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Chapter 29
Psychometric Properties of the Instructional Satisfaction Questionnaire in Face-to-Face and Emergency Remote Education Settings

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Introduction

The COVID-19 pandemic has imposed several challenges for education systems around the world, but one of the most important has been the rapid adaptation of face-to-face education (FFE) scenarios for instruction delivery in the virtual modality. This new educational scenario has been defined as emergency remote education (ERE), to differentiate it from what is commonly known as online education (Bozkurt & Sharma, 2020). The objective of ERE is not to recreate an online training system, in fact, it would be impossible to pretend to do so in the midst of the crisis; what it tries to do is to smooth the learning gap among students through the use of technological resources while the incidence is being resolved.

The transition of educational modality in the face of the COVID-19 pandemic caused a great stir among researchers who, given the speed of events and the need for information to guide decision making, were making important efforts to explore the current educational circumstances from a reflective, critical, and scientific apparatus. For example, in a study by Abbasi et al. (2020), a Likert-type scale questionnaire was administered to 382 medical students at a university in Pakistan to measure their perceptions of online learning during confinement.

Similarly, Grammegna (2020) gave a questionnaire with dichotomous questions to determine the technological proficiency of Italian students before school closure and the technological resources used during the pandemic for academic continuity. Similarly, Arora and Srinivasan (2020) administered a questionnaire to 341 teachers in India with the purpose of measuring the benefits of virtual classes and the challenges in adapting to this new educational modality. Other similar studies were

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those of Castaman and Rodrigues (2020), Shatakshi and Nardev (2020), Sintema (2020), Srivastava (2020), Sun et al. (2020) and Trujillo et al. (2020).

Although these previous studies were carried out in different parts of the world, two aspects commonly stand out: the first has to do with the spontaneous design of the measurement instruments, since no psychometric tests had been conducted to estimate the validity and reliability of the questionnaires, so it was unknown to what extent these instruments could guarantee the consistency and accuracy of the results; the second aspect in common was related to the nature of the items, which were oriented more to the measurement of variables related to the degree of technological appropriation and difficulties in adapting the remote teaching scenario and much less to the instructional activity of teachers in this scenario.

With the purpose of contributing to this emerging line of research, a questionnaire was constructed to measure and compare the satisfaction of university students regarding their experiences with the instructional action of their professors in two different scenarios: FFE and ERE. According to Onrubia and Engel (2012), instructional action, understood as a source of educational assistance to students, will always be fundamental in any educational process, regardless of the modality in which it is taught.

Based on the above, the aim of the present work was to explore the psychometric properties of the Instructional Satisfaction Questionnaire (ISQ) for its application in EFE and ERE settings.

Method

Sample

The sample to which the questionnaire was applied consisted of 393 students from the Autonomous University of Baja California, Mexico (Table 29.1). The age range of the students was between 19 and 24 years; 62% of the sample was female.

Table 29.1 Number of participants per academic program

Academic program	N
Common Core social sciences	92
Degree in education	122
Degree in psychology	107
Degree in communication	57
Degree in sociology	8
Degree in history	7
Total	393

Instruments

The CSI is a self-administered instrument that, in its final version, consists of 16 Likert-type items. The instrument aims to measure and compare the satisfaction of university students regarding their experiences with the instructional action of their professors in FFE and RE scenarios. The questionnaire was structured in the following four categories, each with four items:

(a) *Experiences regarding the design of the activity:* items related to (1) time for the completion of tasks, (2) didactic strategies and resources programmed, (3) relevance of the projected contents, and (4) gradual complexity of the proposed tasks;
(b) *Experiences with direct instruction:* items related to (1) clarity and precision of instructions, (2) follow-up of activities, (3) academic flexibility, and (4) climate of trust;
(c) *Experiences in the evaluation of learning:* items on (1) teacher feedback on tasks completed, (2) feedback on tasks in a reasonable time and before starting the next activity, (3) clear and useful feedback to improve the performance of subsequent work, and (4) appropriate estimates to assign value to tasks according to the difficulty and time invested in them; and
(d) *Assessment of experiences:* items related to (1) teacher performance, (2) design of activities, types of tasks and forms of work, (3) evaluation of learning and (4) overall assessment of the experience.

The response options to the items were scored with values from 1 to 5. It is important to note that in the case of the first three categories of the scale (design, direct instruction, and evaluation), where the items relate to students'experiences, responses were formulated on a frequency scale (5 = Always, 4 = Almost always, 3 = Sometimes, 2 = Almost never, and 5 = Never). For the fourth category of the scale related to the students' evaluations of their experiences, the responses to the items were formulated on a scale of satisfaction (5 = Very good, 4 = Good, 3 = Fair, 2 = Bad and 1 = Very bad). The sum of the option chosen in each of the items was taken as the rating for each of the four categories and the sum of these was taken as the overall rating. Higher ratings indicate more positive experiences and ratings.

It should be noted that for the application of the questionnaire in different scenarios, it was necessary to modify its instructions, indicating that students should answer taking into consideration the subjects they had taken in each modality (FFE and ERE).

