Article **ECORFAN Journal-Republic of Colombia**
June, 2023 Vol.9 No.16 23-28

Collaborative activities mediated by technology for integration into University life in the introductory Engineering course

Actividades colaborativas mediadas por tecnología para la integración a la vida Universitaria en la asignatura de introducción a la Ingeniería

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DOI: 10.35429/EJC.2023.16.9.23.28 Received April 18, 2023; Accepted June 30, 2023

Abstract

The article presents an educational intervention project implemented in the Introduction to Engineering subject of the Computer Engineering Educational Program of the Centro Universitario de Ciencias Exactas e Ingenierías of the Universidad de Guadalajara, developed by the Investigation Groups UDG-CA-991 Desarrollo de Competencias Profesionales en Ciencias Computacionales and the UDG-CA-863 Gestión y Desarrollo de Competencias en Entornos Virtuales during the periods 2022-B and 2023-A which developed strategies that integrated actions and resources for collaborative work mediated by technology for the integration of students into the university life, under a mixed model and a section group as a sample, achieving a pedagogical proposal assisted by technology focused on the development of significant learning, in which an impact evaluation was applied with interview and survey instruments, as well as satisfaction and evaluation , considering the institutional, teacher and student dimensions or categories. The project was focused with the principles of continuous improvement.

Collaborative work, IT in education, Meaningful learning

Resumen

El artículo presenta un proyecto de intervención educativa implementado en la asignatura de Introducción a la Ingeniería del Programa Educativo de Ingeniería en Informática del Centro Universitario de Ciencias Exactas e Ingenierías de la Universidad de Guadalajara, desarrollado por los Cuerpos Académicos UDG-CA-991 Desarrollo de Competencias Profesionales en Ciencias Computacionales y el UDG-CA-863 Gestión y Desarrollo de Competencias en Entornos Virtuales durante los periodos 2022-B y 2023-A el cual desarrolló estrategias que integraron acciones y recursos para el trabajo colaborativo mediado por tecnología para la integración de los estudiantes a la vida universitaria, bajo un modelo mixto y un grupo sección como muestra, logrando una propuesta pedagógica asistida por tecnología enfocada al desarrollo de aprendizajes significativos, en la cual se aplicó una evaluación de impacto con instrumentos de entrevistas y encuestas, así como de satisfacción y evaluación, considerando las dimensiones o categorías institucionales, docentes y de los estudiantes. El proyecto fue enfocado con los principios de mejora continua.

Trabajo colaborativo, las TIC en la educación, Aprendizaje significativo

Citation: MACÍAS-BRAMBILA, Hassem Rubén, ZAMORA-RAMOS, Victor Manuel, OSORIO-ÁNGEL, Sonia and BECERRA-VELÁZQUEZ, Violeta. Collaborative activities mediated by technology for integration into university life in the introductory engineering course. ECORFAN Journal-Republic of Colombia. 2023. 9-16: 23-28

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Introduction

The University of Guadalajara (UdeG) through the Educational Program (PE) Computer Engineering of the University Center of Exact Sciences and Engineering (CUCEI) establishes as an objective the training of professionals with skills and abilities to apply, configure and develop information systems for the implementation of solutions related to information processing.

In this sense and based on the needs of the productive sector and society, aligned to the Curricular Models of the National Association of Information Technology Education Institutions (ANIEI) and the recommendations of the National Council of Accreditation in Informatics and Computing (CONAIC) as Accrediting Body of the PE, through its framework of reference, constant updates of the plans and programs of study have been made, seeking the relevance and quality of the process; considering the integral formation of the student and his integration to the university life.

It is for this reason that within the curriculum of the PE is located in the first semester the subject of Introduction to Engineering that belongs to the area of common basic training and is designed for students to develop a detailed overview of their profession, acquire tools that promote their personal, academic and professional development, in addition to strengthening their sense of relevance to the Institution.

