RESEARCH ARTICLE

Design, Construction and Validation of an Instrument That Evaluates Innovative Teaching Actions Mediated with ICTs.

Diseño, construcción y validación de un instrumento que evalúa acciones docentes innovadoras mediadas con TIC

Desenho, construção de ações e validação de instrumento que avalia professores inovadores mediados com TIC

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ABSTRACT

This article reports on the validation of an instrument designed to measure innovative actions with ICT in pedagogical practices, in terms of: ease of use, perceived utility, resistance to change, trust and intention of use. It is made up of 32 items with Likert-type scale. The validity of the content was evaluated through the judgment of 6 experts, the validity of the construct through convergent validity to adjust the instrument; also, a reliability analysis was carried out since Cronbach's Alpha, Omega and Division by halves. Among the reliability values obtained is Alpha Cronbach with 0.993, Omega with 0.994 and Division by halves with 0.974, it is evident a very high consistency and means that the instrument can be used as a reliable technique of data collection, likewise the convergent validity indicates the dimensionality of each of the factors. It is concluded that the instrument is safe, reliable and valid in the measuring innovative actions with educational technologies in the pedagogical praxis of the educator.

RESUMEN

Este artículo da cuenta de la validación de un instrumento diseñado para medir acciones innovadoras con TIC en prácticas pedagógicas, en términos de: facilidad de uso, utilidad percibida, resistencia al cambio, confianza e intención de uso; conformado por 32 ítems con escala de tipo Likert. Se evaluó la validez de contenido a través del juicio de 6 expertos, la validez del constructo mediante validez convergente para ajustar el instrumento; también, se realizó un análisis de confiabilidad por medio del Alpha de Cronbach, Omega y división por mitades. Entre los valores de confiablidad obtenidos se encuentra Alfa Cronbach con 0.993, Omega con 0.994 y División por mitades con 0.974, se evidencia una consistencia muy alta y significa que el instrumento puede ser utilizado como herramienta confiable de recolección de datos, igualmente la validez convergente indica la dimensionalidad de cada uno de los factores. Se concluye que el instrumento es seguro, confiable y valido en la medición de acciones innovadoras con TIC en la praxis pedagógica del educador.

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SUMMARY

Este artigo relata a validação de um instrumento destinado a medir ações inovadoras com TIC nas práticas pedagógicas, em termos de: facilidade de uso, utilidade percebida, resistência à mudança, confiança e intenção de uso; composto por 32 itens com escala tipo Likert. A validade de conteúdo foi avaliada através do julgamento de 6 especialistas, a validade de construto através da validade convergente para ajuste do instrumento; Além disso, foi realizada uma análise de confiabilidade através do Alfa de Cronbach, Ômega e divisão por metades. Entre os valores de confiabilidade obtidos estão Alfa de Cronbach com 0,993, Ômega com 0,994 e Divisão ao meio com 0,974, uma consistência muito alta é evidente e significa que o instrumento pode ser utilizado como uma técnica confiável de coleta de dados, da mesma forma a validade convergente indica o dimensionalidade de cada um dos fatores. Conclui-se que o instrumento é seguro, confiável e válido na mensuração de ações inovadoras com as TIC na práxis pedagógica do educador.

Introduction

Innovative actions mediated with ICT are based on critical reflection and the "construction of heterogeneous pedagogical contexts conceived for a diverse education" (Contreras et al., 2019, p. 94). These serve to foster new conceptualizations, responsibilities, social roles and the development of technological and communicational skills; hence, formative processes are undergoing new changes based on strategic alliances and methods that strengthen the construction of knowledge. In this sense, the role of the teacher involves going beyond teaching, such as researching, learning and developing digital skills to implement virtual learning environments, which make the implementation of learning ecosystems viable and facilitate "the transformation of information and the generation of more effective knowledge in the student body" (Picon et al., 2020, p. 13).

Innovative actions are intended to make students feel autonomous and proactive participants in the management of knowledge, and also to facilitate decision making in terms of their learning. Hence, "teachers must be able to create and coherently apply the strategies they consider, in order to dynamize the educational act and face their daily life in the classroom" (Intriago et al., 2022, p.1152) with the help of innovative actions that allow the sustainable use of information, the production of digital content, collaborative work, the practice of legal and ethical behaviors, among others.

Finally, the above becomes a challenge in order to strengthen the development of competencies focused on technology and knowledge management, so that educators have sufficient confidence in their abilities when employing innovative actions with ICT and a clear perception of their usefulness.

Theoretical perspective

Innovative teaching actions are processes, procedures and methods through which a teacher finds the need to facilitate the use, perceived usefulness, resistance to change, confidence and intention to use ICT in his/her pedagogical praxis. These actions are linked to the educator's knowledge of his or her technological competencies and the control of these in relation to an intention; therefore, they are associated with educational actors, activities and methods that require effective planning, evaluation and analysis to achieve a valuable educational process. Thus, in planning, activities are built and implemented that end up configured in an action plan; therefore, evaluation ends up becoming a phase that helps to examine the practical sense of innovative actions, review educational and technological advances, among others.

Educational innovation

According to Piedrahita (2023, p. 12), innovation is a process that "allows to identify a need or an idea to transform them into new, improved or different objects. At the same time, it is a multi-faceted process that

involves people, processes and technology" (Owen et al., 2020, p. 3). For Yero et al. (2021, p. 226) innovation is a "process that produces changes in both conceptions and practice", requiring the creativity, imagination and knowledge of the teacher. Imbernón (1996, p. 64) asserts that "educational innovation is the attitude and the process of inquiry of new ideas, proposals and contributions, carried out collectively, for the solution of problematic situations of educational practice". This shows that innovation makes possible the creation of new pedagogical exercises and the optimization of academic performance.

From this perspective, it is useful to consider innovation as a way of combining pedagogical trends with technological trends as they develop, becoming a relevant process in school management. Thus, "on the subject of innovation, certain capabilities are required to achieve results that impact more efficiently" (Delgado et al., 2023, p. 4), in terms of "meeting the needs of society in terms of greater efficiency, compared to existing solutions, and that create better capabilities for the use of assets and resources" (Alonso-Martínez et al., 2015, p. 53).

Unesco (2018, p. 3), defines educational innovation as "a deliberate and planned act of problem solving, which aims to achieve higher quality in student learning, overcoming the traditional paradigm"; therefore, educational innovation must be able to continuously respond to changing situations to produce better results or generate a social and cultural impact. Thus, such innovation ends up being accepted by the different actors in the educational process as they establish relationships with ICTs and face challenges that involve educational institutions and cultural factors. This type of innovation seeks to solve pedagogical and technological problems "in a novel, effective, efficient, sustainable, participatory and even co-creative way" (León et al. 2012, p. 41).

Finally, it can be established that educational innovation integrates a systemic character and, therefore, a link with pedagogy and didactics, requiring discussions around its transfers. Educational innovation ends up being a process that involves the selection, organization, planning and creative use of elements that are part of school management. Therefore, the main objective of any educational innovation is to ensure that the learner has a comprehensive education, which is why it is necessary for teachers to be clear about what they are going to teach and how they are going to do it through the use of innovative actions mediated with ICT.

