The Quality of Assessment Tasks as a Determinant of Learning

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Learning is not just determined by the curriculum, but by how it is assessed. This article focuses on the analysis of the role played by the quality of assessment tasks on learning in undergraduate courses. During two successive academic years, information was collected on the views of students on the assessment activities and practices that they had experienced in subjects in business and economics with the aim of examining what influenced their perception of assessment tasks. A causal relationship model was developed which included key variables such as participation, self-regulation, learning transfer, strategic learning, feedback, and empowerment (learner control). It was validated using Partial Least Squares Structural Equation Modeling (PLS-SEM). The relationships between assessment task quality and these variables were explored. Feedback, participation, empowerment and self-regulation were identified as mediating effects of the quality of assessment tasks on learning. The results highlight how assessment practices in higher education can be enhanced through improvements in the design of assessment and suggestions are offered on future lines of research that will allow a better understanding of the effectiveness of assessment processes.

Keywords: assessment as learning; empowerment; assessment task; feedback; structural equation modelling

Introduction

When educators design teaching activities, they usually focus on trying to answer questions such as: what do I have to do so that students learn? Or what activities do I have to organise? Biggs and Tang (2011) pointed out that this is quite a different point of view from students, who design their activities on the basis of how they are going to be assessed, so that for the student, activities only make sense if they are consistent with what is going to be assessed and with the way in which it is going to be assessed. Therefore, educators would ease communication and mutual understanding between their intentions and students' expectations if they used the same approach as the students. That is, if they could plan from the perspective of what Wiggins and McTighe (1998) called backward design, making the curriculum design process revolve around what students need to be able to do. Of course, this is only likely to be effective if

assessment itself is well designed.

Designing the assessment process involves making decisions to determine its purposes, what the learning outcomes will be, its context, how feedback will be organised and, of course, what assessment tasks will be undertaken (Bearman et al. 2014, 2016). Assessment tasks are central as it is on those that the learner's performances will be judged. While these judgements will be made formally by assessors, in the overall process of a course they are also made by learners themselves, by their peers or by other agents, and they will be communicated either through oral or written comments and recommendations, or through grades.

Different assessment approaches in higher education such as those developed by Carless (2015) or Sambell, McDowell, and Montgomery (2013) pay particular attention to assessment tasks in order to promote in students deep approaches to learning. On the basis of these previous contributions, Rodríguez-Gómez and Ibarra-Sáiz (2015) made assessment tasks a dynamic starting point for what they term student empowerment, that is, students taking control of their own learning process. However, is assessment task design in itself so decisive? To what extent do students value the usefulness of assessment for their learning? What elements or aspects of the assessment processes and practices are the most differentiating from the learner's perspective? What kinds of assessment practice overall might best facilitate learners' learning?

These questions form the basis of our research, although this paper focuses on answering the first two. Firstly, we analyse whether the quality of the assessment tasks is directly related to students' perceptions of their strategic learning and learning transfer, consequently providing a predictive model of learning based on the interrelationship of a set of variables involved in the assessment process. Secondly, we seek to provide an instrument that facilitates analysis and understanding of learners' perceptions of assessment practices in higher education.

Assessment approach and development of hypotheses
Assessment as Learning and Empowerment
There are several approaches and multiple elements that educators have to consider to design assessment. Each of the existing approaches to assessment in higher education emphasizes some or other of these elements and are based on different theoretical conceptions or practices (McArthur 2018). Thus, for example, Boud and Soler (2016) underline the importance of the longer-term influence of the assessment on the learner; Carless (2015) emphasizes the importance of assessment tasks, the development of self-assessment capacity and student participation in feedback; and Whitelock (2010) emphasizes guidelines for action and the role of technologies in the context of assessment. The theoretical basis of each of these approaches is documented and evidence of their benefits published, but there is little evidence on how students perceive the interactions between the different constituent elements of each of these approaches.

Influenced by the ideas of these authors, Rodríguez-Gómez and Ibarra-Sáiz (2015) developed what they termed the assessment as learning and empowerment approach. This approach identifies three main challenges (student involvement, feedback and task quality) and ten fundamental principles or rules that guide assessment. In addition, their approach provides a set of key statements or declarations that regulate assessment, and actions that help design and implement the assessment.

Research suggests that participation and involvement should be used throughout a course to empower students and thus improve their ability to shape their own learning experiences (Baron and Corbin 2012). On the basis of contributions from Freire (1971,

2012), we conceive empowerment as the chance to encourage discussion, reflection and actions with transformative potential that requires active participation from learners (Fangfang and Hoben 2020). Specifically, from the context of assessment, empowerment is conceived as "learners sharing, if they want, in decisions about assessment" (Leach, Neutze, and Zepke 2001, 293). Empowerment in assessment requires enabling spaces that allow learners, as individuals and as social beings, separately and in groups, to take control and value their work and that of their peers, to debate and criticise the assessment system and to be able to suggest and negotiate different assessment practices.

The design of assessment tasks from the perspective of the assessment as learning and empowerment approach is based on the principles of challenge, reflection and transversality. Conceiving the assessment task as a challenge to students requires assessment tasks to provide opportunities for them to address challenging, motivating realizations that incrementally require their implementation of high-level skills and performances. Assessment based on the principle of reflection means that tasks constitute an activity that encourages reflective, analytical and critical thinking through meaningful activities that make it possible to assess own and others' work and actions, which thus allow judgments to be made. Finally, assessment should be carried out in a coherent, interrelated and integrated manner within the course, programme, subject or theme, avoiding the segmentation and disconnection of learning.

In addition, the assessment as learning and empowerment approach considers assessment tasks as the focal point of a whole series of variables that characterise the wider assessment process. When designing assessment tasks, decisions will be taken on important aspects such as learner participation in the assessment process or how the information from the assessment process will be used, since this will largely determine student's self-regulation of the learning process and, consequently, the transfer of learning beyond the immediate tasks.

Table 1 summarizes each of the constructs that interacting with each other make up this assessment approach. It also highlights key references that have served as the basis for supporting these conceptualizations.

Table 1. Constructs definition

| Construct	Definition	Key References
Learning Transfer	Relating knowledge and experience with other modules and with professional reality using communication strategies and valuable skills within an academic and professional context	Ashwin et al. 2015; Gulikers et al. 2004, 2006; Strijbos, Engels, and Struyven 2015
Strategic Learning	Learning in a way that is autonomous, reflexive and critical both as an individual and in groups	Häkkinen et al. 2017; Nielsen and Nielsen 2015; McDonald et al. 2017

Table 1. Constructs definition

Empowerment	Increasing self-confidence and self-assurance to learn and direct your own learning	Francis 2008; Leach, Neutze, and Zepke 2001; Tan 2012
Self-regulation	Self-generated thoughts, feelings, and actions planned and cyclically adapted to the attainment of personal goals	Hawe and Dixon 2017; Kickert et al. 2019; Panadero et al. 2018
Feedback	The use by students of specific and detailed information from others on the quality of their work to enable improvement	Ajjawi and Boud 2018; Dawson et al. 2019; Henderson, Ryan, and Phillips 2019; Boud and Molloy 2013; Pitt 2017
Participation	Design and wording of assessment criteria and instruments to assess their own work and that of their peers	Falchikov 2005; Ibarra-Sáiz and Rodríguez-Gómez 2014; Hortigüela Alcalá, Palacios Picos, and Pastor López 2019; Panadero and Alqassab 2019
Assessment Task Quality	Assessment tasks that are rigorous, credible, interesting which promote worthwhile student learning	Alkharusi et al. 2014; Carless, Bridges, Chan and Glofcheski 2017; Sadler 2016

Research model and hypotheses

The model to be tested proposes that the students' perceptions of transfer of learning, that is application beyond the immediate task or course context, is determined by strategic learning which, in turn, is determined by feedback, participation, self-regulation and empowerment, all these variables being dependent on the quality of the assessment tasks. Figure 1 illustrates this model indicating in each case the relationships between all constructs.