For the achievement of the above, it is necessary the development of some capacities, abilities and skills such as leadership, sense of entrepreneurship, social responsibility, ethics and integrity, which according to Alvarez et el. (2019) are individual qualities that are ingrained and can be transformed and developed.

However; the characteristics of the profile of students entering Engineering programs and who also have a training mediated by technology derived from the effects of the Covid-19 pandemic characterize as a challenge the approach of these topics in groups, which also exceed mostly 40 students per section.

For this reason, the Academic Groups (CAs) UDG-CA-991 Development of Professional Competences in Computer Sciences and UDG-CA-863 Management and Development of Competences in Virtual Environments designed an educational intervention project, defined by De León (2021) as the means to determine strategies that integrate actions and resources with the objective of solving them during the 2022B cycle, project that was applied and evaluated during cycle 2023A, under a mixed approach and with a section as a sample group, in which through collaborative work based on constructivism and defined by Maldonado (2007) as a potentiator of learning and also implemented learning processes mediated by technology, described by Lizcano *et al*. (2018) as environments that streamline communication, collaboration and generate learning environments that promote the integral development of students.

This project counted on the design of learning scenarios and activities that allowed students to live the experience in their immersion in university life and the development of the competencies declared in the subject in a dynamic, interactive and completely opposite way to the initial appreciation declared by students at the beginning of the course.

This intervention process was designed, implemented and evaluated through data collection instruments, analysis and classification, evaluation instruments and satisfaction surveys, which allowed for this case study its assessment and consideration of success, which will allow presenting the results to the university authorities and thus propose the implementation of strategies that favor the transit of students in the rest of the PE that in their curricula offer this subject.

Methodology

The project began with its design and delimitation during the period 2022B, from August to December, for its implementation and evaluation in the calendar 2023A, from January to May 2023, applied to first semester students of the PE of Computer Engineering of the Centro Universitario de Ciencias Exactas e Ingenierías, under a mixed research model and with an impact on a population of 40 students.

ISSN-On line: 2539-1372

Design

The determination of the educational intervention project began with the naming of the project in its identification within the institutional framework of the University of Guadalajara and the Centro Universitario de Ciencias Exactas e Ingenierías, integrating the process of problematization where it was determined that "the excessive use of traditional teaching methods such as expository, limits the generation of meaningful learning", with this it was possible to determine the research question, where according to Hidalgo (1997) formulates the purpose of the research, being for this project: In what way is it possible to transform traditional teaching methods for the generation of meaningful learning? .

The foundation of the project is based on collaborative learning, which has several currents that characterize it as a means of generating meaningful learning, which according to the constructivist vision of learning based on the theories of Piaget and Vygostky, since both consider the social context as a basic element for cognitive development and knowledge construction, which according to Martínez (2003) requires a confrontation of visions and is translated as a socio-cognitive conflict.

The operational determination of the activities contains the strategies conformed by actions to be carried out in the project, which according to Barkley (2005) are intentional and structured with a logical sequence, as shown in the following table with an extract of the project activities:

Activity	
No.	Title
1	Infographic "Collaborative work".
2	Timeline "de la UdeG".
3	Presentation of "Governing Bodies
4	Analysis of "University Regulations
5	Triptych "Computer Engineering".
6	Video "Computer Engineering".
7	Social impact project from the professional profile

Table 1 Extract of project activities
Own Elaboration

For each of the activities, the implementation strategy was designed, which considered the title, the thematic unit in the curriculum, the number of participants who would collaborate in the teams, the technological tool to be used for the development and presentation, considering at all times the use of free and multiplatform software to avoid incompatibility between the various electronic equipment available to the students, the duration of the activity, the place, the resources, its objective and content, in which the conceptual, procedural and attitudinal elements expected to be fulfilled were described, as well as the activities to be developed by the teacher and the students in the three moments of the sessions: beginning, development and closing; as well as the evaluation of the process and product, integrating the performance criteria, considering its indicators. Below is an excerpt of the design of the video activity:

Evaluation Performance criteria Student indicators Attitudinal
Will carry out the proposed activities with creativity and performance. Participate actively in the team. Will show interest in the subject

Table 2. Extract from the description of the project activities
Own Elaboration

The planning of the project activities were distributed during the whole period 2023A according to the time load of the subject, determining a session for the presentation and execution of the activity and another one for the presentation of the results by team as they were conformed.

