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Adaptation, validation, reliability and assessment of an attitude towards online education scale for university students in the COVID-19 crisis

Adaptación, validación, fiabilidad y baremación de una escala de actitud hacia la educación *online* para universitarios en la crisis por COVID-19

在COVID-19背景下对大学生关于在线教育态度量表的修改、检验、验证可靠性及测量

Адаптация, валидация, надежность и ранжирование шкалы отношения к онлайн-образованию для студентов университетов в условиях кризиса по COVID-19

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Abstract

The COVID-19 pandemic accelerated the rolling out of online education worldwide, prompting the need to investigate the "new normal". The aim of this study was to adapt, validate, confirm the viability of and assess an attitude towards online education scale for university students in the context of the pandemic. The quantitative research consisted of basic, descriptive-level research with a descriptive transversal design. The technique used was a survey with application of the abovementioned scale. The cross-cultural adaptation and translation of the *Instrument to Measure University Students' Attitude towards E-learning* developed by Mehra and Omidian (2012) was carried out by inverse translation and back translation. Due to the context, it was adjusted from 83 to 63 items, and compressibility was evaluated by means of a pilot test and information-gathering and paraphrasing by interviews with a sample of 50 university students. The content was validated with 16 experts, whose Aiken's V coefficients were higher than .85, and construct validation, with a sample of 6,852 university students from two regions in Peru, was between sufficient and excellent via Pearson's adjusted correlation coefficient. The reliability evaluation yielded a Cronbach's alpha coefficient of .96, equivalent to very reliable. The scale was graded into four levels: strong negative (63-126), weak negative (127-189), weak positive (190-252) and strong positive (253-315). In conclusion, we were able to successfully adapt, validate, confirm the reliability of and assess the attitude towards online education scale for university students in the context of the COVID-19 crisis, making it ideal for studies in Latin American scenarios.

Keywords: COVID-19, adaptation, validation, reliability, scale, online education.

Resumen

La pandemia por COVID-19 aceleró la implementación de la educación *online* a nivel mundial, generando necesidad por investigar la nueva normalidad. El objetivo del estudio fue adaptar, validar, fiabilizar y baremar una escala de actitud hacia la educación *online* para estudiantes universitarios en el contexto de la pandemia. La investigación de enfoque cuantitativo, tipo básico, nivel descriptivo, y diseño transversal descriptivo, tuvo como técnica la encuesta y aplicó la escala. La adaptación transcultural y traducción del *Instrument to measure university students' attitude towards e-learning* de Mehra y Omidian (2012) se realizó por traducción y retrotraducción inversa; por el contexto se ajustó de 83 a 63 ítems, la evaluación de compresibilidad fue mediante una prueba piloto e indagación y parafraseo por entrevista a una muestra de 50 universitarios. La validez de contenido se realizó con 16 expertos, cuyos coeficientes de concordancia de V de Aiken fueron superiores a .85, y la validación de constructo, con una muestra de 6852 universitarios de dos regiones de Perú, resultó entre suficiente y excelente a través del coeficiente de correlación r de Pearson corregida. La evaluación de fiabilidad alcanzó un coeficiente alfa de Cronbach de .96, siendo muy fiable. Se baremó la escala en cuatro niveles: negativa fuerte (63-126), negativa débil (127-189), positiva débil (190-252) y positiva fuerte (253-315). En conclusión, se logró adaptar, validar, fiabilizar y baremar con éxito la escala de actitud hacia la educación *online* para estudiantes universitarios en el contexto de la crisis por COVID-19, siendo idónea para estudios en realidades latinoamericanas.

Palabras clave: COVID-19, adaptación, validación, fiabilidad, baremación, educación online.

摘要

COVID-19疫情加速了全球在线教育的实行，因此我们认为有必要研究这个新常态。本研究的目的是在疫情背景下修改，检验，验证可靠性并测量大学生对在线教育的态度量表。研

究采用基本类型定量分析，描述性和横向描述性设计，以问卷调查方式应用量表。 我们对Mehra和Omidian (2012) 的*Instrument to measure university students' attitude towards e-learning*量表进行了跨文化性修改和翻译，根据实际情况将83项目调整为63项，对50名大学生样本进行试点测试，询问和访谈意译，并对以上方式获得的信息进行压缩性评估。16位专家对内容进行有效性评估，其中说明一致性的Aiken V系数值高于0.85，并且以来自秘鲁两个地区的6852名大学生作为样本进行的量表验证结果显示其Pearson's r校正系数处于充分与优秀之间。可靠性评估得出的Cronbach α系数为0.96，说明其非常可靠。量表分为四个等级：强负面 (63-126)，弱负面 (127-189)，弱正面 (190-252) 和强正面 (253-315)。结论得出，在COVID-19危机的背景下，针对大学生在线教育的态度量表成功进行了修改，检验，验证其可靠性和评估，使其非常适合对拉丁美洲的现状研究。