Figure 1. Model for testing drivers of assessment as learning and empowerment.

Assessment as Learning and Empowerment
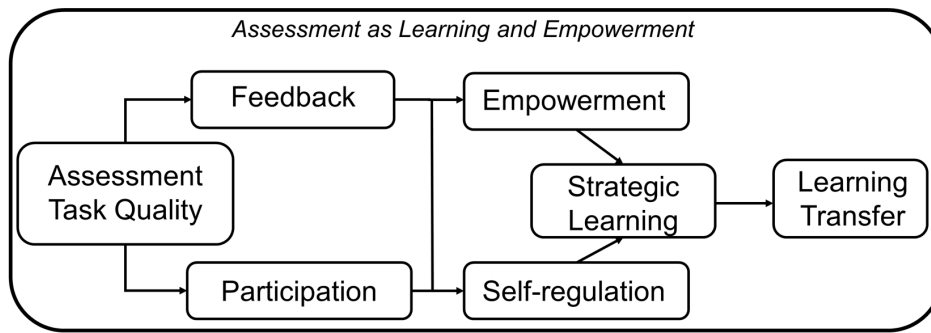
On the basis of this theoretical model and the contributions presented above, the following hypotheses are proposed:

H1: Learning transfer is expected to be positively related to empowerment (H1a), self-regulation (H1b) and strategic learning (H1c).

H2: Strategic learning is expected to be positively related to empowerment (H2a), feedback (H2b), participation (H2c) and self-regulation (H2d).

H3: Empowerment is expected to be positively related to feedback (H3a), assessment task quality (H3b) and participation (H3c).

H4: Self-regulation is expected to be positively related to feedback (H3a), assessment task quality (H4b) and participation (H4c).

H5: Assessment task quality is expected to be positively related to feedback (H5a) and participation (H5b).
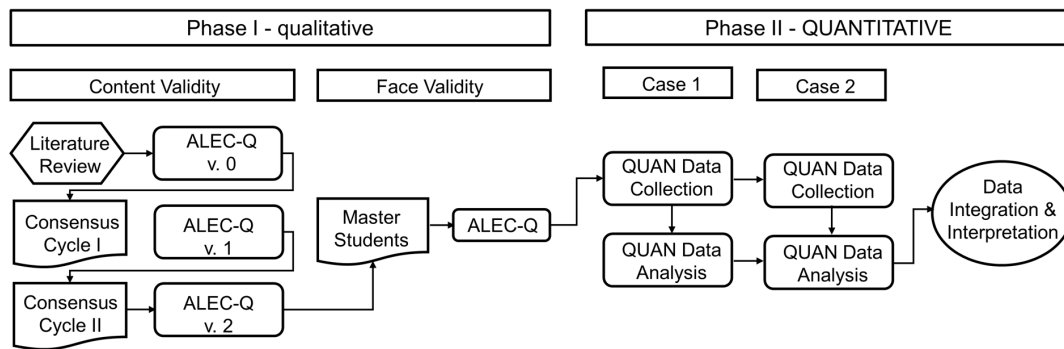
H6: The relationship between assessment task quality and strategic learning is expected to be mediated by feedback (H6a), participation (H6b), empowerment (H6c) and self-regulation (H6d).

H7: The relationship between assessment task quality and learning transfer is expected to be mediated by feedback (H7a), participation (H7b), empowerment (H7c) and self-regulation (H7d).

Methodology
To carry out this study, a mixed methodology was employed, using an exploratory sequential design (qual-> QUAN) (Creswell 2015) in which the emphasis is placed on the quantitative phase (Figure 2). In the first phase of the research, the design and validation of the ALEC_Q-*Assessment as Learning and Empowerment Climate Questionnaire* (Online Resource 1) was carried out. In the second phase we proceeded, through the application of questionnaires, to obtain the opinion of 769 university students who were studying different subjects on the final year of degrees in Business Administration and Management in a Spanish university.

Figure 2. Exploratory Sequential Design.


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│      Phase I - qualitative      │  │     Phase II - QUANTITATIVE     │
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│  Content Validity │ │Face Validity│  │  Case 1  │  │  Case 2  │
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 Literature    ALEC-Q                  QUAN Data    QUAN Data    Data
  Review       v. 0                    Collection   Collection   Integration &
                                                                 Interpretation
 Consensus     ALEC-Q    Master ALEC-Q  QUAN Data    QUAN Data
  Cycle I      v. 1     Students        Analysis     Analysis

 Consensus     ALEC-Q
  Cycle II     v. 2
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Each of the four subjects organised assessment differently, which we can group them around three different assessment styles. The first subject was characterised by summative assessment, based essentially on the results of a final test. Two other subjects included a formative assessment, in which continuous assessments were carried out during the course and students received feedback information on their performance. The final subject was characterized by the participatory nature of the assessment that was carried out, since it used self-assessment and peer assessment formatively in the different assessment tasks during the course.

Data collection was done at the end of the first semester during the academic years 2017/18 (Case 1) and 2018/19 (Case 2). By answering the questionnaires at the end of the semester, students were aware of everything about the assessment process they had followed and could therefore give their opinion on their experience of it.

The perception questionnaire ALEC_Q

The constructs and measurement indicators of the ALEC_Q questionnaire were developed based on a review of the literature and, subsequently, a validation process was carried out by experts (Figure 2). Different methods used for content validation were reviewed by expert judges (Johnson and Morgan 2016) and the group consensus method was used to avoid employing voting systems. The definition of the constructs was revised at the end of each of the cycles and the indicators were specified during the discussion process. Finally, in order to analyse the apparent validity, the questionnaire was presented to a group of Master students so that it could be improved in terms of clarity and ease of understanding.

The questionnaire was structured in seven dimensions (Table 2) and consisted of 40 items in a Likert scale format (0-10) distributed in each of the dimensions. It was administered in Spanish. The completion of the questionnaire required about 15-20 minutes.

Table 2. ALEC_Q Questionnaire Structure

Dimension		# Items
TASK	Assessment Task Quality	6
SELF	Self-regulation	5
PART	Participation	7
FEED	Feedback	6
EMPO	Empowerment	5
STLEA	Strategic Learning	6
TRANS	Learning Transfer	5

It is important to emphasize that, from the beginning of this research, a model of measurement of a formative nature was chosen, since each of the indicators that constituted the different constructs are not interchangeable with each other, but each of them captures a specific aspect of the domain of the construct. As Coltman, Devinney, Midgley, and Venaik (2008) point out, it is vital that the explicit justification of the choice of a formative or reflective model is based on theoretical arguments and that it can be empirically tested. This is to avoid simplification in the measurement of constructs and to increase the rigor of the theory and its relevance for decision making.

Participants

Five experts in assessment and a total of 15 Master students participated in the qualitative phase of the study. In the quantitative phase, a total of 769 questionnaires were collected, of which 55.9% corresponded to women and 44.1% to men (Table 3). The students expressed their views on the activities and the assessment process that had been followed in the subjects they were studying in their final year. The assessment processes and activities of four different subjects were evaluated - Human Resources Management (HR), Operations Management (OP), Project Management (PM) and Market Research (MR) -, all taught in the fourth year of the Business Administration and Management (ADE) degree at the University of Cadiz, Spain.

Table 3. Demographic characteristics

Subject	Female		Male		Total	
	n	%	n	%	n	%
HR	149	58.4	106	41.6	255	33.2
OP	83	58.0	60	42.0	143	18.6
PM	88	52.1	81	47.9	169	21.9
MR	110	54.5	92	45.5	202	26.3
Total	430	55.9	339	44.1	769	100

Data Analysis

In this study, the Partial Least Squares Structural Equation Modeling (PLS-SEM) method and the statistical software SmartPLS 3 (Ringle, Wende, and Becker 2015) were used to estimate the model. In order to confirm the nature of the constructs a Confirmatory Tetrad Analysis (CTA-PLS) was employed.

