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Impact of communication and relationships on student satisfaction and acceptance of self- and peer-assessment

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Abstract

This study presents a learning-oriented assessment experience and examines the impact of communication and relationships on student satisfaction and on the acceptance of self- and peer-assessment. To this end, an analysis was conducted based on the data collected from engineering students in a subject with a high degree of creativity. The answers of online surveys ($n = 180$) were examined by using the structural equation modelling technique (SEM). The results indicate that effective, frequent, and timely communication and quality relationships play an important role in ensuring that formative assessment, based on teamwork, feedback and self- and peer-assessment, is perceived as easy to implement and useful for learning and skills development, which also increases student satisfaction. In addition, these perceptions have an important impact on students' acceptance of self- and peer-assessment, although students show more confidence in the teacher's judgement and concern about the validity and reliability of their peers' marks.

Keywords Relational coordination · Peer-assessment · Self-assessment · Student satisfaction · Structural equation modeling

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1 Introduction

The changes resulting from the implementation of the European Higher Education Area promote the use of strategies that favour the development of competencies such as information seeking, autonomous learning, the development of critical thinking, collaboration, negotiation and discussion skills, creative problem solving and reflective judgement. Formative assessment through teamwork, self-assessment and peer-assessment facilitates the acquisition and development of these competencies (Altinay, 2017; Wanner & Palmer, 2018). In these learning-oriented evaluation processes, relationships have a significant impact (Zhou et al., 2020). Consequently, it is crucial to identify organisational practices that contribute to achieving these competencies, with relational and communication connections among students, as well as between students and the teacher, emerging as key elements to accomplish this. (Sanchez et al., 2015; Margalina et al., 2017).

Many studies have been published on teamwork (e.g., Fathi et al., 2019; Thompson et al., 2021) and self- and peer-assessment (e.g., Altinay, 2017; Wanner & Palmer, 2018), covering multiple perspectives and analyzing different aspects. Nevertheless, there is a lack of studies examining the role of relationships and communication in these elements of formative evaluation.

Hence, the aim of this study is to examine the impact of relational coordination in the formative assessment process of a subject with a high degree of creativity and therefore of subjectivity and difficulty when assessing. Satisfaction with the whole learning-oriented assessment experience is also analyzed, as well as the students' opinion on the validity of the judgments made by their peers and themselves about their work and their willingness to have these judgments included in the grade. Finally, a web application developed to facilitate the whole formative assessment process is also presented.

2 Literature review and theoretical framework

Assessing is not an easy task when the evaluation is intended to be formative as well as to certify learning. This represents a greater challenge when the goal is to evaluate a highly subjective creative work, as illustrated by the studies of Dikici, (2009), Seviour, (2015), and Bartholomew et al., (2019). These researchers have explored the complexities of assessing subjective content and have highlighted the benefits of incorporating formative assessment methods, such as self-assessment and peer-assessment, into the evaluation process.

On the other hand, in accordance with the perspectives of Ibarra Saiz et al., (2012) and Ma et al., (2023), the participation and collaboration of learners are essential for the success of learning-oriented assessment. Some formative assessment strategies that encourage student participation and collaboration include teamwork, self-assessment and peer assessment.

2.1 Self- and peer-assessment

Self-assessment and peer assessment have been widely recognized as effective mechanisms to enhance learning processes (Hwang & Chang, 2021), to encourage critical thinking (Altinay, 2017; Zhang et al., 2023), to improve the quality of collaborative learning or to develop a better understanding (Wanner & Palmer, 2018). However, the subjective nature of self and peer assessment, primarily reliant on evaluating one's or others' merits and abilities in a given task or activity, has led to concerns regarding its reliability and validity (Carless, 2009). These concerns are mirrored by students themselves, who also question the validity of peer assessment when it becomes part of the grading process (Zhou et al., 2020).

2.2 Teamwork

Integrating teamwork as a foundational element of students' learning in higher education brings about numerous educational, professional, and social benefits (Thompson et al., 2021). Thus, teamwork improves students' learning performance and contributes to their professional development (Lohmann, et al., 2019), while fostering cooperative skills highly valued by employers (Fathi et al., 2019). In addition, this approach encourages critical reflection and self- and peer-assessment (Altinay, 2017).