关键词: COVID-19, 修改, 验证, 可靠性, 测量, 在线教育。

Аннотация

Пандемия COVID-19 ускорила внедрение онлайн-образования во всем мире, породив необходимость исследования новой реальности. Цель исследования заключалась в адаптации, валидации, проверке и оценке шкалы отношения к онлайн-образованию для студентов университетов в контексте пандемии. Исследование количественного подхода, базового типа, описательного уровня и описательного кросс-секционного дизайна, имело в качестве техники опрос и применило шкалу. Кросс-культурная адаптация и перевод Инструмента для измерения отношения студентов университетов к электронному обучению Мехры и Омидиана (2012) были выполнены путем перевода и обратного перевода; по контексту он был скорректирован с 83 до 63 пунктов, оценка понятности была проведена путем пилотного теста и опроса и перефразирования путем интервьюирования выборки из 50 студентов университета. Валидность содержания была проведена с 16 экспертами, коэффициенты конкордации которых по критерию V Эйкена были выше .85, а валидность конструкта, на выборке из 6852 студентов университетов из двух регионов Перу, была между достаточной и отличной благодаря скорректированному коэффициенту корреляции r Пирсона. Оценка надежности достигла коэффициента альфа Кронбаха .96, что является очень надежным. Шкала оценивалась по четырем уровням: сильно отрицательный (63-126), слабо отрицательный (127-189), слабо положительный (190-252) и сильно положительный (253-315). В заключение следует отметить, что шкала отношения к онлайн-образованию для студентов университетов в контексте кризиса COVID-19 была успешно адаптирована, валидирована, проверена и оценена, и подходит для исследований в латиноамериканских реалиях.

Ключевые слова: COVID-19, адаптация, валидация, надежность, рейтинг, онлайн-образование.

Introduction

In the context of the rolling out of online education during the emergency caused by the SARS-CoV-2 (COVID-19) pandemic and given the need to carry out studies in the "new normal", the following problem was addressed: Is it possible to adapt, validate, confirm the reliability of and assess an attitude towards online education scale for university students in the context of the COVID-19 crisis? The aim was to adapt an instrument developed in India by Mehra and Omidian (2012) to the situation of universities in Peru.

On-line education is different from virtual education insofar as it takes place synchronously, with the teacher and students interact in real time via teleconference, whereas virtual education includes a platform where communication occurs asynchronously (Orientación Universia, 2018; Gestión, 2020). Before the pandemic, many universities already had experience in virtual education, especially in distance or blended programmes, but little experience in the online modality. The adaptation of universities to virtual environments was a slow process in which virtual teaching platforms were used as repositories of learning resources to complement face-to-face tasks.

The COVID-19 pandemic caused a global educational crisis that forced the acceleration of historical processes, including online education, which was rolled out globally from the early months of 2020 due to the impossibility of continuing with in-person classes and the uncertainty regarding the future evolution of the pandemic. In Peru, 721,745 university students and all universities had to migrate to online education (Ministry of Education, 2020).

According to Mujica (2020), in a country like Peru, considering online or virtual education as the only solution to the health emergency is a utopia destined to fail due to the gaps in access to technology: 73% of Peruvians use the Internet, and of these 82% access via a mobile or cell phone; less than 40% of households have a computer. Furthermore, it is infeasible to only digitise traditional classes for learning since not all teachers have sufficient training to use online teaching tools. On-line education comprises two main aspects: the use of platforms for teaching; and teaching techniques for the proper development of classes (Mujica, 2020). Rolling out online education requires adapting new strategies and methods to students' ways of learning.

In the transition to the remote online modality of education, universities with prior experience in virtual education adapted best and lead the process, while the other universities faced constant difficulties as a result of the radical change. Teachers were required to reinvent their skills due to the mistrust of many students (Morris, 2020).

According to Mujica (2020), the crisis caught the traditional educational system completely by surprise. In the first semester of 2020, the Ministry of Education of Peru (TvPe Noticias, 2020) reported that 174,544 university students had interrupted their studies, representing 9% of all students from public universities and 22% from private universities, and a drop-out rate of 18.6%. The economic factor and mistrust towards the new online modality were the main causes of university dropouts. However, Alfonso (2003) highlighted that there is no evidence to sustain that in-person teaching is the perfect method; distance education can be as or more effective.

