



Title: Quantitative analysis of the incorporation of undergraduate students to scientific work in a public university in Jalisco

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Introduction



CONACYT is the main one in charge of promoting the development of scientific research in Mexico, as well as technological development and innovation.



The public university, as an institution committed to academic excellence, social solidarity and humanistic thinking for the sustainable development of the entity, as well as the contribution to the economic development and social welfare of the regions of Jalisco is the main researcher trainer (UDG, 2018; UDG, 2019).

It is essential to encourage undergraduate students to increasingly join in developing scientific research with an impact on society.



The realization of a quantitative analysis, contemplating the achievements of the implementation of the Multidisciplinary Program for the Development of Modular Projects (PMDPM) of a public university in Jalisco.



This research presents added value, because it reflects the reality of the incorporation of undergraduate students to early research, which allows decision-making for the establishment of new learning strategies and the promotion of science.



What is the impact of the PMDPM on the participation of undergraduate students in a public university in Jalisco during the period from 2014 to 2020?



Introduction

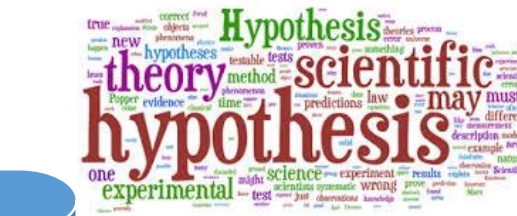
This research proposes to evaluate, through descriptive statistics and the document review technique, the number of students who participate, the number of projects they present, the number of disclosures in different conferences, the number of publications of scientific papers and electronic books, as well as the number of plays.

That allows understanding the incorporation of students to the scientific field, with teaching-learning processes based on the development of projects.



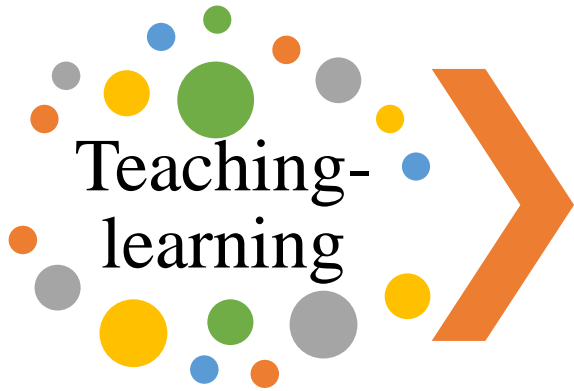
The central hypothesis of this article proposes that, of 1,440 students enrolled in the careers of Chemical Engineering, Bachelor's Degree in Chemistry and Bachelor's Degree in Chemical Pharmaco Biologist (CUCEI, 2020), upon joining the PMDPM they will achieve have an impact on scientific work with scientific products and performing arts.

H_0 : Of the undergraduate students enrolled in the careers of Chemical Engineering, Bachelor of Chemistry and Bachelor of Chemistry Pharmaco Biologist from a public university in Jalisco, less than 50% achieve an impact on scientific development, with academic production of modular projects, articles, publications in electronic books, dissemination in congresses and in the performing arts.



H_a : Of the undergraduate students enrolled in the careers of Chemical Engineering, Bachelor of Chemistry and Bachelor of Chemistry Pharmaco Biologist from a public university in Jalisco, more than 50% achieve an impact on scientific development, with academic production of modular projects, articles, publications in electronic books, dissemination in congresses and in the performing arts.

Introduction



Project-based learning



Modular projects



Performing arts



Theoretical framework

Aspects such as meaningful, autonomous learning; generic and specific competences; active methodologies; teach to think, and learn to learn (Mertens, 2002; Murrieta, 2013).

The role of the teacher has been transformed the role of mediator or facilitator of learning and assumes a role of accompaniment with the students, through the implementation of active methodologies for the student to appropriate knowledge (Cerdeira, 2003; Maldonado, 2008)

Higher education has to adapt its structures and teaching methods to new needs (UNESCO, 1998)

Introduction

Learning is not reduced to the transmission of theoretical knowledge, but also to the development of general and specific skills and abilities (Roldan, 2000)



The university has an important task that consists not only in training, but also in creating socialization spaces for young university students to approach a cultural and social plurality (Hernández & Contreras, 2021).