Procedure

Two researchers with graduate training in educational psychology and previous experience in the study of technology-mediated educational processes met to discuss the theoretical features and basic elements that characterize instructional activity.

The design of the first preliminary version of the instrument was submitted for evaluation by expert judges who assessed the coherence, relevance, clarity, and sufficiency of the items. Based on the observations made by the judges, a second, preliminary version with 24 items was developed and piloted with an initial sample of 20 university students, who suggested additional modifications to improve the comprehension of some items.

Finally, the questionnaire was made available digitally on the Qualtrics platform and disseminated through the official web pages of the educational institution. All participants were informed of the objective of the study and their participation was voluntary. It is important to point out that the questionnaire was completed at the end of the school term, before the students knew their final grade. Once the data was obtained, the IBM SPSS Statistics 23® software was used for statistical analysis.

Statistical Analysis

The analyses were performed independently in two parts, since the questionnaire was intended to measure student satisfaction with respect to the instructional activity in two different scenarios (FFE and ERE), with the purpose of knowing the performance of the questionnaire for different scenarios. In order to perform a reliability analysis, Cronbach's alpha internal consistency test was used.

Regarding the validity of the questionnaire, the items that showed an item-total correlation greater than .30 or that did not decrease the alpha value were subjected to an exploratory factor analysis (EFA), since the questionnaire was recently developed, and the present study is intended to describe its psychometric properties for the first time. The items that showed factor loadings lower than .40 or that loaded on a dimension different from the one proposed theoretically were eliminated. Correlations were identified by means of Pearson's coefficient between the ratings of the dimensions identified from the AFE and the overall rating of the questionnaire. Finally, Pearson's coefficient was used in order to identify the correlation between the overall questionnaire rating in the FFE scenario and the ERE scenario. For all tests α was equal to 0.05.

Results

The first version of the questionnaire with 24 items showed a Cronbach's alpha internal consistency coefficient of .968 and the item-total correlations were higher than .30 for all items, except for 24, 30, and 36 whose correlations were − .099, −.128, and .013 respectively. It should be noted that the elimination of these items did not increase the internal consistency coefficient, therefore, they were also included in the following analysis.

In order to establish the construct validity of the questionnaire, a principal components analysis (PCA with Varimax rotation) was performed because the correlations between the items showed low values. In addition to the aforementioned criteria for item elimination, factors consisting of less than three items were also eliminated.

In the final solution the eigenvalues greater than one showed the existence of four factors. This solution converged in five iterations and explained 66.45% of the variance. The items presented factor loadings greater than .40 within their factor and communalities greater than .40.

The final instrument consisted of 16 items, i. e., eight items were eliminated from the EFA (Table 29.2). Bartlett's test of sphericity was significant (2895.947, $gl = 120$, $p < .001$) and the Kaiser-Meyer-Olkin sample size adequacy indicator was adequate (.917). After item deletion, the Cronbach's alpha internal consistency coefficient alpha for the questionnaire application in the FFE scenario was .904 and the item-total correlations were above .30 for all items. Table 29.3 shows the Pearson's coefficients for the correlations between the dimensions identified from the EFA and the total score of the questionnaire.

Using a procedure similar to that employed to establish the construct validity of the questionnaire for the FFE scenario, a principal components PCA with Varimax rotation was performed for its application in the ERE scenario. For the elimination of items, the same criteria applied in the FFE scenario were followed (Table 29.4).

In the final solution the eigenvalues greater than one also showed the existence of four factors. This solution converged in five iterations and explained 76.30% of the variance. The items presented factor loadings greater than .40 within their factor and communalities greater than .40. Bartlett's test of sphericity was significant (4868.185, $gl = 120$, $p < .001$) and the Kaiser-Meyer-Olkin sample size adequacy indicator was adequate (.951). Cronbach's alpha internal consistency coefficient for the application of the questionnaire in the ERE scenario was .951 and item-total correlations were greater than .40 for all items.

Table 29.5 shows the Pearson coefficients for the correlations between the dimensions identified from the EFA and the total questionnaire score for the ERE scenario.

Table 29.2 Factor weights for the exploratory factor analysis of the CSI applied to the FFE scenario

		Design of activities	Direct instruction	Evaluation of learning	Assessment of experiences
Range		12	16	13	11
Mean		16.67	17.29	16.08	16.92
SD		2.59	2.49	2.96	2.27
Bias		−.58	−1.14	−.57	−.55
Variance explained		15.99	17.52	17.12	15.84
Cronbach's alpha		.80	.83	.84	.80
Item		Factorial loading			
1	How often do teachers provide clear and precise instructions on the activities/goals to be performed?		.793		
2	How often do they generate a climate of trust for you to express doubts or misunderstandings about the contents reviewed?		.791		
3	How often do they resolve your questions in a relatively short time and provide immediate explanations?		.750		
4	How often do they follow up on the development of the requested activities/goals and not just provide initial instructions?		.670		
5	How often do the activities/goals proposed to address the contents of the subjects facilitate my learning (are they diverse, innovative, motivating)?	.767			
6	How often is the level of complexity of the activities/goals progressive (they start out simple and become more complex as the course progresses)?	.724			
7	How often do the requested activities/goals allow me to connect my learning experiences from other contexts (friends, family, work) with the subject content?	.704			
8	How often are the organization of the activities/goals and the way they are approached (individual or teamwork) favorable and allow me to achieve the competencies of the subject?	.668			
9	How often are the difficulty of the activities/goals and the time invested in their development commensurate with the percentage awarded to them?			.831	

