

Reference:

Castillo-Martínez, I.M.. & Ramírez-Montoya, M. S. (2020). Research competencies to develop academic literacy in higher education students through innovative models. In *Proceedings of the 8th International Conference on Technological Ecosystems for Enhancing Multiculturalism* (TEEM 2020). University of Salamanca. Spain.

Research competencies to develop academic literacy in higher education students through innovative models

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ABSTRACT

Research competencies have been gaining more importance in university spaces. At the undergraduate level, it is also essential that students achieve efficient development of academic literacy. This research aims to show how research skills can be fostered to develop academic literacy through innovative models. For the present study, the mixed research method was used. The design of this research was sequential explanatory Quan-Qual in two phases. It is intended that the results allow the design of an innovative training model that establishes research competences to develop academic literacy. The stages of this research correspond to the theoretical framework, contextual framework and an approach to the method.

CCS CONCEPTS

• Applied technology • Education • Digital libraries competencies

KEYWORDS

research competencies, higher education, academic literacy, innovative model.

ACM Reference format:

Castillo-Martínez, I., and Ramírez-Montoya, M. S. 2020. Research competencies to develop academic literacy in higher education students through innovative models. In *Proceedings of the 8th International Conference on Technological Ecosystems for Enhancing Multiculturalism* (TEEM 2020) (Salamanca, Spain, October, 2020), F. J. García-Peñalvo Ed. ACM, New York, NY, USA, 5 pages

1 Context and motivation that drives the dissertation research

In Mexico the topic of research in higher education is becoming increasingly important. The Tecnológico de Monterrey [1], an institution of higher education in Mexico, has considered

research as a strategic activity, conceiving scientific knowledge as the engine that generates innovative solutions for the social, economic and environmental development of the country. Within the institution, research groups have been developed with a strategic focus through a research-action model: "Research that transforms lives", which is carried out in an environment of collaborative, interdisciplinary and open innovation. Each group is made up of professors, researchers, undergraduate and graduate students, and international researchers. Among the strategies to promote research is the i week, which encourages students to apply their knowledge in the field of companies and organizations [2]. Research in higher education requires intra and interinstitutional links, that is why it has been decided to integrate this paper to the track of the Doctoral Consortium, in order to be part of the networks of doctoral candidates from various institutions [3].

At Tecnológico de Monterrey, the proposal for a Research Concentration arises. This proposal establishes as commitments to be defined by each school: the definition of the skills to be developed, the evaluation of students, workshops-contents, the establishment of a representative or coordinator for each school of the concentration and responsibilities. The transversal sub-competencies, also called "for life", seek to be developed in students within the framework of systemic thinking, scientific thinking and critical thinking. To achieve this development, TEC weeks with specific content are proposed [4]; with respect to evaluation, it is suggested that partial progress be evaluated by the advisor, that a report be delivered in the form of a scientific article, and that the final results of the research be presented at a colloquium. Specifically in the School of Humanities and Education (EHE) it is suggested that the student be approved for only one semester, and that the concentration committee be the one to evaluate whether or not the student is authorized to participate in a second semester. The research concentration is presented

as an important alternative to develop research skills in students. This research aims to generate results that can be transferred to various university settings by investigating to what extent and how levels of mastery of research competence linked to academic literacy are developed in students participating in research courses at the undergraduate level. This document also presents a state of the art on research related to research competencies and academic literacy, as well as innovative models. It also presents the hypothesis, the research objectives, the methodology, the results, the dissertation status and the current and expected contributions.

2 State of the art

2.1 Research competencies

The current environment requires that students develop research competencies in an efficient and systematic way to respond to the challenges they face. The research competence according to Ramírez-Montoya [5] is a disposition and a know-how that consists in implementing a set of operations, skills, schemes and knowledge articulated logically and methodologically, related to the object of inquiry and with the purpose of producing knowledge. For Figueroa, Granados and López [6], research competencies are observation, reading, expression, creativity, rigor, socialization, construction, strategy, problematization and ethics. Cynthia Luna Scott [7] reinforces in her study the research competencies that will be developed in the 21st century according to the Organization for Economic Cooperation and Development in 2010, which will favor problem-solving actions to solve problems of reflective thinking, ethical and social impact, communication, adaptability and organization. Also, in the field of research, the importance of developing systemic thinking and creative and innovative thinking is conceived [8]. In the majority of universities, professors have more experience in the transmission of theoretical content than in the research processes themselves [9]. In order for research competencies to be adequately developed in students, it is necessary that teachers' training in skills be permeated by an innovative spirit, by the demands of contemporary pedagogy, and that it respond to the new educational model [10]. Nowadays, the teachers' research culture should be based on their digital identities [11,12]. Teachers play an important role in the development of research skills.