The attitude of students determines the success of the new online modality, as it requires greater participation and more active involvement from the learner; a positive attitude increases the chances of success (Lee & Li, 2016, cited in Hernández et al., 2018). To objectively measure students' attitude towards online education, a validated and reliable instrument is required, adapted to the exceptional circumstances of the pandemic.

The evaluation of the attitude towards online education in the context of COVID-19 can be used to determine the degree of motivation or resistance to the new process, and to identify indicators with a view to establishing effective strategies in the reconfiguration of the educational system and its future development. The documentation of attitudinal responses to the transformation of technological infrastructures and new forms of teaching will, in the coming years, serve as an important legacy for the development of theoretical and methodological knowledge on education.

Hernández et al. (2018) in Guatemala, and Pulido (2017) in Venezuela, adapted the *Instrument to Measure University Students' Attitude towards E-Learning*, developed by Mehra and Omidian (2012), to the Latin American experience before the pandemic caused by COVID-19.

Mehra and Omidian (2012) define "attitude" as an individual's positive or negative feelings (evaluative effect) about performing target behaviour. For Eagly and Chaiken (cited in Haddock & Maio, 2008), it is a psychological tendency expressed through the favourable or unfavourable assessment of a particular entity. This evaluation includes both analytical evaluations and impulsive affective reactions.

Both elements were studied by Zanna and Rempel (1998, cited in Fazio, 2007), who postulated that attitudes derive from beliefs, affects and/or behavioural information. Later, Eagly and Chaiken (1993, cited in Haddock & Maio, 2008) consolidated the multi-component model of attitudes, defining that attitudes as summary evaluations have affective, cognitive and behavioural components.

In terms of the measurement of attitude, Bolívar (1995) mentions that given the latent nature of this variable, it cannot be observed directly and must therefore be measured based on inferences from the beliefs, feelings or behavioural intentions of the subject.

On-line education is the teaching-learning modality that uses Internet-based technologies (Aguilar, 2015), where learning represents advantages such as flexibility, convenience and accessibility for different students; its disadvantages are related to the use of or access to technology (Hernández et al., 2018). According to Mehra and Omidian (2010), six factors affect the attitude towards online education [translator's note: the original document uses "e-learning" rather than "online education]: perceived usefulness of e-learning, intention to adapt e-learning, ease of e-learning use, technical and pedagogical support, e-learning stressors and pressure to use e-learning.

Adaptation is the process in which an instrument is modified for use in a different context than the one for which it was created. In validation, evidence is obtained on coherence between the interpretation of the scores achieved and the theory on which the instrument is based (Sánchez-Villena & De la Fuente-Figuerola, 2020). It comprises logical validation of the construct by experts and metric validation through a pilot study (Bakieva, 2016); reliability guarantees the statistical precision of the instrument. Assessment consists in qualitatively interpreting results using a rating scale.

The aim of this study was to adapt, validate, confirm the viability of and assess an attitude towards online education scale for university students in the context of the pandemic.

Method

A basic quantitative research approach was used in line with Valderrama (2018), with a descriptive level because it aimed to identify specific characteristics of phenomena that were subjected to a non-experimental, cross-sectional, descriptive analysis and design (Hernández & Mendoza, 2018). The descriptive and statistical method was used. The survey technique was used to gather data.

The instrument designed to measure the attitude of university students towards online education in the context of the global crisis caused by the COVID-19 pandemic was adapted from the *Instrument to Measure University Students' Attitude towards E-learning*

(Mehra & Omidian 2012). The original questionnaire consisted of 83 items classified in six dimensions, which were translated and adapted to the study as follows: perceived usefulness of online education, intention to adopt online education, ease of use of online education, technical and pedagogical support of online education, online education stressors and need for online education.

For the cross-cultural adaptation of the instrument and translation from English to Spanish, the reverse translation and back translation method was used (Gascón-Cánovas et al., 2017) with the participation of two translators and the research team; the concept of e-learning was translated using the equivalent "online education" because the Anglicism "online" is more widely used in Latin America than its Spanish equivalent "en línea". The number of items was readjusted (83), dispensing with 21 items that did not reflect the context of the COVID-19 crisis, and one item was added (online education is the best alternative to confront the current situation of social crisis), leaving a 63-item structured questionnaire with five response options on a Likert scale. To evaluate compressibility, a pilot test was carried out with 50 university students aged between 18 and 26 (32 women and 18 men) and the probing and paraphrasing method was applied (Herdman et al., 1997) through individual interviews.

