RESEARCH ARTICLE

Emergency Remote Education, Flow and Satisfaction: A Structural Model.

Enseñanza Remota de Emergencia, flow y satisfacción: un modelo estructural.

Ensino Remoto de Emergência, fluxo e satisfação: um modelo estrutural

*RAÚL RODRÍGUEZ ANTONIO
**JAIR ARODY DEL VALLE LÓPEZ

* PhD. Candidate in Education (Universidad de Montemorelos, Mexico).
ORCID: https://orcid.org/0000-0001-6766-4133

** PhD. in Administration.
ORCID: https://orcid.org/0000-0003-2605-195X

OPEN ACCESS

DOI: http://dx.doi.org/10.18634/sophiaj.18v.1i.1138

Article information

Received: July 2021
Revised: October 2021
Accepted: March 2021
Published: January - June 2022

Palabras clave: autoeficacia, experiencia de flow, educación superior, satisfacción.

Keywords: flow experience, higher education, satisfaction, self-efficacy.

Palavras-chave: autoeficácia, experiência de fluxo, ensino superior, satisfação.

How to cite: /how to cite:
Rodríguez Antonio, R., & del Valle López, J. A. (2022). Emergency Remote Teaching, Flow and Satisfaction: A Structural Model. Sophia, 18(1), 1-15. https://doi.org/10.18634/sophiaj.18v.1i.1138.

Sophia-Education, volume 18 number 1. January/June 2022. English version.

ABSTRACT

The purpose of this study was to investigate the structural relationships between self-efficacy for learning and performance, perceived task value, perceived usability of the LMS, perceived instructional design, flow experience and student satisfaction, in courses adapted to the Emergency Remote Education (ERE) modality, in a private university in Mexico. Using structural equation modeling, evidence was found that self-efficacy has a direct effect on the flow experience, as well as an indirect effect on satisfaction, mediated by the value of the task. In addition, LMS usability was found to have a direct effect on flow experience, while instructional design has a direct effect on task value and satisfaction. The results of this study can provide guidelines for the implementation of virtual or hybrid courses.

ISSN (electronic): 2346-0806 ISSN (print): 1794-8932

Conflict of interest:

The authors declare that they have no conflicts of interest.

Author correspondence:

rrodriguez@um.edu.mx jdelvalle@um.edu.mx

Resumen

El presente estudio tuvo como propósito investigar las relaciones estructurales entre la autoeficacia para el aprendizaje y el desempeño, el valor percibido de la tarea, la usabilidad percibida del LMS, el diseño instruccional percibido, la experiencia de flow y la satisfacción del estudiante, en cursos adaptados a la modalidad de Enseñanza Remota de Emergencia (ERE), en una universidad privada en México. Utilizando modelado con ecuaciones estructurales, se encontró evidencia de que la autoeficacia tiene un efecto directo sobre la experiencia de flow, así como un efecto indirecto sobre la satisfacción, mediado por el valor de la tarea. Además, se encontró que la usabilidad del LMS tiene un efecto directo sobre la experiencia de flow, en tanto que el diseño instruccional tiene un efecto directo sobre el valor de la tarea y sobre la satisfacción. Los resultados de este estudio pueden proveer de pautas para la implementación de cursos virtuales o híbridos.

RESUMO

O presente estudo teve como objetivo investigar as relações estruturais entre autoeficácia para aprendizagem e desempenho, o valor percebido da tarefa, a usabilidade percebida do LMS, o design instrucional percebido, a experiência de fluxo e a satisfação do aluno, em cursos adaptado à modalidade de Ensino Remoto de Emergência, em uma universidade privada no México. Utilizando a modelagem de equações estruturais, foram encontradas evidências de que a autoeficácia tem efeito direto na experiência de fluxo, bem como efeito indireto na satisfação, mediada pelo valor da tarefa. Além disso, verificou-se que a usabilidade do LMS tem efeito direto na experiência de fluxo, enquanto o design instrucional tem efeito direto no valor da tarefa e na satisfação. Os resultados deste estudo podem fornecer diretrizes para a implantação de cursos virtuais ou híbridos.

Introduction

Since its appearance on the world stage, the COVID-19 disease has had a significant impact on various areas of human endeavor, including education. Due to the sanitary contingency decreed because of the pandemic, in Mexico face-to-face classes were cancelled in March 2020 and, in most cases, replaced by the Emergency Remote Education (ERE) modality. For the implementation of ERE, higher education institutions adapted various methodologies and tools such as Learning Management Systems (LMS), simulators, online educational applications and videoconferencing, among others. However, in most cases, this implementation was carried out in a few days without the appropriate planning and redesign of the face-to-face courses. Nevertheless, the experience gained in the following months allowed for a better planning and adaptation of the study programs for the development of the 2020-2021 school year, also in the ERE modality.

Although ERE may have similar elements to online learning such as non-face-to-face teaching, the use of at least one LMS, as well as electronic media for information transfer, it should not be considered as online learning, as it is characterized by being carefully planned and designed from the beginning to be implemented in a robust ecosystem; whereas ERE is a temporary solution (Hodges et al., 2020). Recent research has emphasized the importance of appropriate course design and management in the context of ERE, use of pedagogical and technological resources to prioritize communication and learning, as well as student skills for self-regulated learning, which in turn is associated with student self-efficacy (Fernandez-Rio et al., 2017; Mohmmed et al., 2020; Petillion and McNeil, 2020).

The objective of this research was to analyze the structural relationships between factors associated with student motivation (self-efficacy for learning and performance and task value), as well as factors associated with course design and administration (LMS usability and instructional design), on the *flow* experience and student satisfaction, in undergraduate level courses in the context of the ERE modality in a private institution of higher education in the state of Nuevo Leon, Mexico, during the period from August to December 2020. The constructs that were investigated are described below.