On the other hand, according to Ramdeo et al., (2022), teamwork can lead to dissatisfaction when combined with peer evaluation experiences. Ramdeo et al., (2022) also suggest that to enhance the teamwork experience, it should be addressed through effective communication, small group dynamics, anonymous assessments, and the efficient use of technology.

2.3 The relational coordination

Relationships and communication play a key role in the learning process and formative assessment through teamwork, self-assessment, and peer-assessment. Supporting this idea, Champoux, (2010) points that communication and relationships help team members to foster teamwork and helps to better resolve conflicts.

The model of communication and relationship to integrate tasks and achieve the best organizational results was defined by Gittell, (2002) as Relational Coordination (RC). Within the educational sector several studies find positive relationship between coordination models and level of student's perceived satisfaction (e. g. Margalina et al., 2017; Checa et al., 2020) and teachers' satisfaction with their work (Margalina et al., 2015). Other studies highlighting the influence of RC with quality (Gallego, De-Pablos-Heredero, & Medina, 2015; Margalina et al., 2017); and with efficiency (Gallego et al., 2015). However, we have not found literature that examines the effect of relational coordination on a learning-oriented assessment process and on students' acceptance of peer-assessment, especially when this has an impact on their grades.

Hence, this study aims to tackle the following research questions:

RQ1. How does relational coordination influence students' perceptions of the tools used in formative assessment, in terms of their usefulness and ease of use?
RQ2. How does relational coordination influence students' satisfaction regard the formative assessment process?
RQ3. Do students perceive the grades assigned by themselves and their peers as valid and believe they should be considered in the final grade?

3 Research model and hypotheses

To address the research questions posed, a theoretical model was built. Each of the hypotheses presented below corresponds to a path in the structural equation modelling (SEM) that was applied.

3.1 The relational coordination (RC) model

Teacher-guided learning, with positive feedback, accurate, fluent, and timely information, facilitates students to interact, learn, share and problem-solve. (Margalina et al., 2015). In other words, relational ties are mutually reinforced through communication links that allow effective coordination of work (Estriegana, et. al., Estriegana et al., 2021). According to these authors, we hypothesize that frequent, timely and accurate communication positively influences relationships (H1).

Moreover, some studies find that learners perceive formative assessment process as useful (Panadero & Jonsson, 2013; Stiggins, 2006). On the other hand, as Gallego-Sanchez et al., (2021) indicates, the RC model is influenced by different factors that facilitate or difficult the work or processes to be carried out. In our case, in order to adequately develop the formative evaluation process, it has been necessary to use different strategies as well as a web application created to manage the whole process. The use of this tool and how the students have perceived it as easy and useful has conditioned the formative evaluation process. Thus, we assume that quality relationships, in which learners share goals and knowledge with mutual respect, positively influence the perceived usefulness (PU) (H5) and perceived ease (PEOU) (H6) in the use of the strategies and tools employed in the formative assessment process.

In addition, in line with other authors (e.g., Margalina et al., 2017; Checa et al., 2020), we also think that quality relationships and fluid communication increase the level of student satisfaction (PS) (H4) and (H7).

3.2 Perceived usefulness (PU) and perceived ease of use (PEOU)

In recent years, technology has proven to be a great ally in many learning processes, including formative assessment. For our part, in order to facilitate communication and the whole evaluation process, we have developed a web tool that has been a determining element in this process. Ease of use and usefulness are two factors that explain the user's acceptance of technology in the widely used and well-known

TAM theory (Davis, 1989). Perceived usefulness (PU) was defined as the degree to which a person believes that the use of a certain system or method will improve his or her performance in a task or job (Davis, 1989). On the other hand, perceived ease of use (PEOU) was defined as the degree to which a person feels that using a particular system or method will involve little effort (Davis, 1989). Many studies have found a positive relationship between PEOU and PU (e.g., Davis, 1989; Estriegana et al., 2019; Venkatesh & Davis, 2000).

Based on these studies, we hypothesized that perceiving the tools and procedure used in this formative evaluation as easy (PEOU) would have a positive impact on also being perceived as useful (PU) (H8).