2.2 Academic literacy

Of the research competencies, it is important to identify those that develop academic literacy, an area that requires strengthening in higher education. Academic literacy is defined as "the process of teaching that can (or cannot) be set in motion to favor student access to the different written cultures of the disciplines [13]. Digital skills are now an important element in enriching academic literacy [14]. In the Framework for the development and understanding of digital

competences in Europe, there are five areas of digital competences: a) Information, b) Communication, c) Content creation, d) Security and e) Problem solving [15]. The changing environment of higher education now offers an uncertain information ecosystem that requires greater responsibility from students to create new knowledge and to select and use information appropriately. The research digital platforms should have a technological ecosystem base [16, 17, 18]. In the framework of Information Literacy for Higher Education [19] some key concepts of IL are contemplated: the creation of information as a process, information has value, research as inquiry and search as strategic exploration. Academic literacy can have a better development if information literacy and digital competences are contemplated, in general if innovative models are used.

2.3 Innovative models

Innovative models emerge as a response to the challenge posed by the changing environment in the educational field. Innovation should not be understood as doing different things, always changing. Innovation requires time, it requires overcoming the obstacles that hinder it, it requires training and experimentation [20]. There are multiple factors and motivations that lead to actions that promote innovation, such actions require a great deal of research [21]. Educational innovation is conceived as any adaptation (organizational, administrative, pedagogical, or formative) that enhances or improves student learning [22]. Innovation does not necessarily have to be conceived in the framework of the use of technology. A driver of innovation, as well as social development is the social appropriation of knowledge, whose relevance lies mainly in the fact that it makes scientific knowledge available to the population for its use and application [23]. Ramírez [24] considers seven challenges of educational innovation in higher education: 1) improvement of teaching-learning process, 2) organization of the institution of higher education, 3) networks with industry-business-government, 4) professional skills and active learning, 5) policies of incorporation of ICTs, 6) educational inclusion in HEIs, and 7) open knowledge and innovation. In order to strengthen open knowledge and innovation, institutional repositories play a fundamental role [25,26,27]. A key point within educational innovation is dissemination and therefore open research and the open science movement cannot be left aside [28,29,30]. Innovation must be considered as a change that can improve the teaching-learning process.

"The pedagogy of competencies is presented today as an innovation that should promote more integrated, more practical, and more transferable learning, finding its *raison d'être* in the economic purpose attributed to education today" [31]. In the book *Measuring Innovation in Education* [32], we talk about which are the motors of innovation: teachers, learning networks, and technology, but it is important to comment on the fact that all three do not necessarily have to be present. One educational trend that is already having a high

impact at present and will surely continue to do so in the medium and long term is the immersive experience. However, according to the data collected and analyzed by Kasey Panetta [33], attention will focus on the mixed reality over the next five years. Another innovative model is represented by open and distance education. This provides education with methods and techniques different from those used in traditional education [34]. There are studies that seek to contribute to the field of educational innovation by identifying the guidelines that are required to achieve the development of the competencies that the society of the XXI century needs in the students, from the opening of their processes, productions and developments to external agents in order to have a positive impact on the communities [35]. Open education can be a great support in times of crisis such as the one we are currently experiencing due to the contingency caused by COVID-19, since it can support the continuation of training processes with more open educational resources so that, from their homes, students can continue learning on open platforms with courses taught by trained teachers [36]. When using innovative models, care must be taken not to lose sight of the educational objectives and that the ultimate goal is to improve the teaching-learning process.

3 Hypothesis

The hypothesis for this study is the following:

- ❖ The development of academic literacy in the higher education environment is fostered by the promotion of research skills through innovative models.