Flow Experience and Student Satisfaction with the Course

The experience of *flow*, also called *flow* state or optimal state, is a psychological characteristic that has been linked to academic performance. It is defined as "the dynamic state of a person that generates a holistic feeling of acting with total involvement" (Csikszentmihalyi, 1975, p. 36), and tends to occur when an individual faces a highly engaging challenge that requires a set of appropriate responses. The challenge is defined as a subjective experience of the individual derived from the interaction of the demands of the learning environment and one's own abilities (Rodríguez-Ardura & Meseguer-Artola, 2017). For the *flow* experience to happen, an appropriate balance between the individual's abilities and the demands of the challenge is required (Csikszentmihalyi, 1997).

On the other hand, student satisfaction with the course relates to the learner's perception of his or her own learning experience (Alqurashi, 2019), and can be defined as the degree to which a student feels a positive association with his or her own educational experience (Shin, 2003). In other words, course satisfaction is the degree to which a learning program meets student expectations (Diep et al., 2017). Course satisfaction, viewed as an overall measure of perceived quality and benefit gained, can include any number of factors such as instructional style, learning content and course structure, teacher or instructor assistance, discussion forums, assessments, and the overall course (Sanford et al.,2017; Wei and Chou, 2020).

There is evidence that *flow* experience is a significant predictor of learner satisfaction in online courses, specifically, when the *flow* experience involves total learner engagement accompanied by a highly pleasurable experience while allowing the learner to concentrate on the learning content(Lee and Choi, 2013; Lu, et al., 2019).

ISSN (electronic): 2346-0806 ISSN (print): 1794-8932

Student Motivation: Self-Efficacy and Task Value

The concept of self-efficacy, derived from Bandura's cognitive theory (1977), refers to people's beliefs about their abilities to organize and execute actions to influence events that may affect their lives. There are several types of self-efficacy, such as physical, musical and computational self-efficacy, among others. In the present research, self-efficacy for learning and performance was studied. This is defined as the level of confidence that a person has about one's own abilities to develop a specific activity or challenge (Alqurashi, 2019; Pintrich et al., 1991). A high perception of self-efficacy is especially important in online courses and quite possibly in ERE by virtue of the lack of face-to-face and social interaction, which in turn may cause the learner to feel a sense of loneliness.

Evidence has been found that student self-efficacy has a positive effect on the experience of flow in online learning (Hong et al., 2017; Joo et al., 2015). When students believe they are sufficiently capable they tend to experience the state of flow, in that they increase their level of engagement and performance in academic activities (Erhel and Jamet, 2019; Mesurado et al., 2016; Peifer et al., 2020; Rodríguez-Ardura and Meseguer-Artola, 2017).

On the other hand, task value is the student's assessment of the value of a learning content, i.e., it is the student's perception of how interesting, useful and important the learning content of a specific course is (Pintrich et al, 1991). If the learning content is perceived as highly useful, students will be more motivated to put more effort into learning tasks, as they perceive that such effort will result in improving their own performance (Diep et al., 2017).

Some research has shown that the student's level of self-efficacy, as well as his or her perception about the instructional design, have a positive effect on how he or she perceives the value of the task (Li & Zheng, 2018; Sanchez-Rosas & Esquivel, 2016). So also, the perceived value of the task has a positive effect on the level of *flow* experience (Cho, 2018; Joo et al., 2015), and on the degree of student satisfaction with the course (Alanazi et al., 2020; Sánchez-Rosas and Esquivel, 2016; Yalcin, 2017).

Course Design and Administration: Instructional Design and Usability of the LMS

Instructional design is a concept that can have different interpretations for different people. For example, one can use this term to refer to the creation of online learning scenarios or to create an outline of a curriculum based on a set of expected learning (Turnbow and Roth, 2019). According to Seel et al. (2017), instructional design is a systematic process focused on the planning and development of educational programs in general and structured in such a way as to achieve substantive improvements in learning. The main goal of instructional design is to find the best ways to teach something (Turnbow and Roth, 2019).

An auxiliary tool in the instructional design and development of online courses is the LMS. This is software that includes a variety of services that assist teachers in the management of their courses by allowing the creation, import and export of pedagogical content; the management of files concerning student performance; the distribution of online courses and communication tools, among others (Ouadoud et al., 2018).

An important quality of the LMS is its usability. Usability is understood as the degree to which a system, service or product can be used by specific users to achieve specific goals with effectiveness, efficiency and satisfaction in specific contexts of use (International Organization for Standardization, 2018). Thus, the usability of an LMS is the degree to which the system can be used for learning efficiently and satisfactorily.

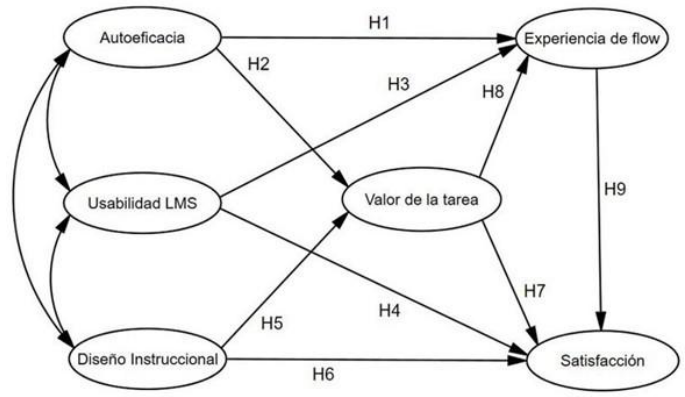
Several studies have found evidence suggesting that how the student perceives the usability of the LMS affects both their flow experience (Chang and Shen, 2015; Khan et al., 2017) and their satisfaction with the course (Ghazal et al., 2018; Stokes et al., 2016). So also, how the student perceives the level of instructional design affects the degree of satisfaction with the course (Hernandez-Nanclares and Perez-Rodriguez, 2016; Lee et al., 2017; Shin and Cheon, 2019; Yalcin, 2017).

