A service-learning educational approach developed the transversal competences of undergraduate students in an outreach workshop aimed to high school students

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Introduction and Objective

In the last decade, research institutes and universities have strengthened the development of outreach activities in the biomedical field, involving researchers and professors as well as graduate students, but with little or no implication of undergraduate students (Curtis, 2017).

However, the development of this type of activities, using the Service-Learning educational approach, could be a valuable tool that would manage the acquisition of learning competencies by undergraduate students of Health Science Degrees and would put science at the service of society (Halpern, 2010).

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Methodology

Secondary education students: 965 students (15 to 17 years old).

Undergraduate students: 301 students, first and second year of a Degree in Nursing or Medicine (University of Málaga, Spain), acted as mentors.

School years: 2016-2017 to 2022-2023, excluding 2019-2020 and 2020-2021 due to the COVID-19 pandemic

Evaluation of the workshop: via questionnaires (Likert scale-based, 'yes' or 'no' answers, open-ended or multiple-choice questions) and a debriefing with the university professors.

Data analysis: Kruskal-Wallis and Mann-Whitney U test using GraphPad Prism 9.5.1. Statistical significance was defined by $p < 0.05$. Data is expressed as Mean±SEM or percentages.

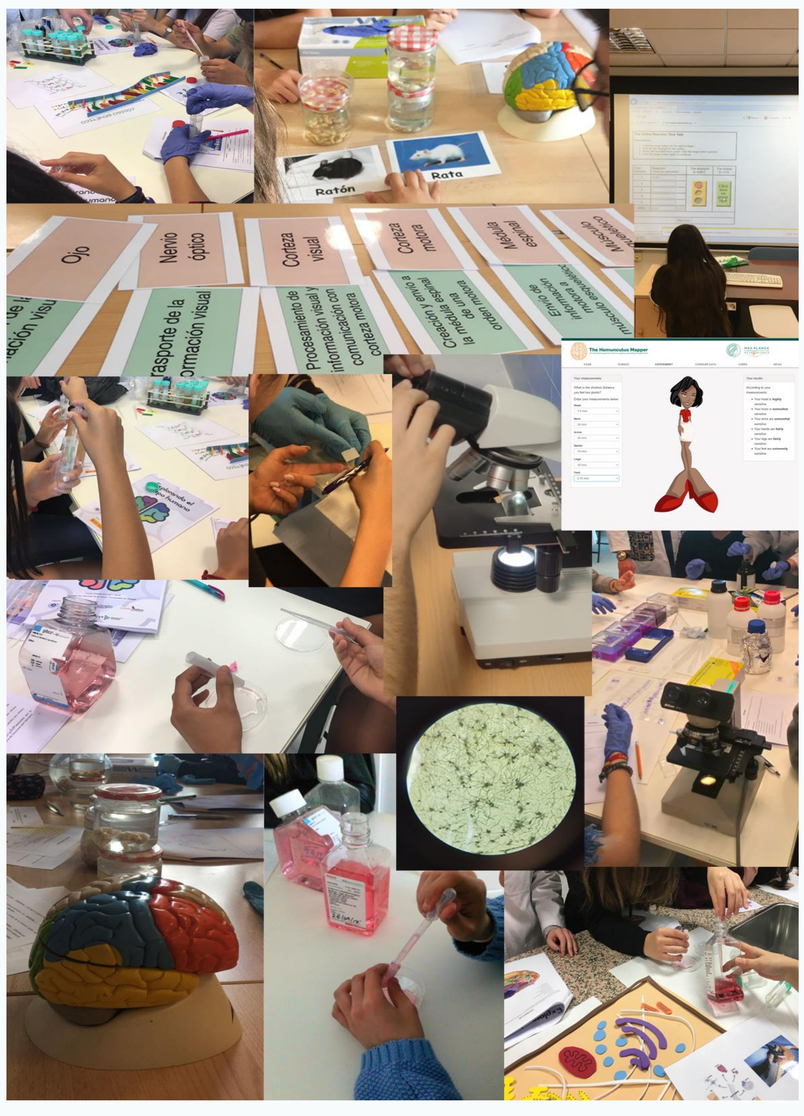
Results

1 Outreach workshop

The outreach workshop consisted in 5 stations:

1. **Biomolecules:** DNA extraction of buccal cells and the effects that mutations have on health
2. **Cells:** design of an animal eukaryotic cell and a simulation of bone-marrow-derived stem cells extraction
3. **Tissues:** histological staining protocol using cresyl violet of rat brain sections, compared with Golgi's staining
4. **Organs:** observation of a brains collection and sensitive cortical homunculus mapping
5. **Systems:** explanation of the neural and musculoskeletal systems interaction and a simulation of myelinated and non-myelinated axons by students

Figure 1. Photographs of the material used in the 5 stations of the workshop



2 Secondary education students

The overall rating of the stations of the workshop was 4.6±0.07 out of 5 points. The station rated with the lowest score was significantly the station "cells", by both male and female students

Table 1. Score values for each station of the workshop by secondary education students from the province of Málaga. &p<0.001 vs biomolecules, tissues, organs, systems

	Biomolecules	Cells	Tissues	Organs	Systems
Male (411)	4.63±0.03	4.24±0.04&	4.58±0.03	4.61±0.04	4.68±0.03
Female (554)	4.72±0.02	4.12±0.04&	4.65±0.02	4.65±0.02	4.67±0.02
Total	4.69±0.02	4.22±0.03&	4.62±0.03	4.63±0.03	4.68±0.03

3 Undergraduate students

The overall rating of the stations of the workshop was 4.64±0.1 out of 5 points. The lowest rated station was "cells", and the highest rated station was "biomolecules"

Table 2. Score values for each station, the structure and organization, and the material used in the workshop by undergraduate students of Medicine and Nursing Degrees. #p<0.001 vs cells, tissues, systems; &p<0.001 vs biomolecules, tissues, organs, systems.

	Biomolecules	Cells	Tissues	Organs	Systems	Structure, organization	Material used
Male (53)	4.81±0.06	4.25±0.11	4.62±0.09	4.68±0.07	4.55±0.09	4.68±0.07	4.77±0.06
Female (248)	4.86±0.02#	4.22±0.05&	4.65±0.04	4.75±0.04	4.62±0.04	4.65±0.03	4.83±0.03
Total	4.85±0.02#	4.23±0.05&	4.64±0.04	4.73±0.03	4.60±0.04	4.66±0.03	4.82±0.03

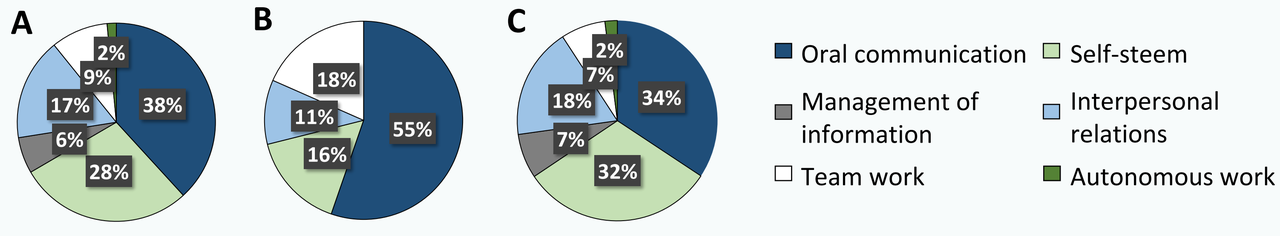
Both male an females undergraduate students stated a similar agreement regarding the positive impact of the workshop, as it far exceeded their expectations

Table 3. Score values for questions about the importance of the workshop for undergraduate students. Nonsignificant differences were found.

	My enrolment in this activity has a positive impact in my academic background	The workshop has far exceeded my expectations	Similar activities should be developed in our Faculty
Male (53)	4.90±0.04	4.77±0.06	4.89±0.06
Female (248)	4.78±0.03	4.78±0.03	4.83±0.03
Total	4.80±0.03	4.78±0.03	4.84±0.03

Undergraduate students think they have mainly improved oral communication skills (34% of the female students and 50% of the male students)

Figure 2. Competences or skill that undergraduate students believe they have improved, regarding all (**A**), male (**B**) or female (**C**) students. Values represent percentages of the total number of answers for each group of student.



Conclusions

These results suggest that this methodology would be valid and applicable to develop the transversal competences of the students in Bachelor's degrees of Health Sciences

References

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