It is required to achieve a true meaningful learning in the students contemplating research and teacher management, according to current scientific and technological progress (Yllescas, 2021).

Students generate greater capacities that allow better access to the labor market (Roldan, 2000)



Since the form of study will be more autonomous, reflective, multidisciplinary, cooperative and practical (Murrieta, 2013)



The teacher will continue to have a guiding function (Maldonado, 2008).



The incorporation of curricular innovation, rethinking the way of innovating, contemplating the work of academics, their conditions and their possibilities to join these proactive processes (Zea, 2021).

Project Based Learning is a teaching model based on the use of authentic and realistic problems, directly related to the context of the profession, through which students develop skills with a collaborative approach in search of solutions (Blank & Harwell, 1997; Maldonado, 2008).



Environmental projects, which are of great importance to minimize the negative impacts that man has caused on biodiversity and ecosystems, as well as the implementation of teaching methodologies in this area for the identification of problems and solutions with the participation of students (Morales, 2021).



Young people are encouraged to be more proactive as promoters of sustainable alternatives, contemplating the development of their environment, their context, problems and needs, avoiding that students not only passively integrate into educational programs (Sánchez & Guerra, 2021).



Modular projects, students must develop a project for each module, to be evaluated by a specialized committee through the modalities of exhibition, prototypes, exams, reports and reports of professional practices, research and social service, among others (UDG, 2013; CUCEI, 2020).



Dramatization or the performing arts are an educational resource little used, especially at the higher level. It has great educational value, since many authors define it as an active tool that involves multidisciplinary approaches (Pérez, 2017).



PMDPM, it creates an academic space for scientific dissemination in which young university students express in a practical way the knowledge acquired in their academic training, through prototypes, research models and / or business incubation; embodied in modular projects that contribute to the solution of any problem identified in their immediate environment and that favor the well-being of society.

Methodology



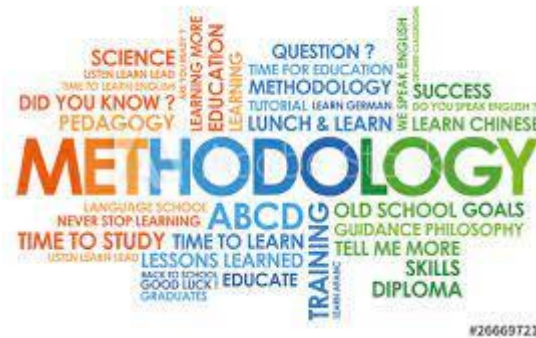
Research type and design. This research presents a quantitative approach, of a non-experimental type with a cross-sectional section (Hernández, Fernández & Baptista, 2014; Bernal, 2016). The technique used was the documentary review of a historical printed report of student participation in the PMDPM for the period 2014-2020 developed by those responsible for it, in order to quantify the data and identify the impact.



Procedure: The information collection was carried out through a matrix that integrates the variables under study, for this, the historical report of student participation in the PMDPM for the period 2014 - 2020 was used, to obtain the necessary data and meet the objective of the present investigation.



Variables: Research project variable; Modular projects variable; Participation in congresses variable; Electronic book variable; Published papers variable



Measuring instrument

The instrument used to collect information was a matrix for the collection of quantitative information, which covers the period from 2014 to 2020, of its own construction, where the variables under study are indicated and the record of the number of products obtained from participation in the PMDPM.

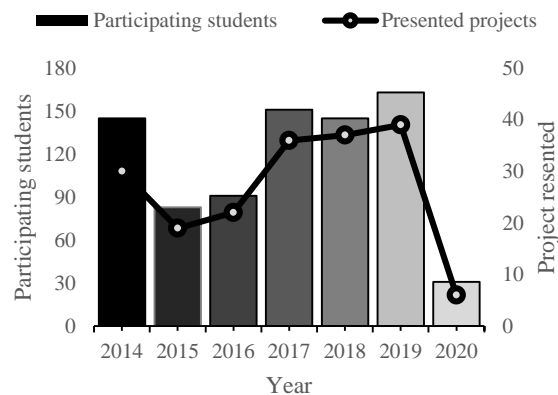


Participants: 809 undergraduate students from the third to the sixth semester of the degrees in Chemistry, Chemical Engineering and Chemical Pharmaco Biologist were considered.