The "attitude towards online education in the COVID-19 crisis scale" can be applied individually or collectively and has an approximate duration of 20 minutes. To score items 1, 2, 3, 4, 5, 6, 7, 8, 9, 13, 14, 15, 16, 18, 25, 26, 27, 30, 31, 32, 38, 42, 44, 45, 46, 47, 48, 50, 51, 59, 60, 61, 62 and 63, the following scores were assigned: strongly disagree = 1, disagree = 2, not sure = 3, agree = 4, strongly agree = 5; the remaining items were reverse scored.

The content was validated based on the judgement of 16 experts comprising psychologists, sociologists, anthropologists, communicators, social workers, educators and a statistician, with PhDs and Master's degrees. The evaluation was carried out using Aiken's V coefficient (1985). For construct validation, the instrument previously validated by experts was applied online to a sample of 6,852 students enrolled in different degree programmes at the National University of Central Peru (UNCP), the Continental University (UC) and the University of Huánuco (UDH) in the Junín and Huánuco regions, respectively, of whom 55.7 % were women, aged between 16 and 30, with a mean age of 21.77 years (SD = 7.06 years), mostly single (85.2%), living in families of 1 to 12 people, the average being 4.53 people (SD = 2.29 people). Pearson's adjusted correlation coefficient was evaluated. To validate reliability, the same study sample was used and evaluated with Cronbach's alpha coefficient to measure internal consistency. The results were processed using the statistical program RStudio v.1.3.1093. Before applying the questionnaire, the participants were informed of the ethical implications of the study and the use of the data that would be obtained, and informed consent was requested and obtained from all the participants in the study sample.

Results

Validity of the instrument

The validity of the instrument encompassed the following: content validity and construct validity. Content validity was evaluated using Aiken's V coefficient and the opinions of 16 experts on 10 indicators, with five opinion options: very bad (1), bad (2), fair (3), good (4) and very good (5). Construct validity was evaluated with the results

of the application of the instrument to the study sample (6,852 students), for *online* education and each of its dimensions with Pearson's adjusted correlation coefficient.

a) Content validity

Table 1

Content validity of the scale with Aiken's V coefficient

Indicator	Criterion	Aiken's V	p value	Validity
1. Clarity	It is formulated in appropriate and understandable language.	.89	< .008	Yes
2. Objectivity	It enables the measurement of observable facts.	.94	< .008	Yes
3. Current awareness	It is adapted to the advancement of science and technology.	.92	< .008	Yes
4. Organisation	It is presented in an ordered manner.	.89	< .008	Yes
5. Sufficiency	It includes aspects of the variables in sufficient quantity and quality.	.88	< .008	Yes
6. Relevance	It allows data to be obtained according to the objectives set.	.92	< .008	Yes
7. Consistency	It aims to obtain data based on theories or theoretical models.	.88	< .008	Yes
8. Coherence	There is consistency between variables, indicators and items.	.91	< .008	Yes
9. Methodology	The adopted strategy serves the purpose of the research.	.92	< .008	Yes
10. Application	The data to be gathered can be statistically processed.	.94	< .008	Yes

According to Aiken's V coefficient, the content of the instrument was validated since the coefficients of all the indicators were higher than .85 (p <.008).

These results confirm that the instrument is valid based on the opinion of experts.

b) Construct validity

Table 2

Validity of the scale items with Pearson's adjusted correlation coefficient.

Items	Pearson's adjusted correlation coefficient
Perceived usefulness of online education	
1. Online education helps resolve educational problems.	.722
2. Online education saves time and effort for both teachers and students.	.674

Items	Pearson's adjusted correlation coefficient
3. Online education increases access to university studies.	.705
4. Online education allows me to achieve better results.	.783
5. Online education can engage students more than other forms of learning.	.760
6. Online education enhances the quality of teaching-learning because it integrates all educational media (text, audio, video and animation).	.778
7. Online education increases the flexibility of teaching-learning.	.780
8. Online education improves interaction between students and teachers.	.640
9. The pedagogical value of a subject can be enhanced through *online education technologies.*	.779
10. Online education has created more problems than it has solved.	.214
11. Online education has not had a positive impact on me.	.237
12. Online education will never replace other forms of teaching and learning.	.274
13. Universities should increasingly embrace online education for their students.	.739
14. Online education improves my academic performance.	.797
15. Online education enhances my effectiveness in submitting academic papers on time.	.756
16. Online education enhances my effectiveness to reinforce my knowledge.	.808
17. Online education is too time consuming to use.	.247
18. Online education enhances my effectiveness when conducting research.	.740
Intention to adopt online education.	
19. Online education makes me uncomfortable because I don't understand it.	.722
20. Online education is a dehumanizing learning process.	.674
21. Online education is not effective for student learning.	.705
22. I feel intimidated by online education.	.783
23. I feel anguish when I have to use online education for my subjects.	.760
24. I dislike the idea of continuing to use online education.	.778
25. I feel extremely motivated when I take online education courses.	.780
26. I think it is a good idea to use online education for my subjects.	.640
27. I find online education easy to use.	.779