Results

Evaluation of the measurement model

Initially, to empirically verify the formative nature of the constructs, a CTA-PLS was carried out. (Online Resource 2). The convergent validity analysis was carried out through an analysis of the redundancy for each of the constructs. In all cases, path coefficients above the established minimum of 0.70 were obtained (Hair et al. 2017), so the convergent validity of the formative constructs is supported (Online Resource 3).

The results obtained from Variance Inflation Factor (VIF) allow us to conclude that collinearity does not reach critical levels in any of the formative constructs and is not an issue for the estimation of the PLS path model (threshold value of 5). When analysing the significance and relevance of the indicators, some were found whose weight (W) was not statistically significant, but instead had loads (L) greater than 0.5, so according to the rules of thumb expressed by Hair et al. (2017) all indicators were maintained (Online Resource 4).

Evaluation of the structural model

Collinearity among the predictor constructs in not a critical issue in the structural model. In fact, Variance Inflation Factor (VIF) values are clearly below the threshold of 5 (Online Resource 5).

According to the guidelines offered by Hair et al. (2017) a consistent bootstrapping (5,000 resamples) was carried out to check the statistical significance of the path coefficients (*t*-statistics and confidence intervals). Table 4 shows the statistical results that support hypotheses H1, H2, H3, H4 and H5 (p<.001), although in the case of hypothesis H3c with a significance level p<.10.

The results presented in Table 4 indicate that the effect sizes (f^2) of the quality of the assessment task on feedback and empowerment , as well as of empowerment on strategic learning are high ($f^2 \geq .35$). Medium level effect sizes ($f^2 \geq .15$) are found for the effect of the quality of the assessment task on participation (.287), of empowerment on the transfer of learning and of feedback on empowerment . In the remaining cases the effect sizes are small ($f^2 \leq .02$).

We can analyse the predictive power of the model through the analysis of the coefficient of determination (R^2). Thus, as shown in Figure 3, it is evident how 73.8% of the variance (R^2) of the learning transfer construct is directly explained by the constructs empowerment , strategic learning and self-regulation and, indirectly, by the quality of tasks , feedback and participation constructs. The strongest effect on transfer is exerted by the empowerment construct , followed by self-regulation and strategic learning . The variance of the strategic learning construct is explained 76.3% by the constructs empowerment , feedback , self-regulation and participation , to which the indirect effect of the quality of the assessment task must be added. Overall, the results indicate the strong predictive power of the model, since the coefficients of strategic learning determination and transfer of learning are greater than 0.70. Furthermore, our research model achieves a SRMR of 0.05, which means an appropriate fit taking the usual cut-off of 0.08 into account.
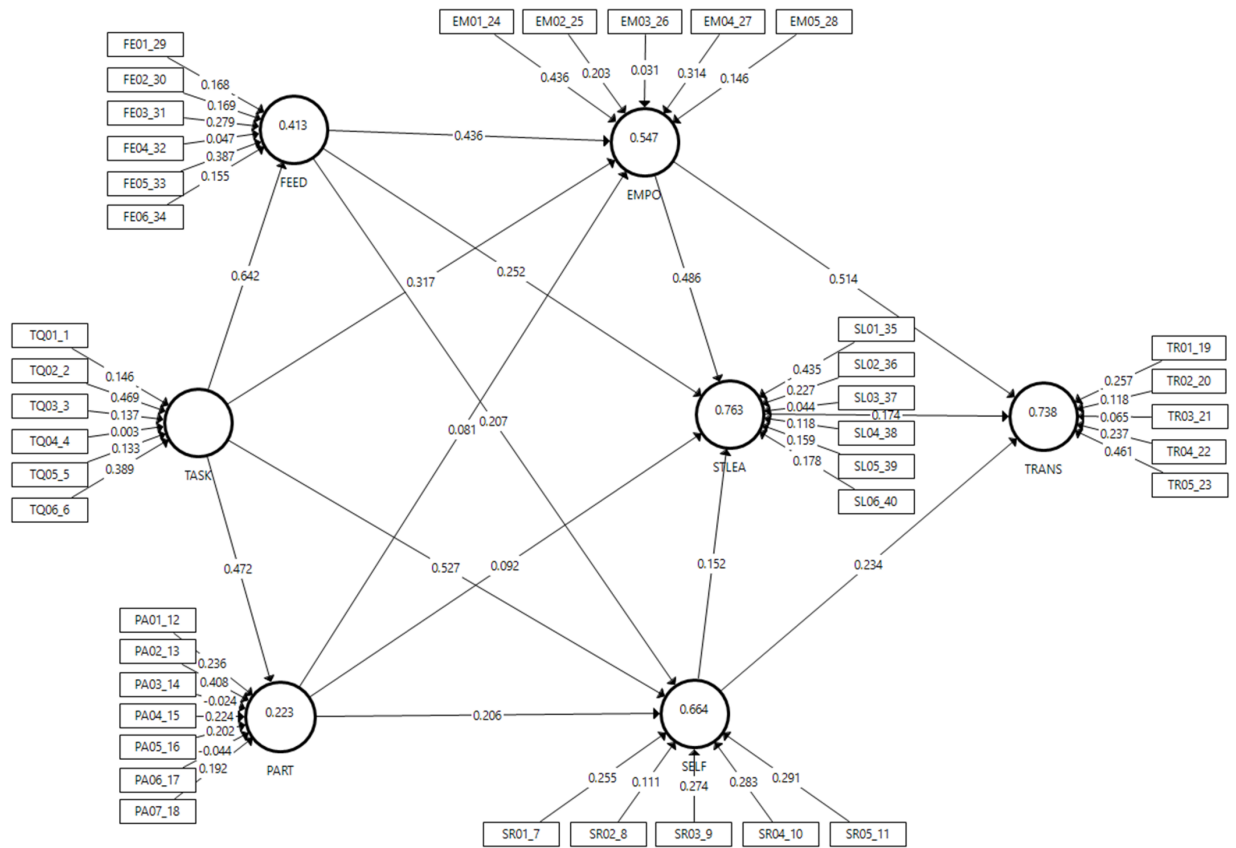
Figure 3. Structural model results.

Table 4. Structural model results using *t* values and percentile bootstrap 95% confidence interval (n=5,000 subsamples)

Relationship	Path Coefficients					Effect Size					Hypothesis
	Path(*)	CI Low	CI Up	*t*	*p*	f^2(+)	CI Low	CI Up	*t*	*p*	
EMPO->TRANS	0.514	0.415	0.613	10.180	0.000	0.278	0.177	0.425	4.412	0.000	H1a
SELF->TRANS	0.234	0.153	0.314	5.735	0.000	0.080	0.033	0.151	2.633	0.008	H1b
STLEA->TRANS	0.174	0.077	0.271	3.510	0.000	0.033	0.006	0.083	1.616	0.106	H1c
EMPO->STLEA	0.486	0.407	0.562	12.298	0.000	0.370	0.245	0.526	5.119	0.000	H2a
FEED->STLEA	0.252	0.179	0.330	6.521	0.000	0.096	0.048	0.168	3.109	0.002	H2b
PART->STLEA	0.092	0.034	0.150	3.153	0.002	0.018	0.003	0.047	1.542	0.123	H2c
SELF->STLEA	0.152	0.073	0.233	3.651	0.000	0.035	0.008	0.085	1.729	0.084	H2d
FEED->EMPO	0.436	0.314	0.550	7.199	0.000	0.166	0.083	0.293	3.113	0.002	H3a
TASK->EMPO	0.317	0.230	0.405	6.963	0.000	0.130	0.067	0.219	3.315	0.001	H3b
PART->EMPO	0.081	0.002	0.167	1.930	0.054	0.008	0.000	0.033	0.839	0.402	H3c
TASK->SELF	0.527	0.448	0.599	13.780	0.000	0.484	0.330	0.677	5.422	0.000	H4a
PART->SELF	0.206	0.138	0.283	5.535	0.000	0.066	0.030	0.126	2.726	0.006	H4b
FEED->SELF	0.207	0.105	0.309	4.016	0.000	0.050	0.013	0.122	1.824	0.068	H4c
TASK->FEED	0.642	0.600	0.692	27.350	0.000	0.703	0.562	0.917	7.726	0.000	H5a
TASK->PART	0.472	0.417	0.542	14.578	0.000	0.287	0.210	0.415	5.387	0.000	H5b