Hypothesis and Structural Model

Based on the literature review, it was proposed to analyze the structural relationships between the operationalized constructs shown in Figure 1, from which the following hypotheses are derived:

Level of self-efficacy for learning and performance positively affects level of *flow* experience (H1) and to the perceived value of the task (H2).
The degree of perceived usability of the LMS positively affects the level of student *flow* experience (H3) and the degree of student satisfaction with the course (H4).
The perceived level of instructional design positively affects the perceived value of the task (H5) and the degree of student satisfaction with the course (H6).
The perceived value of the assignment positively affects the student's satisfaction with the course (H7) and the student's level of *flow* experience (H8).
The level of *flow* experience positively affects the degree of student satisfaction with the course (H9).

Figure 1. *Hypothetical model of predictors of flow experience and satisfaction with the course.*



Author: Own elaboration

Method

Participants

Using a probabilistic cluster sampling scheme, information was collected from 352 undergraduate students at a private university in the state of Nuevo León, Mexico, through an online form containing the measurement instruments. Each of the university's academic units (faculties and schools) was considered as a conglomerate. Within each conglomerate, a random selection was made of students enrolled in face-to-face courses in the fall academic cycle (August to December 2020). These courses were developed in the ERE modality due to the suspension of face-to-face classes derived from the COVID-19 pandemic. The implementation of the courses was done mostly through synchronous videoconferencing, video tutorials, online educational applications, independent study, as well as the intentional use of the LMS, which is owned by the university.

From the initial sample, 18 cases considered outliers were removed, leaving the final sample at n= 334. The detection of outliers was performed by means of Mahalanobis distances, using the conservative criterion p< .001 recommended by Kline (2011). Of the final sample, 150 participants were male (44.9 %) and 184 female (55.1 %) with ages in the range of 16 to 44 years (M= 20.55, SD= 3.676).

Instruments

To measure the level of self-efficacy for learning and performance, as well as the perceived value of the task, the two scales of the MSLQ (Motivated Strategies for Learning Questionnaire) indicated for these constructs were used. This instrument, developed by Pintrich et al. (1991), is based on the social cognitive approach to motivation and learning. It contains 15 scales, grouped into two sections (motivation and learning strategies), which are designed to be used in a modular fashion according to the researcher's needs (Duncan and McKeachie, 2005). The scale that measures the perceived value

ISSN (electronic): 2346-0806 ISSN (print): 1794-8932

of the task contains six items, while the scale measuring the level of self-efficacy for learning and performance contains eight items. For these scales the authors report a reliability coefficient α= .90 and α= .93, respectively. In the present investigation, the response options for both scales were adapted to an 11-point Likert-type scale, from 0 (not true for me at all) to 10 (completely true for me).

The evaluation of the perception of the instructional design of the course was carried out using the five items of the instructional design and delivery section of the Rubric for Online Instruction (California State University, Chico, 2020). This rubric, consisting of six sections, was developed to assess the quality of an online course. A study by Joo et al. (2015) found acceptable internal consistency of the instructional design and delivery section (α= .90).

To assess the degree of perceived usability of the LMS in this study, the positive version of the System Usability Scale (SUS), validated by Hedlefs Aguilar and Garza Villegas (2016), was used. For this version containing 10 positively worded items, the authors reported good internal consistency (α= .92). The standard version of the SUS scale developed by Brooke (1996), like the positive version, also contains 10 items, only these are presented alternately in positive and negative tones (Lewis, 2018). The language used in the standard version has been found to generate comprehension problems more markedly for respondents whose native language is not English. Unlike the standard version, the use of the positive version could result in a lower rate of errors in the interpretation of the items by the respondents, as well as a lower risk of coding errors by the researchers (Hedlefs Aguilar and Garza Villegas, 2016).

The measurement of the level of *flow* experience was performed using the short version of the Dispositional Flow Scale 2 (SDFS-2) developed by Jackson and Eklund (2002), for which a good internal consistency was reported (α= .81). This scale, designed to measure the overall experience of flow in general activities, contains nine items corresponding to the nine dimensions of *flow* proposed by Csikszentmihalyi (1975).

To measure the degree of student satisfaction with the course, an instrument consisting of six items was used. Four of these items were adapted from the scale used by Cheng and Chau (2016) for measuring satisfaction with the online course, while the remaining two items were adapted from the scale used by Lee and Choi (2013) used in their study to assess student satisfaction with distance courses at a Korean university. Both scales, in their full version, showed good internal consistency (α= .84 and α= .93, respectively).

Similar to the self-efficacy and task value scales, in this study the scales corresponding to instructional design, LMS usability, *flow* experience, and satisfaction were adapted to be measured on an 11-point Likert-type scale from 0 (completely disagree) to 10 (completely agree).

Results

To investigate the structural relationships between the variables considered in this study and validate the proposed hypotheses (see Figure 1), we proceeded to estimate the parameters and verify the fit of the theoretical model with the sample data. To this end, first, the validity and reliability of the instruments used were analyzed, and then the parameters were estimated, and the model was adjusted.

Validity and Reliability of the Measurement Instruments

The evaluation of the internal consistency reliability of the measurement instruments was carried out using Cronbach's alpha coefficient (α) and the composite reliability coefficient (*CR*). The results in Table 1 show that both coefficients exceed the value of .70, which according to Taber (2018) and Moral de la Rubia (2019), suggests adequate internal consistency of the measurement instruments.

Convergent validity was assessed by means of the average variance extracted (*AVE*) of each construct. Discriminant validity was assessed by observing the intercorrelations between the operationalized constructs, the fulfillment of Fornell and Larcker's (1981) criterion about the square

roots of the AVE of the corresponding constructs, as well as comparing the maximum value as well as the average value of the square of the correlations between constructs (*MSV* and *ASV*, respectively). The results reported in Table 1 show that the intercorrelations between constructs are not excessively high, in addition to the fact that all the values of *AVE* are greater than .50, as well as greater than *MSV* and *ASV*, except for the *flow* experience construct. In addition, for each construct the square root of the AVE was found to be greater than the intercorrelations with other constructs. All of the above suggests adequate convergent validity and discriminant validity of the scales used in this study (Fornell and Larcker, 1981; Hair et al., 2014; Kline, 2011; Moral de la Rubia, 2019).

