

Good practices in the self-transformation of the engineering student in continuous improvement projects

Buenas prácticas en la autotransformación del estudiante de ingeniería en proyectos de mejora continua

PALOMARES-RUIZ, María Blanca Elizabeth†*, DIMAS-RANGEL, María Isabel, TORRES-BUGDUD, Arturo and BÁEZ -VILLARREAL, Esteban

Universidad Autónoma de Nuevo León, Faculty of Mechanical and Electrical Engineering, Mexico.

ID 1st Author: *María Blanca Elizabeth, Palomares-Ruiz* / ORC ID: 0000-0002-4079-6969, Researcher ID Thomson: S-4843-2018, CVU CONACYT ID: 339594

ID 1st Co-author: *María Isabel, Dimas-Rangel* / ORC ID: 0000-0001-9450-8080 Researcher ID Thomson: S-4720-2018, CVU CONACYT ID: 374045

ID 2nd Co-author: *Arturo Torres Bugdud* / ORC ID: 0000-0003-2214-9394, Researcher ID Thomson: ABE-2852-2020, ArXiv Author ID: Arturo-Torres-Bugdud, CVU CONACYT ID: 216332

ID 3rd Co-author: *Esteban Báez Villarreal* / ORC ID: 0000-0003-0112-6660, Researcher ID Thomson: S-5893-2018

DOI: 10.35429/JUM.2022.16.6.29.35

Received July 30, 2022; Accepted December 30, 2022

Abstract

Due to the confinement caused by the COVID-19 pandemic in 2020, new academic work practices were established with the support of digital platforms in education, in this context, students who perform the compulsory social service of a Higher Education Unit (DES) of a Public University received advice with the support of tutors for improvement projects applied to the industry. The objective of this work is to publicize the processes that were addressed during the confinement decreed by government authorities, developing an advisory model that allows monitoring the indicators established for each specific case. For the preparation of this article, a qualitative and documentary methodology was implemented, in which a positive impact on its results is highlighted, in addition to disseminating and publishing success stories, enabling the insertion of students in the productive sector.

Resumen

Debido al confinamiento causado por la pandemia COVID-19 en el año 2020, se establecieron nuevas prácticas de trabajo académico con el apoyo de plataformas digitales en la educación, en este contexto los estudiantes que realizan el servicio social obligatorio de una Dependencia de Educación Superior (DES) de una Universidad Pública recibieron asesorías con apoyo de tutores para proyectos de mejora aplicados a la industria. El objetivo del presente trabajo es dar a conocer los procesos que se abordaron durante el confinamiento decretado por autoridades gubernamentales, desarrollando un modelo de asesoría que permite dar un seguimiento a los indicadores que se establecen para cada caso específico. Para la elaboración de este artículo se implementó una metodología de corte cualitativo y documental, en la cual se destaca un impacto positivo en sus resultados, además de divulgar y publicar los casos de éxito, posibilitando la inserción de los estudiantes en el sector productivo.

Social Service, Good Practices, Training

Servicio Social, Buenas prácticas, Formación

Citation: PALOMARES-RUIZ, María Blanca Elizabeth, DIMAS-RANGEL, María Isabel, TORRES-BUGDUD, Arturo and BÁEZ -VILLARREAL, Esteban. Good practices in the self-transformation of the engineering student in continuous improvement projects. Journal University Management. 2022. 6-16:29-35.

† Researcher contributing as first author.

Introduction

As is well known, social service is one of the most important elements in the comprehensive training of students, as it involves various activities that positively build their personal, academic and professional development. During the process, students reflect on the importance of applying their knowledge, skills, aptitudes and attitudes to the society around them, establishing harmonious relations with the institution. While laying the foundations for essential training with the university and possible entry into the labour market, their work ranges from the detection of needs for improvement, the development of proposals, their implementation, evaluation and monitoring to be implemented in industry, highlighting their skills at local, national and international level.