(*) 0.75 substantial/0.50 moderate/0.25 weak / (+) 0.35 large/0.15 medium/0.02 small

In order to assess the predictive relevance of the path model it is necessary to focus on the Construct Cross-validated Redundancy estimates (Online Resource 6). All Q^2 values for endogenous constructs are significantly above zero. More precisely, strategic-learning has the highest Q^2 value (0.499), followed by learning transfer , self-regulation , empowerment , feedback and, finally, participation . These results provide clear support for the model's predictive relevance regarding the endogenous latent variables.

Regarding the effect sizes (q^2), a medium value is reached in the case of the effect of feedback on participation and a low value in the case of feedback on empowerment and strategic learning , and empowerment on strategic learning and transfer of learning .

Mediation analysis

As illustrated in Figure 1, this study presents a multiple mediation model in which the relationship between the quality of assessment tasks, strategic learning and the transfer of learning is mediated by several variables simultaneously. The analysis of multiple mediation allows all mediators to be considered at the same time in one model (Hair et al. 2017), so we can achieve a better representation of the mechanisms through which an exogenous construct (quality of assessment tasks) affects an endogenous construct (strategic learning, transfer of learning).

To test the mediation hypotheses (H6-H7) the analytical approach proposed by Nitzl, Roldán, and Cepeda (2016) was employed. To test the indirect effects, following the proposals of Willians and MacKinnon (2008), the bootstrapping procedure was implemented.

Our study aims to analyse, in the first place, the mediating effect that the variables feedback, empowerment, participation and self-regulation exert in the relationship between the quality of assessment tasks and strategic learning (H6). The results of this relationship (Online resource 7) confirm that the total indirect effect of the quality of assessment tasks on strategic learning is 0.630 (t=28.668, p<.01). When analysing the specific indirect effects, we demonstrate that the relationship between the quality of the assessment task and the strategic learning is mediated by feedback (H6a), both in simple mediation (TASK->FEED->STLEA, t=6.161, p<.01) and through multiple mediation (TASK->FEED->EMPO->STLEA, t=6.090, p<.01; TASK->FEED->SELF->STLEA, t=0.020, p<.01). The mediation produced by participation (H6b) is significant, although in this case multiple mediation is significant at 10% (TASK->PART->EMPO->STLEA, t=0.019, p<.10). Likewise, in the case of self-regulation (H6c) we can confirm its direct mediating character (TASK->SELF->STLEA, t=0.154, p <.01), or multiple character in combination with participation or feedback. Finally, the mediation of empowerment (H6d) is confirmed, both directly and in combination with participation and feedback.

To analyse the strength of mediation, the variance accounted for (VAF) has been calculated, as suggested by Cepeda, Nitzl, and Roldán (2017). We note that the effect of feedback represents 25.70% of the total effect of the assessment task on strategic learning, in the case of empowerment it represents 24.48%, 12.72% for self-regulation and 6.93% for participation.

Secondly, we consider the analysis of the mediating effect of feedback, participation, empowerment and self-regulation on the relationship between the quality of the assessment task and the transfer of learning (H7) (see, Online resource 8). The total indirect effect of the assessment task on learning transfer is 0.613 (t= 4.784,

p<.01). Analysis of the specific indirect effects shows that the relationship between the quality of the assessment task and the transfer of learning is mediated by feedback (H7a) and all cases of multiple mediation are significant, although the one with the highest effect is that established by multiple mediation in conjunction with empowerment (0.144), which represents 23.46% of the total indirect effects. This relationship between the quality of the assessment task and the transfer of learning is also mediated by empowerment (H6c), with a strength of 26.57%, and self-regulation (H6d), with a strength of 20.12%. In the case of mediation affected by participation (H6b) we can point out that its strength is reduced since, at best, its strength is 3.71%.

Discussion

This study aimed, firstly, to analyse if students' perceptions of the quality of assessment tasks is related with learning transfer (incorporating knowledge and experience from other subjects, modules or real world; using different communication strategies; using useful strategies for academic and professional contexts) and to verify the interrelationships between the set of variables that characterize assessment as learning and empowerment. Secondly, it was intended to offer an instrument that enabled analysis of the perceptions of university students on assessment practices. The results obtained in this study suggest a series of implications and, in turn, allow us to consider future lines of research.

Theoretical implications

One of the main contributions of this work is the confirmation of a model that establishes the relationship between the set of variables that characterize assessment as learning and empowerment. The results obtained show that the hypothesized model can predict a large part of the relationships between the variables involved and show, on the one hand, that the perceived quality of the assessment tasks is directly related to feedback and participation and, on the other, the mediating role of feedback, participation, empowerment and self-regulation in the context of assessment processes.

The hypothesis which asserts the relationship between empowerment, self-regulation and strategic learning with the transfer of learning (H1) has been confirmed. Likewise, the positive relationship between empowerment, feedback, participation and self-regulation with strategic learning (H2) has also been proven. Similarly, there is clear evidence of the positive relationship of empowerment with feedback and the quality of assessment tasks (H3), the relationship between the quality of assessment tasks and participation with self-regulation (H4) and the relationship between the quality of assessment tasks with feedback and participation (H5). Finally, the hypotheses concerning the mediation character exerted by feedback, empowerment, participation and self-regulation (H6 and H7) have been tested.

In line with the contributions of Carless et al. (2017), Gore et al. (2009), Ibarra-Sáiz, Rodríguez-Gómez and Boud (2020), Kyndt et al. (2011) and Sadler (2016) the results of this study show how students perceive the relevance and importance of the design of assessment tasks. They want them to be challenging, eminently practical and connected with professional reality and be such that they can demonstrate a deep understanding of fundamental concepts and ideas that require them to produce complex outputs.

Limitations and future research

From a methodological perspective, this research suffers from certain limitations that may lead to suggestions for future research. First, it is a study carried out within a specific context and based on the perception of students attending the final year of their degree in the field of Economic and Business Sciences. This fact makes it difficult to generalize the results to other contexts within higher education. Secondly, it is research carried out on the basis of a mixed design in which the degree of control over the intervening variables is reduced so, according to Stone-Romero and Rosopa (2008), the inferences that can be taken from the mediation model are limited. Finally, the measuring instrument is based on the perception of the students themselves, an aspect that could be improved through the use of complementary or alternative measuring instruments.

In this paper, results have been presented from a global perspective, but deeper and more detailed analysis would be interesting regarding the possible differences in students' perceptions of the different assessment systems they evaluated. For example, analysing what are the differences that students manifest when they value different processes and assessment activities. This analysis, which could be enriched with qualitative techniques, would allow a greater understanding of the assessment processes, investigating the active role of students.