Table 1. *Indicators of reliability, convergent validity and discriminant validity of the scales used.*

	Coeficiente de correlación de Pearson						Índices de confiabilidad				
Constructo	AAD	VPT	DI	LMS	FL	SC	α	*CR*	*AVE*	*MSV*	*ASV*
AAD	**.80**						.93	.93	.64	.53	.40
VPT	.67	**.84**					.93	.94	.70	.59	.38
DI	.64	.62	**.80**				.90	.91	.64	.59	.35
LMS	.31	.41	.36	**.83**			.95	.96	.69	.17	.13
FL	.70	.48	.53	.36	**.66**		.87	.89	.44	.49	.30
SC	.65	.77	.77	.41	.51	**.91**	.96	.97	.83	.59	.39

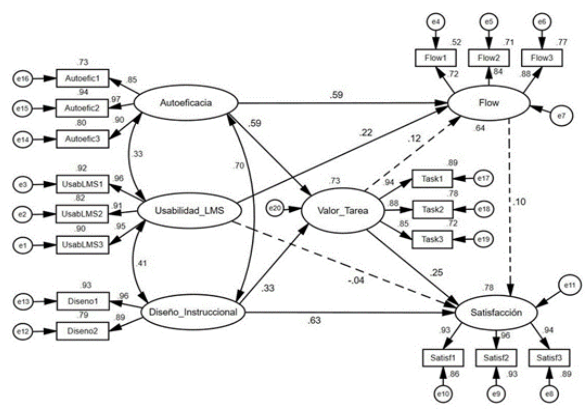
Constructs: ***AAD= Self-efficacy for learning and performance, VPT= Perceived value of the task, DI= Instructional Design, LMS= Usability of the LMS, FL= Flow experience, SC= Satisfaction with the course.***
Indices: α = Cronbach's alpha coefficient, CR= composite reliability coefficient, AVE= average variance extracted, MSV= maximum shared variance, ASV= average shared variance. ***Values in bold represent the square roots of the AVE of the corresponding constructs.***

Structural Model

For the measurement model, as well as for the hypothesized structural model of relationships between variables (see Figure 2), plots were used as indicator variables for each construct. The use of plots in a structural model instead of the original items, when constructs are unidimensional, can help mitigate problems associated with non-normality, increase the efficiency of the model and decrease its complexity (Matsunaga, 2008).

For the formation of the plots, two or more items were randomly grouped in each construct so that three plots were obtained per construct, except for the instructional design construct where only two plots were formed. The scores of each plot resulted from the average of the items that comprise it. Prior to the formation of plots, an exploratory factor analysis was performed for each of the scales, using the factor extraction method by principal axis factorization with Varimax rotation. Using the criterion of eigenvalues greater than 1.0 for factor retention, as well as the visualization of the sedimentation diagram, it was concluded that each scale grouped its items into a single factor, suggesting unidimensional constructs.

Figure 2. *Initial structural model with standardized coefficients*



Author: Own elaboration

ISSN (electronic): 2346-0806 ISSN (print): 1794-8932

Prior to the estimation of model parameters, the assumption of multivariate normality of the data was evaluated by means of the Royston test. Since the results of this test showed evidence of violation of the normality assumption (*H*= 863.879, *p*= .000), it was decided to use the Maximum Likelihood parameter estimation method with robust standard errors and Satorra-Bentler scaled Chi-square test (Satorra and Bentler, 1994). The goodness-of-fit statistics reported in Table 2 suggest that the measurement model shows an acceptable fit with the sample data. Similarly, the initial model represented in Figure 2, in which the structural relationships between the operationalized constructs are posited, also showed an acceptable fit (see Table 2).

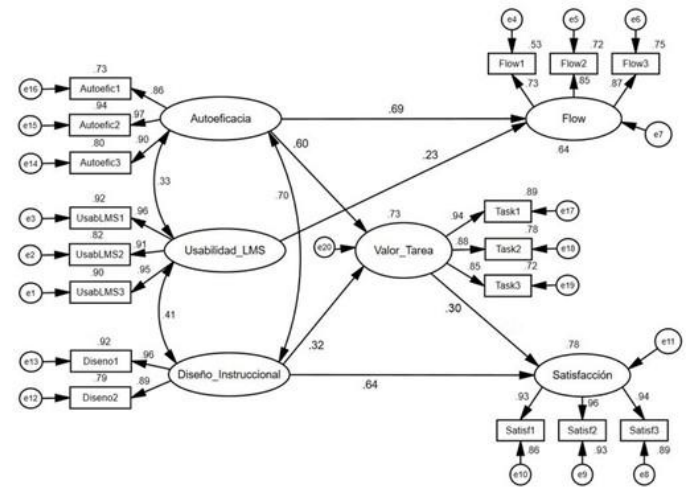
Table 2. ***Fit statistics of the models analyzed (n = 334).***

Modelo	χ^2_{SB}	*NPE*	*gl*	*CFI*	*TLI*	*SRMR*	*RMSEA (90% IC)*
Modelo de medida	257.423	49	104	.931	.910	.041	.067 (.058, .076)
Modelo estructural inicial	262.710	46	107	.966	.957	.042	.066 (.057, .075)
Modelo estructural modificado	267.165	43	110	.966	.957	.044	.066 (.057, .075)
Criterio	-	-	-	>.90	>.90	<.08	<.08

Fit statistics. χ2SB: Satorra-Bentler scaled chi-square, NPE= number of estimated parameters, gl= degrees of freedom, CFI: Comparative Fit Index, TLI: Tucker-Lewis Index, RMSEA: Steiger-Lind Root Mean Square Error of Approximation. 90% CI: 90% confidence interval for RMSEA. SRMR: Standardized Root Mean Square Residual.

When examining the standardized regression coefficients of the initial model, it was observed that all the structural relationships between variables were statistically significant (see Table 3), except for the following effects: (a) degree of perceived usability of the LMS on the degree of student satisfaction with the course (p= .294), (b) value of the task on the level of *flow* experience (p= .120) and (c) level of *flow* experience on the degree of student satisfaction with the course (p= .052). Consequently, hypotheses H4, H8 and H9 were rejected.