The value of ICTs as mediators in the teaching process

The use and appropriation of ICT in the pedagogical praxis of the teacher helps the learner to become a proactive subject as he/she socializes or builds knowledge that bets on the achievement of certain performance indicators or learning outcomes. In this sense, "the teacher assumes the role of guide and facilitator, which varies the way he/she interacts with his/her students, the way he/she plans and designs the learning environment" (Coronel et al., 2020, p. 124).

Therefore, educational technologies become resources that can transform realities, facilitate curriculum development, support teaching and favor research processes; they are also useful for fostering communication, creative thinking and interpersonal relationships; Therefore, it is clear the value of ICT as developmental learning tools, which demand constant feedback from teachers from multidisciplinary and pedagogical perspectives, in this sense the role of the teacher as an actor of change, in its function to train students and stimulate their human development from the deployment of techniques and tools themselves, the assimilation of scientific and technological innovations, the promotion of research of new ways of doing, their active and responsible integration as a useful individual to society (Mejía et al., 2017, cited by Sevillano et al., 2023, p. 431). From the motivational point of view for the student, educational technologies are significant, since they end up "turning him/her into the main protagonist in the teaching-learning process, which allows promoting his/her autonomy and encouraging innovation" (Quezada, 2022, p. 25).

Relevance of the evaluation instrument for innovative actions mediated with ICTs.

With regard to the structure and relevance of the evaluation instrument, key dimensions relevant to the assessment of innovative teaching actions were identified: ease of use, perceived usefulness, resistance to change, confidence and intention to use.

The first dimension, ease of use, derived from the theory of the technology acceptance model "is related to degree of effort, is presented as the user of the technology considers that the use of this

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will not cause him/her to develop greater effort" (Davis, 1989, cited by Villa *et al*., 2015, p.59). In other words: "it refers to the user being free of effort when he/she intends to use the technologies" (Bhatti, 2007; Davis, 1989; Grandón and Durán, 2008). In the same sense, it has to do with "the ease of using technology for a specific purpose and without so much effort" (Davis *et al.*, 1989, p. 987).

The second dimension, perceived usefulness, is the subjective probability that the user of the technology will improve his or her performance compared to previous technologies (Bhatti, 2007; Davis, 1989). Hence, it is understood as "the degree to which a person believes that the use of a particular system would improve his or her job performance" (Davis *et al*., 1989, p. 985).

The third dimension, resistance to change, is elucidated as a difficulty in breaking routines or the emotional stress produced by the expectation of change (Guo *et al.,* 2013); basically, "resistance to the idea of losing something that is valuable or losing something known in order to gain something unknown" (Ibrahim *et al*..., 2013), 2013); for such reason, "resistance to change refers to the opposition to any change in status that regardless of whether or not it is compatible with the potential user's values, ideas or past experiences" (Sanchez *et al*., 2017, p.8).

The fourth dimension, trust, reflects the relevance of the certainty that the individual perceives about the fulfillment of the expectations he/she has about the behavior of the other party in a given process or action (Gefen, 2000); trust should be considered as an "intangible value that influences the decision making of individuals and that in crisis situations decreases, due to the insecurity and changes associated with this situation" (Abad, 2013, p.59); thus, "trust plays a crucial role in building lasting relationships in the long term, especially in situations where one of the parties perceives risk, uncertainty or interdependence" (Palvia, 2009, p. 213).

The fifth dimension, intention to use innovative actions with ICTs, has to do with the user's determination to perform a specific behavior (Fishbein and Ajzen, 1975), and is considered as "a positive influence on the use of technology" (Venkatesh *et al*., 2003). It refers to the desire to perform or not a behavior being a determinant antecedent to carry out an action (Ajzen, 1996; Tavera and Londoño, 2014; Ajzen and Fishbein, 1977).

How to develop innovative actions mediated with ICT

The purpose of innovative actions is to strengthen the professional and occupational profile of the teacher to make the student an actor with skills that allow him/her to "organize his/her learning potential so that he/she can adapt it to different contexts; in other words, it facilitates the path towards autonomous learning, learning to learn" (Jaramillo and Osses, 2012, p. 119). For this reason, it is necessary that from the pedagogical exercise the teacher takes into account epistemic, technological, cultural, social and conditional aspects that help to adequately design and regulate the development of strategies, activities and tasks, both academic and interactive, that facilitate the implementation of such actions.

It is important that the strategies for the development of innovative actions involve the various disciplines that are part of the curriculum, with the students' previous knowledge, the teacher's capabilities and the technological resources of the institution. Thus, such actions become a means to learn from an integral perspective and not as a purpose in itself. Consequently, teachers need to plan, forecast, undertake innovative activities and program, or at least ask themselves: Am I clear about the innovative actions mediated with ICT that I am going to implement in the classroom? Do I understand and learn what I must do or optimize to achieve them? Do I have the appropriate, timely and effective knowledge to apply them?

In summary, the design of innovative actions requires from the teacher, "research and updating in the management of didactic resources to be creative, innovate and motivate learning in their students" (Gómez, Buriticá & Barona, 2020, p.9). For this reason, the need to rethink the current pedagogical practices is highlighted, in which the learner feels the protagonist, the curriculum is aligned with the environment, divergent thinking is taken into account and educational technologies related to the requirements and expectations of the students are used.

How to evaluate innovative actions mediated with ICT

The proposed instrument allows the collection of important data in light of the dimensions exposed in it, contributing to decision making and the strengthening of processes of various types of research; hence the need to establish requirements, objectives and goals that progressively enhance or maximize high-value results, as well as the generation of new spaces and ways of training.

This means that the central educational actors can "possess the technical and operational skills to use ICT in learning and daily activities" (Ng, 2012, p.1,068), as well as to manage information, technological resources and contextualized knowledge. Hence, the teacher has the advantage of being very selective when evaluating and choosing the appropriate technological tools for the development of innovative actions and to meet the needs of interest. To assess these actions, the educator evaluates them in terms of the democratization of knowledge, the development of products and processes, multidisciplinary work, autonomous or collaborative learning, research, project management, the planning of concrete solutions and the appropriation of social and cultural aspects of their environment. Hence, it is necessary to evaluate the knowledge and use of innovative actions mediated with ICT, in order to qualify the student's integral development and enhance the didactic exercise from the reality that surrounds him/her.

According to Araya *et al.* (2015), evaluating innovation makes it possible to obtain clear and reliable information regarding the strengths and weaknesses of an organization's innovation culture. For this reason, one of the pedagogical commitments of teachers is to intentionally foster a culture of innovation within the classroom, as well as to continuously assess it. In this sense, "organizations can take advantage of assessment results to identify perceived discrepancies among multiple factors" (Rao and Weintraub, 2013 cited by Molina and Ramírez, 2021, p. 42).

Finally, the purpose of evaluating innovative actions mediated with ICT is to build, disseminate and use new knowledge, and to make training a high quality process. Thus, the indicators of the instrument help to compile or update curricular, pedagogical, didactic and technological requirements to find opportunities for improvement that qualify academic performance, educational interaction, decision making and to find ways to establish mechanisms that make the achievement of educational objectives feasible.