Finally, as a line of future research, a need has been revealed to review and update the constructs that have been considered in this research and their interrelations, incorporating aspects that will be of great importance in the near future, such as the development of evaluative judgement (Boud 2020), a deeper understanding of the role of feedback or of the nature of assessment tasks (Ibarra-Sáiz and Rodríguez-Gómez 2020). In any case, this necessary, in-depth analysis will have to be carried out from an approach based on considering the student as a learner, in a context promoting empowerment, where he or she plays an active part in the assessment decision-making process.

Conclusion

Through this study the relationship between the constructs that make up the approach of assessment as learning and empowerment and the importance of the design of the assessment tasks has been confirmed. An instrument has been provided that can facilitate replication in other contexts and future lines of research have been proposed, through which assessment and learning in higher education could be improved.

On the basis of the results presented, there is a clear need to emphasise and facilitate the role of educators as designers of challenging, rigorous, realistic, transversal and useful assessment tasks for learning. As Rodríguez-Gómez and Ibarra-Sáiz (2015) have pointed out, the challenge of designing assessment tasks that are challenging and meaningful for students and that provoke their high-level reflective, analytical and critical thinking requires a change in the mentality of both educators and students. The study of Ibarra-Sáiz and Rodríguez-Gómez (2020) as well the review of Pereira, Flores and Niklasson (2016) and the challenges of Boud (2020) on key aspects of assessment in higher education is encouraging in this regard, as it provides an indicator of the changes that are taking place in assessment practices and the evolution towards an approach more focused on the student (learner-centred approach), but as we have seen in this study, it is necessary to continue deepening our knowledge of assessment practices in which student learning is the centre of attention and of the changes required at micro (classroom), meso (curriculum) or macro levels (university).

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Online Resource 1:

ALEC_Q Questionnaire Structure

DIMENSIONS	#	ITEMS
Assessment Task Quality (TASK)	TQ01_1	I've been given written guidance and guidelines which have helped me undertake the assessment tasks
	TQ02_2	In the assessment tasks I've been able to demonstrate my learning and deep understanding of key concepts and ideas
	TQ03_3	The assessment tasks have been intellectually challenging
	TQ04_4	The assessment tasks have been related to reality
	TQ05_5	The assessment tasks have been practical
	TQ06_6	The assessment tasks have required me to produce complex outputs (projects, essays, presentations, debates, etc.)
Self-regulation (SELF)	SR01_7	The guidelines provided by tutors have helped me organise my work, processes and activities and enabled me to respond to the assessment tasks in a way consistent with my own preferred working style
	SR02_8	The assessment tasks have helped me reflect on my strengths, weaknesses and the threats and opportunities in my learning and development
	SR03_9	The assessment tasks have required me to take decisions, find solutions and identify my own perspectives and alternatives
	SR04_10	The assessments have helped me change my learning style and undertake tasks to adapt myself to their requirements
	SR05_11	I've been able to choose the tasks or activities (projects, essays, presentations, debates, reports, etc.) which will be used in the assessment (for example choosing the topic, presentation methods, resources, etc.)
Participation (PART)	PA01_12	I've been able to self-assess my work, activities and practicals
	PA02_13	I've been able to review and assess the work, activities and practicals of my peers
	PA03_14	I've been involved in identifying and selecting the assessment criteria
	PA04_15	I've been involved in the design of the assessment instruments (proposals for what to assess, the instruments such as scales or rubrics, formulating questions, etc.)
	PA05_16	I've been able to agree the timescale for undertaking the assessment tasks or practicals and their hand-in dates
	PA06_17	I've been involved in determining the final marks for the assessment tasks (agreeing the marks with tutors, reviewing the assessments, etc.)
	PA07_18	My peers and I have been able to discuss the assessment process and our suggestions have been taken into account
Learning Transfer (TRANS)	TR01_19	I've been able to incorporate knowledge and experience from other subjects and modules
	TR02_20	I've been able to incorporate knowledge and experience from the real world
	TR03_21	I've used different written and oral communication strategies (presentations, essays, debates, explanations, reports, etc.) which are relevant and useful in both academic and professional contexts
	TR04_22	I've been able to experience and develop a range of skills and abilities which are useful in both academic and professional contexts

DIMENSIONS	#	ITEMS
	TR05_23	I've employed strategies and competences that are useful to undertake professional challenges
Empowerment (EMPO)	EM01_24	I've been able to strengthen my skills and competences
	EM02_25	I've been able to enhance my problem-solving skills
	EM03_26	I've increased my self-confidence
	EM04_27	I've increased my capacity to learn and develop as a person
	EM05_28	I've expanded my ability for self-determination within my academic and extra-academic life
Feedback (FEED)	FE01_29	Tutors have reviewed my work and activities and provided feedback to help me learn and improve
	FE02_30	The review by my peers of my work and activities has helped me improve my work and my learning
	FE03_31	I've received information from my tutors and peers that has helped my progress and results
	FE04_32	I've had access to all the assessment instruments (marking criteria, rubrics, etc.) before undertaking the assessments and this has been very valuable
	FE04_33	The mistakes my peers and I have made have helped me improve my work and learning
	FE04_34	I've marked my own work and my peers' work using the assessment criteria and guidelines, which were available in advance
Strategic Learning (STLEA)	SL01_35	I've significantly improved my capacity for reflexion
	SL02_36	I've been able to undertake my assessment tasks in original and innovative ways
	SL03_37	I've developed my critical abilities
	SL04_38	I've worked and contributed in teams to produce joint outcomes
	SL05_39	I've developed my analytical skills
	SL06_40	I've improved my autonomous and independent working skills

ALEC_Q - Assessment as Learning and Empowerment Climate Questionnaire

Before completing the questionnaire please answer the following questions:

1 – **Which degree** course are you studying: _____

2 – **What year** are you in: 1st   2nd   3rd   4th

3 – **Subject/Module**: _____

4 – **Are you re-taking this Subject/Module?   No   Yes**

5 – **Gender:**   Female   Male

6 – On a **Scale** of **0** (Very low) to **10** (Very high) **What is the level of difficulty of this Subject/Module for you?** _____

7 - **What final mark do you expect you will get for this Subject/Module?** (Choose one of the following)

Fail   Bare Pass   Pass   Good   Above average   Excellent

Below are a number of statements about the assessment for this Subject based on the assessment tasks you have undertaken. **Indicate to what extent you agree** with each statement indicating with a CROSS (X) on the scale at the end from **0** (**Completely disagree**) to **10** (**Completely agree**) or **NA** if it is not applicable.

In the assessment tasks for this subject…

		NA	DISAGREE		AGREE
01	I've been given written guidance and guidelines which have helped me undertake the assessment tasks	NA	0 1 2 3	4 5 6	7 8 9 10
02	In the assessment tasks I've been able to demonstrate my learning and deep understanding of key concepts and ideas	NA	0 1 2 3	4 5 6	7 8 9 10
03	The assessment tasks have been intellectually challenging	NA	0 1 2 3	4 5 6	7 8 9 10
04	The assessment tasks have been related to reality	NA	0 1 2 3	4 5 6	7 8 9 10
05	The assessment tasks have been practical	NA	0 1 2 3	4 5 6	7 8 9 10
06	The assessment tasks have required me to produce complex outputs (projects, essays, presentations, debates, etc.)	NA	0 1 2 3	4 5 6	7 8 9 10
07	The guidelines provided by tutors have helped me organise my work, processes and activities and enabled me to respond to the assessment tasks in a way consistent with my own preferred working style	NA	0 1 2 3	4 5 6	7 8 9 10
08	The assessment tasks have helped me reflect on my strengths, weaknesses and the threats and opportunities in my learning and development	NA	0 1 2 3	4 5 6	7 8 9 10
09	The assessment tasks have required me to take decisions, find solutions and identify my own perspectives and alternatives	NA	0 1 2 3	4 5 6	7 8 9 10
10	The assessments have helped me change my learning style and undertake tasks to adapt myself to their requirements	NA	0 1 2 3	4 5 6	7 8 9 10
11	I've been able to choose the tasks or activities (projects, essays, presentations, debates, reports, etc.) which will be used in the assessment (for example choosing the topic, presentation methods, resources, etc.)	NA	0 1 2 3	4 5 6	7 8 9 10
12	I've been able to self-assess my work, activities and practicals	NA	0 1 2 3	4 5 6	7 8 9 10
13	I've been able to review and assess the work, activities and practicals of my peers	NA	0 1 2 3	4 5 6	7 8 9 10
14	I've been involved in identifying and selecting the assessment criteria	NA	0 1 2 3	4 5 6	7 8 9 10