"Social service is an essential part of the modernising process of national and international higher education institutions, as it is an academic activity for the benefit of society and through which university students consolidate their professional training". Amaya, A. A., Ramos, M. C., & Castillo, G. L. (2017)

The present research product aims to document the process to improve the practices of Social Service in the Faculty of Mechanical and Electrical Engineering of the Universidad Autónoma de Nuevo León, Mexico, during the COVID-19 pandemic, promoting the integral self-transformation of the student by presenting successful results in professional practice, with the guidance and orientation of the faculty members of the academic body UANL-275 "Academic and Administrative Management of Higher Education Institutions", step by step feedback with the support of digital platforms, until presenting favourable indicators in their results, which transcend and are of mutual benefit, both for the student as well as for the work centres where the improvements were applied, evidenced in the solution of specific problems, obtaining a product of disclosure in each project, which have been subjected to evaluation by academic peers, once selected have been exposed in various academic conferences, after this they were published in peer-reviewed and indexed journals.

As Águila, C. (2005) mentions, "society is demanding in a different way that the university should not only be the place where universal knowledge is accumulated, but that society should demand that knowledge be applied to its environment, that it should be relevant and that it should have an impact".

Digital education, in recent years, has been increasing social interest, however, due to the global situation of confinement due to the pandemic and the uncertainty of a safe return to face-to-face classes, it was necessary for all educational institutions. "According to data from the United Nations Educational, Scientific and Cultural Organization (unesco), by mid-May 2020 more than 1.2 billion students at all levels of education worldwide had stopped having face-to-face classes in school." (UNESCO, 2020).

Institutions found it impossible to receive students and staff, added to this the intention not to stop education, so options were made for the performance of students, having to have flexible and adaptable alternatives to the rhythms of study and other personal commitments of distance education, mainly those related to work and family obligations.

The performance of social service in higher education, faced with this challenge, had to confront various problems that had to be addressed with innovative proposals, both in terms of adopting and adapting mechanisms, allowing its essence and value to be renewed for the benefit of society and in turn that of the students themselves.

The design of the proposal was carried out in a public university located in the state of Nuevo León in northern Mexico, which has more than 100 industrial parks, most of which are strategically located in the metropolitan area, allowing companies located in the state to have the ideal facilities to move their products to other entities and countries (Somos Industria, 2011).

In this respect, they consider that "thanks to the strengths that Nuevo León has, it is considered the best place to invest in the country, especially if you plan to serve the North American market, the United States and Canada".

The strategic sectors of the state are: aerospace, automotive, biotechnology, household appliances, specialised medical services, information technologies, agri-food, nanotechnology, sustainable housing and interactive media. Ministry of Economy, (2016) The Universidad Autónoma de Nuevo León (UANL) has 29 high schools and 26 faculties, including the Faculty of Mechanical and Electrical Engineering FIME, which has 11 educational programmes, 25 postgraduate programmes and more than 120 Continuing Education courses, its mission is to train competent, competitive and innovative professionals, socially responsible, fully aware of the regional, national and global environment, with principles and values, committed to sustainable, scientific and technological development. To generate timely, relevant and transcendent contributions to the advancement of science, technology, innovation and humanities, and to the improvement of the level of human development of the society of Nuevo León and the country. (FIME, 2022)

In March 2020, the Pandemic caused by COVID-19 was declared worldwide, so government authorities determined strict health measures that led to the confinement, affecting all sectors of society, indicating their gradual reinstatement each of them, however, the education sector was prepared with strict health measures and prevention protocols, at the end of the stages defined by the authorities, so immediately the UANL undertook the digital strategy in academic and administrative activities.

During this process, the academic community adopted new platforms with the support of training courses, as well as adapting the existing ones so as not to stop the training of future engineers at FIME, in addition to the design of complementary strategies such as the case described here, to attend to the students who during this period undertook their compulsory professional internships, as well as their social service, which leads to documenting this good practice.

Under the supervision and guidance of teachers to fulfil the dual purpose of applying the knowledge acquired with measurable results, as well as fulfilling the compulsory social service, this good practice is described in the development of this document.

Development

The objective of this project is to document the good practices in a Higher Education Institution, promoting the integral self-transformation of the student by presenting successful results in professional practice, with the guidance and orientation of the faculty members of the academic body UANL-275 "Academic and Administrative Management of Higher Education Institutions" with step-by-step feedback, a model was built to monitor the progress of improvements through digital platforms, This was done to achieve favourable indicators in their mutually beneficial results, both for the student and for the work centres where the improvements were applied, evidenced in the solution of specific problems, obtaining a dissemination product in each project evaluated by academic peers, to then present them in various academic congresses, to be published in peer-reviewed and indexed journals.

