

INTED **2021**

15th International
Technology, Education and
Development Conference

8-9 March, 2021

CONFERENCE PROCEEDINGS



Sharing the Passion for Learning

Published by
IATED Academy
iated.org

INTED2021 Proceedings
15th International Technology, Education and Development Conference
March 8th-9th, 2021

Edited by
L. Gómez Chova, A. López Martínez, I. Candel Torres
IATED Academy

ISBN: 978-84-09-27666-0
ISSN: 2340-1079
DL: V-370-2021

Book cover designed by
J.L. Bernat

All rights reserved. Copyright © 2021, IATED

The papers published in these proceedings reflect the views only of the authors. The publisher cannot be held responsible for the validity or use of the information therein contained.

PRELIMINARY ASSESSMENT OF SUSTAINABLE DEVELOPMENT GOALS BY FRESHMEN STUDENTS OF A LIFE SCIENCE DEGREE

M. Leiva-Brondo, A. Atarés, A. Pérez-de-Castro, C. Lull

Universitat Politècnica de València (SPAIN)

Abstract

Sustainable development goals (SDGs) are the main instrument of the 2030 agenda for sustainable development of United Nations (UN) adopted in 2015. The 17 SDGs seek a whole approach in different thematic issues including poverty, water, energy education, climate, or peace. They are a supremely ambitious and transformational vision according the statement signed by Heads of State and Government and High Representatives meet at 70th anniversary meeting of UN. One of the main points to get the success of the SDGs is to spread their existence and engage all the population in meet their goals. University is one of the main places than can contribute to their knowledge and education is one of the SDGs. Universities can support students to develop knowledge and skills to solving the complex sustainable development challenges our world/society faces. Biotechnology can help to achieve SDGs by enabling a more sustainable development in different areas like health, biodiversity, desertification, food security and production or industrial processes. In the present study a test was carried out in first year students of Biotechnology degree to assess the preliminary knowledge of SDGs. The participation was very high, and the students showed a high basic knowledge. Activities during the term will be carried out to improve and deepen their knowledge. Further and more complex assessment will be done to get more insight of the SDG understanding of the students.

Keywords: Agenda 2030; Education; Higher Education; University.

1 INTRODUCTION

In 2015 the United Nations Summit developed a document with 17 Sustainable Development Goals (SDGs) called “Transforming our world: the 2030 Agenda for Sustainable Development” [1]. This agenda is “a plan of action for people, planet and prosperity and seeks to strengthen universal peace in larger freedom” [1]. The 17 SDGs are shown in figure 1 and are a further and more complete step from the Millennium Development Goals [2]. Education is crucial for the achievement of the SDGs [3]–[5] and UNESCO seeks to mobilize educational resources to develop a sustainable future [6]. Higher Education Institutions (HEIs) have a key role in the development of SDGs [7], [8] and are essential spaces for promoting social change and sustainable policies [9]. In particular, SGD 4 focus on education and aims to “ensure that all learners acquire the knowledge and skills needed to promote sustainable development” [1]. Many Universities have introduced sustainability concepts into the curriculum [10], [11], however it is considered that the inclusion of SDGs in universities is in its infancy [12], [13]. Some authors state that Universities are narrow and unable to capture the essence of sustainable development [14], although academics seem to support its inclusion [9], [15].

The implementation of SDGs in HEIs means to review the curricula of the programs, introduce novel pedagogical strategies [7] and promote sustainability in students, professionals, teachers and decision makers [16]. An improvement of skills and knowledge to achieve the 2030 Agenda challenges in HEIs education is needed [7]. Already in 1987 the Brundtland Commissions pointed out the importance of education in sustainability [17] and in 1992 it was introduced the concept of Education for Sustainable Development (ESD) [18]. Later, in 2004 United Nations made emphasis between the relationship of education and sustainable development [18], [19]. HEIs have been collaborating with United Nations for sustainable education and in 2012 in the conference on Sustainable Development created the Higher Education Sustainable Initiative (HESI) for this purpose [20].