#	Statement		Scale											
15	I've been involved in the design of the assessment instruments (proposals for what to assess, the instruments such as scales or rubrics, formulating questions, etc.)	NP	0	1	2	3	4	5	6	7	8	9	10
16	I've been able to agree the timescale for undertaking the assessment tasks or practicals and their hand-in dates	NA	0	1	2	3	4	5	6	7	8	9	10
17	I've been involved in determining the final marks for the assessment tasks (agreeing the marks with tutors, reviewing the assessments, etc.)	NA	0	1	2	3	4	5	6	7	8	9	10
18	My peers and I have been able to discuss the assessment process and our suggestions have been taken into account	NA	0	1	2	3	4	5	6	7	8	9	10
19	I've been able to incorporate knowledge and experience from other subjects and modules	NA	0	1	2	3	4	5	6	7	8	9	10
20	I've been able to incorporate knowledge and experience from the real world	NA	0	1	2	3	4	5	6	7	8	9	10
21	I've used different written and oral communication strategies (presentations, essays, debates, explanations, reports, etc.) which are relevant and useful in both academic and professional contexts	NA	0	1	2	3	4	5	6	7	8	9	10
22	I've been able to experience and develop a range of skills and abilities which are useful in both academic and professional contexts	NA	0	1	2	3	4	5	6	7	8	9	10
23	I've employed strategies and competences that are useful to undertake professional challenges	NA	0	1	2	3	4	5	6	7	8	9	10
24	I've been able to strengthen my skills and competences	NA	0	1	2	3	4	5	6	7	8	9	10
25	I've been able to enhance my problem-solving skills	NA	0	1	2	3	4	5	6	7	8	9	10
26	I've increased my self-confidence	NA	0	1	2	3	4	5	6	7	8	9	10
27	I've increased my capacity to learn and develop as a person	NA	0	1	2	3	4	5	6	7	8	9	10
28	I've expanded my ability for self-determination within my academic and extra-academic life	NA	0	1	2	3	4	5	6	7	8	9	10
29	Tutors have reviewed my work and activities and provided feedback to help me learn and improve	NA	0	1	2	3	4	5	6	7	8	9	10
30	The review by my peers of my work and activities has helped me improve my work and my learning	NA	0	1	2	3	4	5	6	7	8	9	10
31	I've received information from my tutors and peers that has helped my progress and results	NA	0	1	2	3	4	5	6	7	8	9	10
32	I've had access to all the assessment instruments (marking criteria, rubrics, etc.) before undertaking the assessments and this has been very valuable	NA	0	1	2	3	4	5	6	7	8	9	10
33	The mistakes my peers and I have made have helped me improve my work and learning	NA	0	1	2	3	4	5	6	7	8	9	10
34	I've marked my own work and my peers' work using the assessment criteria and guidelines, which were available in advance	NA	0	1	2	3	4	5	6	7	8	9	10
35	I've significantly improved my capacity for reflexion	NA	0	1	2	3	4	5	6	7	8	9	10
36	I've been able to undertake my assessment tasks in original and innovative ways	NA	0	1	2	3	4	5	6	7	8	9	10
37	I've developed my critical abilities	NA	0	1	2	3	4	5	6	7	8	9	10
38	I've worked and contributed in teams to produce joint outcomes	NA	0	1	2	3	4	5	6	7	8	9	10
39	I've developed my analytical skills	NA	0	1	2	3	4	5	6	7	8	9	10
40	I've improved my autonomous and independent working skills	NA	0	1	2	3	4	5	6	7	8	9	10

Confirmatory Tetrad Analysis Results

	O	t	p	CI Low	CI Up
EMPO					
1: EM01_24,EM02_25,EM03_26,EM04_27	3.917	5.675	0.000	2.581	5.287
2: EM01_24,EM02_25,EM04_27,EM03_26	3.902	5.759	0.000	2.592	5.249
4: EM01_24,EM02_25,EM03_26,EM05_28	2.852	4.044	0.000	1.477	4.242
6: EM01_24,EM03_26,EM05_28,EM02_25	-0.092	0.171	0.865	-1.157	0.967
10: EM01_24,EM03_26,EM04_27,EM05_28	0.340	0.696	0.486	-0.614	1.301
FEED					
1: FE01_29,FE02_30,FE03_31,FE04_32	-0.594	0.520	0.603	-2.842	1.643
2: FE01_29,FE02_30,FE04_32,FE03_31	-0.165	0.150	0.881	-2.334	1.980
4: FE01_29,FE02_30,FE03_31,FE05_33	-0.602	0.518	0.604	-2.886	1.670
6: FE01_29,FE03_31,FE05_33,FE02_30	1.037	0.857	0.391	-1.341	3.400
7: FE01_29,FE02_30,FE03_31,FE06_34	-4.064	3.033	0.002	-6.715	-1.461
10: FE01_29,FE02_30,FE04_32,FE05_33	3.114	2.507	0.012	0.663	5.533
16: FE01_29,FE02_30,FE05_33,FE06_34	1.026	0.803	0.422	-1.507	3.500
22: FE01_29,FE03_31,FE04_32,FE06_34	6.107	4.580	0.000	3.507	8.735
26: FE01_29,FE03_31,FE06_34,FE05_33	2.999	2.469	0.014	0.617	5.380
PART					
1: PA01_12,PA02_13,PA03_14,PA04_15	34.193	9.710	0.000	27.448	41.255
2: PA01_12,PA02_13,PA04_15,PA03_14	34.319	9.727	0.000	27.560	41.393
4: PA01_12,PA02_13,PA03_14,PA05_16	26.591	8.799	0.000	20.755	32.603
6: PA01_12,PA03_14,PA05_16,PA02_13	-1.963	2.026	0.043	-3.864	-0.067
10: PA01_12,PA02_13,PA03_14,PA07_18	31.541	9.572	0.000	25.219	38.139
13: PA01_12,PA02_13,PA04_15,PA05_16	34.424	10.940	0.000	28.342	40.680
19: PA01_12,PA02_13,PA04_15,PA07_18	37.910	11.062	0.000	31.343	44.780
25: PA01_12,PA02_13,PA05_16,PA07_18	33.444	10.191	0.000	27.103	39.971
30: PA01_12,PA06_17,PA07_18,PA02_13	1.238	1.516	0.129	-0.331	2.870
34: PA01_12,PA03_14,PA04_15,PA06_17	8.580	4.700	0.000	4.990	12.148
38: PA01_12,PA03_14,PA07_18,PA04_15	7.544	3.019	0.003	2.674	12.474
40: PA01_12,PA03_14,PA05_16,PA06_17	8.086	3.274	0.001	3.201	12.885
50: PA01_12,PA04_15,PA06_17,PA05_16	-5.139	2.209	0.027	-9.707	-0.584
55: PA01_12,PA04_15,PA06_17,PA07_18	-7.154	2.927	0.003	-11.973	-2.391
SELF					
1: SR01_7,SR02_8,SR03_9,SR04_10	0.981	2.271	0.023	0.135	1.828
2: SR01_7,SR02_8,SR04_10,SR03_9	0.985	2.233	0.026	0.122	1.852
4: SR01_7,SR02_8,SR03_9,SR05_11	0.716	1.668	0.095	-0.130	1.553
6: SR01_7,SR03_9,SR05_11,SR02_8	-1.896	2.846	0.004	-3.208	-0.596
10: SR01_7,SR03_9,SR04_10,SR05_11	1.571	3.217	0.001	0.627	2.541
STLEA					
1: SL01_35,SL02_36,SL03_37,SL04_38	0.721	1.028	0.304	-0.649	2.099
2: SL01_35,SL02_36,SL04_38,SL03_37	0.832	1.122	0.262	-0.617	2.291
4: SL01_35,SL02_36,SL03_37,SL05_39	1.279	2.459	0.014	0.265	2.304
6: SL01_35,SL03_37,SL05_39,SL02_36	-1.581	3.128	0.002	-2.574	-0.593