Items	Pearson's adjusted correlation coefficient
28. I am against the implementation of online education because it prevents in-person interaction between students and teachers.	.214
29. I am against online education because it leads to the isolation of the person.	.237
30. I think positively about online education.	.274
31. I plan to participate in future online education courses.	.739
32. The use of online education makes learning enjoyable.	.797
Ease of use of online education	
33. I cannot learn subjects only through online education.	.700
34. It is difficult to learn through online education.	.709
35. It is difficult to express my thoughts and ideas when submitting responses online.	.760
36. It is difficult to take responsibility for my own learning when using online education.	.720
37. It is difficult to communicate effectively with my peers using online education.	.744
38. Online education systems and platforms are easy to master.	.246
39. My interaction with online educational content is not suitable.	.667
40. I learn better through face-to-face contact with teachers and students than using a computer, tablet or smartphone.	.675
41. I think it is better to read from a printed source, such as a book or brochure, rather than from a computer screen, tablet or smartphone.	.646
42. I find that online education is easier than using books, scientific journals, or theses at the library.	.237
43. I feel that students are becoming slaves of technology.	.675
Technical and pedagogical support for online education	
44. My University has the necessary technology to provide online education.	.750
45. My University has updated web platforms and tools for online education.	.767
46. My University has online resources that motivate my learning activities.	.717
47. My University has online resources that motivate my research activities.	.718
48. My University provides me with technical support when I need help.	.648
49. My University does not have the funding to acquire updated and necessary hardware and software.	.264
50. My Faculty has teachers trained in online teaching-learning.	.693

Items	Pearson's adjusted correlation coefficient
51. The students at my Faculty are motivated by the adoption of online education.	.662
52. Students at my Faculty prefer traditional forms of teaching and research.	.241
Online education stressors	
35. I feel unsure of my ability to use online education tools.	.629
54. I get stressed out by slow internet connections while receiving online education.	.614
55. I feel pressured by my teachers to use online education in my research activities.	.841
56. I feel pressured by my teachers when using online education in my learning activities.	.847
57. I feel pressured by my peers when using online education.	.757
58. I feel stressed because my technology equipment is unreliable to use online education.	.746
Need for online education	
59. Online education must continue to be offered to reach out to students living in distant places.	.810
60. Online education should continue to be offered to reduce travel-related stress for teachers and students.	.796
61. Online education should continue to be offered to allow married students to reconcile study and family life.	.857
62. Online education should continue to be offered to allow working students to study from home.	.877
63. Online education is the best alternative to face the current situation of social crisis.	.777

According to Pearson's adjusted correlation coefficient, the items on the "perceived usefulness of online education" sub-scale were valid, reporting coefficients greater than .2, between .214 (item 10) and .808 (item 16), revealing sufficient validity (.2 to .34) and excellent validity (.55 to 1) (Muñiz, 2005), with four items presenting sufficient validity and 14 items excellent validity.

Likewise, the items on the "intention to adopt online education" sub-scale were valid, reporting coefficients greater than .2, between .214 (item 28) and .797 (item 32), showing sufficient validity (.2 to .34) and excellent validity (.55 to 1), with three items presenting sufficient validity and 11 items excellent validity.

Similarly, the items on the "ease of use of online education" sub-scale were valid, reporting coefficients greater than .2, between .237 (item 42) and .744 (item 37), revealing sufficient validity (.2 to .34) and excellent validity (.55 to 1), with one item presenting sufficient validity and 10 items excellent validity.

Similarly, the items on the "technical and pedagogical support of online education" sub-scale were valid, reporting coefficients greater than .2, between .241 (item 52) and .767 (item 45), indicating sufficient validity (.2 to .34) and excellent validity (.55 to 1), with two items presenting sufficient validity and seven items excellent validity.

The items on the "online education stressors" sub-scale were valid, reporting coefficients greater than .55, between .614 (item 54) and .847 (item 56), showing excellent validity (.55 to 1).

The items on the "need for online education" sub-scale were valid, reporting coefficients greater than .55, between .777 (item 63) and .877 (item 62), showing excellent validity (.55 to 1).

With these results, the "perceived usefulness" "intention to adopt", "ease of use", "technical and pedagogical support", "stressors" and "need" sub-scales presented construct validity, thus confirming the construct validity of the attitude towards online education scale.