Quality in ICT-mediated innovative actions

Education has quality to the extent that it is complete, coherent and effective" (García, 2017, p. 4) to approach the society it aims to transform, from those characteristics that define it and the projects it executes; and more, when "the unstoppable development of digital technologies and the democratization in the use of the Internet have been one of the changes that have most transformed the context of the educational process" (Viñals, 2016, p.103). It is necessary to provide valuable attention to the educational models that are currently in force in education, in order to identify specific requirements or problems that can be addressed from the implementation of innovative actions with warmth.

Therefore, education can be conceived as a process that fulfills a social function and innovative actions mediated with ICT are framed by contextualized processes. When speaking of such actions as a way that seeks to bet significantly on all aspects of teaching, technologies become "tools that can be used to support didactic processes, allowing learners and tutors to interact through a mediated dialogue, privately or collectively, in the development of both teaching and learning" (Ramirez, 2016, p. 538).

In summary, there is a need for faculties of education to make efforts that contribute to the transformation of education, based on cutting-edge technologies that responsibly bet on equity, inclusion and quality, especially when the pandemic led educational institutions to assume a new vision and an instructional model that facilitates the mastery of practical knowledge, skills and attitudes that enhance the development of dialogic processes and both systemic and creative thinking.

Methodology

The objective of this research was to construct and validate an instrument to measure knowledge related to innovative actions mediated with ICT, and to establish the basis for the development of a model to determine the quality of intent to use such actions.

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Type of research

The study was framed in criteria that are part of a quantitative approach, which "allows measuring the characteristics of the phenomena and making generalizations regarding the results" (Bernal, 2010, cited by García *et al*., 2017, p. 25) by means of statistical techniques (Hernández, Fernández, & Baptista, 2014) to analyze variables in order to facilitate the response to the validity and reliability of the scale. The research is of a non-experimental correlational type, since it seeks to determine whether the level of reciprocity between the variables makes validation possible without the need to handle control groups or manipulate variables of interest.

Participants

The selection of the sample was non-probabilistic and by convenience, it was composed of 165 teachers belonging to basic secondary and middle school institutions (51.5% men= 85 and 48.5% women= 80). Regarding the years of work or seniority, they ranged from 1 to 36 years (M= 14.68, SD= 8.05), linked to public education in different cities and departments of the national territory.

Technical data sheet of the study developed:

Sampling unit: High school and middle school teachers. Field of study: Colombian context.
Method of data collection: Online survey. Sampling procedure: Convenience sampling Sampling size: 165
Date of field work: May and June 2022

Instruments

The questionnaire is elaborated from "variables related to technological acceptance, such as usability, ease of use and intention of the technology" (Bastidas, 2020, p. 350), then it is subjected to a validation process through experts in the field to establish degrees of reliability, in order to elucidate the correlation between the variables of the survey.

A questionnaire was constructed and applied, consisting of two parts, one on identification data (demographics) and the other composed of a battery of 32 items grouped into five factors: ease of use (6 items), perceived usefulness (6 items), resistance to change (6 items), confidence (8 items) and intention to use innovative actions with ICT (6 items); this battery, is graduated with Likert scale from totally disagree to totally agree to establish compliance to a greater or lesser extent of each of the aspects related to such actions.

Hence, the measurement instrument complies with minimum conditions of validity and internal consistency. According to Arias and Sireci (2021, p.4), validity "can be defined as the process by which evidence is accumulated to support specific interpretations and uses of test scores", so that validity refers to the degree to which an instrument measures what it effectively seeks to measure; therefore, the present study only seeks content and construct validity. Regarding reliability, Hernández *et al*. (2014, p. 200) argue that "reliability is the degree to which an instrument produces consistent and coherent results", hence the need for a pilot test to help determine the reliability of the instrument, using *Cronbach's Alpha*, *Omega and Split-half* coefficients.

The experts' assessment was collected through an ordinal scale where each of the criteria was rated as: Unacceptable (1), Poor (2), Fair (3), Good (4) and Excellent (5). This made it possible to determine whether the items were well constructed in terms of coherence, clarity, relevance and scale, thus contributing to the compliance with suggestions that helped in the qualification of the questionnaire. An ordinal scale was used, with the maximum value being 5 as the optimum value, the medium values being 2, 3 and 4, and when the results were below 2, they were unsatisfactory. Thus, the test helped to prove that the instrument is complete, understandable and simple.

Procedure

Teachers were informed about the object of the study and scope of application, the willingness to participate and their valuable collaboration, as well as about the confidentiality of the answers and data. The time required to complete the online questionnaire was approximately 30 minutes.

Phases of the procedure:

Phase 1: Design and development of the instrument:

- Bibliographic review.
- Elaboration of items.
- Application criteria and instructions.

Phase 2: Identification of content validity

- Content evaluation by expert judges.
- Making adjustments to the instrument.

Phase 3: Application of the instrument

- Guidelines for filling out the form.
- Delivery of the survey.

Phase 4: Analysis:

- Data analysis.
- Conclusions.
- Interpretation and report writing.

Data analysis

A descriptive and correlation analysis of all the variables in the study was carried out and then the relationship between them was tested. Hence, the *Content Validity Coefficient (CVC)* was established, construct validity was tested based on convergent validity, Pearson's correlation test was implemented and internal consistency was measured based on *Cronbach's Alpha, Omega* and *Halving.*

Results and discussion

Validation of the instrument

According to Elizondo and Peláez (2021, p. 68), validity "is one of the important characteristics to take into account in a measurement technique, since a test is valid if it measures what it is intended to measure"; in addition to this, "the contents of the instrument account for the degree to which each of the elements that compose it are related to the objectives for which it was created" (Sánchez, 2021, p. 7). Therefore, validation ends up being the degree to which the measurement stages the measured perception or opinion, in this case, the innovative actions with ICT in terms of resistance to change, ease of use, perceived usefulness, confidence and intention to use. The inquiry is reported as an essentially exploratory process that seeks both content and construct validity. Thus, the reliability of the instrument refers to "the degree to which its repeated application to the same subject or object produces the same results" Hernández *et al.* (2003, p. 260).

Content validity of the instrument

For the analysis of the results of each of the items and the instrument in general, the degree of agreement of the experts was assessed using the Content Validity Coefficient-CVC method, arriving at the results shown in Table 1.

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Table 1. Content validity coefficient (CVCtc) for the test items examined.