In the case of the more complex activities such as the video and the social impact project, 3 and 4 sessions were determined, respectively, due to their characteristics and complexity.

We also determined the primary and secondary resources and materials for each of the activities, considering computer equipment, internet connection, smart phones, projector, speakers and microphone, as well as Classroom as a Virtual Learning Environment (VLE), which even though the University has other VLEs, the institutional accounts that are provided immediately are from the Google environment.

ISSN-On line: 2539-1372

Which facilitated the implementation of activities, the repository, communication and consultation and feedback under this environment. Regarding the online technological tools that were used, a prior determination was made of those that were free access or that according to the collaboration agreements of the University there was access to institutional accounts at no cost, being the following the ones used:

– Google Classroom, Meet and Forms.
– Canvas
– Powtoon
– Filmora
– Office Suite

The site https://capacitateparaelempelo.org was also used to accompany the training process in microcourses such as time management, digital health, programming logic, your internet business, presentation skills, mobile business, tester, the virtue of serving and leadership, resources that were vital for students outside the classroom to work individually on these personal skills to strengthen their profile in parallel to the classroom activities.

The evaluation indicators were defined through the design of evaluation instruments congruent with the educational model, so checklists and rubrics were developed with a focus on self-evaluation, co-evaluation and observation guides, all under the premise established by Fritzen (1982) allowing to observe the content and the process, considering the dynamics of the work teams, identifying the behavior, interaction of the members and their relationships.

Evaluation

According to Fierro (1999) this is the last stage of a systematic intervention project of an educational situation, for which records were made of the sessions and the application of the instruments developed as a means of recovery, organization and analysis of the data; which allowed the determination of the units of analysis and their frequencies. Some of the products developed in the project activities are presented below:

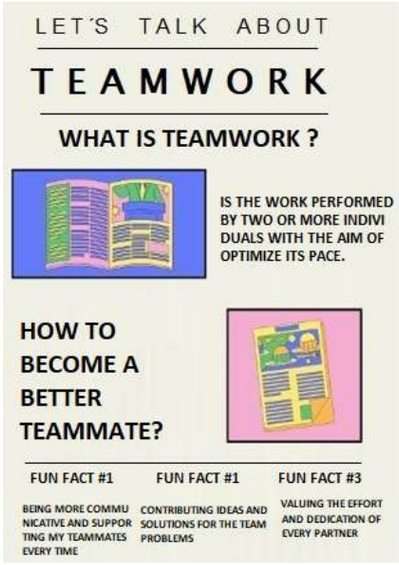

Figure 1 Sample teamwork infographic
Own Elaboration

The previous image corresponds to one of the products developed in the course, in which students identified the characteristics, modalities, elements and situations that arise in collaborative work. The following is one of the proposals for a triptych of Computer Engineering:

Figure 2 Sample triptych of Computer Engineering
Own Elaboration

The previous image shows an example of the triptychs developed by the work teams, which had the objective of identifying aspects such as the activities performed by a graduate, work trends and the salary received according to some statistics, thus contributing to the knowledge of important aspects of the PE. Below is a sample of a triptych related to the attitudes and values described in the profile of the PE, as well as the contributions of professionals in this field to society:

ISSN-On line: 2539-1372

Figure 3 Sample triptych of values and attitudes of a Computer Engineer
Own Elaboration

Each of the activities implemented in the project were evaluated with the described instruments and allowed to characterize and obtain the appreciation of each of the members of the group, as well as the evaluation of the performance by each of the formed teams, as closure of this process, an impact evaluation mechanism was established, which from the International Labor Organization since Abdala (2004) allows to establish an assessment that is applied to a system to obtain information of the results of a project or program, in its follow-up of the process and measurement of its impact on the target population.