Integrating sustainable development in HEIs is a long process [21]. Several reviews are available about the different approaches and actions of HEIs to contribute to SDG development [7], [22]–[27]. Several strategies have been used, but emphasis is given in the need to organize and prioritize objectives and integrate them adequately in the curricula [28] with collaboration of stakeholders [7]. But also a training of the teachers in this change is necessary [29] with three main aspects, contents,

theoretical approaches and teaching methodologies [30], and alignment of the management of the university with SDGs [12], [31], [32].

After the initiatives to develop the SDGs in Higher Education a question arise to how assess their impact in the education of the students [33]. As HEIs have to provide future graduates with sufficient knowledge and skills related to SDGs, they have to be sure that they achieve this objective [33]. The complexity of the sustainability paradigm makes the measurement of the progress in this domain challenging [34]. To measure sustainability awareness and core literacy some tests have been developed [35] like the Sustainability Literacy Test (SULITEST) [36]. This test is a collaboration initiative between Education for Sustainable Development (ESD) and the Principles for Responsible Management Education (PRME) and is an open online training and assessment tool [34].



Figure 1. Sustainable Development Goals of the 2030 Agenda [1].

In Biotechnology Bachelor's Degree, Genetics is one of the main topics and students take a subject called General Genetics in the first year. This subject is related with several of the SDGs like: maintain genetic diversity (SDG 2), research and development of vaccines and medicines (SDG 3), acquire knowledge and skills to promote sustainable development (SDG 4), improve water quality (SDG 6), enhance scientific research (SDG 9), or combat desertification (SDG 15), for example [1]. This relationship provides a very conducive setting to modify the curricula and the classroom activities to implement 2030 agenda and SDGs in the General Genetics subject.

Awareness and knowledge is one of the first steps to engage students in the SDGs [33]. However, there is a lack of knowledge of SDGs and according Spanish Government only 10.8% of the Spanish population knew about it/them in 2019 [37]. Assessment of previous knowledge of university students can allow to design actions to teach and promote SDGs, evaluate the impact of future actions and study the evolution over time [38]. In the present study, a preliminary assessment of SDGs and 2030 agenda awareness by first year students of Biotechnology degree is presented.

2 METHODOLOGY

General Genetics is a first-year subject belonging to the Biotechnology Bachelor's Degree at Universitat Politècnica de València (Spain). The subject has four ECTS (European Credits Transfer System) of theory sessions (40 hours) and two ECTS of lab sessions (20 hours). The study was carried out during year 2020-21 and students were organized in two groups, one with Spanish as medium of instruction and another with English as a medium of instruction. The number of students enrolled was 104.

Classroom activities involved active participation of the student and assessment task were written exams, online test, lab questions, reports, and presentations with screencasts of selected topics. The students had previously all the information and resources for the lectures through a learning platform based in Sakai, called PoliformaT. The screencast task was connected with a contemporary issue related to the subject and students were required to link the chosen topic with one or more of the SDGs.

At the beginning of the subject a survey of ten questions (Table 1) was submitted to the students through the learning platform Sakai-based, PoliformaT. The survey was partially based in United Nations quizzes. Each correct answer added one point to the final mark while each incorrect answer deducted 0.33 points of the final mark of the test. No answered questions neither added nor deducted points for the final mark.

Table 1. Survey used to assess preliminary knowledge of SDGs.

1. What does SDG mean?

- a. Sustainable design goals.
- b. Supportable development objectives.
- c. Sustainable development goals.
- d. Smart Design Object.

2. How many are the SDGs established by the United Nations?

- a. 10.
- b. 15
- c. 17
- d. 23

3. The SDGs are looking for

- a. Protect the planet and ensure the prosperity of all.
- b. Send humanitarian aid.
- c. Assisting war refugees.
- d. End large corporations.

4. Which of the following is NOT a SDG?

- a. Climate action.
- b. Zero hunger.
- c. Improved happiness.
- d. Life of terrestrial ecosystems.