3.3 Perceived satisfaction (PS)

Student satisfaction provides an insight into how students experience a service offered and is considered a key indicator of service quality in the teaching–learning process which is why it has become one of the main objectives of universities (Checa et al., 2020).

Some studies find that the teamwork environment contributes to student satisfaction (e.g. Lohmann et al., 2019). Others add to teamwork the peer review process as a factor of satisfaction (e.g. Altinay, 2017). On the other hand, there are studies that emphasize the significance of perceiving the way in which a certain process is carried out as useful and easy in order for it to produce satisfaction (e.g., Ashfaq et al., 2019; Chen et al., 2022).

In this sense, our hypotheses are that students perceiving the technology and the mechanisms used for formative assessment as useful (PU) and easy (PEOU), as well as the whole process, are significant predictors of student satisfaction (PS), (H9) and (H10) respectively.

3.4 Students' acceptance of the formative assessment (SAFA)

In the model, we have called students' acceptance of the formative assessment (SAFA) how they accept peer-feedback, peer-grading and self-grading being taken into account in the final grades. As can be seen in several TAM studies (e.g., Dong et al., 2022; Estriegana et al., 2019), some of the factors that positively and significantly affect technology acceptance and users' adoption intention are the perception of usefulness (PU) and ease of use (PEOU). Therefore, we hypothesize that perceived usefulness (PU) and perceived ease of use (PEOU) of the process and tool used for formative assessment are significant factors in predicting SAFA, (H11) and (H12). On the other hand, according to Gopal, Singh, and Aggarwal (2021), another factor that positively influences students' performance, and thus the acceptance of a learning tool, is student satisfaction. Hence, we hypothesize that SAFA will also be affected by student satisfaction during the process (H13).

The conceptual model and the hypotheses are shown in Fig. 1.

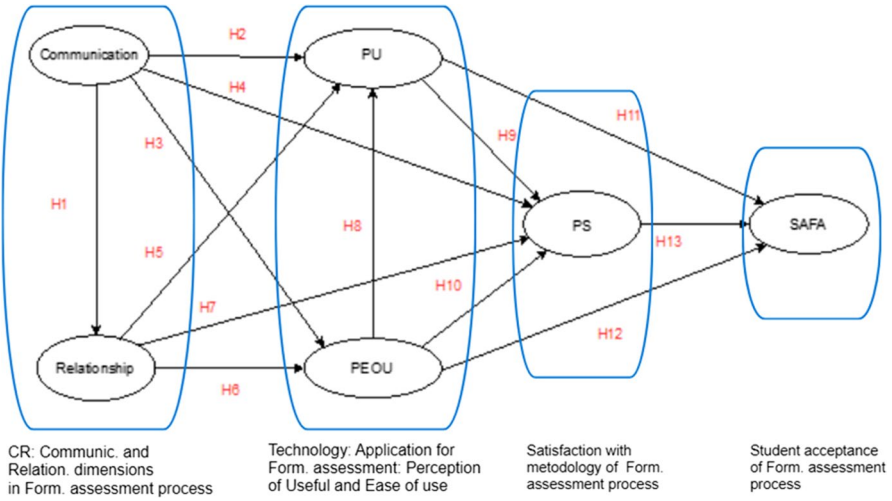

Fig. 1 Baseline model (Structural model and hypothesis)

4 Methodology

Below we detail a formative learning and evaluation experience involving subjective elements where creativity, teamwork, interaction and communication play pivotal roles. The execution of this formative experience is underpinned by the literature review presented earlier. In addition, a web tool, developed to facilitate communication and the whole evaluation process, is presented.

4.1 Formative assessment experience

This learning-oriented assessment experience was carried out in a cross-curricular course offered as part of the engineering degrees of a Spanish university. Students are required to develop a multimedia project, which accounts for 50% of the grade. Students choose freely the format, and the tools to be used, combining graphic design, audio, video, web design, animations, or games.

The students organised themselves, forming teams of 4. Each team had to include in a wiki, the link to their multimedia project, the memory, timeline, storyboard, and all the materials created by the group, so that it would be accessible to the evaluators. Each student had to assess, in addition to their own work, three others. These works were randomly assigned as recommended by Topping, (2009). A rubric was used for assessing student products and performance. The rubric and all criteria, dates and details of assessment were known and agreed by the students from the beginning of the course as proposed by Carless, (2006). The rubric assessed eight criteria: organisation and achievement of the project's purpose, content, presentation, creativity and originality, intuitive interface,

appropriateness of the help system, use of multimedia software, and the teamwork and integration of the project.