Results

The impact evaluation was generated through the contribution among students in the course process, considering social interaction as a tool that allows the improvement of the educational practice and thus achieve to perceive and live a learning process differently and was divided into three axes: institutional, in the teaching practice and in the students.

The institutional category yielded the following elements:

– Implementation of collaborative strategies mediated by technology in the development of significant learning in the students of the introductory engineering course.

– Implementation of new evaluation instruments congruent with the educational model in the introductory engineering course.

– Modification in the semester planning of the introductory engineering course. Elaboration of the proposal for the implementation of data collection instruments.

The category in the teaching practice allowed us to have the following findings:

– Elaboration of a resource planning for the mediation of technology-assisted learning in the subject of introduction to engineering.

– Implementation of evaluation instruments that allow evidencing the achievement of the objectives of the curriculum through the assessment of the products and processes experienced by the students of the subject of introduction to engineering.

The category of students evidenced:

– Verbal manifestation of progress in the development of teamwork skills.

– Verbal manifestation of improvement in the development of interpersonal relationships among group mates through technology-assisted collaborative work strategies.

– Improvement in the student-teacher relationship through personal expressions that allow the teacher to identify factors of motivation and progress of some of the students.

– Increase in the presence and punctuality of students in the sessions through the implementation of strategies that are not related to the processes they experience individually in other subjects.

– Development of interest in students from other groups to know and experience the processes developed by the intervention project strategies.

ISSN-On line: 2539-1372

Conclusions

The design of the intervention project was carried out according to a planning of strategies directed to the development of significant learning in an academic process assisted by technology in the students of the subject of introduction to engineering through collaborative work strategies with the objective of evaluating the academic process and its impact on the students through indicators such as logical, affective and psychological significance.

In this process, evaluation instruments were designed considering aspects such as the organization of work teams, trust and student participation through adequate learning environments for their incentive, as well as the evaluation of knowledge construction. These factors were evaluated from the students' perspective towards learning actions and strategies.

This implementation allowed the development of a technology-assisted pedagogical proposal focused on continuous improvement in a constantly changing environment that will allow, with the results obtained, to propose its implementation in the rest of the sections or groups in which this subject is offered.

References

Abdala, Ernesto (2004) "Manual para la evaluación de impacto en programas de formación para jóvenes" CINTEFOR: Uruguay

Barkley, F. Elizabeth; Cross K. Patricia & Howell Major, Claire (2005) "Técnicas de aprendizaje colaborativo". España: Morata.

De León Cerda, D. D. (2021, agosto). El proyecto de intervención. La importancia del diagnóstico. Guadalajara, Jalisco, México: Sistema de Universidad Virtual

Fierro, Cecilia; Fortuol, Bertha & Rosas, Lesvia. (1999). "Transformando la práctica docente" España: Paidós.

Fritzen, Silvino José (1982) "La ventana de Johari: ejercicios de dinámica de grupos, de relaciones humanas y de sensibilización". Brasil: Editora Vozes.

Hidalgo Guzmán, Juan Luis (1997) "Investigación Educativa: Una estrategia constructivista". México: Castellanos Editores.

Lizcano-Dallos, A. R.; Barbosa-Chacón, J. W. & Villamizar-Escobar, J. D. (2019). Aprendizaje colaborativo con apoyo en TIC: concepto, metodología y recursos. magis, Revista Internacional de Investigación en Educación, 12 (24), 5-24. doi: 10.11144/Javeriana.m12-25.acat

Maldonado Pérez, M. (2007) "El trabajo colaborativo en el aula universitaria". Laurus, Vol. 13, N.23, pp 263-278.

Martínez Sánchez, Francisco (2003) "Redes de la comunicación en la enseñanza: las nuevas perspectivas del trabajo corporativo".España: Paidós Ibérica.

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ISSN-On line: 2539-1372