According to the UNESCO report (2020), as of 30 March 2020, 166 countries had closed their schools and universities. Globally, 87% of the student population was affected by these measures. On the one hand, institutions were unable to receive students and staff, and on the other hand, the intention was not to stop education.

Methodology to be developed

The implementation of research methodologies is fundamental to integrate new theories or improve existing ones, with the aim of generating enriching knowledge that transforms reality and provides a solution to social, scientific, technological and philosophical problems that arise.

In this study, the documentary methodology was used, which, according to Ibarra, G. (2018) consists of extracting information from various documents to analyse, relate and apply them for a specific purpose, resulting in the categorisation of information to generate reliable and relevant knowledge.

It is also qualitative research, as it aims to describe the qualities of a phenomenon. It seeks a concept that can encompass a part of reality. It is not about proving or measuring to what degree a certain quality is found in a certain given event, but about discovering as many qualities as possible. Palacios, R. (2006).

In this context, the International Journal of Education for Social Justice (2020) indicates that it used a documentary, qualitative methodology at the University of Huelva, Spain, in which "teachers have used different active methodologies before confinement such as collaboration, case studies, cooperative learning, service-learning, peer tutoring, workshops, project work, lectures and exhibitions, having to be adapted to the new reality of confinement".

Process

With the support of the Microsoft Teams platform, which is a telecommunications software of the Microsoft company created in 2017 and which was used in several educational institutions due to the pandemic caused by COVID-19, it was the means of communication, where meetings and courses were held, in addition to storing files, scheduling the evidence to be delivered and the feedback of the projects carried out by the providers. For its part, at the Autonomous University of Nuevo Leon in the FIME, a process was designed, which comprises three phases, each of which is described as shown in Figure 1.

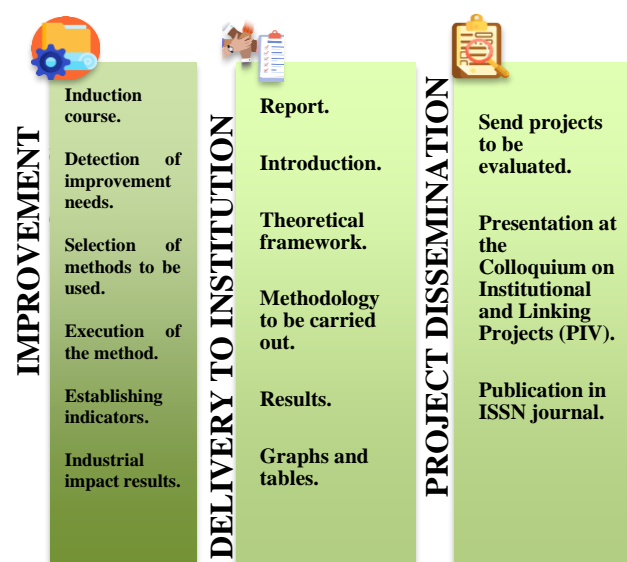


Figure 1 Best Practice Process of Social Service in the Industry during the 2020-2022 confinement

Source: Own elaboration

Phase 1

1. As a starting point, an induction course was given on the activities that would be assigned to them, the mission, vision and values of the institution were shared, as well as the importance of planning, documentation and the necessary academic records in order to make known the structure and organisation of the Faculty of Mechanical and Electrical Engineering.
2. They were trained in the process for carrying out a research project with the methodologies used, such as writing, spelling, correct use of bibliographical references, citations, as well as highlighting the performance criteria used by the journals.
3. A meeting was held with each provider to detect the improvement needs of the company and the department where they were assigned during their stay.
4. Activities were scheduled to upload progress to the Microsoft Teams platform of the results in which the Social Service providers had to deliver, to subsequently receive feedback from the teacher.
5. Indicators were established to determine the goals to be achieved and to design the strategies to obtain them.
6. Once the indicators were established, the selected methodologies were implemented so that the students could put into practice the knowledge acquired during their training, allowing the progress of the improvement to be documented.
7. During the course, doubts were resolved, suggestions were made, meetings were scheduled to review progress and support was provided so that the project to be carried out would adopt the guidelines established by the journals as a reference, with the future vision of achieving successful publication.