Detailed feedback is a very valuable and essential element of the communication process through which learners develop a dialogue related to their execution and performance in learning-oriented assessment (Liu & Carless, 2006; Rakoczy et al., 2019). Therefore, together with the rubric, students provide reinforcement, correction, and suggestions about the work. Based on the feedback, students could improve their work. Each project receives seven or eight intergroup evaluations, and about four intragroup evaluations, in addition to the evaluation of two teachers. The grade was initially agreed with the students as the teacher's average * 0.7 + intergroup average * 0.2 + intragroup average * 0.1.

The development of an experience as detailed above it is very demanding on teachers' time as it requires a careful scaffolding of elements. So to reduce the workload by automating the entire formative assessment process an ad hoc web application was developed. This tool is briefly described below.

4.2 Tool to automate the assessment process

In addition to facilitating and automating the whole assessment process, the aim of this web application is to facilitate and motivate students to participate in this formative assessment. The tool is easy to use from any web navigator using a computer or any mobile device and can be easily adapted to other subjects or other content as it allows different assessment rubrics to be configured, as well as other elements.

The application offers several interfaces:

- Student interface: Students have the option of intra-group assessment (assessment of their own work) and inter-group assessment (assessment of other works), viewing the status of their assessment, viewing all the comments on their work, changing their password, accessing the home page board whit links, notices, dates and tutorials.
- Teacher interface: The application provides for the possibility of multiple teacher evaluators. In this interface, the teacher has access to the assessment rubric to assess all the groups, and to the option of changing his/her password.
- Teacher-administrator interface: In addition to the teacher interface options, it adds other functions for managing, configuring and downloading grades.

Figure 2 shows the different menus of the application and their elements.

4.3 Instrument

To examine the impact of relational coordination in the formative assessment process an online questionnaire was designed, considering other reviewed models as recommended by O'Leary, (2017). Items for each variable in the study were adapted from scales validated in previous studies. Thus, questions on relational coordination: relationships (shared goal, shared knowledge and mutual respect)

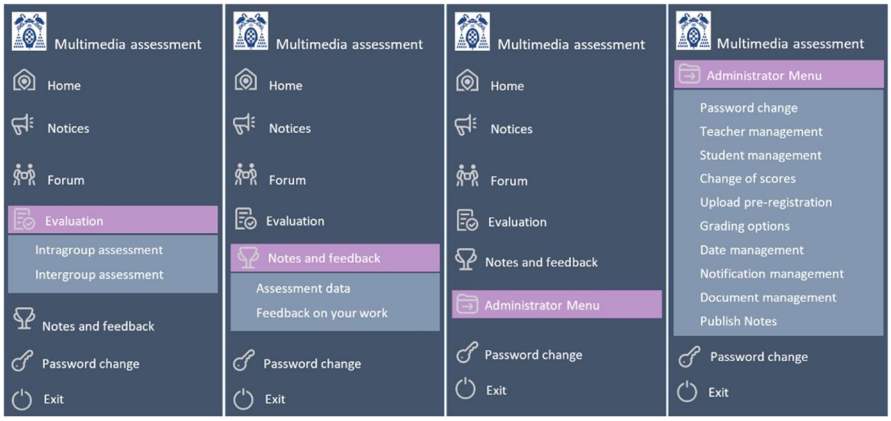

Fig. 2 Web application to automate the assessment process: Student menu **a** and **b** administrator menu **c** and **d**

and communication (frequently, timely, accurate and resolving problems) are based on an adaptation of the original questionnaire provided by Gittell, (2009). This option was also adapted by other authors in previous research applied to education (e.g., Gallego, et al., 2015). Scales of perceived usefulness and perceived ease of use were measured by means of items adapted from Technology Acceptance Model (TAM) (Davis, 1989; Venkatesh & Davis, 2000). Questions on perceived satisfaction (PS) were adapted from (Chiu et al., 2005), also used in Estriegana et al., (2019). Finally, Student acceptance of formative assessment (SAFA) has been measured through student responses on the validity of self- and peer-assessment marks and feedback received. The questions were based on Hassell & Yuch, (2020); Ibarra-Sáiz et al., (2020). The majority of students indicated that the marks assigned by peers are as valid as those assigned by a teacher. However, there were also reluctant students who showed distrust of peers' judgement.

