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QUESTIONNAIRE TO MEASURE LEARNING STYLES

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Abstract: Learning needs are still in vogue, access to technology, digital communication with everything and the fourth industrial revolution, have not been enough to meet the expectations of teachers. The objective of this research was the construction of a valid and reliable measurement questionnaire for the Panamanian population on learning styles. The instrument is made up of 78 items with an Alpha value = 0.986 and a total explained variance of 63.11% achieved with factor analysis to obtain construct validity. This scale is made up of four factors: divergent, assimilative, convergent and accommodating. For each one of them, the internal reliability was obtained, which oscillates between 0.93 and 0.97, according to the results of the Cronbach's Alpha statistic. The construction process included the analysis of Kolb's proposal, the application of a previous version to a university sample of 380 Panamanian students from 12 different degrees, later it was transformed to be administered to 32 university professors, whose data allowed obtaining the index of discrimination of each item, as well as the psychometric properties of validity and reliability, and, finally, 120 university professors who belong to a public institution of higher education in Panama. The type of selection was intentional non-probabilistic. The findings represent innovation because the questionnaire is designed by and for Panamanian university professors.
Keywords: Learning, learning styles, psychometrics, university professors, questionnaire.

INTRODUCTION

The history of learning during the 20th century is full of thinkers who tried to explain it, define it, and make theoretical proposals. Now, in the third decade of the 21st century, you can find innumerable contributions that deal with the concept, based on the previous ideas, however, there are a series of compilations that are far from epistemological solidity, the most popular present approximations that only They help question each other. There is no agreement on the concept of learning, different disciplines such as psychology and pedagogy have tried to claim it, which broadens its meanings.

Thus, the concept acquired a multicultural perspective of certain regions, in which the development of explanation models through its segmentation was fostered, hence the birth of learning styles and with them the various instruments for measuring them.

CONCEPTUAL FRAMEWORK

García Cue (2006) defines them as the traits of preferences for the use of the senses, environment, culture, comfort, development and personality that remain relatively stable, with which people perceive, acquire, process information, interrelate and respond to their learning environments and their own methods or strategies in their way of learning.

The learning style, according to Sáez (2018), is a set of external elements that influence the context of the learning situation that the apprentice lives. It involves the cognitive, affective and physiological traits that serve as relatively stable indicators of the way in which they perceive interactions and respond to their learning environments.

To measure learning styles, the learning styles inventory was used, which was developed by Kolb in 1984, which was also translated and adapted, which has 12 items that integrate four factors: tangible experience, reflective observation, abstract conceptualization, and active experience.

In Panama, a study of learning styles was carried out in 151 psychology students from a private university, through the Kolb model, finding that the predominant style was

Accommodating, that is, those who find it easier to learn from do and feel, later students with a Divergent learning style were found, those who learn by feeling and observing; what becomes relevant in this research is the ease and preference of learning through the senses, that is, at a more concrete level than logical thinking and reasoning, which is more abstract and would be expected in university students (Matus, 2012).

The objective of this research was the construction of a valid and reliable measurement questionnaire for the population of Panama and Central America on learning styles.

MATERIALS AND METHODS

The type of research is field, with an ex post facto design, quantitative in nature and explanatory in scope.

The procedure began with the analysis of the documents referring to the instruments for measuring learning styles in university teachers, later a proposal was elaborated based on the concept of learning supported by John Dewey, Kurt Lewin, and Jean Piaget.

The basic instrument for this research was the one elaborated by David Kolb in 1984, taking into consideration the experiential learning and development of a person. Where it is considered that it is possible to learn from four specific types of experience that form a spiral: feeling, observing, doing and thinking.

Matus, Emiliani and Aranguren (2012) took as a basis the theoretical proposal and Kolb's learning styles instrument, which consists of 36 items, modified it by increasing the number of items to 80, they also changed the ipsative response options, for standard options. Likert so that it was optimized with an interval measurement level and applied to 380 Panamanian students from 12 different undergraduate degrees at a private university in Panama.