5. The SDGs have a cross-cutting principle

- a. "All to one".
- b. "Leave no one behind".
- c. "To infinity and beyond".
- d. "Carpe diem."

6. SDG are only for:

- a. Big corporations.
- b. Large corporations, NGOs, and public administrations.
- c. For companies (large and small), public administrations, universities.
- d. For all: companies (large and small), citizens, public administrations, universities.

7. Can each of us contribute to the compliance of the SDG?

- a. No, we need to do it through plans in place for it.
 - b. Yes, with small contributions like recycling.
 - c. Yes, with considerable financial contributions.
 - d. No, it is impossible to participate.
-

8. What is the date to achieve these goals?

- a. When you can.
- b. 2050
- c. 2030
- d. There is no closed date.

9. What is the goal of Objective 1, ending poverty in all its forms everywhere by 2030?

- a. Develop reliable, sustainable, resilient, and quality infrastructures.
- b. Achieve universal and equitable access to safe and affordable drinking water for all.
- c. Double the global rate of energy efficiency improvement.
- d. To eradicate extreme poverty, measured as people living on less than \$1.25 a day.

10. Who is responsible for complying with the SDGs?

- a. Each of the signatory countries of the 2030 Agenda, based on their own criteria and needs.
 - b. A commission established by the United Nations.
 - c. The Strasbourg Criminal Court.
 - d. The European Union.
-

3 RESULTS

The participation of the students was very high with 97 responses of the 104 possible ones (93.3 %) and if we consider that five of the students have register in the subject, but they have not attended any of the activities (probably due that they are not following the subject) the participation is even higher (98.0 %). The average mark of the students was 8.62 ± 0.14 (mean \pm standard error). This mark indicated a high preliminary knowledge of the 2030 agenda and SDGs. In the first questions, where the meaning of SDG was asked, all the students chose the correct answer. A high number of students (36.1 %) got the maximum mark, while 91.5% of the student got a mark higher than 7, and only one student failed the test. Questions 1 to 8 and 10 where about the general knowledge of the 2030 agenda and SDGs while questions 9 was about knowledge of one specific SDGs. Questions, 5, 9 and 10, where the ones with lower mark (Table 2).

In question 10, related to responsibility for complying with the SDGs at the institutional level, 34% of students did not correctly answered that the responsibility is of the each of the signatory countries of the 2030 Agenda. However, this result contrasts with that obtained in questions 6 and 7 where more than 90% of the students indicated that the SDGs are for all (companies (large and small), citizens, public administrations, universities) and that each of us can contribute to the compliance of the SDG.

Table 2. Result of the survey about preliminary knowledge of SGs (in bold correct answer) of the 97 students that completed the survey.

Question	Number of answers				% Correct answers	% Incorrect answers
	a	b	c	d		
1	0	0	97	0	100.0%	0.0%
2	1	5	80	3	82.5%	17.5%
3	96	1	0	0	99.0%	1.0%
4	0	1	90	3	92.8%	7.2%
5	16	79	0	0	81.4%	18.6%
6	0	4	2	91	93.8%	6.2%
7	0	96	0	0	99.0%	1.0%
8	1	1	93	1	95.9%	4.1%
9	6	8	0	79	81.4%	18.6%
10	64	32	0	0	66.0%	34.0%
Total					91.1%	8.9%

Students' knowledge regarding sustainability is variable [10]. Sustainable literacy has been assessed with tools like SULITEST [36]. Results of this survey in 2017 with more than 40.000 students showed a medium knowledge of 2030 agenda with 57.2% of correct answers worldwide, with slightly higher results among graduate students and staff and faculty members [33]. A similar result was obtained between STEM (science, technology, engineering and mathematics) students [10]. In another study with questions more similar to ours, the result showed a poor knowledge of SDGs, without differences regarding gender or type of studies; however students were aware of their importance in their personal and professional life [38]. In an study carried out in Indonesia, results showed a high level of awareness about SDGs [39]. Other study between Pre-Service teachers showed that initial low awareness improved after classroom activities related to SDGs were carried out [5], and a similar result appeared in a training course among university teachers [30]. Also, previous activities influence knowledge of SDGs as showed in an study carried out in Italian universities in first year students [40].