Data analysis: Descriptive statistics were used for data analysis, counting, tables and graphs, comparing the findings by year.

Results



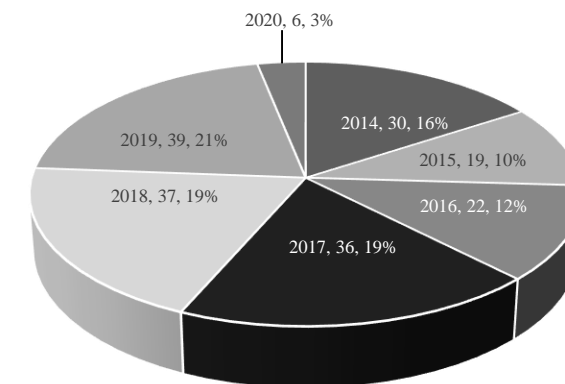
Graph 1 Participation of undergraduate students in the PMDPM. *Source: Own elaboration from data obtained from PMDPM 2014-2020, of the documentary review carried out on the institutional records held by those in charge of its implementation.*

Year	Projects presented	Participating students	Modular projects	Participation in congresses	E-books	Published papers
2014	30	145	5	0	0	0
2015	19	83	8	4	0	0
2016	22	91	14	9	1	1
2017	36	151	32	14	1	0
2018	37	145	35	13	1	1
2019	39	163	38	15	3	2
2020	6	31	6	5	1	1
Total	189	809	138	60	7	5

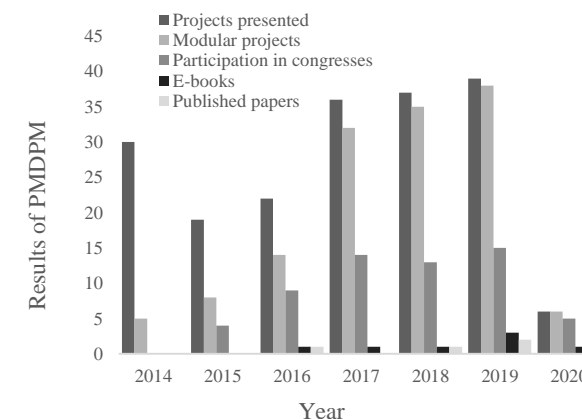
Table 1 Results of the PMDPM in the period between 2014 and 2020. *Source: Own elaboration based on the data obtained from the PMDPM 2014-2020, of the documentary review carried out on the institutional records held by those in charge of its implementation.*

No.	Name of the work	Subject	Presented in:
1	Philosophical water	Alchemy	Cultural Scientific Event of the Pharmaceutical Chemist Biologist
2	My sweet human sacrifice	Alchemy	Cultural Scientific Event of the Bachelor of Chemistry
3	From elements to compounds	Chemical	National Congress of Pharmacy
4	Glucose in the country of enzymes (krebs cycle)	Biochemical	Cultural Scientific Event of the Bachelor of Chemistry
5	Hormone initiative	Biochemical	Cultural Scientific Event of the Bachelor of Chemistry
6	Metabolized in life	Biochemical	Civil Association for Children with Cancer Narices Rojas
7	Cells war	Biochemical	National Congress of Chemistry
8	The ghost of expired drugs	Pharmacist	Cultural Scientific Event of the Pharmaceutical Chemist Biologist
9	Errors of medication	Pharmacist	Civil Association for Children with Cancer Narices Rojas
10	SAEP- Serotonergic combat	Pharmacist	National Congress of Pharmacy
11	The magic formula to heal	Pharmacist	Cultural Scientific Event of the Pharmaceutical Chemist Biologist
12	My pneumonia fever	Medicine	Old Civil Hospital, Social Security Pediatric Specialties Tower
13	My abnormal normality	Psychiatric Medicine	CUCS Psychiatry Conference
14	Metro fail	Cancer	Civil Association for Children with Cancer Narices Rojas
15	Immunological detectives	Immunology	Western Intellectual Property Congress CUCS
16	Mental resonance	Criminalistics	Cultural Scientific Event of the Pharmaceutical Chemist Biologist
17	Head shot	Criminalistics	National Congress of Pharmacy
18	The three feet to the cat	Social Service	X Academic Meeting of Social Work
19	Heroes never die	Ecological	House Home of Guadalajara
20	Plasticize my life	Ecological	Rambla Cataluña of the University of Guadalajara
21	Six reasons not to Live on earth	Ecological	Rambla Cataluña of the University of Guadalajara
22	Recycle my life	Ecological	Conference of With Science Environmental (JACC)
23	Five minutes more	Ecological	Mixed Secondary 71 "Idolina De Cosío Vidaurri"
24	Chemical friendships	Infant	Primary Urbana 124 "Margarita Maza de Juárez"
25	The children's crab bucket	Infant	"Salvation Army" Children's Home
26	Fluoride and the thieves of children's day	Infant	"La Luz" Children's Home
27	Looking for the perfect alchemist	Pastorela	"Salvation Army" Children's Home
28	Chemical pastorela	Pastorela	Old Civil Hospital, Social Security Pediatric Specialties Tower
29	Deadly sins	Pastorela	Civil Association for Children with Cancer Narices Rojas
30	Pastorela according to Satan	Pastorela	Mixed Secondary 35 "Ricardo Flores Magón"

