Health and Sustainability: the Sustainable Development Goals as a pedagogical tool in BSc in Health Biology with occupational and social implications.

Salud y Sostenibilidad: los Objetivos de Desarrollos Sostenible como herramienta pedagógica en el Grado de Biología Sanitaria con implicaciones profesionales y sociales

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Abstract- The future graduates in Health Biology will impact public health and society by implementing actions aiming to achieve the Sustainable Development Goals (SDG). We conducted a teaching innovation project in Ecology and Human Health course for the students to manage health considering sustainability and incorporating the environmental dimension. We applied Challenge Based Learning and Research Based Learning in seminars and practical sessions with two case studies. We evaluated the acquisition of professional competencies through a survey to measure the perception and awareness of the students regarding the importance of the SDG on the human health, before and after the project implementation. Our result showed that students perceived a higher relationship between health and ecology after the course and an increase in their motivation.

Keywords: High Education, university, health sciences, teaching inovation, global problems.

Resumen- Los futuros graduados en Biología Sanitaria pueden mejorar su impacto profesional en salud pública incorporando como referencia el avance hacia los Objetivos de Desarrollo Sostenible (ODS). Se llevó a cabo un proyecto de innovación docente en la asignatura de Ecología y Bienestar Humano con el objetivo de que los alumnos profundizasen en la gestión de la salud considerando los ODS y la dimensión del medio ambiente. Se utilizaron las metodologías de "Aprendizaje Basado en Retos y Aprendizaje Basado en Investigación" en las prácticas y seminarios a través de dos casos de estudio. La adquisición de competencias se evaluó a través de una encuesta estructurada que pretendía medir la opinión de los estudiantes respecto a la importancia de los ODS en la salud y en su futuro profesional. Los resultados muestran un aumento en la importancia que los alumnos dieron a la relación entre salud y ecología tras la asignatura, a la vez que un aumento en su motivación.

Palabras clave: eduación superior, universidad, ciencias de la salud, innovación educativa, enseñanza, poster, problemas globales.

1. INTRODUCTION

Professional graduates in Health Biology will develop the ability to study, investigate and manage health and illness. It is increasingly accepted the relevance of the environment in people's health and well-being. The One Health approach, for instance, recognizes that human health is closely related to animal health and the environmental conditions of the shared ecosystems, requiring transdisciplinary efforts (Rabinowitz et al., 2013). Therefore, ecological knowledge is key for understanding how environmental dynamics and processes impact human health, as shown by the appearance of new disciplines such as the clinical ecology that considers illness and chronic diseases as the response to changes in the ecosystems where humans carry out their lives and experiences (Nelson et al., 2019). Also, there is increasing evidence, that ecological knowledge will be crucial for health practitioners based on the recent advances in human diseases associated with the ecology of the human microbiome (Smith et al., 2015). A vast amount of health issues are closely related to terrestrial and aquatic ecosystems like the water and air quality, plagues, residuals or zoonoses, as recently proposed by the Spanish National Strategy on Health and Environment (PESMA). This strategy, following United Nations recommendations, incorporates the importance of anthropogenic activities to foster ecological risks impacting health and the need to revert the situation by embracing sustainability. Especially the Sustainable Development Goals (SDGs), aiming to protect the planet and ensure human health and prosperity.

2. CONTEXT & DESCRIPTION

Health biologist career would benefit from incorporating the SDG targets and indicators in their study programs to get training in the joint management of health and sustainability that will have positive benefits on the whole society and the healthcare systems. With this purpose, we implemented an innovative training in Ecology and Human Health, a course for students in the third year of BSc in Health Biology (4yrs degree) with the final aim of gaining the competencies for planning and risk assessment in the field of public health and sustainability with an ecological point of view. Research and Project Based Learning were used as didactic methodologies for the two main activities, aiming to foster: *i*) students' engagement to identify issues and dilemmas, *ii*) critical and logical thinking (e.g., by

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detecting misinformation), *iii*) synthesis ability, and *iv*) creativity and communication skills (Marchante and Herrero 2022).

A. Case study 1: Triptych on health-environmental relationships

The first case study provided topics to the students to create an informative triptych about an ecological problem with a direct impact on human health or wellbeing. This case study followed the Research Based Learning framework (Seif & McTighe 2021) and students had to actively search for information from different sources and scientific publications to explore the connection between the environmental problems and the reported consequences on health. This methodology has been successfully applied in high education promoting students' engagement in research and real-life problems for their professional careers (Camacho et al., 2017). The best triptychs for each group were selected and printed for public dissemination and sharing within the university community.

B. Case study 2: Poster analysing the relationships of environment and human health on cities

The second case study was based on Challenge Based Learning (Gallagher & Savage 2020) and the challenge consisted in analyzing and evaluating the socio-ecological conditions of an urban area (village, city), finding the potential health problems caused by the environment in the study area and proposing a diagnosis of possible solutions to improve the situation. The research was presented in poster format during a simulated conference called "*Day of the Ecology and Health*" at the Royal Botanic Garden of University of Alcalá to promote communication skills (Canales & Schmal, 2013). Students also had the opportunity to discuss their findings and debate with other colleagues while having a coffee, which highly promoted Collaborative Learning.

