

Experts' validation of an instrument for self-perception of research competencies to develop academic literacy

Isolda Margarita Castillo-Martínez[†]

Tecnologico de Monterrey
School of Humanities and Education
isoldamcm@hotmail.com

María-Soledad Ramírez-Montoya

Tecnologico de Monterrey
School of Humanities and Education
solramirez@tec.mx

ABSTRACT

The present study aims to present the validation of a scale to measure the perception that university students have about the mastery of research competencies to develop academic literacy. The research approach is positivist, therefore the method employed is quantitative. The scale that has been validated is a Likert type from 1 to 4 and is made up of 30 reagents, 7 from two categories, and 6 from the other two categories. The categories used are: Learning by being, Learning by knowing, Learning by doing, and Learning by solving. It is intended that the scale can be transferred to other university contexts in addition to the environment in which it was applied for validation.

CCS CONCEPTS

• Social and professional topics • User characteristics • Cultural characteristics

KEYWORDS

Instruments, methods, validation, research competencies, academic literacy

ACM Reference format:

Autor¹, Autor². Scale to measure university students' perception of the level of mastery of research competencies to develop academic literacy. In *Proceedings of the 8th International Conference on Technological Ecosystems for Enhancing Multiculturality (TEEM 2020)* (Salamanca, Spain, October, 2020), F. J. García-Peñalvo Ed. ACM, New York, NY, USA, 5 pages

1 Introduction

Research and academic literacy competencies are an important aspect in the formation of undergraduate students. The fact that students participate in research projects from undergraduate level is associated with benefits such as personal and cognitive growth, as well as development of research competencies [1]. The approach of academic literacy is understood as a dynamic communicative process always unstable and negotiated by the continuous interaction between students and teachers according to Clemensen and Holm [2]. Multiple studies have been conducted on research skills and academic literacy separately, but it is considered important to conduct research that addresses them together. The instrument whose validation process is presented in this article is intended to be the basis of a Mixed Method study, but in this document the analysis will focus on the validation of the Scale to measure university students' perception of the level of mastery of research skills to develop academic literacy through expert judgment and statistical analysis. The contribution is that it can serve as a guide for other research that seeks to validate instruments and to provide a basis for what is considered to be the most important content in an instrument that measures research or academic literacy competencies specifically.

2 Conceptual framework

2.1 Research competencies

Research competencies have become increasingly important within Higher Education and it is considered imperative that they form part of the student's exit profile. The research competence according to Autor² [3] is a disposition and a know-how that consists of implementing a set of operations, skills, schemes and knowledge articulated logically and methodologically, related to the object on which one wishes to investigate and with the purpose of producing knowledge. In global education according to the Report on the Future of Education in the World [4] (Luksha et al.,

Expert's validation of an instrument for self-perception of research competencies to develop academic literacy

2018) there are a number of areas to integrate research and education that are new to students, which include "New Technology" Sectors, Virtual Economies, Knowledge Production Sector and "Human Oriented" Services. In higher education institutions, subjects related to the development of research competencies are now a constant, but Spinzi, Sosa, González, and Aquino [5] point out that, in most universities, professors have more experience in the transmission of theoretical content than in the research process itself. In order for research competencies to be adequately developed in students, it is necessary that teachers be trained in skills that are permeated by an innovative spirit, by the demands of contemporary pedagogy, and that respond to the new educational model [6]. From the above, it is important that the role of the research professor is being given more and more weight today.

There are numerous classifications of research competencies, one of which is important for this study is the one used by Colas[7], who considers it important to develop skills to generate scientific knowledge and classifies them into technical-instrumental and scientific-intellectual skills. Another classification that is considered valuable is that of Cervera and Zambrano [8], in which they point out that elements such as attitudes, skills, and knowledge must be taken into account. For Figueroa, Granados and López [9] the competencies in research are observation, reading, expression, creativity, rigor, socialization, construction, strategy, problematization and ethics. The research competencies to be promoted will depend on the area in which they are developed.

