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Teaching and learning in engineering from the theory of experiential learning: Current Review

Enseñanza y aprendizaje en ingeniería desde la teoría del aprendizaje experiencial: Revisión actual

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Teaching and learning in engineering from the theory of experiential learning: Current Review

Abstract

This review article arises within the framework of the doctoral proposal entitled: Teaching and learning processes on analogue modulation techniques in an electronic engineering program from the experiential learning theory. This article shows the current state of teaching and learning in engineering from the experiential learning theory. A methodology based on stages of analysis, design and analysis of results is used. The importance of pedagogical innovation in adopting approaches related to experiential learning to consolidate knowledge in the different areas of knowledge involved in undergraduate engineering programs is observed, and it is suggested that the spectrum of pedagogical approaches and strategies that are adapted to specific academic contexts should be broadened.

Keywords: Learning, teaching, engineering, experiential learning theory.

Enseñanza y aprendizaje en ingeniería desde la teoría del aprendizaje experiencial: Revisión actual

Resumen

Este artículo de revisión surge en el marco de la propuesta doctoral titulada: «Procesos de enseñanza y aprendizaje de técnicas de modulación analógica en un programa de ingeniería electrónica desde la teoría del aprendizaje experiencial». El artículo muestra el estado actual de la enseñanza y el aprendizaje en ingeniería desde la perspectiva de dicha teoría. Se utiliza una metodología basada en las etapas de análisis, diseño y análisis de resultados. Se destaca la importancia de la innovación pedagógica en la adopción de enfoques relacionados con el aprendizaje experiencial para consolidar el conocimiento en las diferentes áreas que abarcan los programas de ingeniería de pregrado, y se sugiere ampliar el espectro de enfoques y estrategias pedagógicas adaptadas a contextos académicos específicos.

Palabras clave: Aprendizaje, enseñanza, ingeniería, teoría del aprendizaje experiencial.

Introduction

Science teaching requires transformations where the teacher stops being a simple transmitter of already discovered knowledge and creates real possibilities where the student builds knowledge for life, identifying learning styles and strategies from everyday situations and can be applied in everyday life from the application of science in life [1]. In turn, university education has some particularities that define it as a process of search, acquisition and construction of scientific knowledge [2]. In this university environment, training processes are implemented from the curricular level associated with the study plan and academic programs and, from the pedagogical side, with the pedagogical practices associated with the teaching and learning processes [3]. In this context, university higher education today has a challenge with respect to the student developing knowledge, attitudes and skills in relation to the theoretical and practical from the teaching and learning process.

In recent years, studies have focused on the problems or ruptures that are generated in the teaching and learning process, since there is a separation between what is thought, done and felt (think, do, be); Furthermore, there is no correspondence between knowledge and reality, causing a gap to be generated between theory and practice, presenting difficulties and increasingly generating a separation between teaching and learning in the classroom. Likewise, when constructing knowledge there is a separation between "what is learned for and how to make sense of what is learned"; understanding giving meaning to what is learned from the perspective of learning as the process in which knowledge is built through reflection and experience; giving meaning to things [4].

Furthermore, the predominant theoretical approach in science teaching focuses on the abstract concepts, since they cannot be observed, and the three-dimensional representation that is required of them for the correct understanding of the phenomena immersed in the area [5] ; specifically in engineering with the management of routine procedures in the application of mathematical equations and formulas when trying to solve a given exercise, without putting emphasis on the understanding of the physical phenomenon [6] and finally the implementation of these phenomena in a real laboratory practice in the application of an experiment using electronic devices and measuring instruments, also from the perspective of what is learned, how to make sense of what is learned and why to learn. Under this premise, from the teaching of science as a science that has the purpose of giving people tools for life, and not only from knowledge, but from teaching and learning strategies that allow both the teacher and the student the investigation of knowledge from situations taken from the environment, where the wide possibilities of applying science in life can be appreciated.

