

Sustainable Training And Responsible Entrepreneurship In Dentistry: An Empirical Analysis Of University Students In Peru

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Abstract

Background: In the 21st century, dentistry demands not only clinical competencies, but also a commitment to sustainable development and responsible entrepreneurship.

Objective: To analyze the relationship between entrepreneurial intention and awareness of sustainability in dental students at a public university in Peru.

Methods: Quantitative, cross-sectional, correlational study with 27 students, using the validated EIQ and SHQ questionnaires (Cronbach's alpha > 0.85).

Results: 70.4% of the students showed high entrepreneurial intention and 85.2% high sustainable awareness. A positive correlation was found between both variables ($p < 0.05$), and significant differences in sustainable awareness by sex.

Conclusions: Integrating sustainability and entrepreneurship in dental education contributes to strengthening an ethical, autonomous professional profile committed to the Sustainable Development Goals (SDGs).

Keywords: entrepreneurial intention; sustainability in health; dental education; higher education; SDGs.

1. Introduction

The practice of dentistry in the 21st century is going through multiple transformations derived from the environmental, economic and social challenges facing humanity. Professional training in this discipline cannot be limited exclusively to the technical and clinical domain, but requires the incorporation of competencies that promote a holistic, ethical and sustainable vision of dentistry. Within this framework, sustainability has emerged as a key dimension in higher education, especially in light of the Sustainable Development Goals (SDGs), where SDG 3 (health and well-being), SDG 4 (quality education), SDG 8 (decent work and economic growth) and SDG 12 (responsible production and consumption) stand out.

At the same time, entrepreneurship has positioned itself as an essential skill for future professionals in the health area, including dentistry, as it provides tools for generating self-employment, clinical innovation and professional leadership. However, both concepts - sustainability and entrepreneurship - are often developed in a fragmented manner in university curricula, which limits the formation of a comprehensive professional profile prepared for contemporary challenges.

Several studies have shown the importance of integrating these dimensions in the training process. González-Pérez and García-Muñoz (2021) highlight that, although there is interest in promoting entrepreneurship in health sciences, it is rarely articulated with sustainable practices. In a similar

vein, Lee and Lin (2022) show that dental students who manifest high entrepreneurial intention also show a greater predisposition to adopt green technologies and sustainable approaches in their future clinics.

In the Peruvian context, research remains scarce and isolated. While some studies have addressed entrepreneurial intention or sustainability in health, there has been no in-depth study of the interaction between the two variables in dental students, especially in regions such as Amazonas. This academic and formative gap raises a crucial question: is there a relationship between entrepreneurial intention and sustainability awareness in dental students at a public university in Peru?

In view of this problem, the present study aims to analyze this relationship through a quantitative and comparative approach. The aim is not only to identify the level of development of these competencies in students, but also to provide empirical evidence to support more integrated curricular proposals, aimed at training professionals with a strong ethical, social and environmental commitment.

2. Literature Review

The integration between entrepreneurship and sustainability in university education has gained relevance in the last two decades, especially in disciplines related to health and wellness. This section develops the theoretical framework that supports the study, addressing the fundamental notions of entrepreneurship, sustainability, its articulation in the dental context, and the approach from the Sustainable Development Goals (SDGs).

Entrepreneurial intention and theory of planned behavior Entrepreneurial intention can be defined as a person's conscious willingness to start one's own business or organization in the future. This behavior has been extensively explained by Ajzen's Theory of Planned Behavior (2020), which identifies three key factors: attitude toward the behavior (favorable perception of entrepreneurship), subjective norms (influence of the social environment), and perceived behavioral control (self-efficacy). These components interrelate to predict the probability of effective entrepreneurial behavior. This theory has been validated in multiple contexts, including dental students (Vázquez-Cano et al., 2021).

Sustainability in health and higher education Sustainability in health involves clinical and educational practices aimed at reducing environmental impact, ensuring social equity and promoting economic efficiency in the healthcare system (Leal Filho et al., 2021). At the university level, institutions such as Arora et al. (2023) have proposed guidelines for integrating ecological principles into dental education. This includes waste management, the use

of biodegradable materials, and the formation of a critical awareness in students regarding the transformative role of the health professional.