Confirmatory Tetrad Analysis Results

|	O	t	p	CI Low	CI Up
7: SL01_35,SL02_36,SL03_37,SL06_40	1.355	2.745	0.006	0.390	2.326
10: SL01_35,SL02_36,SL04_38,SL05_39	3.492	4.274	0.000	1.920	5.124
16: SL01_35,SL02_36,SL05_39,SL06_40	4.087	5.266	0.000	2.586	5.630
22: SL01_35,SL03_37,SL04_38,SL06_40	1.420	2.070	0.039	0.075	2.766
26: SL01_35,SL03_37,SL06_40,SL05_39	1.962	3.077	0.002	0.725	3.224
TASK					
1: TQ01_1,TQ02_2,TQ03_3,TQ04_4	1.250	2.592	0.010	0.309	2.200
2: TQ01_1,TQ02_2,TQ04_4,TQ03_3	1.144	2.424	0.015	0.225	2.076
4: TQ01_1,TQ02_2,TQ03_3,TQ05_5	0.495	0.937	0.349	-0.541	1.531
6: TQ01_1,TQ03_3,TQ05_5,TQ02_2	0.521	1.255	0.209	-0.289	1.338
7: TQ01_1,TQ02_2,TQ03_3,TQ06_6	2.023	3.665	0.000	0.945	3.110
10: TQ01_1,TQ02_2,TQ04_4,TQ05_5	2.830	4.552	0.000	1.620	4.058
16: TQ01_1,TQ02_2,TQ05_5,TQ06_6	0.176	0.389	0.698	-0.717	1.056
22: TQ01_1,TQ03_3,TQ04_4,TQ06_6	-1.228	2.290	0.022	-2.291	-0.189
26: TQ01_1,TQ03_3,TQ06_6,TQ05_5	-0.839	2.000	0.046	-1.671	-0.027
TRANS					
1: TR01_19,TR02_20,TR03_21,TR04_22	3.005	3.050	0.002	1.084	4.947
2: TR01_19,TR02_20,TR04_22,TR03_21	3.396	4.083	0.000	1.780	5.040
4: TR01_19,TR02_20,TR03_21,TR05_23	3.353	3.287	0.001	1.371	5.371
6: TR01_19,TR03_21,TR05_23,TR02_20	0.195	0.256	0.798	-1.299	1.688
10: TR01_19,TR03_21,TR04_22,TR05_23	1.385	1.454	0.146	-0.476	3.258

Online Resource 3:

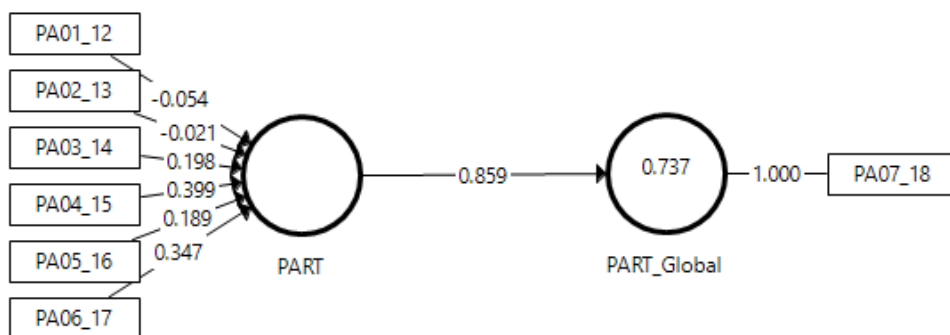**Convergent Validity TASK**
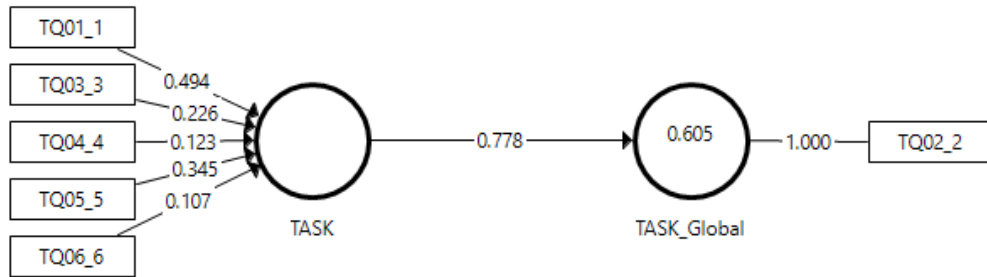
Convergent Validity EMPO
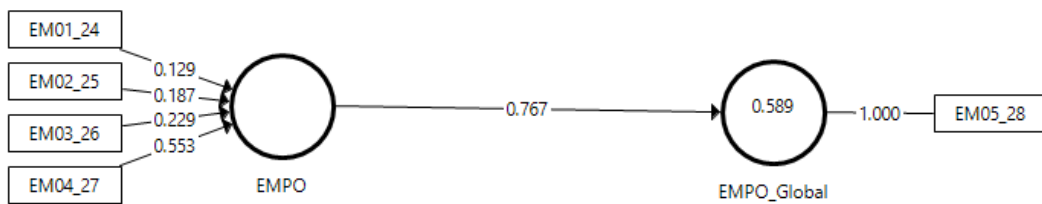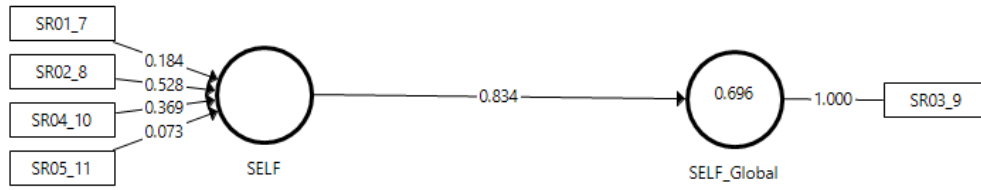