For this reason, from the theory of experiential learning based on the contributions of Kurt Lewin, John Dewey, Kolb and others, it offers a period of learning driven from the double dialectic of action/reflection and experience/abstraction; providing a holistic learning space, developing learning exchanges between students, teachers and the

environment. Likewise, AY Kolb & Kolb offers six fundamental propositions for learning such as: process, relearning, interaction between the being and its environment and, finally, creating knowledge. Based on what has been described, the theory of experiential learning defines learning as the generation of knowledge holistically through the transformation of experience [7]. Knowledge is the result of the combination of grasping and transforming experience" [8]. Therefore, from the perspective of science teaching and the theory of experiential learning, the ways in which the teacher teaches, why he teaches, how students learn, and why they learn must be kept in mind.

This article presents an analysis of the current state of teaching and learning processes in engineering from the theory of experiential learning. Scientific articles were searched in high-impact bibliographic databases, filtering the information through search filters and inclusion and exclusion criteria, the information is classified by geographic location, areas of engineering knowledge, and the trend by areas of knowledge is also analyzed. of the teaching and learning processes in engineering from the theory of experiential learning by continent of origin of the authors. The search window for information in scientific articles is between 2019 and 2023.

Materials and methods

A methodology based on [9] is used that proposes three stages: Analysis, Design and Results, as shown in Figure 1. In the analysis stage, the information selection criteria are determined, based on search filters and inclusion and exclusion criteria, by searching for keywords such as engineering teaching, engineering learning, theory of experiential learning in engineering and filtering works by year of publication in the window between 2019-2023. After that, the scientific documents that have the necessary information required for the research are selected. Therefore, high-impact bibliographic databases such as Google Scholar, ScienceDirect and IEEE Xplore were used.

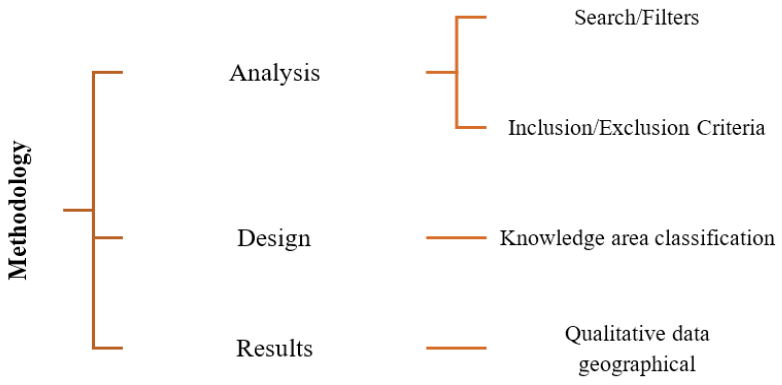

Figure 1. Methodology used

Below, the scientific articles selected for the review are presented in two moments: the analysis of teaching and learning in engineering; and experiential learning theory for

engineering. Firstly, the geographical distribution of the selected works is presented in Figure 2, where the deepening of these research areas in Latin America is observed, also considering a theoretical contribution from Florida, United States. In addition, emphasis is placed on the contributions made in Colombia, with the objective of envisioning the position in which the development of the analysis of teaching and learning in engineering is located, as well as the advances in the theory of experiential learning and comparing it with respect to the other countries.

Figure 2. Distribution of selected research projects by country.

On the other hand, while Figure 3 shows the distribution of the results of teaching and learning in engineering, where 13 articles were selected for engineering education in general, 3 for electronics, 2 for industrial, 2 for STEAM, 1 for telecommunications, 1 for chemistry and 1 for software.

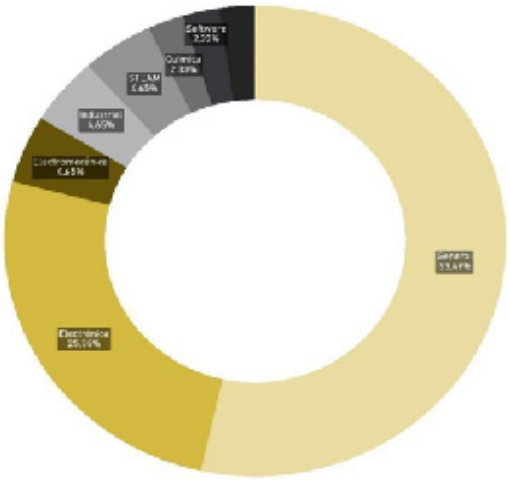

Figure 3. Distribution of teaching and learning results in engineering by knowledge area

Meanwhile, Figure 4 represents the distribution of the results from the theory of experiential

learning according to the area of knowledge, where 20 works were selected, divided between 10 works in general education, 8 in electronics and 2 in electromechanics.

