of the utility of e-learning activities alone does not affect the final marks, the results obtained reveal that e-learning activities support and complement FTF classes, and thus the joint effect is explanatory of the final marks. Accordingly, we may consider that e-learning activities complement, rather than replace, traditional forms of learning (Mitchell & Forer, 2010). This view coincides with the conclusions of other studies (Alexander, 1999; Crawford et al., 1998; Donnelly, 2010). Furthermore, the motivation generated by FTF activities is explanatory of the final marks; the teacher achieves a greater degree of involvement by students in the learning process, and this has a subsequent positive effect on their final marks. There exists a link between students' perceptions and their objective results (Crawford et al., 1998), both because these elements are associated and because they are explanatory, i.e., there exist relations of causality among them.

According to our study, a high degree of utility, motivation and satisfaction is perceived from blended learning, which could lead students to have a positive attitude towards learning. Moreover, this conclusion indicates that blended learning reinforces students' understanding of the subject in question, enhancing and supporting the learning process (Lei, 2010). In addition, it is shown that the online activities included were useful for the students, which could have a favourable influence on the work they carried out independently.

The objective outcomes were mainly determined by the students' prior knowledge, their class attendance record and their age, a finding that coincides with the results of earlier studies (Doran et al., 1991; McKenzie & Schweitzer, 2001; Rohde & Kavanagh, 1996; Sugahara & Boland, 2006). In addition, we observed a correlation between blended learning variables and others that influenced students' final marks, namely class attendance, background and age. This finding shows that the influence of blended learning activities on final marks may also take place in an indirect manner. The relation between blended learning activities and class attendance could indicate that greater student commitment and perseverance is being achieved and, moreover, that this consequence affects the final marks achieved – as has been concluded by Donnelly (2010) and Woltering et al. (2009). With respect to background, it has been shown that students with a better background tend to benefit more from the blended learning experience.

This study focuses on analysing the effects of students' perceptions of the different learning activities performed on the outcomes achieved. However, in addition to achieving the goal of reducing dropout rates and improving exam marks, the students' positive perception of the blended learning experience might bring about other results, such as enhanced skills or greater interest in the degree subject chosen, or in career possibilities. These aspects constitute highly interesting lines of future research that should be investigated. From a practical standpoint, we believe the blended learning experience could be improved by incorporating further suitable proposals that have been shown to be very appropriate in this context, such as blended problem-based learning (via simulation or case-study programs). Among the limitations of the present study, let us mention that we did not take into account the degree of utilisation of e-learning instruments, a factor that might have impacted on the results obtained (as there were students who did not make use of this possibility). The use made of such instruments could, indeed, constitute a more suitable measure than does students' perception of the benefits of blended learning, with

respect to their final marks. In this respect, furthermore, a relatively small weight was awarded in the final assessment of the activities performed, which might be reflected as a lesser incentive to the students and could thus affect the results obtained.

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