2.2 Academic literacy

A definition of academic literacy needs to be established in order to be able to investigate the research competencies that could support the development of academic literacy. It is suggested to call academic literacy "the process of teaching that may (or may not) be set in motion to foster students' access to the different written cultures of the disciplines" [10]. It has two objectives: to teach students to participate in the genres proper to a field of knowledge, it is about training students to be able to read and write as specialists do, and to teach the proper study practices to learn in it, that is, to teach reading and writing to appropriate the knowledge produced by them. Currently, the pedagogy of academic literacy emphasizes the role of educational institutions and teachers in the process of inculturation. Through the actions of teachers and institutional support, this pedagogy seeks to involve students in their literacy practices [11]. Academic literacy requires for its success the participation of students, teachers and the support of educational institutions. Within the study of research competencies for the development of academic literacy, theoretical-conceptual trends and methodological designs play an important role. Autor² et al. [12] consider as theoretical-conceptual trends the psychopedagogical studies, socio-cultural studies, studies of use and development of technology, disciplinary studies, studies of educational management.

2.3 Measuring instruments for research competencies and academic literacy

There are some studies that address instruments for measuring research and academic literacy competencies. The article Development of the Research Competencies Scale [13] addresses methodology, processes, ethics and dissemination of research, as well as academic writing. The article Validation of self-perception scale of transversal and professional competences of higher education students [14] addresses transversal competences of university students, teaching competences and specific teaching competences of physical education teachers. The paper Standardisation of delivery and assessment of research training for specialty trainees based on curriculum requirements: Recommendations based on a scoping review [15] includes knowledge, skills and behaviours. Cognitive, practical and communication skills are present in the paper Developing a Scientific Research Knowledge-Skill Accusation Scale [16] and in the study First year students' perceptions of academic literacies preparedness and embedded diagnostic assessment [17] are present relevance, preparation, improvement and perceptions of embedding and the MASUS. Table 1 shows the instruments analyzed in relation to research and academic literacy competencies.

Table 1. Instruments of research competencies and academic literacy

Expert's validation of an instrument for self-perception of research competencies to develop academic literacy

REFERENCE	INSTRUMENT	TYPE OF INSTRUMENT	DIMENSIONS CATEGORIES VARIABLES
[11]	Development of the Research Competencies Scale. Measurement and Evaluation in Counseling and Development	Likert Scale	(a) Research and literature review, (b) Research methodology and processes, (c) Research ethics, and (d) Dissemination of academic research and writing
[12]	Validation of self-perception scale of transversal and professional competences of higher education students.	Likert Scale	- Transversal competences that every university student must acquire. - Teaching competencies. - Specific competences of physical education teachers.
[13]	Standardisation of delivery and assessment of research training for specialty trainees based on curriculum requirements: Recommendations based on a scoping review.	Likert Scale	- Knowledge – scientific and clinical. - Skills – clinical and technical - Behaviors (also known as attitudes) - Transferable or generic professional skills
[14]	Developing a Scientific Research Knowledge – Skill Accusation Scale: Scientific Research Proficiency in Project-Based Learning Process	Likert Scale	- Cognitive factor skills. - Practical factor skills. - Communication and sharing skills of the factor.
[15]	First year students' perceptions of academic literacies preparedness and embedded diagnostic assessment	Likert Scale	- Relevance for nursing degree. - Preparation for entering the degree program - Improvement and mastery by the end of the first year - Embedding perceptions and MASUS

2.4 Instrument to validate

Once the studies on instruments related to research competencies and academic literacy were analyzed, the Scale to measure university students' perception of the level of mastery of research competencies to develop academic literature was designed. The objective of the Scale is to know the students' perception of the level of mastery they have reached with respect to research and academic literacy competencies, as well as the effectiveness of their application to generate solutions to the research problems detected. The first dimension: Learning by being is integrated by seven items, the second dimension: Learning by knowing is integrated by eight items, the third dimension: Learning by doing is integrated by eight items, the fourth dimension: Learning by solving is integrated by seven items. The scale is Likert type with 4 levels: Totally disagree, disagree, agree, totally agree. Table 2 shows the dimensions of the instrument, the indicators and the associated elements.