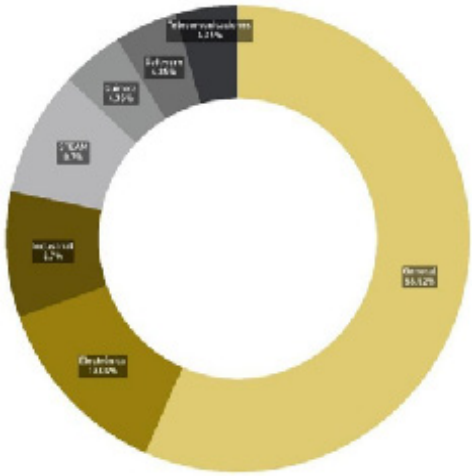

Figure 4. Distribution of results from learning theory experiential in engineering by area of knowledge

Finally, Figure 5 shows the total distribution of jobs according to the teaching area, where general engineering stands out with more than 53% of the total sample.

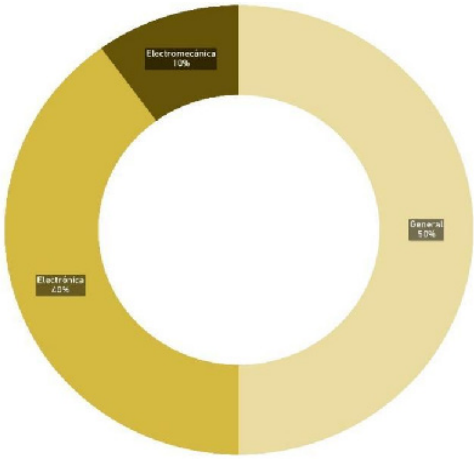

Figure 5. Total distribution by knowledge area

Results and discussion

Analysis of teaching and learning in engineering

In the year 2023 the work [10], aims initially to link pedagogical practice with cognitive practice, secondly to establish the relationship between pedagogy and evaluation in the formation of critical thinking; and third, reflect on teaching practice and learning. Applying a research methodology that seeks contributions from epistemological theses to

implement them in the art of learning, they conclude that pedagogy is not only a strategy for teaching, but even more so it is a connection, where teachers not only become deeply involved in the educational part, but also refers to the human, social and cultural aspects of the individual.

On the other hand, in the article[eleven], present methodological strategies for teaching in teaching practice and the location of these subjects in the next five years of the degree. The results of the bibliographic review allowed us to deduce: psychological, cognitive and constructivist attitudes, and how to place the subjects of design in the engineering programs. However, engineering design subjects are recommended throughout the career development in the that students are main actors in developing projects for the industry.

In 2022 the research [12], focused on two main objectives: teaching students to be information generators and also to use the tool created by themselves. To create the Wiki book, technical and economic criteria of the components and power modules analyzed were considered, and subjects such as industrial electronics and power electronics were involved.

Likewise, in 2022 Díaz et al. They present your work where analyze problem-based teaching as a pedagogical strategy option using bibliometrics through the information provided by Scopus and WoS. The results show that the United States has great scientific production on this topic. Likewise, there is great interest on the part of teachers and students in these aspects in the teaching of chemical engineering.[13].

In Colombia, during the year 2022, an applied and descriptive research was carried out led by [14] with the purpose of developing a didactic model intended for teaching home automation. The results of the study showed that, by using this tool, students improved their skills in the field of electronics and computing. This investigation highlights the need to promote knowledge in the field of home automation, which refers to the automation of systems and devices in the home and industry, in order to achieve more effective use of energy and improve daily living. The designed teaching model is presented as a valuable pedagogical resource for teachers and students involved in the subject, since it allows them to understand in a practical and simple way the concepts and processes involved in home automation.