Table 2 List of original scripts created and staged by the theater group Spontaneous Reaction. *Source: Own elaboration from data obtained from PMDPM 2014-2020, of the documentary review carried out on the institutional records held by those in charge of its implementation.*



Graph 2 Relationship of the participation of projects in the PMDPM. *Source: Own elaboration from data obtained from PMDPM 2014-2020, of the documentary review carried out on the institutional records held by those in charge of its implementation.*



Graph 3 Results obtained from the PMDPM in relation to modular projects, participation in congress, e-book chapters and published articles. *Source: Own elaboration from data obtained from PMDPM 2014-2020, of the documentary review carried out on the institutional records held by those in charge of its implementation.*

Annexes

Year	Projects presented	Participating students	Modular projects	Participation in congresses	E-books	Published papers
2014						
2015						
2016						
2017						
2018						
2019						
2020						
Total						

Table 3 Information collection matrix. *Source: Own elaboration (2020).*

No.	Characteristics to be evaluated	Maximum score
<i>Formal aspects of the project</i>		
1	Originality: design, distribution of elements in space and visual tour.	2
2	Use of the color factor and visual impact (attractiveness of the project).	2
3	Clarity in the presentation of information and proper use of language and spelling.	2
4	Quality and logical sequence of the presentation.	2
5	Includes the institution of origin.	2
TOTAL		10
<i>Project content aspects</i>		
6	Prepared according to the subject of the title.	10
7	Aimed at the intended recipients.	5
8	Provides relevant information for the intended recipients.	10
9	Contains the points of view of the students, in addition to the information collected.	5
10	Provides up-to-date and innovative information.	15
11	Allows recipients to have useful support tools in their professional work.	15
12	Evidence of acquisition of knowledge of different subjects by students.	10
13	Includes bibliography used.	10
14	Defense of the authors on the theme of the project.	10
TOTAL		90

Table 4 Project evaluation format. *Source: Own elaboration, based on the document review of the PMDPM (2020).*

Conclusions



Through the quantitative analysis carried out in this research, the main finding shows that the number of undergraduate students incorporated into programs for the development of projects, such as the PMDPM of the public university participating in this research, is able to foster interest in science with the use of the scientific method and awareness of the various problems that afflict society. Therefore, entering undergraduate students in scientific work is more than the generation of innovative ideas; given that it becomes a way of life committed to society and the environment, through innovative actions under a scientific and technological approach, with applicability in the daily actions of undergraduate students, as an invaluable and highly necessary human talent today.

Further to this, the teaching-learning process achieves its mission at this educational level, where the student is the center of this process and their involvement is essential so that learning effectively generates knowledge and it is applied, through various innovation projects, science and technology, with an approach that results in the creation of prototypes or unpublished research models, according to the social reality of the state of Jalisco.