Table 2. Instrument's items

Construct	Variables	Indicators	Reactives
Research competence to develop academic literacy	Research competence	Learning by being	1-5
		Learning by knowing	8-12
		Learning by doing	16-20
		Learning by solving	24-28
	Academic literacy competencies	Learning by being	6-7
		Learning by knowing	13-15
		Learning by doing	21-23
		Learning by solving	29-30

In order to provide greater clarity, Table 3 also includes the elements that make up the four dimensions of the instrument.

Table 3. Elements of the dimensions of the instrument

Learning by being	Learning by knowing	Learning by doing	Learning by solving
I carry out my responsibilities in research projects without anyone reminding me what to do.	I have knowledge of the different research methods.	I can design research instruments in a coherent way in relation to the research method used.	When I detect a need or problem immediately I look for the most effective solution.
I have the ability to constantly evaluate myself based on the goals I have achieved.	I know how to establish constructs when starting an investigation process.	I can select from databases information relevant to my research.	I have an ability to understand what is going on and what is needed to solve the research problems I am faced with.
When I fail to fulfill some academic responsibility, I usually evaluate myself to detect my own mistakes.	I know how to search databases to carry out my investigations.	I have the ability to organize and systematize information effectively.	In addition to proposing ideas, I execute actions in order to solve research problems.
I ask for directions if I have any doubts about my research work.	I possess the theoretical and methodological elements for the elaboration of hypotheses.	I have the skills for data analysis and interpretation.	I apply creativity and seek innovative solutions when solving research problems.
I take advantage of opportunities that allow me to learn something new in the field of research.	I know how to elaborate research reports.	I am able to efficiently use computer programs for data analysis.	I tend to critically evaluate the solutions that arise from a given research problem.
I am able to accept criticism of my writing and improve it as often as necessary.	I have knowledge of grammar and spelling rules.	I apply correctly the rules of spelling and grammar in my writing.	If I do not have enough knowledge about the elaboration of a type of text I am able to investigate to elaborate it with the appropriate structure.
I am in the habit of reviewing my writing in detail when I finish it before sending it out for review.	I know the structure of research reports.	I prepare research reports following the appropriate structure.	If I do not understand a text, I look for strategies that will make it easier for me to understand it.
	I know the structure of a research article.	I prepare research articles following the specific structure for this type of text.	

3. Method

Validation of the Scale implies that it is shown to actually measure what it is stated to measure. A theoretical support is required, but also empirical evidence [18] that in this case is presented with studies related to the measurement of research skills and academic literacy. For the validity tests, those referring to the validation of the instrument's content were used. The method of expert judgment was used, which gives validity to the instrument by means of its

Expert’s validation of an instrument for self-perception of research competencies to develop academic literacy

evaluation in terms of content and form [19]. For the design of the Expert Judgment Template, the following criteria were taken into consideration: clarity, coherence, relevance and sufficiency [20]. There are other studies in which criteria change, such as handling pertinence rather than coherence [21]. Sufficiency corresponds to summarization without loss of information, and so the maximum such possible summarization is of obvious interest [22]. In addition to the experts' assessments according to the validation criteria, the comments they made on the instrument's reagents were considered. In the following validation phase, the reliability analysis of the results obtained according to Kendall's W concordance coefficient was carried out. This coefficient allows knowing the degree of association between the results provided by the judges [23]. Since an ordinal scale was used, Kendall's W was selected.

3.1 Participants

For the validation of an instrument, expert assessment is essential. The experts who were considered have mostly a doctoral profile and some have a master's degree. The experts' area of expertise is in education and research. Eight experts participated in this process of validation of the instrument. Table 3 shows the profile of the experts who participated in the instrument validation process.