4 Research objectives/goals

The objective of this research is to analyze the influence that research competencies have on the development of academic literacy in higher education students, by studying the impact of a research concentration that is composed of different training units in a Mexican university, in order to generate an innovative technology-based training model.

The following are the specific objectives:

- To study the theoretical and practical components of developing research competencies through mapping and systematic literature reviews to support a conceptual framework for research.
- To investigate the impact of innovative models on the development of research skills and academic literacy.
- To propose an innovative technology-based training model that promotes research competencies that develop academic literacy.

5 Research approach and methods

For the present study we will use the mixed research method, which according to Creswell [37] and Johnson & Onwuegbuzie [38], combining quantitative and qualitative data, allows us to have a better and clearer view of the problem to be studied [39]. This will allow a broader view of the elements that make up research skills, as well as the development of academic literacy and innovative models. The design of this research will be sequential explanatory Quan-Qual in two phases [40].

In the first phase, the Likert Scale questionnaire will be applied to students of various degrees of the Tec 21 Model of the Tecnológico de Monterrey as a pre-test and post-test as part of their research experience in the various courses in which they are enrolled. A semi-structured interview with a teacher and two semi-structured interviews with students will also be applied; in addition, online participant observation will be carried out in the course to which the interviewed teacher and two of the students of that course belong.

In the second phase, the participant observation will be continued, but in another course of those corresponding to the Tec 21 model, the Likert Scale questionnaire will also be applied as a pre-test and post-test as part of their experience in the courses of the research concentration. Two other semi-structured interviews will be carried out with professional students who are in courses of the research concentration, and product rubrics delivered in these courses will be analyzed.

5.1 Population and sample

They will be higher education students from different careers of the Tec 21 model. For the selection of the sample, an intentional (qualitative), but also probabilistic (quantitative) sampling will be used in the selection of the participants according to the Mixed method [41].

5.2 Variables in the study and instruments

Three variables have been established in the study:

Research skills: it 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 it is desired to investigate and with the purpose of producing knowledge [5].

Academic literacy: Academic literacy is "the process of teaching that may (or may not) be set in motion to promote students' access to the different written cultures of the disciplines" [13].

Innovative models: Innovation requires overcoming the obstacles that hinder it, it requires training and experimentation [21]. Educational innovation is conceived as any adaptation (organizational, administrative, pedagogical or training) that enhances or improves student learning [22].

These variables will be analyzed based on the information provided by the following instruments:

Likert scale questionnaires: to know the students' self-perception and interest in the generation of research skills to develop academic literacy, in addition to knowing the socio-demographic aspects (research skills/academic literacy).

Semi-structured interviews: with professors in the undergraduate area, to find out their perception of the development of academic literacy through research skills that the students have had and how they encourage the development of these skills in the students in their courses and what innovative strategies they use. To students to learn in depth how they perceive the usefulness of research skills in their training and specifically how they help them improve the development of academic literacy (research skills/academic literacy/innovative models).

Participant observations/observation list: will be done in the undergraduate group to which the Likert scale questionnaires were applied (research skills/academic literacy).

Evaluation rubrics: to identify in the products delivered by the students if they reached the levels of mastery that guarantee the fulfillment of the research competencies (research competencies/academic literacy).

In the first phase, the Likert Scale questionnaire will be applied to students of various degrees of the Tec 21 Model of the Tecnológico de Monterrey as a pre-test and post-test as part of their research experience in the various courses in which they are enrolled. A semi-structured interview with a teacher and two semi-structured interviews with students will also be applied; in addition, online participant observation will be carried out in the course to which the interviewed teacher and two of the students of that course belong.

In the second phase, the participant observation will be continued, but in another course of those corresponding to the Tec 21 model, the Likert Scale questionnaire will also be applied as a pre-test and post-test as part of their experience in the courses of the research concentration. Two other semi-structured interviews will be carried out with professional students who are in courses of the research concentration, and product rubrics delivered in these courses will be analyzed.

5.3 Information sources

Students enrolled in the Tec 21 model careers: they will express how they perceive research skills to influence their training and how they help them improve the development of academic literacy.

