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A 5Ps approach to e-teaching sustainability: The case of Universidade Aberta

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Abstract. In higher education, approaches to how students learn to reflect and act on sustainability issues on the scope of Agenda 2030, influence their actions as change agents in society. However, education on Sustainable Development Goals (SDGs) is still in its early stages. This paper aims to present the structure and pedagogical approach of a newly developed micro-credential module on “Sustainable Development Goals” at Universidade Aberta (UAb), Portugal, with a special focus on the concept of 5Ps (People, Planet, Prosperity, Peace, and Partnerships), as well as assess the outcomes of its first pilot teaching. A collaborative learning approach was adopted in the micro-credential. The module comprised 6 topics, covering the Sustainable Development historical path and the fulfilment of the SDGs that make up each 5Ps. The knowledge improvement and effectiveness of the training were assessed through pre- and post-questionnaires. The training was very successful in increasing the participants’ knowledge of both Sustainability and SDGs. The participants were totally satisfied with the training, appreciating the diversified learning resources. The interaction with "nature and family", by addressing People and Planet, was the main contributor to developing sustainable positive-thinking approaches, and the model presented here can be replicated elsewhere.

1. Introduction

Education is one of the key transformations needed for achieving Sustainable Development Goals (SDGs) (Sachs *et al.*, 2019, p. 806) to empower students to tackle social and ecological problems and enable them to put sustainability into practice. In this context, approaches to how students learn to reflect and act on sustainability issues on the scope of UN Agenda 2030 are pivotal and will influence their actions as change agents in society (Caeiro *et al.*, 2020, p. 2). However, environmental, social, and economic problems commonly require synergies from all public elements, including Higher Educational Institutions (HEIs). They are considered significant contributors to the promotion of sustainability (Mapar, Bacelar Nicolau and

Caeiro, 2022. P. 153). and are major driving forces behind shaping knowledge, skills, and values in society (Moreno Pires *et al.*, 2022, p. 2; Cortese, 2003, p. 17), and have a fundamental role in positively driving social changes, by teaching sustainability to their community. Besides their role in shaping a sustainable society, it is essential to emerge their commitment to practice sustainability and to reduce the inconsistency of the development of bonds between theory and practice in higher education (Viegas *et al.*, 2016, p. 269). These actions should be proven within and outside the university (Moreno Pires *et al.*, 2022, p. 14), through defining, implementing, evaluating, and finally reporting the sustainable approaches to ensure their actions and programs are aligned with Sustainable Development Goals (SDGs). One of the key components in practicing sustainability and developing a sustainable HEI is to build and deepen the sustainability knowledge among all elements of HEIs including students, academics, and non-academic staff, and later the wider community. However, effective education on sustainability based on the SDGs is still in its early stages at Higher Education Institutions besides several initiatives (Moreno Pires *et al.*, 2022, p. 3).

Recognizing this need, a micro-credential module of 6 ECTS was developed at Universidade Aberta (UAb), Portugal, which takes a 360-degree approach to teaching sustainability in the context of five areas (5Ps) of critical importance for humanity and the planet (People, Planet, Prosperity, Peace, and Partnerships). This module helps participants grasp the complexity of the SDGs by highlighting how the SDGs are intertwined frameworks in the context of the 5Ps, instead of being perceived as a list of independent goals. This paper aims to present the pedagogical approach and the structure of this newly developed module and assess the outcomes of its first pilot teaching at UAb. Namely, it aims to understand the impact of the SDGs micro-credential module on the participants in the ability to make them more aware of sustainability and SDGs concepts and to empower them as change agents in the community to transform lives and future workplaces towards sustainability.

The paper is built up as follows. Section 2 situates the study in relation to the previous research on sustainability education with a special focus on the concept of 5Ps and micro-credentials. Section 3 describes the paper's methodological approach to developing the module at UAb. Results are presented in Section 4 and discussed further in the same section. The study is concluded in Section 5 by highlighting the future paths of the module.