ITEMS	MEDIA	CVCi	Pei	CVCtc
Construct: Ease of use				
1	5,55	0,925	0,00002143	0,92
2	5,6	0,93333333	0,00002143	0,93
3	5,35	0,89166667	0,00002143	0,89
4	5,4	0,9	0,00002143	0,90
5	5,55	0,925	0,00002143	0,92
6	5,2	0,86666667	0,00002143	0,87
Construct: Perceived usefulness				
7	5,65	0,94166667	0,00002143	0,94
8	5,65	0,94166667	0,00002143	0,94
9	5,75	0,95833333	0,00002143	0,96
10	5,8	0,96666667	0,00002143	0,97
11	5,75	0,95833333	0,00002143	0,96
12	5,65	0,94166667	0,00002143	0,94
Construct: Resistance to change				
13	4,9	0,81666667	0,00002143	0,82
14	4,95	0,825	0,00002143	0,82
15	4,15	0,69166667	0,00002143	0,69
16	4,95	0,825	0,00002143	0,82
17	5,55	0,925	0,00002143	0,92
18	5,2	0,86666667	0,00002143	0,87
19	5,45	0,90833333	0,00002143	0,91
Construct: Confidence				
20	5,35	0,89166667	0,00002143	0,89
21	5,35	0,89166667	0,00002143	0,89
22	5,55	0,925	0,00002143	0,92
23	5,7	0,95	0,00002143	0,95
24	5,2	0,86666667	0,00002143	0,87
25	5,2	0,86666667	0,00002143	0,87
26	5,6	0,93333333	0,00002143	0,93
27	5,8	0,96666667	0,00002143	0,97
Construct: Intention to use innovative actions with ICTs				
28	5,6	0,93333333	0,00002143	0,93
29	5,6	0,93333333	0,00002143	0,93
30	5,2	0,86666667	0,00002143	0,87
31	5,15	0,85833333	0,00002143	0,86
32	4,9	0,81666667	0,00002143	0,82
33	5,1	0,85	0,00002143	0,85
CVCt			0,90	

The indicators were selected and interpreted based on the following criteria or scale of values, recommended by Cassepp-Borges *et al.* (2010):

- Items with a CVC of less than 0.70 are deleted or excluded.
- Items with values greater than 0.71 and less than or equal to 0.80 have acceptable validity and concordance.
- Items with CVC greater than 0.80 and less than or equal to 0.90 have good validity and concordance.
- Those above 0.90 have excellent validity and agreement.

It should be noted that item 15 was eliminated for not having a Content Validity Coefficient above 0.70, the result of the validation procedure allowed the reconstruction of an instrument with 32 indicators that evaluate the use of innovative actions with ICT in educational scenarios. In summary, all the items were adjusted according to the judges' suggestions and the content validity process, by calculating the CVC.

Construct validity of the instrument

Hernández and Mendoza (2018, p.232) point out that "construct validity refers to how well an instrument represents and measures a theoretical concept". To establish the admission of constructs of the present instrument, convergent validity was carried out, a technique that supported by the data collected helped to recognize its underlying organization or distribution, specifying the configuration of the dimensions that make up the scale.

Construct: Ease of use

KMO and Bartlett's test
Kaiser-Meyer-Olkin measure of sampling adequacy: ,913
Bartlett's test for sphericity
Approx. chi-square: 883.724
Gl: 15
Sig.: ,000

Table 2. Total variance explained

Component	Initial eigenvalues			Extraction sums of squared loads		
	Total	% variance	Accumulated	Total	% variance	Accumulated
1	4,685	78,088	78,088	4,685	78,088	78,088
2	,377	6,292	84,379			
3	,341	5,676	90,055			
4	,257	4,291	94,346			
5	,214	3,568	97,913			
6	,125	2,087	100,000			

Extraction method: principal component analysis.

Table 3. Component matrix[a]

	Component
	1
1.It is easy to plan and develop innovative actions mediated with ICT.	,873
2. It is timely and feasible to innovate based on the institution's ICT resources.	,837
3.he use of innovative actions mediated with ICT is clear and understandable.	,924
Innovative actions mediated with ICT are feasible to build and use in the didactic exercise.	,921
It is easy to implement innovative actions mediated with ICT from the guidelines offered by the institutional pedagogical model.	,861
6.It is easy to use innovative actions mediated with ICT when I am with an open and flexible curriculum design.	,884

Extraction method: principal component analysis.
a. 1 components extracted.

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The Kaiser-Meyer-Olkin sampling adequacy index (KMO) obtained a value of 0.913 for the ICT ease of use items, showing an appropriate adequacy of the data for convergent validity. Bartlett's sphericity test was significant (χ2= 883.724, l.g.= 15 p<0.0001), thus showing the good fit of the model. The solution ends up consisting of a single factor, without using rotation; this factor explains 78.088% of the variance (Table 2) and is made up of the 6 items of the Ease of Use dimension (Table 3).

Construct: Perceived usefulness

KMO and Bartlett's test

Kaiser-Meyer-Olkin measure of sampling adequacy: ,913

Bartlett's test for sphericity

Approx. chi-square: 1360.308

gl: 15

Sig.: ,000

Table 4. Total variance explained

Component	Initial eigenvalues			Extraction sums of squared loads		
	Total	% variance	Accumulated	Total	% variance	Accumulated
1	5,147	85,777	85,777	5,147	85,777	85,777
2	,401	6,680	92,457			
3	,199	3,313	95,770			
4	,104	1,739	97,509			
5	,098	1,632	99,141			
6	,052	,859	100,000			

Table 5. Component matrix[a]

	Component
	1
1. The use of innovative actions mediated with ICT dynamizes the pedagogical exercise or practice.	,949
2. Innovative actions mediated with ICT facilitate the development of didactic processes.	,958
3. I prefer to implement innovative actions as a team rather than individually.	,809
4. Innovative actions with ICT allow me to plan my classes more effectively.	,952
5. The use of innovative actions responds to pedagogical needs that affect significantly on academic performance.	,940
6. The use of innovative actions with ICTs qualifies the teaching process.	,940

Extraction method: principal component analysis.

a. 1 components extracted.

The acceptance of this construct was acquired through convergent validity, a statistical method that allows establishing the degree of conviction of a set of proposed indicators when measuring the same latent variable or factor; therefore, operations such as: sample adequacy KMO were carried out in order to analyze whether the sample is suitable for the analysis, and Bartlett's test of sphericity in order to find the existence of relationships between variables (Table 5).

The sample adequacy measure KMO (Kaiser-Meyer-Olkin) reveals that the study sample is appropriate to perform the respective analysis. It should be noted that Bartlett's test of sphericity allowed establishing that the correlation matrix between the variables considered is an identity matrix; the result obtained

(Chi-square= 1360.308; gl= 15; p=.000) supports the validity analysis by showing that there are significant relationships between the attached variables. Table 4 shows the items that make up the factor and the percentage of variance explained (85.7%).

Construct: Resistance to change

KMO and Bartlett's test
Kaiser-Meyer-Olkin measure of sampling adequacy: ,898
Bartlett's test for sphericity
Approx. chi-square: 722.632
gl: 15
Sig.: ,000

Table 6. Total variance explained

Component	Initial eigenvalues			Extraction sums of squared loads		
	Total	% variance	Accumulated	Total	% variance	Accumulated
1	4,301	71,687	71,687	4,301	71,687	71,687
2	,664	11,062	82,749			
3	,352	5,866	88,615			
4	,261	4,352	92,967			
5	,249	4,158	97,125			
6	,173	2,875	100,000			

Method all extraction methods: principal component analysis.