Expert	Discipline	Institution	Academic Degree	Experience
José María Romero Rodríguez	Educational technology, educational research, innovation, active methodologies	Universidad de Granada	Doctorate	4
Olga Gonzalez	Education	Colegio Helvetia	Doctorate	24
Natalia Rocha Díaz	Ethical fashion, ethics, AI and Algorithms, sexual diversity, etc.	Tecnológico de Monterrey	Master's Degree	3
Carmen Herrero	Modern Languages (Spanish as a Foreign Language), Cultural Studies, Film Studies, Pedagogy	Manchester Metropolitan University (UK)	Doctorate	31
Kenneth Bauer	Educational Innovation, Software Engineering, Information Security	Tecnológico de Monterrey	Postdoc	25
José Carlos Vázquez Parra	Gender Studies, Economic Ethics and Educational Innovation	Tecnológico de Monterrey	Doctorate	14
Neil Hernández Gress	Data-Based Decision Making, Academic and Research Administration, University Rankings	Tecnológico de Monterrey	Postdoc	25
Leonardo David Glasserman Morales	Educational Innovation	Tecnológico de Monterrey	Doctorate	13

3.2 Instruments

The instrument used to develop the content validation procedure was the Expert Judgment Template, which establishes for each category: clarity, coherence, relevance and sufficiency 4 values, 1: Not fulfilling the criterion, 2: Low level, 3: Moderate level and 4: High level. Table 4 shows the rubric with each of the categories and the indicators to designate each level.

Table 4. Experts' Profile

Expert's validation of an instrument for self-perception of research competencies to develop academic literacy

Table 5. Content validation rubric

Criteria	1. Does not meet the criterion	2. Low level	3. Medium level	4. High level
Clarity The reagent is easily understood, that is, its syntax and semantics are adequate	The indicator is not clear.	The indicator requires many modifications or extensive modification in the use of words according to their meaning or by the order assigned to them.	A very specific modification of some of the terms of the indicator is required.	The indicator is clear, has semantics and proper syntax.
Coherence The reagent has a logical relationship with the dimension or indicator you are measuring.	The indicator has no logical relationship to the dimension.	The indicator has a tangential relationship with the dimension.	The indicator has a moderate relationship to the dimension you are measuring.	The indicator is completely related to the dimension you are measuring.
Relevance The reagent is essential or important, i.e. it must be included.	The indicator can be removed without affecting the dimension measurement.	The indicator has some relevance, but another reagent may be including what it measures.	The indicator is relatively important.	The indicator is very relevant and should be included.
Sufficiency Reagents belonging to the same dimension are sufficient to obtain the measurement of this dimension.	The indicators are not sufficient to measure the dimension.	The indicators measure some aspect of the dimension, but do not correspond to the total dimension.	Some indicators need to be increased in order to fully assess the dimension.	The indicators are sufficient.

3.3 Procedure

The procedure to carry out the data collection was through an online questionnaire. An invitation was made by email where 8 experts evaluated the questionnaire. The judges assigned a value according to the clarity, coherence, relevance and sufficiency of the items in the instrument and issued observations if they considered it necessary.

The process of analyzing the results was carried out using descriptive statistics to obtain information about the main characteristics of the dimensions analyzed. In addition, the standard deviation was calculated to know the dispersion of the responses with respect to each reagent.

Finally, to validate the reliability of the obtained results, the Kendall's Concordance Coefficient W was calculated by means of SPSS software, which provided the significance level and the value of W. When the significance level is lower than 0.05 it is concluded that there is a significant agreement between the values assigned by the judges, and when W approaches 1 it means a higher strength of the agreement [19].

4. Results

The data that were collected were analyzed using descriptive statistics. The minimum, maximum, mean and standard deviation were obtained. To facilitate understanding, the data have been divided into four tables.

Table 6. Dimensional descriptive statistics Clarity

Descriptive statistics CLARITY				
N	Mean	Deviation	Minimum	Maximum
Learning by being				
8	3.75	,46291	3,00	4,00
8	3.50	,53452	3,00	4,00
8	3.75	,46291	3,00	4,00
8	3.88	,35355	3,00	4,00
8	4.00	,00000	4,00	4,00
8	3.75	,46291	3,00	4,00
8	3.75	,46291	3,00	4,00
Learning by knowing				
8	3.25	,70711	2,00	4,00
8	2.88	,83452	2,00	4,00
8	3.88	,35355	3,00	4,00
8	3.50	,75593	2,00	4,00
8	3.88	,35355	3,00	4,00
8	4.00	,00000	4,00	4,00
8	3.88	,35355	3,00	4,00
8	3.75	,46291	3,00	4,00
Learning by doing				
8	3.63	,51755	3,00	4,00
8	3.88	,35355	3,00	4,00
8	4.00	,00000	4,00	4,00
8	3.75	,46291	3,00	4,00
8	3.63	,51755	3,00	4,00
8	4.00	,00000	4,00	4,00
8	3.50	,75593	2,00	4,00
8	3.50	1,06904	1,00	4,00
Learning by solving				
8	3.75	,46291	3,00	4,00
8	3.75	,46291	3,00	4,00
8	3.75	,46291	3,00	4,00
8	3.63	,51755	3,00	4,00
8	3.63	,51755	3,00	4,00
8	3.75	,46291	3,00	4,00
8	3.88	,35355	3,00	4,00