The questionnaire used a 5-point bipolar Likert scale, with responses ranging from 1: completely disagree to 5: completely agree. To minimize errors in items related to variance, the questionnaire used simple questions and easy-to-understand language. While the study follows a quantitative design, an optional open-ended question was also included to give students the opportunity to express their opinion on the formative assessment process.

Additionally, although this study and the questionnaire focus on how quality relationships and communication affect teamwork, the acceptance of self- and peer-assessment and student satisfaction, the validity of self- and peer-assessment was also examined by comparing them with teacher ratings (Ibarra Saiz et al., 2012).

In addition, the validity and reliability of the scale were calculated using Cronbach's alpha.

Thus, all the data obtained from Cronbach's alpha test were greater than 0.91, as suggested by George & Mallery, (2003) for values between 0.90 and 0.95 the value

is excellent, besides, all the items passed the validity test discriminant (Hernandez & Pascual Barerera, 2018).

4.4 Participants and data collection

Data were collected on a voluntary basis when the assessment process was fully completed. 180 students completed the questionnaire, out of a total of 194. The demographic variables such as gender, geographical environment and origin are shown in Table 1

5 Data analysis

A regression analysis of latent variables, based on the optimization technique of partial least squares (PLS) to construct the model, has been done by means of SmartPLS 3.3.3. Hair et al., (2016) present this technique as a multivariate one for testing structural models that estimates the model parameters oriented to minimize the residual variance of the entire model's dependent variables. SmartPLS not require any parametric conditions and is recommended for small size samples (Hulland, 1999).

5.1 Measurement model evaluation

Results of the analysis indicated that the measurement model was satisfactory. The degree of skewness is not severe and there is one of the two indicators measuring the (reflective) construct, this deviation from normality is not considered an issue and the indicator is retained. All standardized loadings (λ) are greater than 0.707,

Table 1 Geographical setting and the age of the students

	Number	Percentage
Attributes	180	0.817
Gender		
Female	29	16.12%
Male	151	83.88%
Total		100%
Age		
20 a 21	52	28,88%
21 a 22	128	71,12%
Total		100%
Geographic Regions	Madrid (Spain)	
Instrument used for data collection	Survey and Web survey	
Date	December and January 2022	
Data processing	Smartpls 3.3.3	

Table 2 Cronbach's alpha coefficients, Rho_A, construct reliability, and average variance extracted

	Cronbach's alpha	Rho_A	Composite reliability	Average variance extracted (AVE)
PEOU	0.796	0.817	0.868	0.625
RELATION	0.817	0.819	0.879	0.646
PS	0.888	0.902	0.914	0.639
PU	0.857	0.857	0.894	0.583
SAFA	0.874	0.876	0.941	0.888
COMMUNIC	0.882	0.885	0.914	0.682

Table 3 Discriminant validity matrix (Heterotrait-monotrait ratio criterion)

	Easy to use (PEOU)	Relation (REL)	Satisfac (PS)	Usefulness (PU)	Stud. approval(SAFA)	Communic (COM)
PEOU						
Relation	0.450					
PS	0.696	0.635				
PU	0.739	0.532	0.816			
SAFA	0.676	0.410	0.565	0.593		
Communic	0.307	0.804	0.448	0.406	0.276	

except for the COM_PSOL_3 item, although it is very close and has been included. Therefore, according to (Carmines & Zeller, 1979), the individual item reliability is adequate since the values are more than 0.707.

Cronbach's alpha values were above 0.70 (Nunnally & Bernstein, 1994), which proofs simple reliability of the measurement scales. Regarding the composite reliability, all the indicator values are shown to be greater than 0.7 (Werts et al., 1974), so high level of internal consistency reliability has been demonstrated among latent variables. In the analysis of variance, all the values for the average variance extract (AVE) were above 0.50 (Fornell & Larcker, 1981), exceeding the minimum acceptable values for validity (Table 2).