In the year 2022, in Colombia, an investigative work developed by the authors was carried out[fifteen], whose goal is the implementation of a method for teaching and learning that provides students with a wonderful and motivating experience with the use of visual content, educational games, short periods of reading and innovative activities that generate motivation in students to continue. their studies and research. This method consists of three sections: Pre-laboratory, Laboratory and Post-laboratory, in which students must include pedagogical moments based on methods such as active learning, affective and playful teaching as a learning practice. This method adjusts to the planned guidelines from the teacher's perspective to provide a comprehensive experimentation

experience necessary in the comprehensive training of students as professionals.

In 2021, Oliveros Ruiz presents the panorama of teaching in Mexico in his work. In Mexico, the involvement of students in this area is critical, as mentioned by employers, since it is not easy to find professionals with these skills to meet the needs of vacancies in STEM areas. The study also showed that age, culture and gender equality are predominant factors when choosing their areas of study, in the area of Baja California and Sonora. In conclusion, universities must generate strategies to have greater involvement of students in these areas.[16].

In 2021, the authors present a solution for how to carry out the teaching and learning process for Industrial Engineering students at the Universidad de Oriente. The objective of this research is for industrial engineering students to have complete training, facilitating their learning.

On the other hand, Mizanoor Rahman shows results of teachers' experiences based on traditional teaching, classroom experiences and observations, and brainstorming. Teachers were trained in how to design, develop and implement robotics-supported classes under a research-based approach to design for experiential learning. The learning results showed that the activities with robotics were not only related to the knowledge observed in traditional teaching, but also to improvements in the behavior, social, scientific, cognitive and intellectual skills of the students. The learning outcomes assessment scheme can be used to evaluate and justify the benefits and advantages of robotics-enabled STEM education, compare results, help improve preparation for teaching, from STEM education and plan development robotics-enabled studio [18].

Furthermore, in 2021 the author [19] In his work he describes engineering-based learning methods and learning situations for derivative concepts. The methodology used is Michel Artigue's learning project. They were supported by 20 students from the 2018 calculus subject from the Faculty of Agricultural Engineering of the National University of the Altiplano. The diagnosis was unsatisfactory because the majority of the students scored below 11 on the vigesimal scale in the interpretation questions. After applying the pedagogical context, the results were satisfactory because a large number of the students were in the correct evaluation category of the process. Finally, it was concluded that control of operational algebra was found to be lacking and that their answers were not reliable, since most needed the teacher's approval to demonstrate his contribution. The result may be related to the lack of structuring in the students' pre-knowledge and errors in learning concepts; they do not have a clear scale, transmission of representation and registration of actions.

In 2020 the authors [20] They present a questionnaire that allows us to know the ideas about teaching in professors who teach in engineering. It consists of twelve dilemmas that contain items such as “what” and “how” to teach. The study is qualitative. This activity was carried out with one hundred professors from the Faculty of Engineering of the National University of Mar del Plata where it was concluded that it is an advantageous

study to represent the ideals about teaching.

Furthermore, in 2020 the author[21] presents how the information received by students in learning by doing in subjects of the Industrial Engineering career at the Technological University of Havana influences the formation of good skills in students. The methodology used was a case study of different subjects, the result was how important knowledge management is from learning-by-doing in teamwork.

In 2020, Solano & Aarón presented a way in which teachers can teach understanding of content with the use of the SMILE platform. The methodology is qualitative-quantitative, using the analysis of information and observation as a technique and quantitative from the statistical point of view. As a result, the SMILE platform allowed individual and collective evaluation, and students identified themselves as active actors.[22].

In 2020 the author [23] In his work he shows 2 examples of this articulation between didactic engineering and theory of didactic situations to the study of numerical sequences, taking it to an investigative methodology. The conclusion that the author gives is that if teachers trace the origins of mathematical knowledge, it would allow them to improve their teaching relationship, which would increase criticism and participation in classes.

Likewise, Marín-González et [24]present a work where an analysis of the relevance and methodology of multidisciplinary teaching in the concepts of education, basic sciences and engineering is carried out. The results show that integrated teaching from different disciplines, from a constructivist approach, strengthens the processes with a focus on academics and quality.

In 2020, Santamaria & Chanto Sánchez, in their work, seek a way of teaching through virtuality as a method for training engineers. The authors investigate virtual tools for teaching Telecommunications Engineering in aspects such as: dropout, permanence, study topics, among other parameters.[25].