The Clarity aspect met the quality criterion of having at least 3 points on average in all the reagents, except for number 9 which questions whether the student knows how to establish constructs when starting a research process. In all cases the deviation is less than 1.5, as shown in Table 5.

Expert’s validation of an instrument for self-perception of research competencies to develop academic literacy

Table 7. Dimensional descriptive statistics Coherence

Descriptive statistics COHERENCE				
N	Mean	Deviation	Minimum	Maximum
Learning by being				
8	3.75	,70711	2,00	4,00
8	3.88	,35355	3,00	4,00
8	4,00	,00000	4,00	4,00
8	4,00	,00000	4,00	4,00
8	4,00	,00000	4,00	4,00
8	4,00	,00000	4,00	4,00
8	4,00	,00000	4,00	4,00
Learning by knowing				
8	3.88	,35355	3,00	4,00
8	4,00	,00000	4,00	4,00
8	4,00	,00000	4,00	4,00
8	4,00	,00000	4,00	4,00
8	3.88	,35355	3,00	4,00
8	3.88	,35355	3,00	4,00
8	4,00	,00000	4,00	4,00
Learning by doing				
8	4,00	,00000	4,00	4,00
8	4,00	,00000	4,00	4,00
8	4,00	,00000	4,00	4,00
8	4,00	,00000	4,00	4,00
8	4,00	,00000	4,00	4,00
8	3,75	,70711	2,00	4,00
8	4,00	,00000	4,00	4,00
8	3.63	,74402	2,00	4,00
Learning by solving				
8	3.75	,70711	2,00	4,00
8	4,00	,00000	4,00	4,00
8	4,00	,00000	4,00	4,00
8	4,00	,00000	4,00	4,00
8	4,00	,00000	4,00	4,00
8	4,00	,00000	4,00	4,00
8	4,00	,00000	4,00	4,00

In the results regarding the Coherence criterion, it could be observed that the quality criteria considered for the average and for the standard deviation were covered. The range for this aspect was from 3.63 to 4 points, having a maximum score in 21 of the reagents, as shown in Table 6.

Table 8. Dimensional descriptive statistics Relevance

Descriptive statistics. RELEVANCE				
N	Mean	Deviation	Minimum	Maximum
Learning by being				
8	3.38	1,18773	1,00	4,00
8	3.88	,35355	3,00	4,00
8	3.38	,91613	2,00	4,00
8	3.88	,35355	3,00	4,00
8	4,00	,00000	4,00	4,00
8	4,00	,00000	4,00	4,00
8	4,00	,00000	4,00	4,00
Learning by knowing				
8	3.88	,35355	3,00	4,00
8	4,00	,00000	4,00	4,00
8	4,00	,00000	4,00	4,00
8	4,00	,00000	4,00	4,00
8	3.88	,35355	3,00	4,00
8	3.88	,35355	3,00	4,00
8	4,00	,00000	4,00	4,00
Learning by doing				
8	4,00	,00000	4,00	4,00
8	4,00	,00000	4,00	4,00
8	4,00	,00000	4,00	4,00
8	4,00	,00000	4,00	4,00
8	3.88	,35355	3,00	4,00
8	3.88	,35355	3,00	4,00
8	3.75	,70711	2,00	4,00
8	3.88	,35355	3,00	4,00
Learning by solving				
8	4,00	,00000	4,00	4,00
8	4,00	,00000	4,00	4,00
8	4,00	,00000	4,00	4,00
8	4,00	,00000	4,00	4,00
8	4,00	,00000	4,00	4,00
8	4,00	,00000	4,00	4,00
8	4,00	,00000	4,00	4,00
8	4,00	,00000	4,00	4,00
8	3.75	,70711	2,00	4,00
8	4,00	,00000	4,00	4,00
8	4,00	,00000	4,00	4,00
8	3.88	,35355	3,00	4,00
8	4,00	,00000	4,00	4,00
8	4,00	,00000	4,00	4,00
8	4,00	,00000	4,00	4,00