Discriminant validity measures using the Fornell & Larcker, (1981) criterion were applied. The value is higher than other correlation values between latent variables, indicating acceptable discriminant validity of the measurements. On the other hand, as shown in Table 3, the discriminant validity measures using the heterotrait-multitrait (HTMT) method (Henseler et al., 2015) indicate the mean of the heterotrait-heteromethod correlations relative to the geometric mean of the average monotrait-heteromethod correlation of both variables. A conservative criterion of 0.85 has been used, which is associated with sensitivity levels of 95% or over. With construct correlations of 0.70, the specificity rates for HTMT 0.85 are near to 100%. The HTMT ratio for Perceived Usefulness (PU) and Satisfaction (PS), at 0.816, was below the 0.85 cut-off, and substantially below the 0.95 cut-off recommended for conceptually close constructs (Henseler et al., 2015). This provides good support for

Table 4 Structural model results

	Rsquare	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics |O/STDEV|	*P* Values	Q^2
PEOU	0.132	0.144	0.060	2.206	0.014	0.073
Relation	0.481	0.487	0.056	8.626	0.000	0.306
PS	0.616	0.623	0.062	9.997	0.000	0.376
PU	0.439	0.449	0.069	6.354	0.000	0.243
SAFA	0.384	0.394	0.073	5.267	0.000	0.326

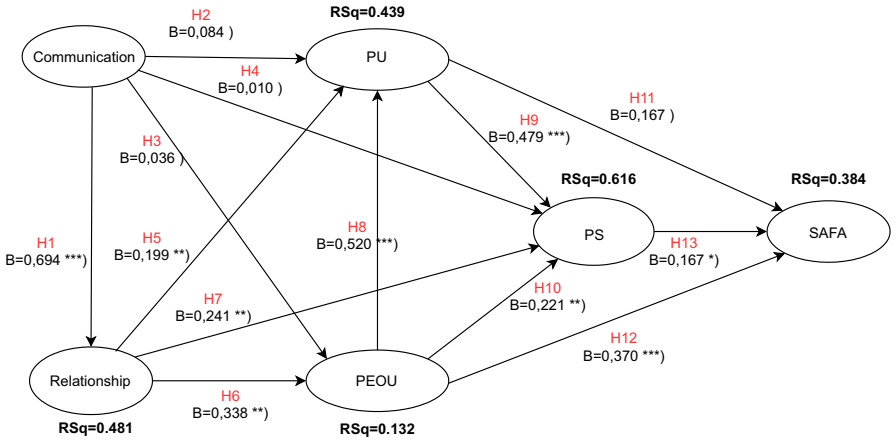

Fig. 3 Results of testing the model significance * $P<0.05$, ** $P<0.01$, *** $P<0.001$

our claims of discriminant validity between measures of Perceived Usefulness (PU) and Satisfaction (PS).

5.2 Structural model analysis

Chin, (1998) confirms how PLS program can generate T-statistics for significance testing of both the inner and outer model, using the procedure called bootstrapping. Many subsamples (5000) are considered from the original sample with replacement to give bootstrap standard errors, which in turn gives approximate T-values for significance testing of the structural path.

After the bootstrapping procedure was completed, the results were as follows: All the R^2 (R-squared) values range from 0 to 1 (Table 4). The higher the value, the more predictive capacity the model has for that variable. Because R^2 should be high enough for the model to reach a minimum level of explanatory power, the R^2 values are greater than 0.10 with a significance of $t>1.64$ (Falk & Miller, 1992).

Figure 3 and Table 4 show the variance explained R^2, in the dependent constructs and the path coefficients for the model. They are not less than 0.10, indicating that the independent explanatory variables are adequate.

The hypothesized relationships between constructs are estimated by standardized regression coefficients. So, the algebraic sign will be analyzed, if there is change of sign; the magnitude and statistical significance (T statistics) is greater of 1.64 (t (4999), one-tailed test). After, the hypotheses were checked and validated. Relationships were positive, mostly with high significance as shown in Table 5.

However, when percentile bootstrap is applied to generate a 95% confidence interval using 5,000 resamples, H2, H3, H4, and H11 are not supported because their confidence interval includes zero (Table 5). The rest of hypotheses are validated. All these results complete a basic analysis of PLS-SEM in our research. PLS-SEM results are shown in Fig. 3.