Figure 3. ***Modified structural model with standardized coefficients.***



Author: Own elaboration

The three structural relationships that were not significant, shown in Figure 2 by means of trajectories with a dashed line, were removed from the initial model to obtain the modified model represented in Figure 3. In addition, because the initial and modified structural models are nested models, since the latter was obtained from the former by removing some model parameters, a Chi-square test was performed to evaluate whether there is a difference between the two models. The results of this test showed that, in terms of goodness of fit, there is no significant difference between the initial structural model and the modified model (Δχ2= 4.445, gl= 3, p= .216). Thus, it was decided to propose the modified model as the final model to explain the structural relationships between variables.

For the modified model, as shown in Table 3, all structural relationships between variables were statistically significant with positive regression coefficients, so that hypotheses H1, H2, H3, H5, H6 and H7 were not rejected. These results suggest that: (a) the level of self-efficacy for learning and performance has a direct positive effect on the level of *flow* experience and on the perceived value of the task, (b) the degree of perceived usability of the *LMS* has a direct positive effect on the level of *flow* experience, (c) the level of perceived instructional design has a direct positive effect on the perceived value of the task and on the degree of student satisfaction with the course, and (d) the perceived value of the task has a direct positive effect on the degree of student satisfaction with the course.

Table 3. ***Hypotheses, regression coefficients and results for the modified model***

Hipótesis		Relación		β_1	*SE*	β_2	*p*
H1	Autoeficacia	→	*Flow*	.723	.066	.693	.000
H2	Autoeficacia	→	Valor de la tarea	.653	.085	.604	.000
H3	Usabilidad LMS	→	*Flow*	.149	.033	.232	.000
H4	Usabilidad LMS	→	Satisfacción	*	*	*	*
H5	Diseño Instruccional	→	Valor de la tarea	.295	.066	.315	.000
H6	Diseño Instruccional	→	Satisfacción	.863	.120	.637	.000
H7	Valor de la tarea	→	Satisfacción	.430	.114	.298	.000
H8	Valor de la tarea	→	*Flow*	*	*	*	*
H9	*Flow*	→	Satisfacción	*	*	*	*

β_1 : Unstandardized regression coefficient, β_2 : Standardized regression coefficient, ***SE***: Standard error.
* Relationship not significant in the initial model and not included in the modified model.

Next, we proceeded to evaluate the significance of the mediating effect of task value on the degree of student satisfaction with the course. By means of Sobel's test (Kline, 2011), the significance of the indirect effect of the level of self-efficacy for learning and performance, as well as the perceived level of instructional design, on the level and degree of student satisfaction with the course, mediated by the perceived value of the task, was evaluated. For this test, the unstandardized regression coefficients and standard errors reported in Table 3 were used. In addition, the total standardized effects were calculated and are summarized in Table 4.

Table 4. ***Standardized total effects for the modified model***

	Valor de la tarea	*Flow*	Satisfacción
Autoeficacia	.604	.693	.179
Diseño instruccional	.315	0	.731
Usabilidad LMS	0	.232	0
Valor de la tarea	0	0	.298

The results of Sobel's test showed evidence that: (a) the indirect effect of the level of self-efficacy for learning and performance on the degree of student satisfaction with the course, having as mediator the perceived value of the task, was statistically significant (Z= 3.385, p= .0003) and (b) the indirect effect of the perceived level of instructional design on the degree of student satisfaction with the course, with the perceived value of the task as mediator, was also statistically significant (*Z=2*.882, *p= .*0019). For the modified structural model, given that there is no direct effect of self-efficacy on satisfaction, it is observed that the perceived value of the task is a complete mediator of the effect of the level of self-efficacy for learning and performance on the degree of student satisfaction with the course. Likewise, given that there is a direct significant effect of instructional design on satisfaction, it is observed that the perceived value of the task is a partial mediator of the effect of the perceived level of instructional design on the degree of student satisfaction with the course.

ISSN (electronic): 2346-0806 ISSN (print): 1794-8932

Discussion

The purpose of this research was to analyze the structural relationships between the level of self-efficacy for learning and performance, the perceived value of the task, the degree of perceived usability of the LMS, the level of perceived instructional design, the level of student *flow* experience and the degree of student satisfaction, in courses adapted to the ERE modality, in a private institution of higher education in the state of Nuevo León, Mexico. For this purpose, a structural model was proposed from which a modified model was derived, which was used to explain the relationships between variables.

The results of this study revealed that: (a) the level of self-efficacy for learning and performance has a positive direct effect on the level of student *flow* experience and perceived value of the task, (b) the degree of perceived usability of the LMS has a positive direct effect on the level of student *flow* experience, (c) the level of perceived instructional design has a positive direct effect on the perceived value of the task and the degree of student satisfaction with the course, and (d) the perceived value of the task has a positive direct effect on the degree of student satisfaction with the course. No evidence was found of a significant effect of the degree of perceived usability of the LMS on the degree of student satisfaction with the course, nor of the perceived value of the task on the student's level of *flow* experience, nor of the level of *flow* experience on the degree of student satisfaction with the course.

Based on the findings derived from the modified structural model, it was observed, similar to that reported by Joo et al. (2015) in the context of online courses, that the main predictor of the student's level of *flow* experience in the ERE modality is his or her level of self-efficacy. Likewise, it was observed that the main predictor of the degree of student satisfaction with the course is the perceived level of instructional design, while the main predictor of the perceived value of the task is the level of self-efficacy.

Additionally, evidence was found that the degree of perceived LMS usability positively affects the level of student flow experience. This result may have important implications for how academic courses using an LMS are developed. In a post-social confinement scenario derived from the COVID-19 pandemic, where a good part of face-to-face courses will be adapted to be completely virtual or hybrid (Benito et al., 2021), it is essential to align learning activities and technological tools to propitiate the flow experience in students, since the latter is positively related to students' academic performance and positive emotions (Rijavec et al., 2017; Rodríguez-Ardura and Meseguer-Artola, 2017). In this regard, an interesting alternative is the personalization based on student motivation of the gamification elements incorporated in the LMS used in the course, such as storytelling, interactive activities, challenges and rewards, among others (Roosta et al., 2016).