Table 8 shows that the Relevance criterion obtained for the average a range between 3.38 and 4 points and the deviation was below 1.5 as stated in the quality criterion.

Table 9. Dimensional descriptive statistics Sufficiency

Descriptive statistics		SUFFICIENCY		
N	Mean	Deviation	Minimum	Maximum
Learning by being				
8	3.50	,75593	2,00	4,00
8	3.75	,46291	3,00	4,00
8	3.50	,75593	2,00	4,00
8	3.75	,46291	3,00	4,00
8	3.88	,35355	3,00	4,00
8	3.75	,46291	3,00	4,00
8	3.75	,46291	3,00	4,00
Learning by knowing				
8	3.75	,70711	2,00	4,00
8	4.00	,00000	4,00	4,00
8	4.00	,00000	4,00	4,00
8	4.00	,00000	4,00	4,00
8	3.88	,35355	3,00	4,00
8	4.00	,00000	4,00	4,00
8	3.88	,35355	3,00	4,00
8	3.88	,35355	3,00	4,00
Learning by doing				
8	4.00	,00000	4,00	4,00
8	4.00	,00000	4,00	4,00
8	4.00	,00000	4,00	4,00
8	4.00	,00000	4,00	4,00
8	4.00	,00000	4,00	4,00
8	4.00	,00000	4,00	4,00
8	4.00	,00000	4,00	4,00
8	4.00	,00000	4,00	4,00
Learning by solving				
8	3.75	,70711	2,00	4,00
8	4.00	,00000	4,00	4,00
8	4.00	,00000	4,00	4,00
8	4.00	,00000	4,00	4,00
8	4.00	,00000	4,00	4,00
8	4.00	,00000	4,00	4,00
8	4.00	,00000	4,00	4,00

The criterion of sufficiency obtained in the average a range of 3.50 to 4 points and the deviation was below 1.5 according to the established quality criteria.

Another aspect that is important to consider for the validation of an instrument is the establishment of hypotheses and knowing whether the hypothesis is accepted or rejected.

The hypotheses considered were the following:

H0: The average ranges assigned by the 8 experts are independent, not consistent.

H1: There is significant concordance between the average ranges assigned by the 8 experts.

Kendall's W concordance coefficient was used to determine the reliability of the results. The results are shown in Table 10. The null hypothesis was rejected because the significance level was ,000.

Table 10. Kendall's Concordance Coefficient

Indicator	SPSS result
W de Kendall	,232
Sig. asin.	,000

5. Discussion

The Scale to measure university students' perception of the level of mastery of research competencies to develop academic literacy was submitted to expert judgment for validation based on a quality criterion that considered a score greater than 3 and a standard deviation of less than 1.5. The findings that emerged from the statistical analysis are shown below.

Clarity is an important aspect to consider when writing the reagents of a measuring instrument. In the statistical analysis, it was identified that in general, the minimum of 3 points for the average was covered, except for reagent 9, which is part of the Learning by Knowing dimension. This dimension is part of scientific-intellectual competences, that make up the classification of Colas [7] with respect to research competencies. In case there is not clarity in some reagent according to the experts' evaluation, it is important to make the corresponding modification so that it is not confusing in the application process, in this case the experts' recommendations were followed around clarifying the term construct that was included in reagent 9.

Coherence scored high with respect to the average and was below the established standard deviation value. It could be determined that the reagents had coherence in all dimensions and that the Learning by Solving dimension scored 4 points on six of seven reagents, which placed it as the dimension with the highest average in the Coherence category as shown in Table 6. In other studies the coherence criterion is replaced by pertinence, as in the case of Rocío Serrano's validation [21]. In the reagents of the four dimensions, coherence was observed based on the average score and with the value of the standard deviation.