Subsequently, in 2017, a pilot study was carried out based on the instrument of Matus, Emiliani and Aranguren (2012) and it was applied to 32 university professors, whose data made it possible to obtain the discrimination index of each item and to verify the construct validity. obtaining a 79.09% explained variance and a Cronbach's alpha reliability of 0.862, with the statistical program IBM SPSS Version 24 ©, through the analysis two items were eliminated, leaving a final instrument of 78.

The scale called the Learning Styles Questionnaire, Revised and specific version for teachers (CEA-R2022) was used based on the questionnaire of Matus, Emiliani and Aranguren (2012) with validity and reliability criteria for a population of university teachers with 78 items on a Likert-type scale divided into four factors: Divergent, Assimilation, Convergent and Accommodator, in digital version through Google Forms© software

The sample consisted of 120 university professors from a public institution of higher education in Panama. The type of selection was intentional non-probabilistic.

RESULTS AND DISCUSSION

Data collection through the Learning Styles Questionnaire (CEA-R2022) was digitized in the cloud, as a downloadable file in SPSS-compatible format, and the information was transformed to perform the corresponding statistical analysis.

The results were submitted to Cronbach's Alpha statistics and factor analysis to obtain the psychometric characteristics of construct validity, in addition to establishing their reliability.

Table Number 1: integrates the statistical values obtained from the CEA-R2022 measurement instrument for reliability and validity.

Instrument	Reliability: Cronbach's Alpha	Validity: Factor analysis (Variance explained)	Factors
Learning Styles Questionnaire - CEA-R2022	0.986.	63.11%	Divergent assimilator Convergent Usher

Table Number 1: Psychometric characteristics of the CEA-R2022 scale

The previous values confirm the high levels of global or external reliability and construct validity that allow verifying the adequate psychometric characteristics of the instrument applied to university professors.

The analysis was performed for each of the four factors of the CEA-R2020 instrument, calculating the percentage of explained variance and the Cronbach's Alpha value, in addition to the factor loadings and the total corrected correlation per item, which is detailed in Table 2.

Factor	Item Number	Reactive	Number	Factor Load	Alpha	Explained variance
	22	When I see the complete process	0.902	0.759		
	31	Finding the logic	0.838	0.747		
	24	Demonstrating what has been learned	0.877	0.740		
	65	Putting it into practice	0.867	0.729		
	70	Doing activities	0.853	0.720		
	06	Applying it to my daily life	0.759	0.693		
	71	R unning experiments	0.855	0.674		
	54	Reading	0.794	0.651		
	26	Highlighting the essentials	0.709	0.649		
1	74	Solving problems	0.822	0.643		
Convergent	33	Writing things in my own words	0.799	0.629	0.97	22.66
	52	Getting involved in the execution	0.828	0.615		
	59	Observing	0.824	0.614		
	36	Explaining to someone	0.760	0.584		
	53	Reading in short chunks	0.745	0.565		
	19	When I know the goal of the class	0.749	0.557		
	01	Trial and error	0.609	0.529		
	23	Defining things	0.843	0.528		
	67	Asking who knows more	0.723	0.488		
	57	I get involved in new situations	0.756	0.465		

Table Number 2: Factorial Structure of the Learning Styles Questionnaire (CEA-R2022).

Factor one called convergent is made up of 20 items with high internal reliability Alpha = 0.97.

It is convergent because it works on the practical application of ideas and problem solving using hypothetical deductive reasoning (Matzumura, 2018).