The difference in the results of the survey here presented from those obtained in other studies is probably also due to the complexity of the questions. The assessment of the core literacy of the students should be done with a test with a proper level of complexity related to their level. However, complex tests can deter students that may have "exam-like" feelings and hamper their participation [40]. The results of the assessment of the students can point out the contents that can be reinforced and the changes that can be done in the curricula to improve knowledge of SDGs and 2030 agenda.

Improvement of literacy of the students can be done with classroom activities [16], [29]. For example, rubrics have been designed to assess sustainable implementation in student works [41]. Other studies give recommendations to foster sustainable competencies [31], [42] or present examples of activities and opinions of teachers [9], [21]. In our case, contemporary issue knowledge activities are carried out in the subject. These activities seek to improve the knowledge and skills of the students in several outcomes related to the subject, but also seek to improve the general knowledge of the 2030 agenda. As a future task, the assessment of the student's awareness after the end of the subject will be done, to see if it has improved. Results can be used to identify gaps in sustainability awareness and implement methods and activities to address these gaps.

4 CONCLUSIONS

Preliminary knowledge of 2030 agenda and SDGs by first year students of Biotechnology degree is very high and activities in the classroom seek to improve their awareness of the importance of sustainable development. However, a deeper knowledge is needed to achieve the 2030 agenda goals so more complex test need to be done to assess the core literacy of the students.

ACKNOWLEDGEMENTS

The publication of this work has been funded by a project of Educational Improvement and Innovation awarded by the Vice Dean for Studies, Quality and Accreditation of the Universitat Politècnica de València (Spain).

REFERENCES

- [1] United Nations, "Transforming our world: The 2030 agenda for sustainable development," 2015. [Online]. Available: <https://sdgs.un.org/publications/transforming-our-world-2030-agenda-sustainable-development-17981>.
- [2] United Nations, "The Millennium Development Goals Report," *United Nations*, p. 72, 2015.
- [3] K. Vladimirova and D. Le Blanc, "Exploring Links Between Education and Sustainable Development Goals Through the Lens of UN Flagship Reports," *Sustain. Dev.*, vol. 24, no. 4, pp. 254–271, Jul. 2016.
- [4] V. Kioupi and N. Voulvoulis, "Education for Sustainable Development: A Systemic Framework for Connecting the SDGs to Educational Outcomes," *Sustainability*, vol. 11, no. 21, p. 6104, Nov. 2019.
- [5] E. García-González, R. Jiménez-Fontana, and P. Azcárate, "Education for Sustainability and the Sustainable Development Goals: Pre-Service Teachers' Perceptions and Knowledge," *Sustainability*, vol. 12, no. 18, p. 7741, Sep. 2020.

