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Teaching innovations in STEM careers: Centers for teaching and learning in co-creation of value

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Abstract: This research aims to estimate the impact of a model based on concourses for managing teaching innovations, facilitated by a center for teaching and learning in the Faculty of Physical and Mathematical Sciences at the University of Chile. To identify the themes, strategies, and execution contexts, we analyzed 47 projects carried out during the 2021-2022 period. The design also involved conducting 10 semi-structured interviews with faculty members who participated in this initiative, in order to assess their perceptions of the program. It is observed that a significant proportion of the projects in 2021 were focused on adapting classes to virtual platforms, while the 2022 projects prioritize the development of specific competencies and skills. Additionally, faculty members emphasize the need for increased student engagement in the process and the creation of new methods to disseminate pedagogical innovations.

Keywords: Educational innovation, active learning, STEM education undergraduate students, higher education.

1 Introduction: Challenges to STEM education and relevant actors

STEM education has been criticized for its focus on expository teaching strategies, which produce passive learning through memorization. This is perpetuated by a university system that prioritizes research over teaching and the lack of resources for teaching development. Nevertheless, in a context that demands creative and innovative professionals, it is necessary to stimulate teaching innovations and active learning (Baldwin, 2008; Durán & Rosado, 2020).

Teaching and learning centers (CTLs) are key for promoting teaching innovation (Sorcinelli, 2002). The University of Chile's Engineering and Sciences Learning Area (A2IC) enhances this via initiatives like the Teaching Innovations Concourse, aiding faculty innovation (Célèry, Contreras & Bravo, 2019).

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The objective of this research is to "Characterize the model of management of teaching innovations based on funding by concourse, administered by CTLs, in undergraduate education for engineering programs." The secondary objectives are: (1) To identify faculty members' perceptions of this management model, and (2) To recognize the main challenges associated with this model.

2 Theoretical framework: Centers of teaching and learning in value co-creation

CTLs have been relevant in educational environments since the 1990s, providing teaching consultancy and development services (Sorcinelli, 2002). Over time, these organizations have expanded their reach, evolving into innovation laboratories (Lieberman, 2005), and contributing to the implementation of new educational dynamics (Barbezat & Pingree, 2012), particularly at the undergraduate level.

CTLs possess the ability to bring together stakeholders in educational improvement initiatives, yielding results superior to those of individual organizations, and co-creating teaching value (Sorcinelli, 2002; Schumann, Peters & Olsen, 2013) to address faculty concerns about teaching.

Marshall (2018) identifies three distinct groups of relevant actors in higher education: Students, faculty, and staff. These groups are not homogeneous, as noted by Célèry, Contreras, and Bravo (2019). It is evident that there are traditional, indifferent, susceptible, or innovative faculty members. Consequently, it is important to differentiate between different levels of impact from a concourse-based model of teaching innovation stimulus.

3 Methods

We employed a mixed-methods design, utilizing the triangulation of information (Timans et al., 2019) acquired through document analysis (Molina & Amat, 1991) of 47 project application forms from the 2021-2022 period. Additionally, we conducted 10 semi-structured interviews with faculty members who took part in this initiative. Interview participants were selected using convenience and availability criteria (Sampieri, 2018). The interviews were analyzed utilizing thematic content analysis (Krippendorff, 2009).

4 Results

During the 2021-2022 period, a total of 47 projects were developed, involving approximately 1900 students. The projects in 2021 were primarily focused on adapting virtual courses to the context of the COVID-19 pandemic, involving the creation of virtual

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pedagogical resources. In 2022, the projects shifted their focus towards the development of professional skills and generic competences, with an emphasis on active learning. Challenges such as low student participation, learning gaps, and the necessity for autonomous student engagement were observed. All faculty members expressed satisfaction with the implementation of their innovations and the collaborative efforts with A2IC.

One of the significant challenges for the CTLs is the recognition and integration of the Scholarship of Teaching and Learning (SoTL) paradigm. This arises due to the limited time and incentives for research related to teaching improvement. As a consequence, a substantial number of faculty members sought assistance from A2IC in designing their tools. However, the process of documentation and result dissemination yielded inconclusive outcomes in several cases.

To enhance the model, there is a need to encourage the participation of teachers who might be less inclined towards these initiatives. Furthermore, there should be a stronger focus on disseminating innovations effectively. Additionally, it is imperative to involve the student body and establish robust systems for data collection and analysis.