2. Literature Reviews

The 17 Sustainable Development Goals (SDGs) were introduced by the United Nations in 2015 (UN 2015) and have rapidly come to represent a shared and universal reference framework for sustainability (Fiorani and Di Gerio, 2022, p. 15). As described by United Nations (UN, 2015), "Agenda 2030 is a plan of action for people, planet, and prosperity". It also seeks to strengthen universal peace in larger freedom and all countries and all stakeholders, acting in collaborative partnership (UN 2015). To achieve these approaches, the Agenda established five areas of critical importance for humanity and the planet (United Nations Development Programme, 2016, p. 132), known as the "5Ps": people, planet, prosperity, peace, and partnership. These integrated areas show the potential synergies and trade-offs related to the 17 goals and the classification of their targets (Tremblay *et al.*, 2020, p. 1593). United Nations Development Programme (2016, p. 132) also underlined that achieving the SDGs would transform the status of human development by addressing these 5 critical areas, since a critical analysis of sustainable development, and by extension, the SDGs, can enable the HEIs community to deal with accelerating change, increasing complexity, contested knowledge claims, and inevitable uncertainty (Kopnina, 2018, p. 1268).

To ensure that all above 5 areas are integrated into HEI's main dimensions and fields of action, several commitments and initiatives were promoted and signed worldwide, aiming to integrate sustainability into i) campus organization, ii) education, iii) research, iv) outreach, and v) assessment and reporting (Lozano *et al.*, 2013, p. 11). In the element of "Education", besides the sustainability formal courses, offered by HEIs for both graduate and post-graduate full programs, the HEIs have been recently offering a broad range of informal courses, not only for students but also for those who are working in labor market as well as for the wider community. The most implemented actions are the ones that have a more limited impact, among them, the presence of an optional Sustainable Development course (Lozano *et al.*, 2015, p. 7). Another action that is less frequent, but more critical is having an optional Sustainable Development course for all students (Moreno Pires *et al.*, 2020, p. 23), or a set of informal, small, accredited courses known as "micro-credentials" to meet the demands of learners, enterprises, and organizations.

A micro-credential is defined as "a certification of assessed learning that is additional, alternate, complementary to or a formal component of a formal qualification (Oliver, 2019, p. i)". The Council of the

European Union (EU) adopted a Recommendation on a European approach to micro-credentials for lifelong learning and employability which mainly emphasizes the role of micro-credentials in enabling individuals to acquire, update and improve the knowledge, skills, and competences needed to evolve labor market and society (Council of the European Union, 2019, p. 11). Among the micro-credentials, sustainability-oriented ones have newly gained attention worldwide, offering an inclusive approach to learning sustainability to practice and allowing the participants to reflect on their role as change agents in the work or society actively. The topics offered by sustainability micro-credentials are varied, casing from the more environmental sphere (e.g. energy (University of Alberta, 2023), carbon literacy (University of Glasgow, 2023), climate change (Aurora, 2023), among many others), to those integrating all dimensions of sustainability (e.g., sustainability certificate (ENHANCE Alliance, 2023), or micro-credential in Sustainability (una Europa, 2023) which aims to acknowledge the complexity and interconnectedness of the sustainability issue by covering the environmental, economic, and social aspects of the SDGs). However, considering the list of existing micro-credentials, developing an optional course that covers all 17 SDGs in an integrated framework while covering all 5 areas of humanity and the planet (5Ps) is still in its infancy and further action is needed. Also, with the pandemic COVID19, several eLearning courses emerged but were not grounded in a validated pedagogical model (Moreira *et al.*, 2020).

3. Methodology

The online micro-credential module entitled “Sustainable Development Goals” was designed at Universidade Aberta through the contribution of the Sustainable Campus Group UAb - a group established in 2021 under the direct supervision of the rector, to promote sustainability approaches at UAb in 5 core elements of sustainability actions at HEIs: i) planning and administration, ii) operation and innovation, iii) academia and research, iv) assessment and reporting, and v) involvement with the community. The module was preliminary developed for undergraduate students, however, it tends to also be taught to the wider community of HEIs in the future, by incorporating it into different disciplines, from all courses and degree types. The module aimed at making students acquainted with the sustainability concepts and SDGs from the field of 5 areas of critical importance for humanity and the planet (5Ps).