The practical part, of skills and competences was the most relevant for the experts. The Learning-by-doing dimension obtained the highest score with respect to the criterion of relevance, as can be seen in Table 7. Competencies are a valuable part of higher education. The development of research skills are now a constant, but Spinzi, Sosa, González, and Aquino point out that, in most universities, theory is given higher priority than the research process [5]. According to the results obtained, it was determined that the experts consider that although the attitudinal and cognitive aspects are important, the skills, competencies and problem solving are even more relevant.

Expert's validation of an instrument for self-perception of research competencies to develop academic literacy

Sufficiency was averaged across all dimensions analyzed. The sufficiency with respect to the average was in a range of 3.5 to 4 as shown in Table 8. Sufficiency corresponds to summarization without loss of information, and so the maximum such possible summarization is of obvious interest [22]. According to the results shown, it could be determined that it is not necessary to add more reagents to the instrument.

Conclusion

This article shows that the expert validation process supports the Likert Scale instrument, which could be determined with the score obtained with respect to the average, which was in accordance with the established quality criteria. The results also allow identifying that the standard deviation indicates that there were no very low scores. Furthermore, the significance obtained through the application of Kendall's non-parametric W test allowed confirming that there is significant agreement between the average ranges assigned by the eight experts.

The Scale can therefore serve the purpose of measuring students' perception of their research and academic literacy skills, but it is important to point out that in order to have a study that also allows us to know the levels of performance with respect to these skills, other types of instruments must be applied, such as semi-structured interviews, participant observation or rubric analysis. However, this instrument constitutes an important basis for this broader research process and can be enriched through a pilot study prior to the application of the questionnaire to university students enrolled in research courses.

ACKNOWLEDGMENTS

This paper is a product of the project " Concentration of research", with support from Vice-Rector's Office for Research at the Tecnológico de Monterrey, Mexico. This research work has been completed within the Ph.D. in Educational Innovation, CONACYT support and WritingLab at Tecnológico de Monterrey is also gratefully acknowledged. I would like to thank the experts who participated in the validation process and who have opened the access to the realization of the pilot.

REFERENCES

[1] E. T. Carbone, and S. Ware. 2017. Are College Graduates Ready for the 21st Century? Community-Engaged Research Can Help. *Journal of Higher Education Outreach and Engagement*, 21(4), 173–207.

[2] N. Clemensen, and L. Holm. 2017. Relocalising academic literacy: Diversity, writing and collective learning in an international Master's programme. *Learning and Teaching*, 10(3), 34–55. <https://doi.org/10.3167/latiss.2017.100304>

[3] Ramírez-Montoya, M.S. 2016. Investigar: oportunidad para la generación de nuevo conocimiento. Competencias transversales para una sociedad basada en conocimiento. J.R. Valenzuela, ed. Cengage Learning Editores. 67–87.

[4] P. Luksha, J. Cubista, A. Laszlo, M. Popovich, and I. Ninenko. 2018. Ecosistemas educativos para la transformación de la sociedad. http://globaledufutures.org/uploads/files/Results/GEF_Report2018_ES.pdf

[5] C. Spinzi Blanco, D. Sosa Marín, L. González Kunert and B. Aquino Sánchez. 2015. A investigar se aprende investigando: Programa de Jóvenes

Investigadores. *Sinéctica*. 44 (2015), 1–11.

[6] M. Oropeza, A. Mena, and G. Soto. 2013. La formación y desarrollo de la competencia investigativa en docentes en ejercicio de la Benemérita Universidad Autónoma de Puebla * The Formation and Development of the Investigative Universidad Autónoma de Puebla. *Revista de La Facultad de Derecho y Ciencias Sociales*, 15, 43–59. <https://dialnet.unirioja.es/servlet/articulo?codigo=6622334>

[7] P. Colas. 2011. Competencias para generar conocimiento científico: 2011. <http://catedra.ruv.itesm.mx/handle/987654321/296>. Accessed: 2020-01-12.