Finally, Table 6 shows the amount of variance that each antecedent variable explains on each endogenous construct. R^2 were greater than 0.384 for almost all values except PEOU which was 0.132 but greater than 0.1. Moreover, all values of Q^2 were greater than 0.073, it means what cross-validated redundancy measures show that the theoretical/structural model has a predictive relevance ($Q^2 > 0$).

Derived from the results obtained, and as can be seen in Fig. 3, RC influences, through relationships, on the perception that the resources employed in formative assessment are perceived as useful (H5) and easy to use (H6). Despite the absence of a direct impact of communication (H2, H3), its indirect effect is clear as it significantly influences relationships (H1). Therefore, this address the first research question, RQ1.

Additionally, in Fig. 3, it is evident that RC influences students' satisfaction with the formative assessment process, addressing the second research question, RQ2. So, relationships exert a significant impact on student satisfaction (H7). Once again, while communication does not seem to have a direct effect (H4), it does have an

Table 5 Structural model results. Path significance using percentile bootstrap 95% confidence interval ($n = 5{,}000$ subsamples)

Hyp	Results	Influence	SPC	Samp Mean (M)	Stand. Dev (STDEV)	T Statist |O/STDEV|	P Val	±ch
H1	Accepted (***)	COM—> REL	0.694	0.697	0.040	17.232	0.000	No
H2	No Accepted	COM—> PU	0.084	0.084	0.072	1.165	0.122	Si
H3	No Accepted	COM—> PEOU	0.036	0.036	0.088	0.408	0.342	Si
H4	No Accepted	COM—> PS	0.010	0.006	0.068	0.143	0.443	Si
H5	Accepted (**)	REL—> PU	0.199	0.198	0.084	2.378	0.009	No
H6	Accepted (**)	REL—> PEOU	0.338	0.339	0.105	3.224	0.001	No
H7	Accepted (**)	REL—> PS	0.241	0.243	0.079	3.034	0.001	No
H8	Accepted (***)	PEOU—> PU	0.520	0.520	0.057	9.183	0.000	No
H9	Accepted (***)	PU—> PS	0.479	0.478	0.074	6.480	0.000	No
H10	Accepted (**)	PEOU—> PS	0.221	0.221	0.072	3.071	0.001	No
H11	No Accepted	PU—> SAFA	0.167	0.169	0.105	1.591	0.056	Si
H12	Accepted (***)	PEOU—> SAFA	0.370	0.367	0.088	4.195	0.000	No
H13	Accepted (*)	PS—> SAFA	0.167	0.165	0.094	1.772	0.038	No

Note: t (0.05, 4999) = 1.645158499, t (4999, 0.01) = 2.327094067, t (0.001, 4999) = 3.091863446* $P < 0.05$ ** $P < 0.01$ *** $P < 0.001$. ns. No significant based on t (4999), one-tailed test

Table 6 Effects on endogenous variables (extended model)

Depen. Variabl	Rquare	Q^2	Anteced	Path Coeff	Correlation	Explain varianc. (%)
PEOU	0.132	0.073				13.23
			H3: COM	0.036	0.270	0.97
			H6: REL	0.338	0.363	12.26
REL	0.481	0.306				48.16
			H1: COM	0.694	0.694	48.16
PS	0.616	0.376				38.95
			H4: COM	0.010	0.410	0.41
			H7: REL	0.241	0.541	13.03
			H10: PEOU	0.221	0.606	13.39
			H9: PU	0.167	0.726	12.12
PU	0.439	0.243				43.89
			H2: COM	0.084	0.362	3.04
			H5: REL	0.199	0.446	8.87
			H8: PEOU	0.520	0.615	31.98
SAFA	0.384	0.326				38.38
			H11: PU	0.167	0.515	8.60
			H13: PS	0.167	0.512	8.55
			H12: PEOU	0.370	0.574	21.23

indirect impact as it significantly influences relationships (H1). Furthermore, RC also indirectly affects satisfaction, as students' perception of the formative evaluation process as useful and ease of use positively influences their satisfaction (H9 and H10).