Figure 2 describes the first phase of the process of improving the performance of social service in productive projects where the student is inserted in the industry and determines an improvement to be made.

PALOMARES-RUIZ, María Blanca Elizabeth, DIMAS-RANGEL, María Isabel, TORRES-BUGDUD, Arturo and BÁEZ-VILLARREAL, Esteban. Good practices in the self-transformation of the engineering student in continuous improvement projects. Journal University Management. 2022

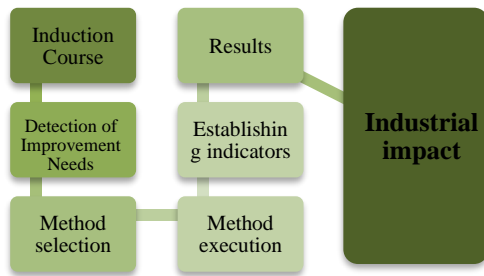


Figure 2. Phase one: best practices in industry best practices of social service in industry
Source: Own elaboration

Phase 2

1. In the deliverables to the institution it is requested to elaborate an introduction to the selected improvement project, it can contain the justification and the importance of solving the improvement.
2. The next step was the elaboration of the theoretical framework that supports the technique to be used for the proposed improvement.
3. It continues with the methodology to be developed in the study and describes the research method used to solve it.
4. The report of results should contain the description of the background in relation to the indicators proposed for the improvement.
5. This report should contain in a graphical and editable form the indicators achieved.
6. Likewise, it is important that it contains information on the achievements obtained with follow-up proposals to be applied in the future on continuous improvement plans, basing each piece of information with the support of the consultations carried out and bibliographical references.
7. The selected projects must follow the structuring guide promoted by the institutional and networking projects journal.
8. The processes must be deliverable to the institution by means of reports, which must include the introduction of the improvement project, together with the theoretical framework, methodology, results, graphs or tables showing the changes and conclusions. As shown in figure 3.

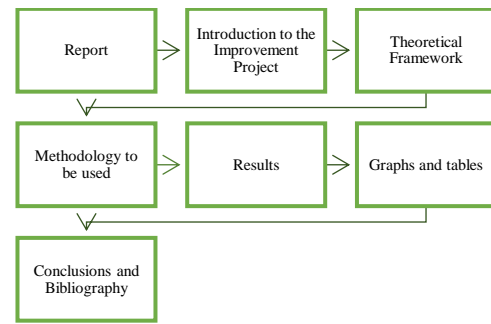


Figure 3 Second phase: deliverables to the institution
Source: Own elaboration

Phase 3

1. At this stage, a prior review is carried out by the assessor before it is sent for evaluation by the peer reviewers assigned by the journals.
2. When the article is selected, it is presented at the Colloquium of Institutional and Liaison Projects, due to the fact that this event was constituted as an initial forum for the Faculty's own dissemination, it has motivated the Faculty to attend multiple calls for papers from other congresses in the country, achieving publication in journals. As shown in figure 4.

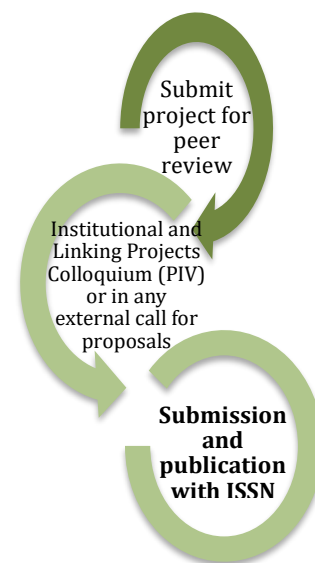


Figure 4 Third phase: dissemination of the project
Source: Own elaboration

Results

The most important achievement was the elaboration of a research product at the beginning, which was subsequently published and shared in congresses organised by FIME, of the 14 students who participated: 13 were success stories, as they obtained improvements in the proposed indicators, and 7 of them were selected to be published in journals with ISSN. As shown in table 1.