References

- Bernal, C. A. (2016). *Metodología de la Investigación. Administración, economía, humanidades y ciencias sociales (4 ed.)*. Colombia: Pearson.
- Blank, W., & Harwell, S. (1997). *Promising practices for connecting high school to the real world*. Estados Unidos: Educational Resources Information Center.
- Centro Universitario de Ciencias Exactas e Ingenierías. (2020). *Programa de Oferta de Proyectos y Evaluación Modular División de Ciencias Básicas – CUCEI*. Recuperado de <http://proyectosciencia.cucei.udg.mx/>
- Cerda, H. (2003). *Cómo elaborar proyectos: Diseño, ejecución y evaluación de proyectos sociales y educativos*. Colombia: Cooperativa Editorial Magisterio.
- Hernández, R., Fernández, C., & Baptista, M. P. (2014). *Metodología de la Investigación (6 ed.)*. México: McGraw-Hill.
- Hernández, E., & Contreras, K. A. (2021). Género y capital cultural en estudiantes de educación superior. *Brazilian Journal of Education, Technology and Society (BRAJETS)*, 14(April), 99-109.
- Maldonado, M. (2008). *Aprendizaje basado en proyectos colaborativos: Una experiencia en educación superior*. *Laurus Revista de Educación*, 14(28), 158-180.
- Mertens, L. (2002). *Formación, productividad y competencia laboral en las organizaciones: conceptos, metodologías y experiencias*. Montevideo, Uruguay: Cinterfor/OIT.
- Morales, M. A. (2021). *Los servicios ecosistémicos en ríos urbanos, el canal San Antonio en Bogotá como estrategia de aula ambiental para estudiantes de secundaria* (tesis de maestría). Universidad Nacional de Colombia Facultad de Ciencias. Bogotá, Colombia.
- Murrieta, R. (2013). El modelo centrado en el aprendizaje y su implicación en la formación de docentes. *Revista Iberoamericana para la Investigación y el Desarrollo Educativo*. México: Benemérito Instituto Normal del Estado.
- Pérez-Aldeguer, S. (2017). Las artes escénicas como metodología educativa en la educación superior. *Foro de Educación*, 15(22), 1-7.
- Roldán, A. (2000). El aprendizaje centrado en el alumno: De la teoría a la práctica. *Encuentro. Revista de Investigación e Innovación en el Aprendizaje de Idiomas*, 11, 218-232.
- Sánchez, D., & Guerra, N. (2021). Educación superior para las juventudes rurales: reflexiones sobre el caso de la ingeniería en la innovación agrícola sustentable, en Cuquío, Jalisco, México. *Cadernos do Aplicaçãõ*, 34(1), 1-22.
- Universidad de Guadalajara. (2013). *Dictamen N° I/2013/390 Consejo General Universitario*. Recuperado de <http://www.hcgu.udg.mx/dictamenes/dictamen-ndeg-i2013390>
- Universidad de Guadalajara. (2018). *Presentación Universidad de Guadalajara*. Recuperado de <http://www.udg.mx/es/nuestra/presentacion>
- Universidad de Guadalajara. (2019). *Plan de Desarrollo Institucional 2019 - 2025, Visión 2030, "Tradición y Cambio"*. Recuperado de: <http://www.udg.mx/es/PDI>
- United Nations Educational, Scientific and Cultural Organization. (1998). *Declaración Mundial sobre la Educación Superior en el Siglo XXI: Visión y Acción. Conferencia Mundial sobre la Educación Superior. La educación superior del siglo XXI*. Recuperado de <http://www.iesalc.unesco.org/ess/index.php/ess3/article/view/171>
- Yllescas, O. E. (2021). *Gestión del formador y el aprendizaje significativo de la investigación científica en estudiantes del Instituto Superior Tecnológico Público, Daniel Alcides Carrión, Yanahuanca, 2018* (tesis de maestría). Universidad Nacional Daniel Alcides Carrión Escuela De Posgrado. Cerro de Pasco, Perú.
- Zea, A. A. (2021). *La innovación curricular y los académicos en la Universidad Pública Estatal Mexicana: Procesos de Incorporación a sus prácticas* (tesis doctoral). Instituto Tecnológico y de Estudios Superiores de Occidente. Tlaquepaque, Jalisco.



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