In 2020, the authors Lozano et al mention that active learning must engage students in learning processes through activities given in the classroom. The authors reported in their article the results of comparing forms of learning; an active one for teaching Scrum for an introductory Software Engineering course. The results showed that there are significant differences in what students learn and the importance of using active learning strategies to teach Scrum. Furthermore, by using different forms of learning they facilitate the appropriation of concepts related to Scrum.[26].

In 2020, Zayas Figueras et al, in their work, make known the teachers' reflections and how to adapt the material they use and how to nourish it to provide an improvement in the teaching-learning process and the student's self-learning. Simulation software offers different scenarios so that the student learns differently, impacting their motivation. This project allows the student to learn through virtual resources as a means for the teaching and learning process of the subjects of theory of machines and mechanisms and project

II in the mechanical engineering degree.[27].

In 2020 the author Balaguera[28], present the different ways used by the teacher in the period of deepening of the faculty of industrial engineering, showing that a large percentage of teachers use active methodologies in the classroom; Likewise, what students think about the methodologies that teachers use when teaching was evaluated. In this way they test the deepening period for the industrial engineering program at the Santo Tomás University.

In 2019, the authors Arzola De La Peña et al. In their work they present the lack of motivation that children have to study an academic program in engineering. Initially, it is thought that studying engineering is only about connecting and using devices, forgetting the background that this science entails. Second, they do not want formal theory to understand the phenomena of how devices are manufactured and operationalized. Finally, when studying engineering you require skills and knowledge that the market demands and they do not have it and the salaries are not very attractive; where for other areas they rely on the use of technologies and turn them into highly profitable businesses [29].

In 2019, the authors Gonzalo Garcés & Eric Forcael mention that engineering teachers use teaching strategies that are aimed at reproducing practices based on existing models without analyzing and interpreting them in detail. For this reason, it is necessary to use different teaching and learning techniques in the classroom that provide the engineering teacher with a guide that can be developed in the classroom, according to the capabilities that he wants to develop in his students.[30].

On the other hand, Fortea Bagán conceptually presents elements of the teaching and learning process using didactic methodologies, proposes different methodologies for teaching and learning, strengthening the student's capabilities, and finally, suggests the evaluation of capabilities, revealing different evaluation methodologies and little recognized [31].

In 2019 the authorsSologuren Insúa et al. propose active teaching and learning methodologies in higher education for the development of generic innovation and communication skills in the first years of engineering. The objective of this study is to recommend and implement learning resources and strategies for first-year engineering students. The authors conclude that the students consulted valued the course's teamwork, practical experience, ethics, and application of soft skills. Regarding the deficiencies, they found poor teaching preparation, rigidity in the methods and low time in the use of the laboratory.[32].

In 2019 the authors Domínguez et al. They sought to encourage critical thinking, teamwork and creativity in students. These skills are essential to face challenges and take advantage of the opportunities presented by the industrial revolution 4.0. The methodology to be used is a methodology of research and innovation in activities. Finally, young people are prepared with the skills, attitudes and competencies necessary to be applied in

commercial and/or industrial environments.[33].

In 2019, the authors Trujillo et al carried out a study where topics in which students found the greatest difficulty were identified, with limits and continuity being the concepts that generated the most complexity. To address this situation, didactic sequences were implemented as a teaching strategy to improve the learning of these concepts. This approach allowed us to provide a better understanding and facilitate the teaching and learning process of limits and continuity. [34].

Experiential learning theory

The author Medina Vergaraat work Creative thinking and experiential learning in students of the Faculty of Education of a private university, Lima 2022, carried out a basic study using a quantitative approach using the survey as a technique, where it was found that creative ideas have a direct correlation with experiential learning, indicating the more creative ideas in students, the better learning [36].

In 2023, the authors Nicolete et al in their work identified the learning styles of students in an electromechanics course, based on David Kolb's Experiential Learning Theory. Likewise, they combine different technological tools in an experiential learning process and verify the advantages in teaching Physics. What is obtained from this work will help teachers propose new pedagogical strategies considering the Experiential Learning Theory [37].