Given that the content and construct validity of the instrument was confirmed, it is concluded that the attitude towards online education scale is valid.

The reliability of the instrument was evaluated using Cronbach's alpha coefficient of internal consistency for the scale and each of its sub-scales. According to this coefficient, the attitude towards online education scale is reliable, with a Cronbach's alpha of .96, showing excellent reliability (.85 to 1) (Muñiz, 2005). The sub-scales were also reliable, presenting excellent reliability, between .855 ("Intention to adopt online education") and .933 ("Need for online education"). These results confirm the validity of the instrument.

Table 3

Reliability of the attitude towards online education scale and the sub-scales

Sub-scale	**Number of items**	**Cronbach's alpha coefficient**
Perceived usefulness of online education	18	.930
Intention to adopt online education.	14	.855
Ease of use of online education	11	.892
Technical and pedagogical support for online education	9	.868
Online education stressors	6	.903
Need for online education	5	.933
Attitude towards online education	**63**	**.960**

The attitude towards online education scale and its dimensions were constructed based on uniform statistical distribution into four levels or categories: 1) strong negative, 2) weak negative, 3) weak positive, and 4) strong positive. The scales are illustrated in Table 4.

Table 4

Attitude towards online education scale and its dimensions according to the uniform statistical distribution

Sub-scale	Number of items	Theoretical range	Level			
			Strong negative	Weak negative	Weak positive	Strong positive
Perceived usefulness of online education	18	18 to 90	18 to 36	37 to 54	55 to 72	73 to 90
Intention to adopt online education.	14	14 to 70	14 to 28	29 to 42	43 to 56	57 to 70
Ease of use of online education	11	11 to 55	11 to 22	23 to 33	34 to 44	45 to 55
Technical and pedagogical support for online education	9	9 to 45	9 to 18	19 to 27	28 to 36	37 to 45
Online education stressors	6	6 to 30	6 to 12	13 to 18	19 to 24	25 to 30
Need for online education	5	5 to 25	5 to 10	11 to 15	16 to 20	21 to 25
Attitude towards online education	**63**	**63 to 315**	**63 to 126**	**127 to 189**	**190 to 252**	**253 to 315**

Discussion and conclusions

According to the results, the cross-cultural adaptation and translation of the original instrument using the translation and reverse back-translation method was successful, as was the adaptation to the context of COVID-19, eliminating 21 items and adding one. The compressibility evaluation using the probing and paraphrasing method through interviews with 50 university students confirmed the semantic equivalence of the instrument studied, adapted from the *Instrument to Measure University Students' Attitude towards E-learning* developed by Mehra and Omidian (2012).

The validity of the content of the final 63-item instrument was based on the opinion of 16 experts, evaluated using Aiken's V coefficient (1985); it was obtained as a result of all the coefficients of the indicators being greater than .85 ($p < .008$), indicating excellent validity (Muñiz, 2005). The validity of the construct was evaluated using Pearson's adjusted correlation coefficient. For this purpose, the instrument was applied to a sample of 6,852 students from three universities (UNCP, UC and UDH). The results reported excellent validity between sufficient (.2 to .34) and excellent (.55 to 1). Consequently, all the items of the instrument consistently measured the attitude towards online education in the context of the health crisis caused by the COVID-19 pandemic.

Cronbach's alpha coefficient of internal consistency was used to evaluate reliability, resulting in a validity of .96, which means that the scale achieved excellent reliability. Therefore, the results will be consistent when the instrument is applied repeatedly in similar contexts (Hernández el al., 2014).

Based on the results, it was found that attitude is measurable based on beliefs, feelings or behavioural intentions (Bolívar, 1995; Fazio, 2012), which define positive or negative psychological tendencies to behave objectively (Mehra & Omidian , 2012; Eagly & Chaiken cited in Haddock & Maio, 2008).

The results obtained coincide with those reported by Pulido (2017), who adapted the same instrument for postgraduate students at the Libertador Experimental Pedagogical University ("Universidad Pedagógica Experimental Libertador") in Venezuela; internal consistency measured using Cronbac's alpha coefficient was .86, but the number of dimensions was different because it excluded the "need" dimension. Another similarity was the number of items considered by the author, 61 in the case of Pulido and 63 in this study; these data are similar due to the similar characteristics of the reality in Latin America.

Also, Hernández et al. (2018), in studies carried out among postgraduate students in online education at the Galileo University in Guatemala, evaluated the validity and reliability of the instrument with 57 items.