In both activities, the students had free choice on research topics and urban areas easing a more meaningful learning (Da Silva 2020) by allowing students to choose topics of their interest and/or from their experiential context. The students obtained outstanding scores based on the learning requirements established in the course handbook. Examples of each case study are presented in **Figure 1**.

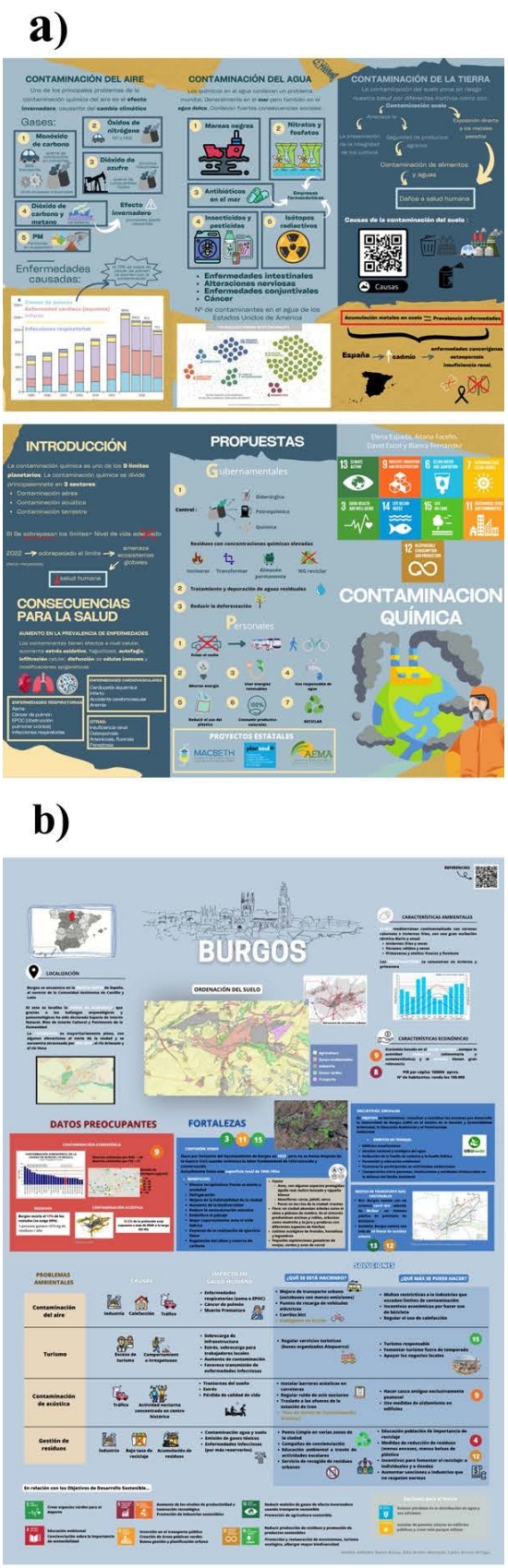

Figure 1. Examples of the outputs of the case studies developed by the students **a**) triptych (case 1) and **b**) poster (case 2) to learn about the relationship between ecology and health issues and the use of environmental indicators.

3. RESULTS

To assess the teaching-learning performance, we conducted a questionnaire to retrieve students´ opinion before and after the teaching practice. The survey was composed of 27 questions and did not include any information that could identify the respondent. Most questions aimed to measure how important is a given SDG goals to health and wellbeing. We included all the SDG with the expectation that an increase in their importance will indicate an increase in the awareness about the relevance of sustainability for health protection. For instance, ranking how important they considered biodiversity conservation (SDG15) to preserve and promote human health. To evaluate the differences in the survey scores before and after the teaching process, we applied Wilcoxon signed-rank test as a statistical test, since the residuals of the parametric analysis of variance were not normally distributed.

According to our results, students had an average high awareness regarding SDG and their relevance in society and health, with mean values of 4.4 for all the SDG. After the teaching, the awareness significantly increased for five SDG related to health, energy, sustainable growth, cities and biodiversity (Figure 2). Importantly, the relevance of the SDG3 called "Good health and well-being" significantly increased, proving that the activities improved the perception of how important sustainability was for human health. Notably, the importance that students gave to biodiversity conservation (SDG15) and sustainable cities (SDG11) raised, highlighting the direct impact of the activities that, as described previously, were intimately related to research and management of environmental and ecological problems on urban areas. The students also provided in-person feedback revealing their motivation and enthusiasm in the subject.

To evaluate the achievement of competencies and learning results according to the teaching guide, we applied a rubric to evaluate each group's tryptic and poster. The average score for the 20 groups based on both activities was 8.45 (SD=0.6) with maximum and minimum scores of 9.4 and 7.3, respectively.