Convergent Validity FEED
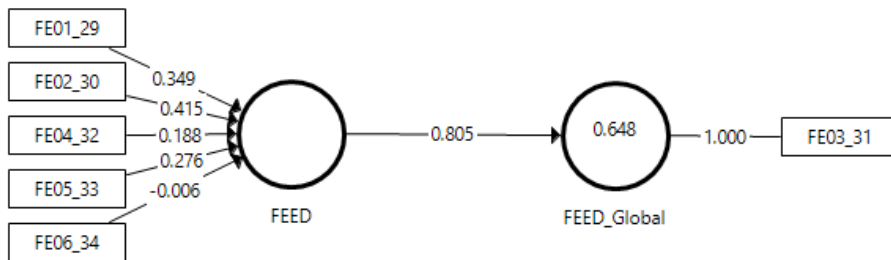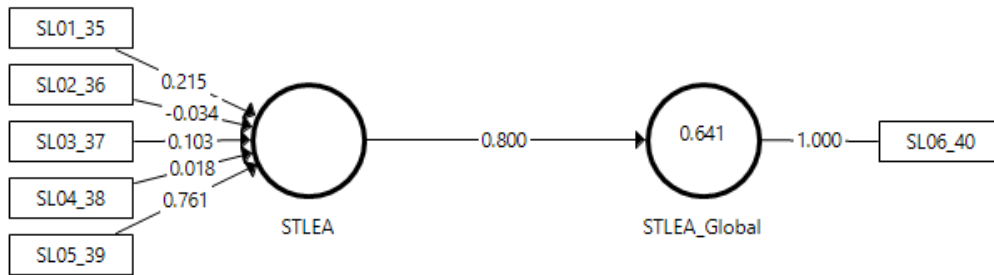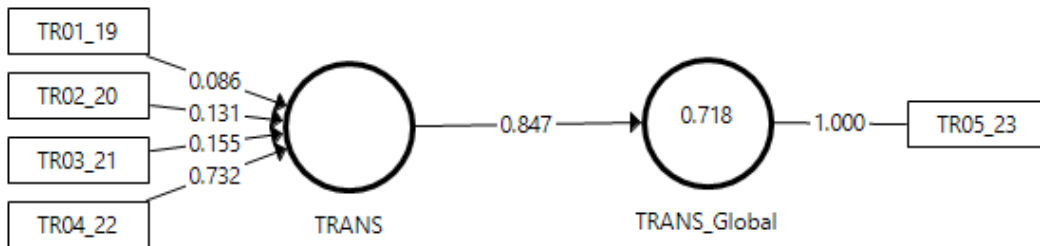

Convergent Validity PART

Convergent Validity SELF

Convergent Validity STLEA

Convergent Validity TRANS

Online Resource 4:

Weights (W), loadings (L) and collinearity statistics (VIF) of formative constructs

Construct	Indicator	W	L	VIF	Construct	Indicator	W	L	VIF
FEED	FE01_29	0.168	0.735	1.827	PART	PA01_12	0.236	0.834	2.723
	FE02_30	0.169	0.803	2.347		PA02_13	0.408	0.865	2.543
	FE03_31	0.279	0.877	2.839		PA03_14	-0.024	0.800	3.960
	FE04_32	0.047	0.740	2.215		PA04_15	0.224	0.836	5.713
	FE05_33	0.387	0.877	2.236		PA05_16	0.202	0.821	3.895
	FE06_34	0.155	0.785	2.359		PA06_17	-0.044	0.800	4.119
SELF	SR01_7	0.255	0.808	2.036		PA07_18	0.192	0.789	3.803
	SR02_8	0.111	0.823	2.988	STLEA	SL01_35	0.435	0.928	2.966
	SR03_9	0.274	0.878	3.291		SL02_36	0.227	0.852	2.842
	SR04_10	0.283	0.852	2.375		SL03_37	0.044	0.837	3.314
	SR05_11	0.291	0.761	1.535		SL04_38	0.118	0.685	1.786
TRANS	TR01_19	0.257	0.814	2.331		SL05_39	0.159	0.883	4.239
	TR02_20	0.118	0.826	2.851		SL06_40	0.178	0.817	2.782
	TR03_21	0.065	0.718	1.898	TASK	TQ01_1	0.146	0.729	1.868
	TR04_22	0.237	0.908	3.856		TQ02_2	0.469	0.889	2.530
	TR05_23	0.461	0.938	3.540		TQ03_3	0.137	0.702	1.687
EMPO	EM01_24	0.436	0.915	2.677		TQ04_4	0.003	0.624	2.029
	EM02_25	0.203	0.883	3.143		TQ05_5	0.133	0.664	2.068
	EM03_26	0.031	0.810	3.304		TQ06_6	0.389	0.745	1.346
	EM04_27	0.314	0.892	4.071					
	EM05_28	0.146	0.798	2.430					

Collinearity Statistics (VIF)

	EMPO	FEED	PART	SELF	STLEA	TASK	TRANS
EMPO					2.697		3.629
FEED	2.528			2.528	2.785		
PART	1.911			1.911	2.018		
SELF					2.769		2.623
STLEA							3.539
TASK	1.708	1.000	1.000	1.708			
TRANS							

Online Resource 6:

Construct Crossvalidated Redundancy (Q^2 values)

	SSO	SSE	Q² (=1-SSE/SSO)
EMPO	3,845.000	2,397.478	0.376
FEED	4,614.000	3,469.407	0.248
PART	5,383.000	4,689.347	0.129
SELF	3,845.000	2,222.944	0.422
STLEA	4,614.000	2,311.776	0.499
TASK	4,614.000	4,614.000	
TRANS	3,845.000	1,950.239	0.493

Effect Sizes (q^2)*

	EMPO	FEED	PART	SELF	STLEA	TRANS
EMPO		-0.004	-0.010	0.019	0.106	0.074
FEED	0.083		0.164	0.014	0.034	0.000
PART	-0.002	0.009		0.007	0.006	0.002
SELF	0.007	-0.004	-0.009		0.012	0.033
STLEA	0.004	0.000	0.001	-0.004		0.011

* 0.02 small/0.15 medium/0.35 large

Summary of mediating effect test of TASK on STLEA

Total Indirect Effect	Effect	CI Low	CI Up	*t*	*p*	Mediation Type	VAF	H
TASK->STLEA	0.630	0.590	0.676	28.688	0.000			
Specific Indirect Effect								
TASK->FEED->STLEA	0.162	0.114	0.217	6.161	0.000	Indirect-only	25.70	
TASK->FEED->EMPO->STLEA	0.136	0.094	0.183	6.090	0.000	Indirect-only	21.61	H6a
TASK->FEED->SELF->STLEA	0.020	0.008	0.037	2.731	0.006	Indirect-only	3.21	
TASK->PART->STLEA	0.044	0.017	0.072	3.117	0.002	Indirect-only	6.93	
TASK->PART->SELF->STLEA	0.015	0.006	0.028	2.729	0.006	Indirect-only	2.35	H6b
TASK->PART->EMPO->STLEA	0.019	0.001	0.040	1.883	0.060	Indirect-only	2.94	
TASK->EMPO->STLEA	0.154	0.106	0.206	5.989	0.000	Indirect-only	24.48	H6c
TASK->SELF->STLEA	0.080	0.038	0.125	3.550	0.000	Indirect-only	12.72	H6d

Summary of mediating effect test of TASK on TRANS

	Effect	CI Low	CI Up	*t*	*p*
Total Indirect Effects					
TASK->TRANS	0.613	0.568	0.665	24.784	0.000
Specific Indirect Effect					
TASK->FEED->EMPO->TRANS	0.144	0.097	0.197	5.712	0.000
TASK->FEED->SELF->TRANS	0.031	0.015	0.053	3.260	0.001
TASK->FEED->EMPO->STLEA->TRANS	0.024	0.010	0.040	3.077	0.002
TASK->FEED->STLEA->TRANS	0.028	0.010	0.051	2.735	0.006
TASK->FEED->SELF->STLEA->TRANS	0.004	0.001	0.008	2.116	0.034
TASK->PART->EMPO->STLEA->TRANS	0.003	0.000	0.008	1.670	0.095
TASK->PART->STLEA->TRANS	0.008	0.002	0.015	2.176	0.030
TASK->PART->SELF->STLEA->TRANS	0.003	0.001	0.006	2.113	0.035
TASK->PART->SELF->TRANS	0.023	0.013	0.036	3.762	0.000
TASK->PART->EMPO->TRANS	0.020	0.001	0.043	1.858	0.063
TASK->EMPO->TRANS	0.163	0.110	0.224	5.552	0.000
TASK->EMPO->STLEA->TRANS	0.027	0.011	0.044	3.189	0.001
TASK->SELF->TRANS	0.123	0.077	0.172	5.112	0.000
TASK->SELF->STLEA->TRANS	0.014	0.005	0.026	2.540	0.011