Table 7. Component matrix[a]

	Component 1
13. Innovative actions mediated with ICT make resistance to change an unusual behavior.	,852
ICT-mediated innovative actions make resistance to change an unusual behavior.	,892
15.Resistance to change facilitates attitudinal development from innovative actions with ICT.	,664
16.I would like innovative actions with ICT to improve educational interaction.	,882
Resistance to change is related to the teacher's needs and interests at the moment of proposing and implementing innovative actions mediated with ICT.	,880
18.It would be easy for me to assume the changes in the teaching methodology that innovative actions mediated with ICT imply.	,887

Extraction method: principal component analysis.
a. 1 components extracted.

The Kaiser-Meyer-Olkin sample adequacy measure (0.898) or KMO, and the Bartlet sphericity measure (722.632, with a significance level of 0.000), indicate that convergent validity can be performed with the available sample data. Table 6 shows the percentage of variance explained, associated with the respective factor or component; undoubtedly, this factor manages to explain 71.687% of the variance of the original data. Convergent validity was used for construct approval, achieving values ranging from 0.664 to 0.892; the lowest score was obtained in the item referring to attitudinal development and the highest in the item referring to the pedagogical exercise (Table 7).

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

Construct: Confidence

KMO and Bartlett's test
Kaiser-Meyer-Olkin measure of sampling adequacy ,959
Bartlett's test for sphericity
Approx. chi-square: 2107.152
Gl: 28
Sig: ,000

Table 8. Total variance explained

Component	Initial eigenvalues			Extraction sums of squared loads		
	Total	% variance	Accumulated	Total	% variance	Accumulated
1	7,099	88,737	88,737	7,099	88,737	88,737
2	,262	3,273	92,010			
3	,175	2,185	94,194			
4	,124	1,550	95,744			
5	,110	1,380	97,124			
6	,082	1,022	98,146			
7	,080	,998	99,144			
8	,068	,856	100,000			

Extraction method: principal component analysis.

Table 9. Component matrix[a]

	Component
	1
19. Innovative actions mediated with ICT are reliable in the management of education. and learning.	,958
20. Innovative actions with ICT are reliable to enhance pedagogical praxis.	,946
21. Innovative actions with ICT favor academic performance.	,963
22. Innovative actions with ICT contribute to the student's integral formation.	,941
23. Innovative actions mediated with ICT are reliable.	,956
24. I design innovative actions with ICT to be more confident in my practice. pedagogical.	,887
25. I believe that innovative actions with ICT meet the educational expectations of my students.	,954
26. I feel confident when I apply didactic strategies supported by innovative actions with ICT.	,929

Extraction method: principal component analysis.
a. 1 components extracted.

The construct complies with the KMO test criterion which was .959 (Excellent), its value is greater than 0.5; it also complies with Bartlett's sphericity coefficient which was 0.000 ($p<0.05$), since the *p-value* or significance is also complied with. The aforementioned shows that these criteria make the possibility of convergent validity of this construct feasible.

In the component matrix, the values of each of the items are elucidated in terms of their factor loadings, Table 8 shows that all of them are greater than 0.5, therefore, they end up fulfilling one more requirement. Now, to ensure the convergent validity of the construct: Confidence, the average of the eight values is greater than 0.7, thus ensuring this validity, especially when the standardized factor loadings have values greater than 0.6 or 0.7.

Construct: Intention to use

KMO and Bartlett's test
Kaiser-Meyer-Olkin measure of adequacy of sampling ,919
Bartlett's test for sphericity
Approx. chi-square: 1916.282
gl: 15
Sig: ,000

Table 10. Total variance explained

Component	Initial eigenvalues			Extraction sums of squared loads		
	Total	% variance	Accumulated	Total	% variance	Accumulated
1	5,619	93,649	93,649	5,619	93,649	93,649
2	,154	2,569	96,218			
3	,094	1,575	97,793			
4	,051	,855	98,648			
5	,044	,735	99,382			
6	,037	,618	100,000			

Extraction method: principal component analysis.

Table 11. Component matrix[a]

	Component 1
27. I would use innovative actions mediated with ICT in my future teaching work.	,972
28. I will recommend other teachers to make use of innovative actions in their didactic exercise.	,969
29. I would use educational technologies to build and implement innovative actions.	,976
30. I would frequently use innovative actions mediated with ICT to qualify processes. training.	,975
31. Innovative actions with ICT contribute to the implementation of the institutional pedagogical model.	,944
32. I would use innovative actions mediated with ICT to strengthen the institutional curricular process.	,970

Extraction method: principal component analysis.

a. 1 components extracted.

The convergent validity for this construct facilitated the comparison between the underlying structure of the instrument with the theoretical structure, providing relevant information in order to study its validity and optimize the questionnaire based on the data collected. To this end, the criteria for its viability were checked: KMO test = 0.919 and Bartlett's test of sphericity with a significance of 0.000. Once the criteria were checked, the verification of the factor loadings was carried out, where all of them were above 0.5 and the average of them was above 0.7. The analysis carried out shows that the factors explain 93.649 % of the variance (Table 10 and Table 11).

Correlational analysis

This section focuses on the correlational study of the five factors of the instrument, which is why the Pearson correlation test is implemented in order to perceive the relationship between these factors, which can be seen in Table 12 below.

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

Table 12. Bivariate correlations between items and total instrument.

		Ease of use of ICT (FU)	Perceived usefulness in the use of ICT (UP)	Resistance to change (RC)	Trust (C)	Intention to use innovative actions with ICT (UI)	SUMA
Ease of use of ICT (FU)	Pearson correlation	1	,890**	,836**	,883**	,879**	,933**
	Sig. (bilateral)		,000	,000	,000	,000	,000
	N	165	165	165	165	165	165
Perceived usefulness in the use of ICT (UP)	Pearson correlation	,890**	1	,893**	,923**	,942**	,968**
	Sig. (bilateral)	,000		,000	,000	,000	,000
	N	165	165	165	165	165	165
Resistance to change (CR)	Pearson correlation	,836**	,893**	1	,907**	,888**	,940**
	Sig. (bilateral)	,000	,000		,000	,000	,000
	N	165	165	165	165	165	165
Confidence (C)	Pearson correlation	,883**	,923**	,907**	1	,959**	,978**
	Sig. (bilateral)	,000	,000	,000		,000	,000
	N	165	165	165	165	165	165
Intention to use innovative actions with ICT (UI)	Pearson correlation	,879**	,942**	,888**	,959**	1	,975**
	Sig. (bilateral)	,000	,000	,000	,000		,000
	N	165	165	165	165	165	165
SUMA	Pearson correlation	,933**	,968**	,940**	,978**	,975**	1
	Sig. (bilateral)	,000	,000	,000	,000	,000	
	N	165	165	165	165	165	165

**. Correlation is significant at the 0.01 level (2-tailed).
Source: own elaboration based on SPSS V.22 software.

The results obtained show that there is a relationship between dimension 1 (FU) with: dimension 2 (UP; R= 0.890 and p= 0.000), dimension 3 (RC; R= 0.836 and p= 0.000), dimension 4 (C; R= 0.883 and p= 0.000) and dimension 5 (IU; R= 0.879 and p= 0.000) since the bilateral correlation is significant at n.s.= 0.01. Thus, the correlation is strong (Mateo, 2004; Pérez *et al.*, 2009). There is also a relationship between dimension 2 (UP) and dimension 1 (FU; R= 0.890 and p= 0.000), dimension 3 (RC; R= 0.893 and p= 0.000), dimension 4 (C; R= 0.923 and p= 0.000) and dimension 5 (IU; R= 0.942 and p= 0.000) as the bilateral correlation is significant at n.s.= 1, presenting a very high correlation in all dimensions. Likewise, dimension 3 (CR) is related to dimension 1 (FU; R= 0.836 and p= 0.000), dimension 2 (UP; R= 0.893 and p= 0.000), dimension 4 (C; R= 0.907 and p= 0.000) and dimension 5 (IU; R= 0.888 and p= 0.000) as the bilateral correlation is significant at n.s.= 0.01, presenting a strong correlation in all dimensions.