In 2022 the authors Mariño et al. In their work they present the studies that have been carried out in engineering in the area of education and have shown interest in the teaching and learning processes in this area. There are methodologies from experiential learning that make learning styles contribute to the improvement of students' attitudes and knowledge in the area, from Kolb's contributions articulating contextual, active experiences allowing progress in generic and specific competencies. The Faculty of Engineering of the University of Los Andes in Bogotá, Colombia, has carried out training activities for master's students in engineering, generating methodologies for their teaching work and during the pandemic. Returning to face-to-face training and with the ABET accreditation processes, we reorient ourselves towards the design of workshops to identify the Kolb learning cycle and collaborative learning in students.[38].

In 2021 the authors Tinoco et al. In their work entitled Kolb's experiential learning in students of the Faculty of Metallurgical and Materials Engineering of the National University of Central Peru, they determined Kolb's learning styles as the active, reflective, theoretical and practical student with respect to how they learn. It is obtained that the students of this career have different learning styles, the divergent style predominates and that the students who study in basic sciences tend to adopt this learning style.[39].

In 2021, the authors Azevedo & Zampa in their work show the results of the application

of a didactic sequence (DS) based on the foundations of Kolb's Experiential Learning Theory, relating body awareness and learning. It is qualitative research, of an applied nature, structured in the action research methodology. The results of the analysis showed the Accommodator style as predominant in the group investigated. This shows that most students emphasize feeling and doing during the learning process, acting predominantly through feelings, learning by doing things, and tending to solve problems intuitively.[40].

In 2021 the authors [41] and in the article they mention that the teaching and learning processes must be active and not just a simple transmission of information. For this reason, two instruments are developed and applied to analyze class planning, class dynamics and evaluation, based on the theory of experimental learning of teachers and students. As a result, a decrease is obtained in correspondence: teaching and learning, concluding that there must be a transformation of teachers and students in: planning, dynamization and evaluation of their classes.

In 2021 the article titled Processor in the loop (PIL) technique applied in the development of electronic engineering laboratory practices proposes a methodology that satisfies the needs in virtual environments in the development of laboratories in Discrete Control in the Electronic Engineering Program of the Cundinamarca University. They take Kolb's experiential model and the Processor in the Loop (PIL) implementation technique. It is concluded that students greatly accept the proposed methodology [42].

In 2020, the author Rodrigues mentions that based on David Kolb's theoretical model for experiential learning, individual learning styles and modes are identified. They used two instruments: data collection through a bibliographic analysis and a questionnaire called learning styles inventory. It is concluded that the groups were varied in styles and there is no superiority in the convergent learning style as indicated by theory for students in the technological area. On the other hand, the female gender showed results regarding accommodating and assimilating learning styles [43].

In 2020, the author Vanoni Martínez presented a teaching strategy using the case method for the managerial decision-making module. As a result, it is important to introduce pedagogical practices that eliminate the university-business gap and provide space for virtual practices [44].

In 2020, the author Díaz Ronceros presented a study that aims to identify the best way of learning for Electronic Engineering students at the José Faustino Sánchez Carrión National University in the subject of Microcontrollers. The type of research is descriptive-relational, a before and after test is applied to know the degree of microcontroller programming. By applying microrobotics to the subject, students improved their academic performance and their way of using these devices in the area of electronics and automation [45].

In 2020, the authors [46] in their article mention that educational institutions as a strategy are including experiential learning in their educational models through projects applied to

the labor field. As a result, students have applied their knowledge to solve real problems such as critical thinking, creativity and communication.

In 2020, the authors [47] in their article present a different way for students to learn the concept of harmonic wave through Kolb's experiential theory. They use a quantitative approach following the CUVIMA model. The authors identified a convergent and assimilative learning style, since students prefer simulation and the laboratory where they can apply theory to practice.

In 2020, the authors [48] present an analysis of pedagogical strategies from the student's experience, according to their educational capabilities and needs. The authors carry out a bibliographic review and use the deductive and inductive method focused on the student's learning and experiences. It is concluded that the identification of learning styles in students and applied to the development of the class favors competencies in students and teachers.