Before developing the module, a collaborative approach was adopted by the Group. The team consisted of 9 professors, 1 researcher, and 2 instructional designers from different backgrounds and expertise, but all with scientific fields in environmental science and management, sustainability, and education. In the first step, the preliminary structure was discussed to decide which clustering framework is the most appropriate one for categorizing the SDGs by bearing in mind that the SDGs and their targets are fundamentally interdependent and interlinked (Breuer, Janetschek and Malerba, 2019, p. 1). An initial literature review was done among 11 clustering frameworks, and finally, after 2 rounds of dialogues, the team decided to focus on the SDGs in the context of the 5Ps. A plan was then set to structure the module which was developed in Portuguese language. The pilot training took place in the fall term of 2022-2023 (from October to February), by enrolling the undergraduate students of Environmental Science. The online training was hosted on the open Moodle platform of Universidade Aberta, while all collaborative learning processes served asynchronously, based on the pedagogical model of UAb and further improvements (Pereira *et al.*, 2008, p. 11; Amante and Oliveira, 2019, p. 11)

To assess the effectiveness of the pilot phase, two sets of questionnaires were developed i) a pre-questionnaire to evaluate students' pre-knowledge on Sustainability and SDGs, and ii) a post-questionnaire to evaluate students' knowledge improvement on sustainability and SDGs, as well as assessment the effectiveness of the training based on the participants' perceptions. The pre-questionnaire covered closed-ended questions concerning the concepts and definitions of Sustainability and SDGs, and it served as a brief pre-quiz before starting the training. The post-questionnaire was conducted in 2 parts. The first part was the repetition of the same quiz questions on the sustainability and SDGs to assess the participants' knowledge improvement, and the second part included a set of closed and open-ended questions to assess the effectiveness of the training by covering 5 thematic areas: Structure of the training, its quality, learning materials, topics and content, and total satisfaction.

A five-point Likert scale was applied (from “very low” to “very high” or “very little” to “very much”) for the closed questions of the post-questionnaire (Otto *et al.*, 2019, p. 15). The survey was validated by the team engaged in developing the module (Moreno Pires *et al.*, 2022, p. 7). To analyse the closed questions, a descriptive data analysis was performed on the questionnaire data (Figueira *et al.*, 2018, p. 619; Perbandt *et*

al., 2021, p. 809). The open questions on the strengths/weaknesses and suggestions were analysed based on content analysis by grouping, and labelling categories, grounded on the units of meaning of participants' responses (Ghahramani, 2016, p. 284; Moreno Pires *et al.*, 2022, p. 7).

4. Results and Discussion

4.1. The results of the module design

The full module, comprising 156 study hours (equivalent to 6 ECTS workload), was structured in 6 micro-credential topics (each topic 1 ECTS): i) Introduction to Sustainable Development, ii) People, iii) Planet, iv) Prosperity, v) Peace, and vi) Partnerships. The first module covered the concept of Sustainable Development within the scope of a historical path, and the rest of the topics discussed the importance and fulfillment of the SDGs that make up each 5Ps, respectively.

Various learning materials were developed ranging from text and slides to videos and narrative and interactive multimedia presentations. Also, to cover the scientific content of each topic, a set of 6 introductory videos was produced to assist as the pedagogical material for each topic. Along with the learning materials, different individual/collaborative activities were also applied by using engaging and captivating tools such as Padlet, WIKIS, and Forums (in all topics). This approach followed Moreira *et al.* (2020) call on the use of diverse pedagogical materials and e-activities for a quality process of e-learning. Table 1 shows a summary of the module structure, the educational materials, and the associated activities in each topic.

Table 1. Module structure

Topic No.	Name	length	Content	Educational materials	Activities
0	Presentation of the module	1 Week	-Online environment -Learning roadmap	-Tool (Padlet)	-Wall of happiness (Ice-breaking activity) -Pre-questionnaire
1	Sustainable Development	2 Weeks	-Sustainable Development Concept -Historical context -Ideological conceptions -Transformations	-Video -Interactive multimedia presentation -Text	-Reflection about Sustainable Development (Individual)
2	People	2 Weeks	-The five SDGs that make up the P of People -Compliance with the P for People and SDGs 1, 2, 3, 4 and 5	-Video -Narrative introductory presentation -Text	-Indicators of the "People" pillar (Group work)
	Learning pause	1 Week	-Following the activities of the last 2 topics	-Guideline "Be Sustainable"	- Self-assessment checklist (Optional)
3	Planet	2 Weeks	-The concepts of the P for Planet -Interconnection between the Planet and SDGs 6, 12, 13, 14, 15	-Video -Text -Tool (Padlet)	-Creating a MindMap for the "Planet" pillar (Individual)
4	Prosperity	2 Weeks	- The concepts and challenges of Prosperity	-Video -Slides -Quiz -Tool (Padlet)	-Creating a visualization board for a prosperous life (Individual)