There is also a relationship between dimension 4 (C) and dimension 1 (FU; R= 0.883 and p= 0.000), and with dimension 2 (UP; R= 0.923 and p= 0.000), dimension 3 (RC; R= 0.907 and p= 0.000) and dimension 5 (IU; R= 0.959 and p= 0.000), the bilateral correlation being significant at n.s.= .01, presenting a strong correlation in all dimensions. Finally, a relationship was found between dimension 5 (IU) and dimension 1 (FU; R= 0.879 and p= 0.000), dimension 2 (UP; R= 0.942 and p= 0.000), dimension 3 (RC; R= 0.888 and p= 0.000) and dimension 4 (C; R= 0.859 and p= 0.000), the bilateral correlation being significant at n.s.= 0.01, presenting a very high correlation in all dimensions.

Reliability of the instrument

In order to acquire the reliability of the instrument, an analysis of the data was carried out based on the following criteria: coherence, clarity, relevance and scale, and then the *Cronbach's alpha* coefficient was calculated. Reliability seeks to "determine to what extent the responses of a measurement instrument applied to a set of individuals, are stable regardless of the individual who applies it and the time in which it is applied" Sanchez (2017, p.5); this, "implies defining reliability as the stability of our measurements" (Canales, 2006, p.101).

With *the Cronbach's alpha coefficient*, it was shown that the variance of each of the items did not distort the coefficient, so that no item was eliminated, since none of them reduced the instrument's confidence. In this sense, it can be said that all of them helped to promote an alpha greater than 0.6. The final or conclusive version of the instrument in question was made up of the same 32 items, hence a summary of interest was made available.

Summary of the case procedure and *Cronbach's Alpha* Coefficient

Reliability statistics
Cronbach's alpha: 993
Valid population: 30 (100%)
Excluded population: 0 (0%)
Total population: 30 (100%)
Number of items of the instrument: 32 Sum of
the variance of the items: 51,660 Total variance
of the instrument: 1364,329

In addition to guaranteeing the reliability of the instrument by means of *Cronbach's Alpha* (Merino-Soto, 2016), use was made of McDonald's *Omega* statistic (1999) and division by halves (Spearman Brown coefficient). The results of the *Alpha coefficient*, both overall (set of items) and in the five factors of interest (block of items), showed in all cases excellent reliability with values greater than 0.930. The *Omega coefficient* also provided excellent reliability in the total value (ω= 0.994) and in each of the factors, exceeding 0.935. Likewise, the degree of reliability in the total value is 0.974, determined by division by halves (Spearman Brown coefficient), which shows a reliable result as well as in each of the factors above 0.935. The three indexes give the instrument a high internal consistency (Table 13). In summary, it can be concluded that all scores represent the same degree of reliability (DeVellis, 2017).

Table 13. Internal consistency of the instrument

Construct	α	Ω	Division by halves
Ease of use (FU)	0,963	0,955	0,936
Perceived Usefulness (PU)	0,967	0,973	0,965
Resistance to change (R)	0,932	0,937	0,898
Confidence (C)	0,985	0,984	0,974
Intention to use (IU)	0,991	0,988	0,982
Total	0,993	0,994	0,974

Source: own elaboration with the help of the Excel V.18 program (2022)

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Table 20 shows that the internal consistency of the total questionnaire is almost perfect, hence according to George and Mallery (2003, p. 231) the coefficient is excellent, which would not improve if any item were eliminated from the instrument. The value obtained as a result of the reliability analysis shows a high homogeneity and equivalence of response to all items at the same time, as well as for all respondents. Undoubtedly, "the high internal consistency is a sufficiently valid indicator of the unidimensionality of the scale used, which is interpreted as a guarantee of high reliability of the measure" (Acosta, 2005, p. 21).

The validity of this instrument (questionnaire type) makes possible an empirical collection of information with which it is possible to establish the correlation between them, allowing to explain the innovative actions, so that this instrument becomes a model and management tool that guides teachers in the organization of their pedagogical praxis from a clear, specific and updated vision; likewise, it helps in the fulfillment of institutional goals and strategies. Therefore, it can be said that the items proposed to analyze innovative actions mediated with ICT are timely and adequate. Thus, the interrelation of the dimensions involved in innovative actions with respect to the acceptance and use of ICT, their efficiency and effectiveness in training processes is assumed. Consequently, the integration of innovative actions demands a "combination of ICT competencies and educational technology integration skills" (Bahcivan *et al*., 2019, cited by Cartagena - Beteta, *et al*., 2022).

Finally, the research on the object of interest constitutes a contribution to qualify the educator's pedagogical praxis in curriculum design. In short, this instrument responds to the need to integrate innovative actions with ICT competencies and current pedagogical competencies, since these are of vital importance for the development of educational processes that lead to the improvement of knowledge management and technology in educational environments.

Conclusions

The structure of the instrument helps to identify strengths and aspects to be qualified in innovative actions with ICT in the pedagogical practice of the teacher, as well as to provide valuable elements that enable decision making. In the Colombian context, the findings of this study can contribute to the literature to understand how innovative actions affect teachers' pedagogical praxis, as well as provide elements that contribute to the design of strategies to strengthen teachers' professional growth. It is also evident that the indicators help to guide the development of didactic initiatives and the optimization of current technological management proposals.

Respondents recognize the importance of the benefits provided by innovative actions with ICT and the possibility of interpreting the good practices that foster them. Thus, the perceived usefulness and confidence towards the use and appropriation of innovative actions end up being decisive constructs for teachers to undertake the development of their own potential and strengthen the didactic and multidisciplinary work from the options offered by them, especially when "the knowledge society in which we live requires training in competencies that enable the person to act effectively before the demands of a given context" (Merida, 2008).

Regarding the intention and ease of use, any training need should not only motivate or awaken the desire or the idea of using innovative actions mediated with ICT, but also how to enable their appropriation and applicability. Knowing the results derived from the implementation of various innovative actions and knowing how to implement them in the pedagogical exercise helps teachers to dynamize the teaching process. The didactic and technical competitiveness alone are not enough, hence the teacher must understand the possibilities offered by such actions in order to qualify the student's learning, the student's integral development and the different ways of managing educational knowledge.