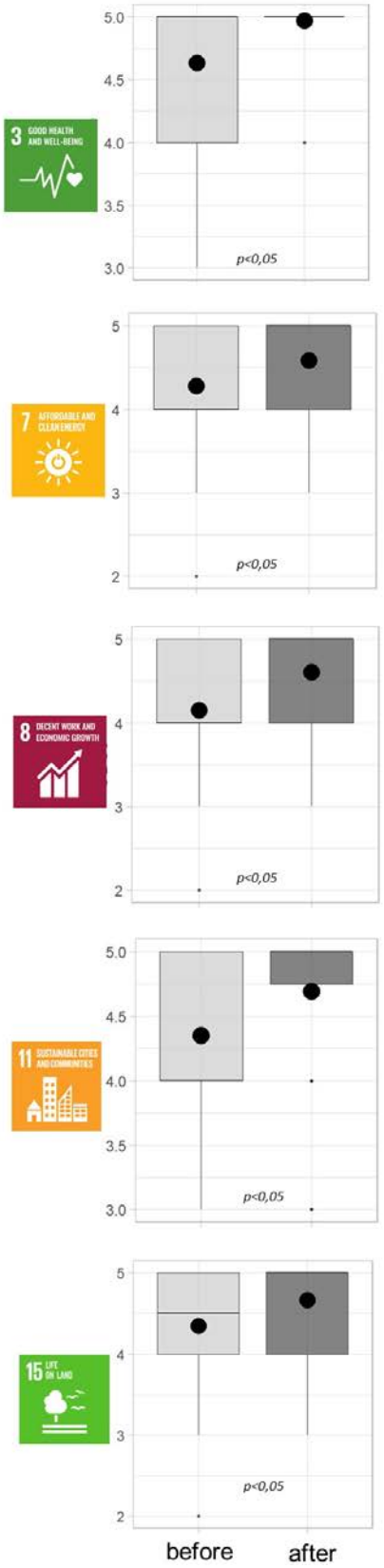

Figure 2. Degree of importance (low=1, high=5) of the Sustainable Development Goals (SDGs) on human health and wellbeing, according to the students´ perception, before and after the project implementation. Circles represent mean values and only SDG that significantly increased (p>0.05) were included.

4. CONCLUSIONS

The positive student's feedback about the activities, the results of the questionnaire and the high scores obtained in the final academic evaluation of seminars and practical sessions, highlighted the outstanding performance of our innovation approach. All students successfully acquired the learning competences and results as stated in the teaching handbook of the course. For this reason, we conclude that the propose teaching innovation is worthy and will be implemented in the future academic years.

Our approach is simple and can easily be implemented, with the required knowledge, in other courses and degrees by a professor in High Education as most of the disciplines and lectures can be linked to sustainability. The added value to get training using subject matters that are professionally relevant and can contribute to a better future for the global society are rewarding activities that boost learning and motivation in most disciplines (Argento et al., 2020) and constitute a step further into a more inclusive society.

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REFERENCES

Argento, D., Einarson, D., Mårtensson, L., Persson, C., Wendin, K., & Westergren, A. (2020). Integrating sustainability in higher education: A Swedish case. International Journal of Sustainability in Higher Education, 21(6), 1131-1150.

Camacho, M., Valcke, M., & Chiluiza, K. (2017). Research based learning in higher education: A review of literature. INTED2017 Proceedings, 4188-4197.

Canales, T., & Schmal, R. (2013). Trabajando con Pósteres: una Herramienta para el Desarrollo de Habilidades de Comunicación en la Educación de Pregrado. Formación universitaria, 6(1), 41-52.

Da Silva, J. B. (2020). David Ausubel's Theory of Meaningful Learning: an analysis of the necessary conditions. Research, Society and Development, 9(4), 3.

Gallagher, S. E., & Savage, T. (2020). Challenge-based learning in higher education: an exploratory literature review. Teaching in Higher Education, 1-23.

Marchante, B. M., & Herrero, E. C. (2022). The academic poster as a resource to enhance cross-curricular competences in higher education. Revista Digital de Investigación en Docencia Universitaria, 16(2), e1590-e1590.

Nelson, D. H., Prescott, S. L., Logan, A. C., & Bland, J. S. (2019). Clinical ecology—transforming 21st-century medicine with planetary health in mind. Challenges, 10(1), 15.

Rabinowitz, P. M., Kock, R., Kachani, M., Kunkel, R., Thomas, J., Gilbert, J., ... & Rubin, C. (2013). Toward proof of concept of a one health approach to disease prediction and control. Emerging Infectious Diseases, 19(12).

Seif, E., & McTighe, J. (2021). Teaching for Lifelong Learning: How to Prepare Students for a Changing World. Solution Tree Press.

Smith, V. H., Rubinstein, R. J., Park, S., Kelly, L., & Klepac-Ceraj, V. (2015). Microbiology and ecology are vitally important to premedical curricula. Evolution, Medicine, and Public Health, 2015(1), 179-192.

United Nations General Assembly (2015) Transforming our world: the 2030 Agenda for Sustainable Development, 21 October 2015, A/RES/70/1, available at: https://www.refworld.org/docid/57b6e3e44.html