Factor	Item Number	Reactive	Number	Factor Load	Alpha	Explained variance
	58	Memorizing	0.594	0.680		
	03	Through brainstorming	0.734	0.675		
	11	With Power Point presentations	0.662	0.653		
	50	Doing group work	0.645	0.631		
	77	Using written reports	0.746	0.617		
	08	Classifying information	0.731	0.599		
	76	Taking notes	0.779	0.571		
	49	Making summary	0.750	0.534		
2	20	When they are concepts	0.660	0.513		
Usher	64	Putting illustrations to the content	0.711	0.513	0.96	15.02
	16	When the teacher explains	0.736	0.508		
	30	In field practices	0.788	0.501		
	17	When a colleague explains it to me	0.653	0.495		
	18	When the established plan is fulfilled	0.728	0.493		
	13	When things are concrete	0.758	0.464		
	32	Rehearsing repeatedly	0.709	0.460		
	56	I mainly pay attention to what I receive	0.643	0.453		
	21	When they are done	0.775	0.431		
	69	Practical projects	0.760	0.326		

Factor two, called Accommodator, is made up of 19 items and obtained a reliability Alpha = 0.96, which implies high internal consistency. The items belong to this factor because learning improves through concrete experience (EC) and active experimentation (EA). People with this trait excel when it comes to adapting to immediate and specific situations, circumstances, or contexts (Matzumura, 2018).

Factor	Item Number	Reactive	Number	Factor Load	Alpha	Explained variance
	40	Doing exercises with the imagination	0.783	0.732		
	35	Experiencing sensations	0.759	0.688		
	48	Making metaphors	0.697	0.629		
	51	Imagining things	0.688	0.629		
	42	Doing interviews	0.717	0.624		
	73	Solving mazes	0.704	0.601		
	47	Making models	0.633	0.573		
3	09	With plays	0.511	0.569		
Divergent	02	Through songs	0.483	0.519	0.93	14.01
	62	Participating in discussions	0.671	0.517		
	10	Watching movies	0.608	0.481		
	75	Solving puzzle	0.639	0.471		
	37	Setting myself up to fail	0.611	0.464		
	41	Doing simulation exercises	0.768	0.459		
	55	Manipulating	0.647	0.455		

14	When things are imagined	0.520	0.439	
04	Manual activities	0.523	0.420	
07	Attending conferences	0.567	0.315	

Factor three, known as Divergent, is made up of 18 questions and shows a reliability Alpha = 0.93, which indicates a high internal consistency. The items belong to this factor because they adjust to performance in concrete things (CE) and reflective observation (OR) (Matzumura, 2018).

Factor	Item Number	Reactive	Number	Factor Load	Alpha	Explained variance
	28	Making pictures	0.81	0.804		
	29	Drawing schemes	0.83	0.760		
	43	Making graphs	0.75	0.757		
	45	Making maps	0.79	0.712		
	46	Making concept maps	0.78	0.690		
4	27	Discriminating one thing from another	0.66	0.618		
Assimilator	60	Sorting data	0.83	0.570	0.95	11.42
	44	Doing research on the topic	0.75	0.450		
	38	Making analogies	0.70	0.472		
	25	Breaking everything down into its parts	0.73	0.449		
	72	Reflecting on the subject	0.78	0.404		
	78	Valuing the content	0.69	0.398		
	39	Drawing pictures	0.57	0.314		
	63	Thinking about what they just explained to me	0.73	0.308		

Finally, factor four named Assimilator, is made up of 14 items and presents a reliability Alpha = 0.95, which means high internal consistency. The items belong to this factor because abstract conceptualization (CA) and reflective observation (OR) predominate. It highlights the ability to create theoretical models, in addition, it is characterized by inductive reasoning and the ability to articulate disparate observations in a comprehensive explanation (Matzumura, 2018).

The psychometric properties of the learning styles instrument determine that it is highly valid and reliable for the sample of Panamanian university professors.

CONCLUSIONS

The objective of preparing a Learning Styles Questionnaire, Revised and specific version for teachers (CEA-R2022) valid and reliable for the Panamanian population was achieved.

The instrument is made up of 78 items with an Alpha value = 0.986 and a total explained variance of 63.11% achieved with factor analysis to obtain construct validity. This scale is made up of four factors: divergent, assimilative, convergent and accommodating. For each one of them, the internal reliability was obtained, which oscillates between 0.93 and 0.97, according to the results of the Cronbach's Alpha statistic.

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