Topic No.	Name	length	Content	Educational materials	Activities
			- Interconnection between Prosperity and SDGs 7, 8, 9, 10, 11 - A prosperous life		
	Learning pause	1 Week	- Following the activities of the last 2 topics	- Guideline “Be Sustainable”	- Self-assessment checklist (Optional)
5	Peace	2 Weeks	- Peace and the absence of peace - The goals and targets of SDG 16 - The Challenges and solutions to Peace - The role of governments	- Video - Narrative interactive presentation (with quiz) - Text	- Analyse the reasons for the disparities of peace in 2 countries or - Analyse the peace indicators in 2 municipalities (Group work)
6	Partnerships	Week 13 & 14	- The concept and challenges of partnerships and SDG 17 - Interconnection with all SDGs - Inter-sectoral partnerships	- Video - Interactive slides - Text - Tool (WIKI)	identify a global challenge/crisis and suggest global partnership solutions (Group work)
	Learning pause (Conclusions)	Week 15	- Following the activities of the last 2 topics	- Guideline “Be Sustainable”	- Wall of happiness (Reflective activity) - Post-questionnaire

An extra topic at the beginning of the module welcomed students inside the content and online environment, inviting them to collaboratively build a “Wall of Happiness”, by sharing a photo about a well-being moment or activity in their life which was later revisited by them, in the last week (conclusions), in a reflective approach to link it with the SDGs and 5Ps concepts. All topics had detailed learning instructions, learning materials, and a mandatory activity for assessment, which in the end sum up 100 % of the assessment with the same weight.

Three units were also proposed as the pause weeks to take the opportunity for participants to complete the remaining activities of the last 2 topics. Served as an optional activity, in the pause units, the UAb guideline about “Be sustainable: Some tips to live sustainably on campus and outside” was presented to the participants which gave them the opportunity to self-assess their intentions for improving a sustainable life through a self-checklist available in the guide.