(continued)

Table 29.2 (continued)

		Design of activities	Direct instruction	Evaluation of learning	Assessment of experiences
10	How often are graded activities/goals accompanied by feedback?			.829	
11	How often is feedback on activities/goals provided in a timely manner (before the next activity/goal)?			.750	
12	How often is the feedback you receive so clear and accurate that it helps you improve upcoming activities/goals?			.495	
13	How do you rate your performance (participation, attendance, punctuality, completion of tasks) in this scenario?				.801
14	How do you rate the performance of most of your teachers in this scenario?				.752
15	How do you rate the workload and the level of demand in this scenario?				.718
16	How do you rate the assessment of learning (assessment activities, assessment criteria and feedback) in this scenario?				.699

Table 29.3 Correlations between the dimensions of the CSI applied in the FFE scenario

	Design of activities	Direct instruction	Evaluation of learning	Assessment of experiences	Total
Design		.54	.61	.41	.81
Sig.		.001	.001	.001	.001
Instruction	.54		.535	.48	.799
Sig.	.001		.001	.001	.001
Evaluation	.61	.54		.47	.844
Sig.	.001	.001		.001	.001
Assessment	.41	.42	.469		.718
Sig.	.001	.001	.001		.001
Total	.81	.80	.84	.72	
Sig.	.001	.001	.001	.001	

In order to determine the relationship between the total score of the questionnaire applied to the FFE scenario and the ERE scenario, Pearson's coefficient was used, which revealed a moderate correlation ($r = .44$, $p = .001$).

Table 29.4 Factor weights for the exploratory factor analysis of the CSI applied to the ERE scenario

		Design of activities	Direct instruction	Evaluation of learning	Assessment of experiences
Range		16	16	16	16
Mean		14.20	14.90	13.28	13.86
SD		3.55	3.70	4.18	3.48
Bias		−.34	−.46	−.12	−.25
Variance explained		13.22	20.92	23.39	18.77
Cronbach's alpha		.85	.90	.90	.87
Item		Factorial loading			
1	See items in Table 29.2.		**.81**		
2			**.80**		
3			**.78**		
4			**.62**	.44	
5		**.88**			
6		**.53**			
7		**.48**		.43	
8		**.45**	.43	.42	
9				**.85**	
10				**.82**	
11				**.79**	
12		.49		**.51**	
13					**.84**
14					**.70**
15					**.70**
16				.51	**.66**

Note: Values in bold type indicate the highest factor loadings

Table 29.5 Correlations between the dimensions of the CSI applied in the ERE scenario

	Design of activities	Direct instruction	Evaluation of learning	Assessment of experiences	Total
Design		.75	.73	.67	.89
Sig.		.001	.001	.001	.001
Instruction	.75		.72	.66	.89
Sig.	.001		.001	.001	.001
Evaluation	.73	.72		.70	.90
Sig.	.001	.001		.001	.001
Assessment	.67	.66	.70		.85
Sig.	.001	.001	.001		.001
Total	.89	.89	.90	.85	
Sig.	.001	.001	.001	.001	

Discussion

The purpose of the present study was to determine the psychometric properties of the instructional satisfaction questionnaire, specifically its validity and internal consistency, when applied in the FFE ERE scenarios. As could be observed, the internal consistency coefficient Cronbach's Alpha for the application in both scenarios was higher than .90, which reflects an adequate level of reliability.

From the first EFA carried out for the application of the questionnaire in the FFE scenario, it was necessary to eliminate eight items, which gave a solution of four factors/dimensions that was congruent with the base theory for the development of the questionnaire, since it was possible to identify the four areas. This solution explained a variance of 66.45%.

The correlations found between the four dimensions of the questionnaire in the FFE scenario were positive and moderate, while the correlations between these and the total questionnaire score were positive and very high.

Regarding the application of the second version of the questionnaire in the ERE scenario, the EFA results were similar to what was found with the application in the FFE scenario. A four-factor/dimension solution explained 76.30% of the variance. The correlations between the four dimensions showed positive and moderate to high values, while the correlations between these dimensions and the total score of the questionnaire were positive and very high.

These results allow us to affirm that the application of the questionnaire is suitable for both scenarios (FFE and ERE) with university students with characteristics similar to those of the sample used here. In addition, the correlation between the final scores of the questionnaire applied to the two scenarios showed a positive and moderate value ($r = .44$), that is, it can be interpreted that the questionnaire was able to identify differences between the participants' responses to different scenarios, since otherwise a perfect or almost perfect correlation would have been obtained when applying the questionnaire twice in the same condition and at the same time.

Overall, it can be concluded that the CSI is a suitable instrument for measuring and comparing the satisfaction of university students with the instructional action of faculty in FFE ERE settings.

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