In 2019 the authors [49] present an experiential learning model for third-year BGU students of the "Dr. Francisco Huerta Rendón in the subject of entrepreneurship and management. The authors use ethnography as a methodology; They obtain positive results when applying the model and design a guide that has practical activities based on experience.

In 2019 the author [50] in the work titled "Didactic Design based on Kolb's Experiential Constructivist Model. Case study: Unit #2 RLC filters of the transmission circuit course of the telecommunications engineering program of the University of Pamplona. The authors present a way (design) for teaching and learning the RLC passive filters unit from Kolb's experiential model. As a result, the authors propose some changes to the current model since it must be aligned with the institutional requirements and the new generations of students.

In 2018, the author Zavala Atilano in his work used experiential learning as a teaching strategy so that students analyze, reflect and experiment with their knowledge. Likewise, students will integrate new knowledge with previous knowledge along with new experiences. They use John Elliott's action research method, in addition to the theory of experiential learning in its four stages [51].

In 2018, the author Rodríguez Cepeda presented a study of two learning models in his work, first, the model proposed by David Kolb and second, the Honey and Mumford model. The two models are analyzed for differences and similarities, proposing initiatives in this area of knowledge to teacher-researchers [52].

In 2018, the authors present a methodology for teaching Analog Electronics through virtual laboratories for the Electronics Engineering degree (UNCa). The methodology is based on two stages, first, the development of a portable laboratory model and second, the implementation of the model in teaching [53].

In 2017, according to the authors Menéndez & Tarabella, they presented the incorporation of extension activities in the university curriculum from an epistemological perspective, from experiential education. This research aims to be innovative from the curricular point of view, generating new practices in teaching, contributing to the training of students and in turn consolidating extension at the university [54].

In 2017 Albort-Morant et al. In their work they highlight the importance of carrying out different practices in addition to the master class. They use the theory of experiential learning as a method where they propose optimizing the learning and motivation of students for the management and cultural skills course in East Asian organizations, belonging to the Degree in Asian Studies [55].

In 2017, the authors Moreno Martín et al. They reveal the change from a constructivist paradigm to a connectivism one, maintaining the creativity and training of students through meaningful learning. They used as a methodology a bibliographic analysis in relation to the various learning theories for this case in higher education, starting from behaviorism, cognitivism and constructivism, ending in connectivism [56].

In 2016, the authors Martínez Florido identified a problem which occurs in carrying out experiments in the generation and transportation of electrical energy. The authors use the qualitative method and the action research model. They conclude that students' concepts and learning are linked to the theories of meaningful learning, the constructivist model and their personally significant experiences. Finally, this work generates the linking of technological instruments in the classroom [57].

With the above, the bibliographic review of the analysis of teaching and learning in engineering; and experiential learning theory for engineering highlights the integration and effectiveness of using pedagogical platforms to assess students' individual and group understanding; and encourage their participation. Furthermore, the studies highlight the importance of considering the origins of the concepts taught to improve their teaching, as shown by the projects that integrated the theory of didactic situations in engineering environments.

On the other hand, it is possible to observe the contribution to the progress of learning generic and specific competencies in engineering that applied Kolb's experiential learning theory, showing the validity of this study and its scalability. However, the correspondence between teaching and learning presents limitations that must be overcome by transforming the methods of planning, development and evaluation of classes, which is achieved thanks to the particular use and consideration of the group and its diverse learning styles. as shown in the analyzed works.

Conclusions

This research, which highlights the results of the application of engineering education from the theory of experiential learning in Latin America, Spain and Florida, USA; offer a detailed overview of the application of different techniques and learning models in engineering, confirming the relevance of the use of pedagogical approaches to improve the learning of engineering students, which improved the teaching-learning correspondence in areas of knowledge such as electronics , telecommunications, STEM, chemistry, among others. Despite the progress obtained, it is important to consider the limitations of the study, mainly the concentration of projects in Latin America and the focus on certain areas of knowledge, so the scalability of the results of the exposed techniques may generate different results in others. scenarios. Finally, it is recommended to expand the geographical scope to consider other strategies that fit the specific requirements of engineering students, as well as consider additional areas of knowledge for a general analysis of didactic techniques under the theory of experiential learning and detail the effectiveness of the methods in different scenarios.

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