Teachers of various degree level careers: they will report how they perceive that students have acquired research skills that have helped them develop academic literacy and what innovative strategies they use to promote the acquisition of these skills.

Meaningful documents: rubrics to identify how elements are designed and evaluated to determine the achievement of research skills, as well as the products delivered by students to identify whether they reached domain levels.

5.4 Data collection and analysis

First phase:

1. Validity tests of the Likert Scale questionnaires.
2. Pilot test for questionnaires.
3. Modification of the results based on pilot tests.
4. Application of Likert scale questionnaires (pre-test and post-test).
5. Analysis of the results of the questionnaires
6. Expert analysis test for interviews.
7. Application of student interviews.
8. Application of teacher interviews.
9. Analysis of interview records.
10. Transcription of the information obtained from the analysis of the interview records
11. Report writing.
12. Conducting participant observations and recording what was observed.
13. Analysis of the observation records.
14. Transcription of the information obtained from the analysis of the observation records
15. Report writing.

Second phase:

1. Carrying out the participant's observations and recording what has been observed.
2. Analysis of the observation records.
3. Transcription of the information obtained from the analysis of the observation records.
4. Writing the report.
5. Application of Likert scale questionnaires (pre-test and post-test).
6. Analysis of the results of the questionnaires.
7. Expert analysis test for the interviews
8. Application of student interviews.
9. Analysis of interview records.
10. Transcription of the information obtained from the analysis of the interview records.
11. Report writing.
12. Analysis of the rubrics of the products delivered by the students.

The results of the quantitative and qualitative instruments will be taken into account according to the Mixed Methodology. Similarly, triangulation should be carried out by comparing the results of the different instruments: questionnaires, interviews, and observations [42]. With respect to the ethical principles to be followed in a study, participants will be asked to sign a letter of acceptance, which will indicate that they can make a decision at any time to withdraw from the study, and will also follow the principle of confidentiality. In addition, the principles of the British Educational Research Association will be the basis.

6 Results to date and their validity

Triangulation is a very important aspect to give validity to an investigation. In the present study a methodological triangulation was carried out [43], as well as of information sources [44], since the results obtained when applying the instruments to students, teachers and analyzing the rubrics of the products delivered by the students were compared. In addition, we returned to the informants after transcribing the interviews, so that they could confirm that what they had written in the transcripts accurately reflected what they wanted to communicate, in order to give the participants a real voice.

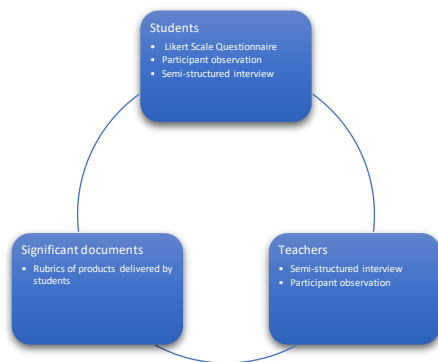


Figure 1. Triangulation process with information sources

The processes of forming research competencies to develop academic literacy offer a research niche, according to the systematic review of the literature, since in this research, unlike the studies analyzed, it is intended to address research competencies and academic literacy together.

7 Dissertation status

The current advances consist of the elaboration of the theoretical framework, the delimitation of the nature and dimension of the object of study and the planning of the study.

8 Current and expected contributions

This research proposal aims to generate a contribution to the field of education, specifically in the line of innovation. It proposes the establishment of an innovative training model that contemplates research competencies to develop academic literacy in higher education students. Furthermore, it is expected that the training model resulting from the research will contribute to the development of research competences that promote academic literacy not only in the context where the research was developed, but also in other university contexts.

9 Conclusions

Although research and academic literacy skills are conceived as an important element for the formation of university students, no studies were identified in the systematic review of literature that addressed them jointly. Therefore, it is considered that there is a niche for research that analyzes the link between both skills and that allows the design of a technology-based training model that promotes research skills that facilitate the development of academic literacy in higher education students.

ACKNOWLEDGMENTS

This document is a product of the project "Concentration of Research", with the support of the Office of the Vice Chancellor of Research of the Tecnológico de Monterrey (Mexico). This research work has been completed within the Doctorate in Educational Innovation, supported by CONACYT.

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