Previous studies: articulation between entrepreneurship and sustainability International research (Lee & Lin, 2022; Müller et al., 2022) has shown a positive relationship between entrepreneurial intention and sustainable awareness in dental students, indicating the emergence of a new professional profile: the "green entrepreneur". In Latin America, authors such as González-González & Ramírez-Montoya (2021) highlight the growing interest in integrating sustainability and entrepreneurship in dental education, although curricular gaps are still identified.

Peruvian and regional context In Peru, Vázquez-Cano et al. (2021) reported that more than 60% of dental students expressed the intention to open a dental practice, but with limited management skills. Ramirez and Torres (2021) evidenced an incipient implementation of sustainable practices in private dental clinics. At the regional level, Tello Rojas (2022) found a favorable attitude towards self-employment among health students in Amazonas, while Alvarado Chávez (2023) warned about the scarce incorporation of sustainable practices in professional training. However, no studies were found that integrate both variables in the Amazon context, which justifies the present analysis.

3. Material And Methods

Design and Approach A quantitative approach with a non-experimental, cross-sectional, correlational-comparative design was used. This design made it possible to analyze the relationship between entrepreneurial intention and awareness of sustainability at a given time, without manipulation of variables, following an empirical explanatory approach.

Population and Sample The population consisted of students of the Professional School of Dentistry of a public university in Peru. A stratified probability sample was applied by academic cycle (first to tenth cycle) and sex. The sample size was calculated using the formula for finite populations, with a confidence level of 95% and a margin of error of 5%. The final sample consisted of 27 students, ensuring proportional representation at the different levels of professional training.

Instruments Two structured instruments were used with a five-point Likert-type scale (1 = strongly disagree; 5 = strongly agree):

- Entrepreneurial Intention Questionnaire (EIQ): Based on Ajzen's (2020) theory of planned behavior, it assessed four dimensions: attitude towards entrepreneurship, subjective norms, self-efficacy and

entrepreneurial intention.

- Sustainability in Health Questionnaire (SHQ): Evaluated five dimensions: knowledge of sustainability, sustainable practices, social impact, disposition towards sustainable practices and perception of university education. Both instruments were adapted to the dental context through content validation by expert judgment and pilot testing, achieving adequate reliability (Cronbach's alpha > 0.85 in both cases).

Data Collection Procedures The data collection was carried out in person during the second academic semester of 2024, in coordination with the academic heads of the faculty. Informed consent and voluntary participation were guaranteed. The questionnaires were administered in the classroom and then digitized for statistical analysis.

Data Analysis Techniques The data were processed using SPSS version 27 software:

- Descriptive statistics (mean, standard deviation, frequencies),
- Normality tests (Kolmogorov-Smirnov and Shapiro-Wilk),
- Correlation tests (Pearson or Spearman depending on the distribution),
- Comparisons by sex and group using Student's t test and ANOVA. The significance level considered was $p < 0.05$.

Ethical Considerations The study respected ethical principles in research involving human subjects. Informed consent was obtained from the participants and anonymity of responses was guaranteed. The protocol was reviewed and approved by the Institutional Ethics Committee of the host university.

4. Results

Entrepreneurial intention The results show that 70.4% of the students evaluated have a high level of entrepreneurial intention, while the remaining 29.6% have a medium level. No student expressed a low level, which shows a favorable disposition towards the creation of dental offices, businesses or private practices within the dental field.

Awareness of sustainability Regarding awareness of sustainability in health, 85.2% of the students presented a high level and only 14.8% a medium level. These results reflect a positive attitude towards environmental care, social responsibility and ethical professional practice in clinical contexts.

Comparison according to sex It was found that women obtained a mean of 72.4 points in sustainable awareness, while men achieved a mean of 68.2 points. This difference was statistically significant ($p = 0.041$). However, no significant differences were found in entrepreneurial intention between the two groups ($p = 0.320$), indicating a homogeneous

development of this competency.