- [6] I. Mulà and D. Tilbury, "A United Nations Decade of Education for Sustainable Development (2005–14)," *J. Educ. Sustain. Dev.*, vol. 3, no. 1, pp. 87–97, Mar. 2009.
- [7] S. Romero, M. Aláez, D. Amo, and D. Fonseca, "Systematic review of how engineering schools around the world are deploying the 2030 agenda," *Sustain.*, vol. 12, no. 12, pp. 1–24, 2020.
- [8] A. Boni, A. Lopez-Fogues, and M. Walker, "Higher education and the post-2015 agenda: a contribution from the human development approach," *J. Glob. Ethics*, vol. 12, no. 1, pp. 17–28, Jan. 2016.
- [9] B. A. Christie, K. K. Miller, R. Cooke, and J. G. White, "Environmental sustainability in higher education: What do academics think?," *Environ. Educ. Res.*, vol. 21, no. 5, pp. 655–686, Jul. 2015.
- [10] L. Zizka, D. M. McGunagle, and P. J. Clark, "Sustainability STEM Higher Education: Making Social Change Together," *J. High. Educ. Theory Pract.*, vol. 18, no. 7, pp. 121–132, 2018.
- [11] F. Lourenço, "To challenge the world view or to flow with it? Teaching sustainable development in business schools," *Bus. Ethics A Eur. Rev.*, vol. 22, no. 3, pp. 292–307, Jul. 2013.
- [12] F. Zamora-Polo and J. Sánchez-Martín, "Teaching for a Better World. Sustainability and Sustainable Development Goals in the Construction of a Change-Maker University," *Sustainability*, vol. 11, no. 15, p. 4224, Aug. 2019.
- [13] W. Leal Filho *et al.*, "Sustainable Development Goals and sustainability teaching at universities: Falling behind or getting ahead of the pack?," *J. Clean. Prod.*, vol. 232, pp. 285–294, Sep. 2019.
- [14] R. Lozano, R. Lukman, F. J. Lozano, D. Huisingh, and W. Lambrechts, "Declarations for sustainability in higher education: becoming better leaders, through addressing the university system," *J. Clean. Prod.*, vol. 48, pp. 10–19, Jun. 2013.
- [15] B. Lazzarini, A. Pérez-Foguet, and A. Boni, "Key characteristics of academics promoting Sustainable Human Development within engineering studies," *J. Clean. Prod.*, vol. 188, pp. 237–252, Jul. 2018.
- [16] V. G. Zuin *et al.*, "Integrating Green and Sustainable Chemistry into Undergraduate Teaching Laboratories: Closing and Assessing the Loop on the Basis of a Citrus Biorefinery Approach for the Biocircular Economy in Brazil," *J. Chem. Educ.*, vol. 96, no. 12, pp. 2975–2983, Dec. 2019.
- [17] G. H. Brundtland, "Report of the World Commission on environment and development: "our common future"," 1987.
- [18] UNESCO, "Education for Sustainable Development." [Online]. Available: <https://en.unesco.org/themes/education-sustainable-development>.
- [19] UNESCO, C. Buckler, and H. Creech, *Shaping the Future We Want UN Decade of Education for Sustainable Development; final report*. 2014.
- [20] United Nations, "Higher Education Sustainability Initiative (HESI)," 2020. [Online]. Available: <https://sustainabledevelopment.un.org/sdinaction/hesi>.
- [21] B. E. Wood, S. Cornforth, F. Beals, M. Taylor, and R. Tallon, "Sustainability champions?," *Int. J. Sustain. High. Educ.*, vol. 17, no. 3, pp. 342–360, May 2016.
- [22] J. Smith, A. L. H. Tran, and P. Compston, "Review of humanitarian action and development engineering education programmes," *Eur. J. Eng. Educ.*, vol. 45, no. 2, pp. 249–272, Mar. 2020.
- [23] C. Allen, G. Metternicht, and T. Wiedmann, "Initial progress in implementing the Sustainable Development Goals (SDGs): a review of evidence from countries," *Sustain. Sci.*, vol. 13, no. 5, pp. 1453–1467, Sep. 2018.
- [24] L. Rashid, "Entrepreneurship Education and Sustainable Development Goals: A literature Review and a Closer Look at Fragile States and Technology-Enabled Approaches," *Sustainability*, vol. 11, no. 19, p. 5343, Sep. 2019.
- [25] D. Giribabu, "Mapping and Scoping of the World Concepts to the Sustainable Development Goals: The First Review," *Sustainability*, vol. 12, no. 6, pp. 310–322, Dec. 2019.