On the other hand, the fact that the perceived value of the task did not emerge as a predictor of the *flow* experience, but of student satisfaction, may be a result of the fact that the learning activities and experiences provided by the teachers, although they met the students' learning expectations, were not planned based on challenging yet highly engaging learning activities, with clearly defined goals and rules that motivate the student to apply his or her skills thoroughly, which are fundamental conditions for the *flow* experience to emerge.

This does not mean that teachers are pedagogically incapable, but rather, as Csikszentmihalyi (2014) warns, schools are not structured for *flow* to happen. Notwithstanding this reality, it is possible to make the student experience *flow*, if one knows how to develop learning activities that maintain a balance between the demands of the challenge and the abilities of the individual. Otherwise, when the skill level is higher than the challenge, boredom is experienced, while if the skill level is lower than the challenge, anxiety is experienced.

Another relevant finding is related to the influence of the level of self-efficacy on the degree of student satisfaction. Unlike that suggested by Prifti (2020), who found evidence of a direct effect, in this study it was found that the level of self-efficacy indirectly affects the degree of student satisfaction with the course, mediated by the perceived value of the task. This relationship, similar to that observed by Doménech-Betoret et al. (2017) in Spanish high school students, suggests that the student's perception of the usefulness and value of learning activities depends largely on his or her level of confidence in achieving a good performance in the class, and in turn affects the degree of satisfaction experienced in the course.

In sum, since self-efficacy is a fundamental component for student learning and satisfaction (Alqurashi, 2019), it is advisable that teachers and institutions of higher education develop educational strategies and programs aimed at strengthening self-efficacy for learning and performance, counteracting the negative effects of low levels of student self-regulation (Pool-Cibrián and Martínez-Guerrero, 2013). In this sense, actions such as facilitating the student to develop his or her capacity for choice in terms of methods and results applicable to learning activities, adapting learning environments to allow self-regulation, and providing attributive feedback, among others, will foster the development of students' self-efficacy for learning (Schunk, 2012).

Conclusions

In this research, a structural equation model was proposed to analyze the relationships between factors associated with student motivation, course design and administration, *flow* experience and student satisfaction, in undergraduate level courses in the context of the ERE modality, during the fall semester of 2020, in a private institution of higher education in Mexico.

The results of this study suggest that: (a) an increase in the level of student self-efficacy will result in an increase in the level of *flow* as well as the perceived level of learning activities,
(b) an improvement in the usability experience of the LMS used in the course will positively affect the student's level of *flow* experience and (c) an increase in the level of instructional design perceived by the student will translate into an increase in the perceived value of the learning activities as well as in the student's level of satisfaction with the course.

These findings allow us to propose that in order to improve the *flow* experience and the level of student satisfaction with the course, it is necessary to clearly define the learning objectives and implement learning activities aligned with those objectives, create learning conditions that foster interaction, accessibility, critical thinking and problem solving, in a way that positively stimulates the student's perception of self-efficacy, while continuously improving the usability of the LMS used in the management of the courses.

It is worth mentioning that the findings derived from this research, although applicable specifically to the institution studied, may be useful for other educational institutions that seek to face the great challenges of post-COVID-19 education. These challenges, according to Zhao and Watterston (2021), involve the development of a personalized and evolving curriculum; authentic, purposeful, student-centered, discovery-based pedagogy; and teaching media that take advantage of synchronous and asynchronous learning.

Bibliographic references

Alanazi, A. A., Frey, B. B., Niileksela, C., Lee, S. W., Nong, A., y Alharbi, F. (2020). The role of task value and technology satisfaction in student performance in graduate-level online courses. TechTrends, 64, 922-930. https://doi.org/10.1007/s11528-020-00501-8

Alqurashi, E. (2019). Predicting student satisfaction and perceived learning within online learning environments. Distance Education, 40(1), 133-148. https://doi.org/10.1080/01587919.2018.1553562

Bandura, A. (1977). Self-efficacy: Toward a unifying theory of behavioral change. Psychological Review, 84(2), 191-215. https://doi.org/10.1037/0033-295X.84.2.191

Benito, Á., Dogan Yenisey, K., Khanna, K., Masis, M. F., Monge, R. M., Tugtan, M. A., Vega Araya, L. D., y Vig, R. (2021). Changes that should remain in higher education post COVID-19: A mixed-methods analysis of the experiences at three universities. Higher Learning Research Communications, 11, 51-75. https://doi.org/10.18870/hlrc.v11i0.1195

Brooke, J. (1996). SUS: 'a quick and dirty' usability scale. En P. W. Jordan, B. Thomas, B. A. Weerdmeester, y A. L. McClelland (Eds.). Usability evaluation in industry (pp. 189-194). Taylor y Francis. https://doi.org/10.1201/9781498710411

California State University, Chico. (2020). Exemplary Online Instruction: The Rubric. https://www.csuchico.edu/eoi/rubric.shtml

ISSN (electronic): 2346-0806 ISSN (print): 1794-8932

Chang, S.Y. y Shen, C.Y. (2015). The effect of usability of learning management system on student's flow experience and learning experience. En S. Carliner, C. Fulford y N. Ostashewski (Eds.). Proceedings of EdMedia 2015-World Conference on Educational Media and Technology (pp. 489-493). Association for the Advancement of Computing in Education (AACE).

Cheng, G., y Chau, J. (2016). Exploring the relationships between learning styles, online participation, learning achievement and course satisfaction: An empirical study of a blended learning course. British Journal of Educational Technology, 47(2), 257-278. https://doi.org/10.1111/bjet.12243

Cho, M. (2018). Task complexity and modality: Exploring learners' experience from the perspective of flow. The Modern Language Journal, 102(1), 162-180. https://doi.org/10.1111/modl.12460

Csikszentmihalyi, M. (1975). Beyond boredom and anxiety. Jossey-Bras Publishers.

Csikszentmihalyi, M. (1997). Finding flow: The psychology of engagement with every day life. BasicBooks.