Finally, with regards to students' acceptance of formative assessment, specifically the acceptance of self-assessment and peer assessment as valid components for determining the final grade, which was the focus of RQ3, acceptance is primarily explained by the perception of ease of use of formative evaluation (H12) and is also influenced by the perception of satisfaction (H13).

6 Discussion

According to the results, the model proposed for this analysis is fully satisfactory, the relationships between variables were mostly significant and most of the hypotheses were validated. Thus, we can provide answers to each of the research questions.

RQ1: How does relational coordination influence students' perceptions of the tools used in formative assessment, in terms of their usefulness and ease of use?

As shown in Table 5, relationships influence PU with 8.87% (H5) and PEOU with 12.26% (H6) in line with the findings of other authors (Checa et al., 2020; Margalina et al., 2017). Communication has no direct impact on whether students perceive the

tool used in this formative assessment process as useful (PU) H2, as easy to carry out (PEOU) H3. However, it does impact indirectly, since relationships do significantly affect these two factors, so communication (frequent, reliable, timely) has a great impact on quality relationships, as stated by Gittell, (2009), explaining as much as 48.16% H1 in this study.

RQ2. How does relational coordination influence students' satisfaction regard the formative assessment process?

Relationships directly and significantly impact student satisfaction, as stated by Margalina et al., (2017) and Checa et al., (2020), explaining 13.03% (H7). It also indirectly influences through PU 12.12% (H9) and PEOU 13.39% (H10). While, communication would only affect indirectly through the relationship.

RQ3. Do students perceive the grades assigned by themselves and their peers as valid and believe they should be considered in the final grade?

PEOU plays a key role in explaining students' acceptance of formative assessment (SAFA) explaining 21.23% (H12). Also, PU and PS contribute to the explanation of SAFA with 8.6% (H11) and 8.55% (H13) respectively. On the other hand, PEOU affects very significantly PU 31.98% (H8), in line with (Davis, 1989; Venkatesh & Davis, 2000, Estriegana et al., 2019).

The effect of satisfaction in SAFA is, although significant, not very large. This could be because, as stated by Zhou et al., (2020), students are reluctant to use peer-assessment for summative purposes. This is further reinforced by the response to the open question, where, although most of the students consider feedback, self- and peer-assessment as useful and enriching, some of them nevertheless show resistance to the use of peer assessment for summative purposes. This is in line with Dikici, (2009) who found in student interviews that students judged peer-assessment as less trustworthy than instructor assessment.

Concerning the analysis of the validity of the grades assigned by students when compared to those assigned by teachers, like the findings of Wagner et al., (2011), students' self-grades in our study were very similar to those reported by faculty. It is also extracted from the comparison that students were more critical of peers than teachers, with peer-grades being slightly lower overall. This contrast with what was reported by Wagner et al., (2011) and Dikici, (2009) whose results showed the lowest correlation values between instructor and peers, and the highest correlation values between self and peers.

7 Conclusions

Our results indicate the following: Firstly, effective, frequent, and timely communication leads to a strong and significant impact on the improvement of relationships. Secondly, relationships play an important role in ensuring formative assessment process. It is therefore important to consider a relational coordination model in these types of formative evaluation, promoting frequent, accurate and timely problem-solving communication and relationships through shared goals, shared knowledge, and mutual respect. Thirdly, the experience of formative assessment, student

satisfaction and acceptance of the process are also influenced by the use of the web tool and how it is perceived as useful and easy to use.

Other theoretical and practical implications for education drawn from this study are the following: Students seem to be prepared and willing to take part in self- and peer-assessment as part of their learning process. However, some of them prefer to have their classmates'-attributed marks not being considered too important when deciding the final grade. Well-defined assessment criteria and unambiguous quality standards can help in both peer- and self-assessment as well as in teacher assessment, especially with subjectively assessed creative task.

The methodology applied in this study presents some limitations, such as the use of self-reported data, which can have the potential to lead to the common method variance. Moreover, the total variance accounting for the dependent variables is not fully explained. Therefore, in future works it would be interesting to carry out a similar study in other subjects, also including other mediating factors such as the age or gender, which could not be carried out due to the low number of women involved.

Data availability The data that support the findings of this study are available from the corresponding author upon reasonable request.

Declarations

Conflict of interest None.

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