[8] F. M. Cervera, and R. G. Zambrano. 2010. Dificultades y potencialidades en la formación de investigadores educativos y usuarios de Recursos Educativos Abiertos (REA) en ambientes virtuales. *Recursos Educativos Abiertos en ambientes enriquecidos con tecnología: Innovación en la práctica educativa*. ITESM. 129–147.

[9] S. Figueroa, D. Granados, and J. López. 2019. Investigación en estudiantes universitarios de psicología: experiencia formativa intramuros. *Enseñanza & Teaching*, 37, 135–145. <https://doi.org/https://doi.org/10.14201/et2019372135145>

[10] P. Carlino. 2013. Alfabetización académica diez años después. *Revista Mexicana de Investigación Educativa*. 18, 57 (2013), 355–381.

[11] J. Wolfe, B. Olson, and L. Wilder. 2014. Knowing what we know about writing in the disciplines: A new approach to teaching for transfer in FYC. *The WAC Journal*, 25: 42-77.

[12] Ramírez-Montoya, M.-S. and Valenzuela, J. 2019. Innovación educativa: tendencias globales de investigación e implicaciones prácticas. M.-S. Ramírez-Montoya and J.R. Valenzuela González, eds. Octaedro. 9–17.

[13] J. M. Swank, and G. W. Lambie. 2016. Development of the Research Competencies Scale. *Measurement and Evaluation in Counseling and Development*, 49(2), 91–108. <https://doi.org/10.1177/0748175615625749>

[14] I. Salcines, N. González-Fernández, A. Ramírez-García, and L. Martínez-Minguez. 2018. Validation of self-perception scale of transversal and professional competences of higher education students. [Validación de la Escala de autopercepción de competencias transversales y profesionales de estudiantes de educación superior] *Profesorado*, 22(3), 31-51. doi:10.30827/profesorado.v2i3.7989.

[15] A. Rangan, J. Pitchford, P. Williams, B. Wood, and S. Robson. 2017. Standardisation of delivery and assessment of research training for specialty trainees based on curriculum requirements: Recommendations based on a scoping review. *BMJ Open*, 7(2) doi:10.1136/bmjopen-2016-013955

[16] Y. Cerkez, S. Ozbas, Z. Altinay, F. Altinay, U. Akcil. 2017. Developing a Scientific Research Knowledge - Skill Accusation Scale: Scientific Research Proficiency in Project-Based Learning Process. *International Journal of Economic Perspectives* 2017;11(1):703-709. Recuperado de <https://0-search-proquest-com.millennium.itesm.mx/docview/1964554041/fulltextPDF/FB9F6C076DAB4A52PQ/2?accountid=11643>

[17] L. Palmer, T. Levett-Jones, and R. Smith. 2018. First year students' perceptions of academic literacies preparedness and embedded diagnostic assessment. *Student Success*, 9(2), 49. <https://doi.org/10.5204/ssj.v9i2.417>

[18] A. A. V. Cuervo, F. I. G. Vázquez, G. M. T. Acuña, and M. U. Murrieta. 2019. Medición en Investigación Educativa con Apoyo del SPSS y el AMOS. CONACYT, México.

[19] R. F. DeVellis. 2012. Scale development. Theory and applications (3rd ed.). SAGE, California.

[20] J. Escobar-Pérez, and A. Cuervo-Martínez. 2008. Validez de contenido y juicio de expertos: Una aproximación a su utilización. *Avances en Medición* 6, 27-36.

[21] R. Serrano, W. Macias, K. Rodriguez, and M. I. Amor. 2019. Validating a scale for measuring teachers' expectations about generic competences in higher education: The Ecuadorian case. *Journal of Applied Research in Higher Education*, 11(3), 439–451. <https://doi.org/10.1108/JARHE-09-2018-0192>

[22] S. Dudoit. 2012. Selected works of Terry Speed. *Selected Works in Probabilistics and Statistics*, 1–665. <https://doi.org/10.1007/978-1-4614-1347-9>

[23] S. Siegel, and N. J. Castellan. 1995. Estadística no paramétrica aplicada a las ciencias de la conducta. Trillas, Mexico.

Expert's validation of an instrument for self-perception of research competencies to develop academic literacy