Csikszentmihalyi, M. (2014). Applications of flow in human development and education: The collected works of Mihaly Csikszentmihalyi. Springer.

Diep, A., Zhu, C., Struyven, K., y Blieck, Y. (2017). Who or what contributes to student satisfaction in different blended learning modalities? British Journal of Educational Technology, 48(2), 473-489. https://doi.org/10.1111/bjet.12431

Doménech-Betoret, F., Abellán-Roselló, L., y Gómez-Artiga, A. (2017). Self-efficacy, satisfaction, and academic achievement : The mediator role of students' expectancy-value beliefs. Frontiers in Psychology, 8:1193. https://doi.org/10.3389/fpsyg.2017.01193

Duncan, T. G., y McKeachie, W. J. (2005). The making of the motivated strategies for learning questionnaire. Educational Psychologist, 40(2), 117-128. https://doi.org/10.1207/s15326985ep4002_6

Erhel, S., y Jamet, E. (2019). Improving instructions in educational computer games: Exploring the relations between goal specificity, flow experience and learning outcomes. Computers in Human Behavior, 91, 106-114. https://doi.org/10.1016/j.chb.2018.09.020

Fernandez-Rio, J., Cecchini, J. A., Méndez-Gimenez, A., Mendez-Alonso, D., y Prieto, J. A. (2017). Self-regulation, cooperative learning, and academic Self-efficacy : Interactions to prevent school failure. Frontiers in Psychology, 8:22. https://doi.org/10.3389/fpsyg.2017.00022

Fornell, C., y Larcker, D. F. (1981). Evaluating structural equation models with unobservable variables and measurement error. Journal of Marketing Research, 18(1), 39-50. doi: 10.1177/002224378101800104

Ghazal, S., Al-Samarraie, H., y Aldowah, H. (2018). "I am still learning": Modeling LMS critical success factors for promoting students' experience and satisfaction in a blended learning environment. IEEE Access, 6, 77179-77201. https://doi.org/10.1109/ACCESS.2018.2879677

Hair, J. F., Black, W. C., Babin, B. J., y Anderson, R. E. (2014). Multivariate data analysis (7ª ed.). Pearson.

Hedlefs Aguilar, M. I., y Garza Villegas, A. A. (2016). Análisis comparativo de la Escala de Usabilidad del Sistema (EUS) en dos versiones. Revista Iberoamericana de las Ciencias Computacionales e Informática, 5(10), 44-58. https://doi.org/10.23913/reci.v5i10.48

Hernández-Nanclares, N., y Pérez-Rodríguez, M. (2016). Students' satisfaction with a blended instructional design: The potential of "flipped classroom" in higher education. Journal of Interactive Media in Education, 1:4. https://doi.org/10.5334/jime.397

Hodges, C., Moore, S., Lockee, B., Trust, T., y Bond, A. (2020). The difference between emergency remote teaching and online learning. EDUCAUSE Review. https://er.educause.edu/articles/2020/3/the-difference-between-emergency-remote-teaching-and-online-learning

Hong, J. C., Hwang, M. Y., Tai, K. H., y Lin, P. H. (2017). Intrinsic motivation of Chinese learning in predicting online learning self-efficacy and flow experience relevant to students' learning progress. Computer Assisted Language Learning, 30(6), 552-574. https://doi.org/10.1080/09588221.2017.1329215

International Organization for Standardization. (2018). Ergonomics of human-system interaction-part 11: Usability: Definitions and concepts. ISO 9241-11:2018(en). https://www.iso.org/obp/ui/#iso:std:iso:9241:-11:ed-2:v1:en

Jackson, S. A., y Eklund, R. C. (2002). Assessing flow in physical activity: The Flow State Scale-2 and Dispositional Flow Scale-2. Journal of Sport and Exercise Psychology, 24(2), 133-150. https://doi.org/10.1123/jsep.24.2.133

Joo, Y. J., Oh, E., y Kim, S. M. (2015). Motivation, instructional design, flow, and academic achievement at a Korean online university: A structural equation modeling study. Journal of Computing in Higher Education, 27, 28-46. https://doi.org/10.1007/s12528-015-9090-9

Khan, I. U., Hameed, Z., Yu, Y., y Khan, S. U. (2017). Assessing the determinants of flow experience in the adoption of learning management systems: The moderating role of perceived institutional support. Behaviour & Information Technology, 36(11), 1162-1176. https://doi.org/10.1080/0144929X.2017.1362475

Kline, R. B. (2011). Principles and practice of structural equation modeling (3ª ed.). The Guilford Press.

Lee, J., Lim, C., y Kim, H. (2017). Development of an instructional design model for flipped learning in higher education. Educational Technology Research and Development, 65, 427-453. https://doi.org/10.1007/s11423-016-9502-1

Lee, Y., y Choi, J. (2013). A structural equation model of predictors of online learning retention. The Internet and Higher Education, 16, 36-42. https://doi.org/10.1016/j.iheduc.2012.01.005

Lewis, J. R. (2018). The System Usability Scale: Past, present, and future. International Journal of Human-Computer Interaction, 34(7), 577-590. https://doi.org/10.1080/10447318.2018.1455307

Li, S., y Zheng, J. (2018). The relationship between self-efficacy and self-regulated learning in one-to-one computing environment: The mediated role of task values. Asia-Pacific Education Researcher, 27, 455-463. https://doi.org/10.1007/s40299-018-0405-2

Lu Y., Wang, B., y Lu, Y. (2019). Understanding key drivers of MOOC satisfaction and continuance intention to use. Journal of Electronic Commerce Research, 20(2), 105-117.