The findings reported here also coincide with those presented by Bazán and Sotero (2000), who developed a questionnaire using a Likert-type scale of 31 items divided into 4 dimensions - affectivity, applicability, ability and anxiety, two of which - applicability and anxiety - coincide with dimensions studied in our research, namely ease of use and stressors, respectively. The scale was also designed to measure the attitude of university students towards online education. Attitudes are summary evaluations with affective, cognitive and behavioural components (Haddock & Maio, 2008).

Some studies of the design and adaptation of instruments developed to measure the attitude towards online education, specifically for mathematics in which 3 dimensions were established, differ substantially from those described in the present study (Ursini, Sánchez, & Orendain, 2004).

In the assessment, ranges were determined to qualitatively interpret the levels of attitude towards online education of university students, resulting in the proposal, based on a uniform or rectangular statistical distribution, of a table of calculations in four levels: strong negative (63-126), weak negative (127-189), weak positive (190-252) and strong positive (253-315). This implies that the instrument can be used for the standardised classification of the levels of attitude towards online education of the persons to whom it is applied.

Thus, the attitude towards online education scale for university students in the context of the COVID-19 crisis, proposed in this study, is an adequate instrument for measuring the attitude towards online education in a Latin American experiment. Prytz Nilsson and Suárez (2009) substantiate the need to construct valid and reliable instruments based on first-hand experiences in Latin America which are adapted and adjusted to the current contexts of analysis and application. The studies that design evaluation instruments provide justify their benefits and productivity on the grounds that they enhance scientific knowledge in their respective areas and strengthen investigative maturity in their field of study.

The instrument has been adapted for application in times of pandemic, but it is also designed for use in post-COVID-19 times, since online education is a modality that is here to stay (Morris, 2020). In this regard, Mehra and Omidian (2012) highlight the complex and changing nature of our current reality; hence, we should expect a different future dominated by online education.

In conclusion, we were able to successfully adapt, validate, confirm the reliability of and assess the attitude towards online education scale for university students in the context of the COVID-19 crisis, and confirmed that it will be ideal for use with students in Latin America in the new normal scenarios.

The cross-cultural adaptation and translation of the *Instrument to Measure University Students' Attitude towards E-Learning*, developed by Mehra and Omidian (2012), was completed successfully, applying the inverse translation and back translation method and, with similar success, the compressibility evaluation of the final 63-item instrument using the probing and paraphrasing method.

The scale content validity, as validated by experts, was excellent, construct validity was also excellent, and reliability was very high. Thus, the items in the instrument consistently measured the attitude towards online education in the context of the health crisis caused by the COVID-19 pandemic, and consistent results will be obtained whenever it is applied in similar contexts.

We successfully constructed a scale that offered continuous uniform distribution, thus enabling the quantitative interpretation of attitude towards online education in the context of the COVID-19 pandemic at four levels: strong negative, weak negative, weak positive and strong positive.

The scale adapted to assess attitude towards online education in the context of the pandemic is also designed for use in post-COVID-19 scenarios, since online education is a modality that will be here to stay in the educational system.

Bibliographic references

Aguilar, D. (2015). *Being a virtual teacher: time and presence* [Doctoral thesis]. UMA institutional repository. https://riuma.uma.es/xmlui/handle/10630/12380

Aiken, L. (1985). Three coefficients for analyzing the realiability and validity of ratings. *Educational and Psychological Measuremnet*, *45*, 131-142.

Alfonso, I. (2003). La educación a distancia. *ACIMED*, *11*(1). http://eprints.rclis.org/5122/1/educacion.pdf

Bakieva, M. (2016). *Diseño y validación de un instrumento para evaluar la colegialidad docente* [Doctoral thesis]. Repositorio institucional UV. http://roderic.uv.es/handle/10550/56226

Bazán, J., & Sotero, H. (2000). Una aplicación al estudio de actitudes hacia la Matemática en la UNALM. *Anales Científicos de la Universidad Nacional Agraria La Molina*, 60-72. http://argos.pucp.edu.pe/~jlbazan/download/1998_62.pdf

Bolívar, A. (1995). *La evaluación de valores y actitudes*. Alauda Anaya.

Fazio, R. H. (2007). Attitudes as Object-Evaluation Associations of Varying Strength. *Social Cognitive and Affective Neuroscience*, *25*(5), 603-637. https://doi.org/10.1521/soco.2007.25.5.603

Haddock, G., & Maio, G. R. (2008). Attitudes: content, structure and functions. In M. Hewstone, W. Stroebe, & K. Jonas (Eds.). *Introduction to social psychology: a European perspective* (pp. 112-133). Blackwell.

Herdman, M., Fox-Rushby, J., & Badia, X. (1997). Equivalence' and thetranslation and adaptation of health-related quality of life questionnaires. *Quality of Life Research*, *6*(3), 237-247.