5 Discussion

This model relies on the participation of what is termed as "innovative faculty" (Célèry, Contreras, & Bravo, 2019). CTLs must adapt their dissemination strategies to incorporate new, less participative faculty. Interviewees unanimously acknowledged that a major challenge is to explore novel avenues for disseminating results in order to foster recruitment, recognition, and the appreciation of the efforts of those already actively engaged.

Additionally, participants mentioned that they have engaged with fellow faculty members to share their innovations, typically within the activities organized by A2IC. These activities tend to be attended mostly by faculty of the innovative type, making collaborative engagement among faculty members in this particular context less common compared to their interaction with students or A2IC.

Student involvement was identified through two mechanisms: The more common one is of an indirect nature, stemming from the population benefited by the projects. The second type entails a higher level of commitment and arises from the funding provided by the concourse. This funding is often utilized to hire auxiliary and assistant students who offer various services. An incidental outcome of their involvement in these projects is that they gain early exposure to paid roles, thereby cultivating a culture of teaching innovation. This becomes one of the most potent ways of co-creating value in undergraduate education (Sorcinelli, 2002).

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Lastly, due to the diversity of projects, CTL assessments cannot be overly specific. Consequently, there is a need to devise "generic" assessment models for various stages of project design and implementation.

6 Conclusions

We identified several needs, including enhancing student involvement, refining data collection systems, implementing and improving new communication channels for disseminating results, and continuing the search for strategies to engage less willing faculty members. Additionally, there is a recognized need to promote collaboration among faculty members to foster the development and strengthening of teaching innovation networks. Lastly, it is imperative to devise new assessment mechanisms capable of harmonizing the specific aspects of each project within the broader framework of the diverse innovations within the faculty.

7 Limitations and future research

After characterizing the management model, the next step involves advancing the evaluation of project efficacy. For this purpose, future research should involve the active participation of the student body, encompassing both students of the innovated courses and the assistants who are part of each teaching team.

References

Barbezat, D., & Pingree, A. (2012). ***Contemplative pedagogy: The special role of teaching and learning centers***. To improve the academy, 31(1), 177-191.

Baldwin, R. G. (2009). ***The climate for undergraduate teaching and learning in STEM fields.*** New Directions for Teaching and Learning, 2009 (117), 9-17.

Célèry, F., Contreras, J., Bravo, N. (2019) ***Estrategia de promoción de innovaciones docentes en la Facultad de Ciencias Físicas y Matemáticas (FCFM) de la Universidad de Chile.*** [Ponencia]. Congreso Chileno de Educación en Ingeniería (SOCHEDI), Talca, Chile. Recuperado a partir de https://drive.google.com/file/d/1npEqyh-ZYo_5ZZMVPinpiM1PjwHb3nTP/view.

Durán Chinchilla, C. M., & Rosado Gómez, A. (2020). ***Aprendizaje activo e innovación en estudiantes de ingeniería.*** Revista Colombiana de Tecnologías de Avanzada (RCTA), 1(35), 127–135. Recuperado a partir de https://ojs.unipamplona.edu.co/ojsviceinves/index.php/rcta/article/view/52

DOI: https://doi.org/10.15443/codes1990

Schumann, D. W., Peters, J., & Olsen, T. (2013). ***Cocreating value in teaching and learning centers***. New directions for teaching and learning, 2013(133), 21-32.

Sorcinelli, M. D. (2002). ***Ten principles of good practice in creating and sustaining teaching and learning centers.*** A guide to faculty development: Practical advice, examples, and resources, 9-23.

Lieberman, D. (2005). ***Beyond Faculty Development: How Centers for Teaching and Learning Can Be Laboratories for Learning.*** New directions for higher Education, 131, 87-98.

Timans, R., Wouters, P., & Heilbron, J. (2019). ***Mixed methods research: what it is and what it could be.*** Theory and Society, 48, 193-216.

Sampieri, R. H. (2018). ***Metodología de la investigación: las rutas cuantitativa, cualitativa y mixta.*** McGraw Hill México.

Krippendorff, K. (2009). ***The content analysis reader.*** Sage.

Marshall, S. J. (2018). ***Internal and external stakeholders in higher education***. *Shaping the University of the Future: Using technology to catalyse change in university learning and teaching*, 77-102.

Molina, M. P., & Amat, C. B. (1991). ***Análisis documental: fundamentos y procedimientos.*** Revista Española de Documentación Científica, 14(3), 368.