Regarding resistance to change, it should be emphasized that teachers should not only participate in change activities, but also be continuously open to awareness-raising spaces that motivate them to dynamize their pedagogical practice through the use of educational technologies. In this sense, it is of great interest to promote the applicability of innovative actions to favor the training process, based on dialogic processes that can guarantee critical, systemic and creative thinking.

Finally, it is concluded that the instrument presents satisfactory content and construct validity, therefore, it can be used to measure the quality of innovative actions with ICT; likewise, it is a tool that can be used by teachers and researchers to carry out a diagnosis, also as a pretest and posttest measure (Gargallo et al., 2016).

It can be said that the instrument is reliable and functional due to its role, stability and internal coherence to measure the efficiency and effectiveness of innovative actions in the formative process of basic secondary and middle school education; it allows assessing such actions through dimensions with cohesion, adaptability and effectiveness.

Bibliographic References

Abad, M. V. (2013). Estrategias de comunicación para generar confianza. *Comunicación y hombre: revista interdisciplinar de ciencias de la comunicación y humanidades*, (9), 59-73.

Acosta, A. M. (2005). Validación de un instrumento para medir la calidad de servicio en programas de estudios universitarios. *Ingeniería industrial*, *26*(2), 20-25.

Ajzen, I. (1996). The directive influence of attitudes on behavior. In P. M. Gollwitzer & J. A. Bargh (Eds.), *The psychology of action: Linking cognition and motivation to behavior* (pp. 385-403). The Guilford Press.

Ajzen, I., & Fishbein, M. (1977). Belief, attitude, intention, and behavior:An introduction to theory and research. Psychological Bulletin.

Alonso-Martínez, D., González-Álvarez, N., & Nieto, M. (2015). La innovación social como motor de creación de empresas. Universia Business Review, (47), 48-63. Recuperado de https://www.redalyc.org/ pdf/433/43341001003.pdf

Araya, S., Rojas, L., & Fernández, J. (2015). Preferencias por un Programa de Posgrado: Un análisis de los factores que contribuyen a la elección de los posgrados en administración por profesionales de la Región de Coquimbo, Chile. *Revista Universitaria Ruta*, 17(1), 63-76. https://revistas.userena.cl/index.php/ruta/ article/view/635

Arias, A., & Sireci, S. G. (2021). Validez y Validación para Pruebas Educativas y Psicológicas. *Revista Iberoamericana de Psicología*, 14(1), 1-12. https://reviberopsicologia.ibero.edu.co/article/view/1926

Bahcivan, E., Gurer, M. D., Yavuzalp, N., & Akayoglu, S. (2019). Investigating the relations among pre-service teachers' teaching/learning beliefs and educational technology integration competencies: A structural equation modeling study. *Journal of Science Education and Technology*, 28(5), 579-588. https://doi. org/10.1007/s10956-019-09788-6

Bastidas, A. B. (2020). *Destinos turísticos inteligentes: Un análisis de su origen, evolución y potencial de futuro* [Tesis de doctorado publicada]. Universidad de Granada. https://digibug.ugr.es/handle/10481/64592

Bernal, C. (2010). Metodología de la investigación: Administración, economía, humanidades y ciencias sociales (Tercera ed.). Colombia: Pearson Educación.

Bhatti, T. (2007). Exploring Factors Influencing the Adoption of Mobile Commerce. *Journal of Internet Banking & Commerce*, 12(3), 1-13. https://www.icommercecentral.com/archive-internet-banking-and-commerce. php

Canales, M. (2006). *Metodología de investigación social. Introducción al oficio*. Chile: LOM Ediciones.

Cartagena-Beteta, M. A., Revuelta-Domínguez, F. I. y Pedrera-Rodríguez, I. (2022). Propiedades psicométricas de una prueba sobre creencias docentes respecto de la Integración de las TIC. *Revista de educación a distancia (RED)*, 22(70). https://doi.org/10.6018/red.524401

Cassepp-Borges, V., Balbinotti, M.A.A. & Teodoro, M.L.M. (2010). Traducao e validacao de conteudo: uma proposta para adaptacao de instrumentos. In: Pasquali, L. (Org.), *Instrumentação psicológica. Fundamentos e práticas* (pp.506-520). Porto Alegre: Artmed.

Contreras, V. H., Lapolla, A., Galeano, J., Fernandez, D., Broda, L., & Ducombs, C. (2019). Tecnologías aplicadas para el aprendizaje escolar en niños con inteligencias múltiples. In *VI Simposio Argentino sobre Tecnología y Sociedad (STS 2019)-JAIIO 48 (Salta)*.

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

Coronel, P. C. P., Herrera, D. G. G., Álvarez, J. C. E., & Zurita, I. N. (2020). Las TIC como mediadoras en el proceso enseñanza–aprendizaje durante la pandemia del COVID-19. *Revista Arbitrada Interdisciplinaria Koinonía*, *5*(1), 121-142.

Davis, F. D. (1989). Perceived Usefulness, Perceived Ease of Use, and User Acceptance of Information Technology. *MIS quarterly*, 13(3), 319-340.

Davis, F.; Bagozzi, R. and Warshaw, P. (1989). User Acceptance of Computer Technology: A comparison of two Theoretical Models. *Management Science*, 35(8), 982-1003.

Delgado, Y. B., Savon, R. C. B., & Quevedo, H. J. M. (2023). Aproximación desde el posgrado al fortalecimiento de las capacidades de innovación: maestría en Biotecnología. *Mendive. Revista de Educación*, *21*(3), 3217.

DeVellis, R. (2017). *Scale Development Theory and Applications*. (4ª ed.). SAGE Publications

Fishbein, M y Ajzen, I. (1975). *Belief, attitude, intention, and behaviour: An introduction to Theory and Research*. Massachusetts: Addison-Wuesly Publishing Company.

Elizondo, M. L., y Peláez, A. (2021). Investigación en Ciencias de la Salud: validez y con fiabilidad. *Revista de la Facultad de Odontología*, *1*(4), 66-69.

García, I. (2017). Integración del concepto de calidad a la educación: una revisión histórica. In *Trabajo presentado en XIV Congreso Nacional de Investigación Educativa en San Luis Potosí*. https://bit.ly/3aV1Ii3

García, M., García, J. y Cabello, J. (2017). Eficiencia en el uso de los recursos y producción más limpia (RECP) para la competitividad del sector hotelero. *Revista de Gestão Social e Ambiental – RGSA*, 11 (2), 18-35.

Gargallo, B., Campos, C., & Almerich, G. (2016) Learning to learn at university. The effects of an instrumental subject on learning strategies and academic achievement. *Cultura y Educación*, 28 (4), 771-810.

Gefen, D. (2000). E-Commerce: the Role of Familiarity and Trust. *Omega*, 28(6), 725-737.

George, D., y Mallery, P. (2003). *SPSS for Windows step by step: A simple guide and reference. 11.0 update (4thed.)*. Boston: Allyn & Bacon

Gómez, J. S., Buriticá Cano, L. M., & Barona Ramirez, A. (2020). El comic como recurso didáctico en el diseño de estrategias pedagógicas para la convivencia escolar.