Semester	Number of students	Completed projects	Published projects
August - December 2020	1	1	1
January - June 2021	2	2	2
August - December	5	5	2
January - June 2022	6	5	2

Table 1 Projects carried out by social service students in the industry during the confinement

Source: Own elaboration

The purpose of the Colloquium of Institutional and Liaison Projects is to disseminate scientific production and promote academic reflection in all fields of engineering at national and international level.

Therefore, the link with the productive sector is fundamental to realise the results of the learning of future engineers when implementing a project in the industry, as well as documenting the strategies for improvement, which in the future will be useful in the processes of the same, creating opportunities for them to later join their staff and transcend professionally.

Conclusions

After the analysis of the good practices of the Social Service during the pandemic in the Faculty of Mechanical and Electrical Engineering of the Universidad Autónoma de Nuevo León, Mexico, it is concluded that the purpose of the integral self-transformation of the student has borne fruit, as the provider is able to implement strategies, processes and results for continuous improvement in the industry, having the support and advice of the faculty members of the academic body UANL-275 "Academic and Administrative Management of Higher Education Institutions", through constant feedback to obtain successful results, within the framework of the digital strategy implemented with the use of digital platforms and therefore document the evidence with this to achieve that they are published in peer-reviewed and indexed journals during the period 2020-2022.

Likewise, FIME's objective is for the Social Service provider to achieve their professional development in order to stand out in society with their good practices and have their professional growth within the industry.

It represents a joint effort for both the student and the teacher, as they fulfil a dual purpose: on the part of the student to develop a project in the company, generating a positive impact that can insert him/her in the productive sector, and on the other hand, the teacher documents the success stories and increases his/her academic production.

References

Águila, C. (2005) "El concepto calidad en la educación universitaria: clave para el logro de la competitividad institucional". Ministerio de Educación Superior. Retrieved 01 August 2022 from:

<https://rieoei.org/RIE/article/view/2886/3819>

Amaya, A. A., Ramos, M. C., & Castillo, G. L. (2017). "El servicio social en los programas educativos en línea". Dialnet. Retrieved 08 August 2022 from: <https://dialnet.unirioja.es/servlet/articulo?codigo=5906403>

Ibarra, G. (2018). “*Análisis documental de las metodologías de enseñanza*”. Revista Electrónica Desafíos Educativos. REDECI. Retrieved 01 August 2022 from: <http://ciinsev.com/web/revistas/2017-2018/primerEdicion/REVISTA4/03.pdf>

FIME, (2022). “*Servicio Social*” - Facultad de Ingeniería Mecánica y Eléctrica. Facultad de Ingeniería Mecánica y Eléctrica. Retrieved 12 August 2022 from: <https://www.fime.uanl.mx/tramites/servicio-social>

Palacios, R. (2006). “*Investigación cualitativa y cuantitativa Diferencias y limitaciones*”. Retrieved 08 August 2022 from: https://www.insp.mx/resources/images/stories/Centros/nucleo/docs/dip_lsp/investigacion.pdf

Revista Internacional de Educación para la Justicia Social (2020) “*Adaptación de las Metodologías Activas en la Educación Universitaria en Tiempos de Pandemia*” revistas UAM. Retrieved 01 August 2022 from: https://revistas.uam.es/riejs/article/view/riejs2020_9_3_022/13140

Secretaría de Economía, (2016). “*Nuevo León y sus principales sectores productivos y estratégicos*”. Gobierno de México. Retrieved 08 August 2022 from: <https://www.gob.mx/se/articulos/nuevo-leon-y-sus-principales-sectores-productivos-y-estrategicos>

Somos Industria (2011). “*Es Nuevo León Líder Industrial*”. Retrieved 08 August 2022 from: <https://www.somosindustria.com/articulo/es-nuevo-leon-lider-industrial/0>

UNESCO (2020). “*La educación en tiempos de pandemia COVID-19*”. CEPAL-UNESCO. Retrieved 08 August 2022 from: https://repositorio.cepal.org/bitstream/handle/11362/45904/1/S2000510_es.pdf

.