Hernández, R., Fernández, C., & Baptista, P. (2014) *Metodología de la investigación.* McGraw-Hill Education.

Hernández, V., Fernández, K., & Pulido, J. (2018). La actitud hacia la educación en línea en estudiantes universitarios. *Revista de Investigación Educativa*, *36*(2), 349-364. http://dx.doi.org/10.6018/rie.36.2.277451

Hernández, R., & Mendoza, C. (2018). *Metodología de la investigación, las rutas cuantitativa, cualitativa y mixta.* McGraw-Hill Education.

Gascón-Cánovas, J., Russo., J., Cózar, A., & Heredia, J. (2017). Adaptación cultural al español y baremación del Adolescent Peer Relations Instrument (APRI) para la detección de la victimización por acoso escolar: Estudio preliminar de las propiedades psicométricas. *Anales de Pediatría*, *87*(1), 9-17. http://dx.doi.org/10.1016/j.anpedi.2015.12.003

Gestión. (2020). *La educación virtual en el país: ¿está funcionando?* Gestión. https://gestion.pe/opinion/la-educacion-virtual-en-el-pais-esta-funcionando-noticia/

Mehra, V., & Omidian, F. (2012). Development an instrument to measure university students´ attitude towards e-learning*. Turkish Online Journal of Distance Education*, *13*(1), 34-51. https://files.eric.ed.gov/fulltext/EJ976928.pdf

Mehra, V., & Omidian, F. (2010). Predicting factors affecting university students' attitudes to adopt e-learning in India using technology acceptance model*. International Journal on New Trends in Education and Their Implications, 1*(1), 33-43. http://www.ijonte.org/FileUpload/ks63207/File/04._mehra-_omidian.pdf

Ministerio de Educación. (2020). *Todas las universidades públicas migrarán este año al sistema de educación virtual*. Ministerio de Educación. https://www.gob.pe/institucion/minedu/noticias/189379-todas-las-universidades-publicas-migraran-este-ano-al-sistema-de-educacion-virtual

Morris, E. (2020). *Educación online durante la cuarentena: ¿Por qué seguir aprendiendo?* ESAN. https://www.esan.edu.pe/conexion/actualidad/2020/04/16/educacion-online-durante-la-cuarentena-por-que-seguir-aprendiendo/

Mujica, A. (2020). *Coronavirus: ¿Educación virtual en tiempos de cuarentena?* Hacer Perú. http://hacerperu.pe/coronavirus-educacion-virtual-en-tiempos-de-cuarentena/

Muñiz, J. (2005). Utilización de los tests. In J. Muñiz, A. M. Fidalgo, E. García-Cueto, R. Martínez & R. Moreno (Eds.). *Análisis de los ítems* (pp. 133-172). La Muralla.

Orientación Universia. (2018). *Diferencias entre educación en modalidad a distancia, online y virtual*. Orientación Universia. https://orientacion.universia.net.co/infodetail/orientacion/consejos/diferencias-entre-educacion-en-modalidad-a-distancia-online-y-virtual-4738.html

Prytz Nilsson, N., & Suárez, A. (2009). *Estudio bibliométrico de las publicaciones científicas sobre el área de Habilidades Sociales en América Latina* [Tesis de licenciatura inédita]. Universidad Nacional de Córdoba.

Pulido, J. (2017). Actitud hacia la educación virtual de los alumnos de postgrado de la UPEL. *Razón y Palabra*, *21*(98), 606-623. https://www.redalyc.org/pdf/1995/199553113030.pdf

Sánchez-Villena, A., & De la Fuente-Figuerola, V. (2020). Estandarización, adaptación y validación de pruebas psicométricas: diferencias necesarias. *Anales de Pediatría*, *93*(5), 353-3544. https://doi.org/10.1016/j.anpedi.2020.05.014

TvPe Noticias. (2020). *Minedu: Más de 174 mil estudiantes dejaron la universidad en lo que va del 2020*. TvPe Noticias. https://www.tvperu.gob.pe/noticias/nacionales/minedu-mas-de-174-mil-estudiantes-dejaron-la-universidad-en-lo-que-va-del-2020

Ursini, S., Sánchez, J. G., & Orendain, M. (2004). Validación y confiabilidad de una escala de actitudes hacia las matemáticas enseñadas con computadora. *Educación Matemática*, *16*(3), 59-78. http://www.revista-educacion-matematica.org.mx/descargas/vol16/vol16-3/vol16-3-3.pdf

Valderrama, S. (2018). *Pasos para elaborar proyectos de investigación científica, cuantitativa, cualitativa y mixta.* San Marcos.