- [26] D. Vazquez-Brust, R. S. Piao, M. F. de S. de Melo, R. T. Yaryd, and M. M. Carvalho, "The governance of collaboration for sustainable development: Exploring the 'black box,'" *J. Clean. Prod.*, vol. 256, p. 120260, May 2020.
- [27] Y.-C. Chang and H.-L. Lien, "Mapping Course Sustainability by Embedding the SDGs Inventory into the University Curriculum: A Case Study from National University of Kaohsiung in Taiwan," *Sustainability*, vol. 12, no. 10, p. 4274, May 2020.
- [28] D. Zelinka and B. Amadei, "A Methodology to Model the Integrated Nature of the Sustainable Development Goals: Importance for Engineering Education," in *2017 ASEE Annual Conference & Exposition Proceedings*, 2017, vol. 2017-June.
- [29] J. L. Blatti *et al.*, "Systems Thinking in Science Education and Outreach toward a Sustainable Future," *J. Chem. Educ.*, vol. 96, no. 12, pp. 2852–2862, Dec. 2019.
- [30] L. Collazo Expósito and J. Granados Sánchez, "Implementation of SDGs in University Teaching: A Course for Professional Development of Teachers in Education for Sustainability for a Transformative Action," *Sustainability*, vol. 12, no. 19, p. 8267, Oct. 2020.
- [31] C. Desha, D. Rowe, and D. Hargreaves, "A review of progress and opportunities to foster development of sustainability-related competencies in engineering education," *Australas. J. Eng. Educ.*, vol. 24, no. 2, pp. 61–73, 2019.
- [32] K. Ceulemans, R. Lozano, and M. Alonso-Almeida, "Sustainability Reporting in Higher Education: Interconnecting the Reporting Process and Organisational Change Management for Sustainability," *Sustainability*, vol. 7, no. 7, pp. 8881–8903, Jul. 2015.
- [33] A. Décamps, G. Barbat, J.-C. Carteron, V. Hands, and C. Parkes, "Sulitest: A collaborative initiative to support and assess sustainability literacy in higher education," *Int. J. Manag. Educ.*, vol. 15, no. 2, pp. 138–152, Jul. 2017.
- [34] A. M. Mason, "Sulitest ©: A Mixed-Method, Pilot Study of Assessment Impacts on Undergraduate Sustainability-related Learning and Motivation," *J. Sustain. Educ.*, vol. 20, no. March 2018, 2019.
- [35] G. Bullock and N. Wilder, "The comprehensiveness of competing higher education sustainability assessments," *Int. J. Sustain. High. Educ.*, vol. 17, no. 3, pp. 282–304, May 2016.
- [36] Sulitest, "Sustainability Literacy Test," 2020. [Online]. Available: <https://www.sulitest.org/>.
- [37] S. Government, "Action Plan for the Implementation of Agenda 2030. Towards a Spanish Sustainable Development Strategy," 2018.
- [38] F. Zamora-Polo, J. Sánchez-Martín, M. Corrales-Serrano, and L. Espejo-Antúnez, "What Do University Students Know about Sustainable Development Goals? A Realistic Approach to the Reception of this UN Program Amongst the Youth Population," *Sustainability*, vol. 11, no. 13, p. 3533, Jun. 2019.
- [39] H. F. Jati, S. N. A. C. Darsono, D. T. Hermawan, W. A. S. Yudhi, and F. F. Rahman, "Awareness and knowledge assessment of sustainable development goals among university students," *J. Ekon. Stud. Pambang.*, vol. 20, no. 2, 2019.
- [40] C. Smaniotto *et al.*, "Sustainable Development Goals and 2030 Agenda: Awareness, Knowledge and Attitudes in Nine Italian Universities, 2019," *Int. J. Environ. Res. Public Health*, vol. 17, no. 23, p. 8968, Dec. 2020.
- [41] B. Crespo, C. Míguez-Álvarez, M. E. Arce, M. Cuevas, and J. L. Míguez, "The Sustainable Development Goals: An Experience on Higher Education," *Sustainability*, vol. 9, no. 8, p. 1353, Aug. 2017.
- [42] F. Annan-Diab and C. Molinari, "Interdisciplinarity: Practical approach to advancing education for sustainability and for the Sustainable Development Goals," *Int. J. Manag. Educ.*, vol. 15, no. 2, pp. 73–83, Jul. 2017.