Matsunaga, M. (2008). Item parceling in structural equation modeling: A primer. Communication Methods and Measures, 2(4), 260-293. https://doi.org/10.1080/19312450802458935

Mesurado, B., Cristina Richaud, M., y José Mateo, N. (2016). Engagement, flow, self-efficacy, and eustress of university students: A cross-national comparison between the Philippines and Argentina. The Journal of Psychology. Interdisciplinary and Applied, 150(3), 281-299. https://doi.org/10.1080/00223980.2015.1024595

Mohmmed, A. O., Khidhir, B. A., Nazeer, A., y Vijayan, V. J. (2020). Emergency remote teaching during Coronavirus pandemic: The current trend and future directive at Middle East College Oman. Innovative Infrastructure Solutions, 5:72, 1-11. https://doi.org/10.1007/s41062-020-00326-7

Moral de la Rubia, J. (2019). Revisión de los criterios para validez convergente estimada a través de la varianza media extraída. Psychologia, 13(2), 25-41. https://doi.org/10.21500/19002386.4119

Ouadoud M., Nejjari A., Chkouri M.Y., y El-Kadiri K.E. (2018). Learning Management System and the underlying learning theories. En M. Ben Ahmed y A. Boudhir. (Eds.). Innovations in Smart Cities and Applications. SCAMS 2017. Lecture Notes in Networks and Systems (pp. 732-744). https://doi.org/10.1007/978-3-319-74500-8_67

Peifer, C., Schönfeld, P., Wolters, G., Aust, F., y Margraf, J. (2020). Well done! Effects of positive feedback on perceived self-efficacy, flow and performance in a mental arithmetic task. Frontiers in Psychology, 11:1008. https://doi.org/10.3389/fpsyg.2020.01008

Petillion, R. J., y McNeil, W. S. (2020). Student experiences of emergency remote teaching: Impacts of instructor practice on student learning, engagement, and well-being. Journal of Chemical Education, 97(9), 2486-2493. https://doi.org/10.1021/acs.jchemed.0c00733

Pintrich, P. R., Smith, D. A. F., García, T., y McKeachie, W. J. (1991). Manual for the use of the Motivated Strategies for Learning Questionnaire (MSLQ). National Center for Research to Improve Postsecondary Teaching and Learning, Ann Arbor, MI. https://eric.ed.gov/?id=ED338122

Pool-Cibrián, W. J., y Martínez-Guerrero, J. I. (2013). Autoeficacia y uso de estrategias para el aprendizaje autorregulado en estudiantes universitarios. Revista Electronica de Investigación Educativa, 15(3), 21-37. https://redie.uabc.mx/redie/article/view/551/810

ISSN (electronic): 2346-0806 ISSN (print): 1794-8932

Prifti, R. (2020). Self–efficacy and student satisfaction in the context of blended learning courses. Open Learning: The Journal of Open, Distance and eLearning. https://doi.org/10.1080/02680513.2020.1755642

Rijavec, M., Ljubin Golub, T., Jurčec, L., y Olčar, D. (2017). Working part-time during studies: The Role of Flow in Students' Well-Being and Academic Achievement. Croatian Journal of Education, 19, Sp.Ed.No.3, 157-175. https://doi.org/10.15516/cje.v19i0.2724

Rodríguez-Ardura, I., y Meseguer-Artola, A. (2017). Flow in e-learning: What drives it and why it matters. British Journal of Educational Technology, 48(4), 899-915. https://doi.org/10.1111/bjet.12480

Roosta, F., Taghiyareh, F., y Mosharraf, M. (2016, 27-28 de septiembre). Personalization of gamification-elements in an e-learning environment based on learners' motivation. En M. Vaezi y M. Khansari (chairs), IST 2016 [Simposio]. Eight International Symposium on Telecommunications (IST), Theran, Iran. https://doi.org/10.1109/ISTEL.2016.7881899

Sánchez-Rosas, J., y Esquivel, S. (2016). Instructional teaching quality, task value, self-efficacy, and boredom: A model of attention in class. Revista de Psicología, 25(2), 1-20. https://doi.org/10.5354/0719-0581.2016.44966

Sanford, D., Ross, D., Rosenbloom, A., y Singer, D. (2017). Course convenience, perceived learning, and course satisfaction across course formats. e-Journal of Business Education & Scholarship of Teaching, 11(1), 69-84. https://eric.ed.gov/?id=EJ1167321

Satorra, A., y Bentler, P. M. (1994). Correction to test statistics and standard errors in covariance structure analysis. En A. von Eye y C. C. Clogg (Eds.). Latent variable analysis: Applications for developmental research (pp. 399-419). Sage Publications.

Schunk, D. H. (2012). Teorías del aprendizaje: Una perspectiva educativa (6ª ed.). Pearson.

Seel, N. M., Lehmann, T., Blumschein, P., y Podolskiy, O. A. (2017). Instructional design for learning: Theoretical foundations. Sense Publishers.

Shin, N. (2003). Transactional presence as a critical predictor of success in distance learning. Distance Education, 24(1), 69-86. https://doi.org/10.1080/01587910303048

Shin, S., y Cheon, J. (2019). Assuring student satisfaction of online education: A search for core course design elements. International Journal on E-Learning, 18(2), 147-164. https://www.learntechlib.org/primary/p/178238/

Stokes, T. A., Gillan, D. J., y Braden, J. P. (2016). Establishing the link between usability and student satisfaction in adaptive online learning. Proceedings of the Human Factors and Ergonomics Society Annual Meeting, 60(1), 1976-1980. https://doi.org/10.1177/1541931213601450

Taber, K. S. (2018). The use of Cronbach's alpha when developing and reporting research instruments in science education. Research in Science Education, 48, 1273-1296. https://doi.org/10.1007/s11165-016-9602-2

Turnbow, D., y Roth, A. (2019). Demystifying online instruction in libraries: People, process, and tools. ALA Editors.

Wei, H. C., y Chou, C. (2020). Online learning performance and satisfaction: Do perceptions and readiness matter? Distance Education, 41(1), 48-69. https://doi.org/10.1080/01587919.2020.1724768

Yalcin, Y. (2017). Online learners' satisfaction: Investigating the structural relationships among self-regulation, self-efficacy, task value, learning design, and perceived learning [Tesis de doctorado, Florida State University]. https://fsu.digital.flvc.org/islandora/object/fsu%3A605036/

Zhao, Y., y Watterston, J. (2021). The changes we need: Education post COVID-19. Journal of Educational Change, 22, 3-12. https://doi.org/10.1007/s10833-021-09417-3