Grandón, E. y Durán N. (2008). *Exploratory Study of the Factors that Influence the Adoption of Electronic Commerce in a Latin-American Context.* AMCIS 2008 Proceedings, AMCIS.

Guo, X., Sun, Y., Wang, N., Peng, Z., y Yan, Z. (2013). The dark side of elderly acceptance of preventive mobile health services in china. *Electronic Markets*, 23(1), 49-61.

Hernández, R. y Mendoza, P. (2018). *Metodología de la investigación. Las rutas cuantitativas, cualitativas y mixtas*. Mc Graw-Hill Education.

Hernández, R., Fernández, C. y Baptista, P. (2003). Metodología de la Investigación. Tercera edición. McGraw-Hill. Interamericana. México, D. F. Pp. 252-277; 340- 341.

Hernández R., Fernández C. y Batista P. (2014). *Metodología de la investigación (6ta ed.).* México: McGrawHill Education.

Ibrahim, A., Al-Kaabi, A., y El-Zaatrari, W. (2013). Teacher resistance to educational change in the United Arab Emirates. International Journal of Research Studies in Education, 2(3), 25-36.

Imbernón, F. (1996). *En busca del Discurso Educativo*. Buenos Aires, Argentina: Edit. Magisterio del Río de la Plata,

Intriago, L. D. I., Alcívar, G. L. M., Zambrano, A. E. D., Cedeño, M. J. E., & Ledesma, N. V. M. (2022). La tecnología del empoderamiento y la participación como planificación académica del docente del curso de nivelación de carrera del instituto de admisión y nivelación de la universidad técnica de Manabí. *Ciencia Latina Revista Científica Multidisciplinar*, *6*(2), 1144-1160.

Jaramillo, S., & Osses, S. (2012). Validation of an instrument on metacognition for second year students. cycle of basic general education. *Estudios pedagógicos (Valdivia)*, *38*(2), 117-131.

León, M. F., Baptista, M. V., & Contreras, H. (2012). Social innovation in the context of social responsibility. corporate social responsibility. Business Forum, 17(1), 31-63. Doi: https://doi.org/10.33801/fe.v17i1.3745

Mateo, J. (2004). The 'ex post facto' research. In R. Bisquerra, (coord.) Methodology of educational research. (pp. 196-230). The Wall

McDonald, R. P. (1999). *Test theory: A unified treatment*. Lawrence Erlbaum Associates, Inc.

Mejía, C., Michalón-Dueñas, D., Michalón-Acosta R., López, R., Palmero, D., & Sánchez, S. (2017). Hybrid learning spaces. Towards an education of the future at the University of Guayaquil. Medisur Journal. 15(3), 350-355.

Mérida, R. (2008). *The acquisition of professional competencies in the degree of Early Childhood Education teacher: building bridges between the academic context and work scenarios. Good practices of teaching innovation at the University of Cordoba.* Córdoba: Social Council of the University of Córdoba.

Merino-Soto, C. (2016). Differences between Cronbach's alpha coefficients with small samples and small parts: A VB program. *Annals of Psychology*, *32* (2), 587-588. https://doi.org/10.6018/analesps.32.2.203841.

Molina Vanegas, J., and Ramírez Guerra, J. J. (2021). *Strengthening the culture for innovation in a temporary services company* [Doctoral thesis]. Universidad Externado de Colombia.

Ng, W. (2012). Can we teach digital natives digital literacy? *Computers & Education*, 59(3), 1065-1078. http://dx.doi.org/10.1016/j.compedu.2012.04.016.

Unesco (2016). *Text 1: Educational Innovation. Herramientas de apoyo para el trabajo docente.* Lima Peru. http://unesdoc.unesco.org/images/0024/002470/247005s.pdf.

Owen, O. Roach, McLaughlin, Gregory C. and McLaughlin, Heidi M. (2020). Innovation and Value: Customer Perception, Application, and Concept. *Journal of Management & Public Policy*, 12(1), 4-16.

Palvia, P. (2009). The role of trust in e-commerce relational exchange: A unified model. *Information & Management*, 46 (4), 213-220.

Pérez, R., García, J. L., Gil, J. A., & Galán, A. (2009). Estadística aplicada a la Educación. Pearson Prentice Hall.

Piedrahita, C. (2023). *Business model for a legal innovation center at Universidad EAFIT* [Doctoral thesis]. EAFIT University

Picón, G., Gonzales, G., & Paredes, J. (2020). Performance and teacher training in digital competencies in non-face-to-face classes during the COVID-19 pandemic. *Lasallian*, 1 (1), 45-63. https://preprints.scielo.org/index.php/scielo/preprint/view/778/version/819.

Quezada, G. (2022). *Didactic strategy for the improvement of digital competence in students of the specialty of administration of the I cycle of a private higher technological institute of Lima* [Published doctoral thesis]. San Ignacio de Loyola University.

Ramírez, M. (2016). Possibilities of the educational use of Youtube. *Ra Ximhai*, 12(6), 537-546.

Rao, J., & Weintraub, J. (2013). How innovative is your company's culture? *MIT Sloan Management Review*, 54(3), 29-37.

Sanchez, G. S. (2017). Validity and reliability of the SF-36 quality of life questionnaire in women with LUPUS, Puebla. *Autonomous University of Puebla, Puebla*.

Sánchez, J. L. (2021). *Content Validity of Diagnostic Scales of Child Development* [Doctoral dissertation]. Universidad Autónoma Metropolitana.

Sánchez Prieto, J.C., Olmos, S., and García-Peñalvo, F.J. (2017). will future teachers use mobile technologies? Validation of an extended TAM model proposal. *Journal of Distance Education (RED),* 52. http://www.um.es/ead/red/52

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

Sevillano, L. N. D. J. M., Burgos, N. P. V., & Sevillano, I. M. M. (2023). La educación virtual e híbrida. Consideraciones desde la Universidad de Guayaquil. *Revista Conrado*, *19*(90), 429-438.

Tavera, J. F., y Londoño, B. (2014). Factores determinantes de la aceptación tecnológica del E-Commerce en países emergentes. *Revista Ciencias Estratégicas*, 22(31), 101-119.

Venkatesh, V., Morris, M., Davis, G. y Davis, F. (2003). User acceptance of information technology: Toward a unified view. *MIS quarterly*, 425-478.

Villa, A., Ramírez, K., y Tavera, J. (2015). Antecedentes de la intención de uso de los sitios web de compras colectivas. *Revista EIA*, 12(24), 55-70.

Viñals, A. V., y Cuenca, J. C. (2016). El rol del docente en la era digital. *Revista interuniversitaria de formación del profesorado: RIFOP*, (86), 103-114.

Yero, M. R., Mantecón, Y. Q., & Graus, M. E. G. (2021). Procedimiento para el desarrollo de la innovación educativa como competencia de dirección en educación: innovación educativa como competencia de dirección en educación. *Didasc@ lia: didáctica y educación ISSN 2224-2643*, *12*(3), 204-228.