Relationship between entrepreneurial intention and sustainability The cross-tabulation revealed that 78.3% of students with high sustainable awareness also report high entrepreneurial intention. Complementarily, it is observed that 75% of those with medium level of awareness also have medium entrepreneurial intention. This positive correlation suggests a synergy between the two competencies.

Perception of university training in sustainability Finally, 59.3% of the students have a positive perception of the training in sustainability provided by their university. However, 40.7% maintain an intermediate perception, which suggests that, although there is progress, there are still opportunities for improvement in the curricular integration of the sustainable approach.

5. Discussion

The findings of this study reinforce the importance of integrating responsible entrepreneurship and sustainability as key competencies in the university education of health professionals. Firstly, the high level of entrepreneurial intention found in most of the students coincides with that reported by González-Pérez and García-Muñoz (2021), who found a positive predisposition towards self-employment among health sciences students, especially when they perceive institutional and family support. Likewise, studies such as that of Martínez et al. (2020) in Lima confirm that there is interest in entrepreneurship, although usually without a solid foundation in management and strategic planning.

On the other hand, the high level of awareness of sustainability is consistent with the findings of FDI (2023) and Romero-García et al. (2021), who noted that dental students show a growing sensitivity to the environmental impact of their future clinical practice. However, they caution that such awareness does not always translate into action without cross-cutting training that includes internships, green technologies and real projects.

The significant difference in sustainable awareness by sex has also been documented by Chanioti et al. (2021), who argue that women tend to show greater ecological empathy and sense of environmental responsibility, possibly due to cultural and social factors internalized since childhood.

The most noteworthy finding of the study is the significant correlation between entrepreneurial intention and sustainable awareness. This result validates the hypothesis put forward and is in line with research such as that of Lee and Lin (2022), who identified an emerging profile of "green entrepreneur" in Taiwanese dental students. Müller et al. (2022) also argue that the fusion between entrepreneurial and

sustainable competencies is key to building resilient, ethical and economically viable healthcare systems.

Finally, the positive perception of students regarding sustainability training, although not unanimous, suggests institutional progress. However, the practical and contextual dimension of this training still needs to be strengthened. Ceulemans et al. (2020) recommend integrating active methodologies, interdisciplinary projects and participation in real activities to consolidate sustainable learning. In this sense, the study provides useful evidence for redesigning curricula with a more applied, cross-cutting and SDG-oriented pedagogical approach.

6. Conclusion

The results of the present study allow us to conclude that there is a significant and positive relationship between entrepreneurial intention and awareness of sustainability in the dental students evaluated. This correlation confirms the need to design curricular proposals that integrate both competencies as transversal pillars in professional training.

Firstly, it was found that most of the students have a high level of entrepreneurial intention, which represents an opportunity to promote the creation of innovative and sustainable projects within the dental field. Secondly, the high level of awareness of sustainability reflects a favorable predisposition towards the ethical, responsible and environmentally conscious practice of the profession.

Likewise, the gender difference found in the sustainable dimension suggests that educational strategies should be sensitive to sociodemographic variables, promoting equitable, contextualized and gender-focused training.

From a practical perspective, it is recommended to strengthen the pedagogical approach to sustainability and entrepreneurship through:

- The incorporation of active methodologies,
- The creation of experiential experiences in clinics and communities,
- The development of interdisciplinary projects aligned with the SDGs.

This study provides relevant empirical evidence for the continuous improvement of dental curricula, proposing a posthumanist vision of the health professional: autonomous, transformative and committed to the collective well-being and the future of the planet.

PRACTICAL IMPLICATIONS

This study provides evidence to redesign dental and health curricula, proposing a more comprehensive, resilient and SDG-aligned professional profile.

LIMITATIONS

- Small sample size.
- Cross-sectional design that does not allow

causal inference.

- Geographic context restricted to a single university.

FUTURE RESEARCH

- Extend the sample to other regions.
- Mixed or longitudinal designs.
- Evaluate the impact of sustainable pedagogical strategies.

DECLARATION OF CONFLICT OF INTEREST

The authors declare that they have no conflicts of interest related to this article.

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