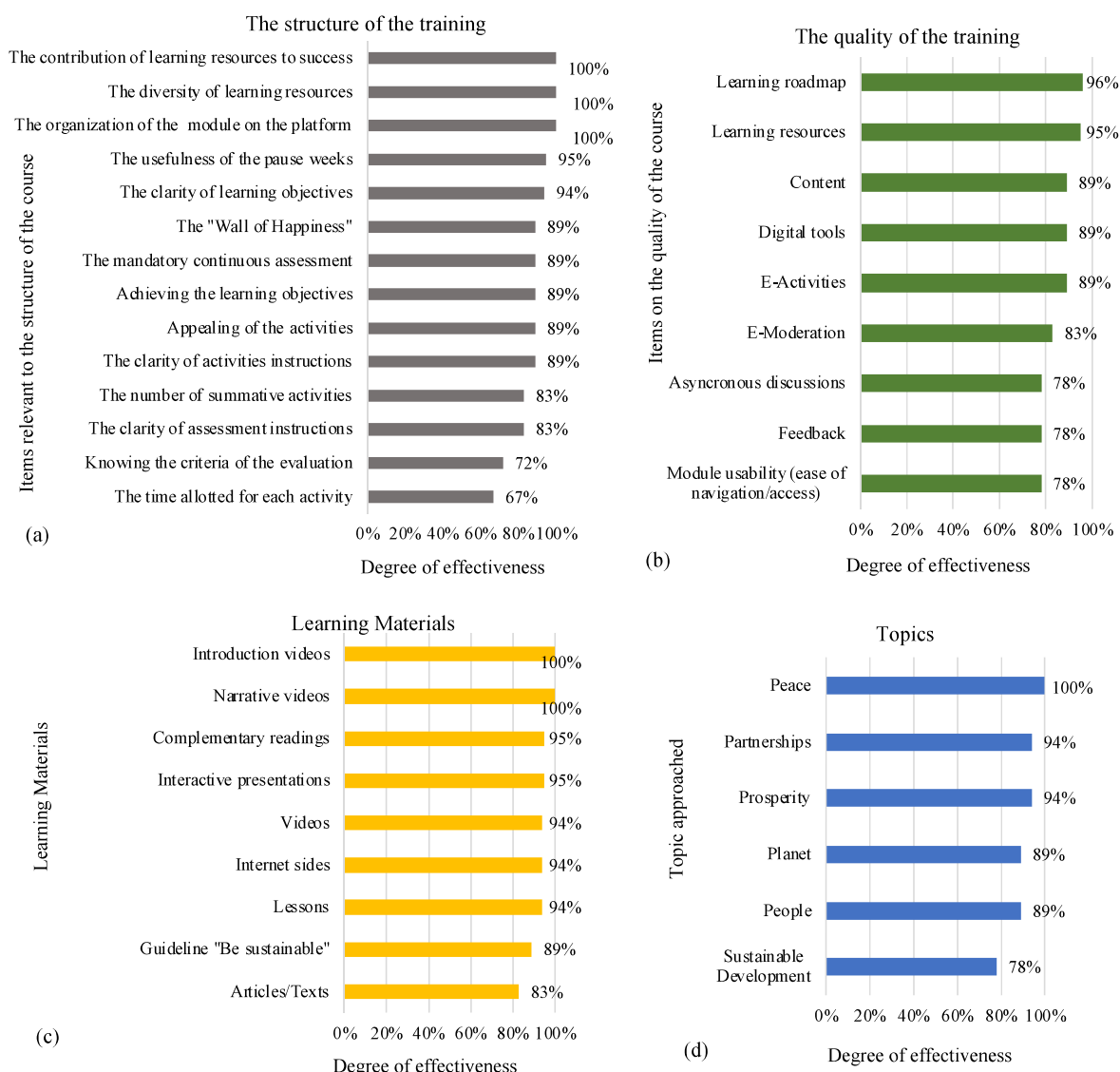
4.2. The results of the pilot phase and discussion

A total of 43 students, mainly from the undergraduate program of environmental Science, freely enrolled in the pilot training, led by 10 educators. Also, 2 instructional designers supported the team during the whole process of designing and implementing the pilot phase. In the end, 22 students finished all 6 topics successfully and responded to the post-questionnaire. Students’ perceptions of different content and applied materials of the module are shown in Figure 1.

The participants rated the “diversified learning resources” (Figure 1.a) as the most qualified aspect of the training which helped them to have a successful learning path. Also, as shown in Figure 1.b, the students specifically appreciated the “quality of the learning roadmap” presented at the beginning of the training to familiarize them with the training content, the learning path, and the evaluation methods. Among the learning

materials (Figure 1.c), the “narrative presentations” and the “introduction video in each topic” were mainly acknowledged by students as paramount materials. Within the topics, Peace stands in first place, closely followed by prosperity and partnerships both in second place (Figure 1.d). The results also show that 94% of the students were fully satisfied with the training.

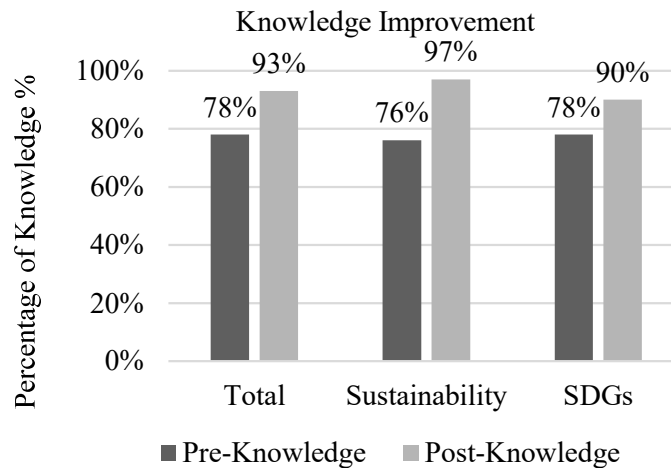
Figure 1. Participants’ assessment of (a) the structure of the training, (b) the quality of the training, (c) the usefulness of the learning materials, and (D) the usefulness of the covered topics



The results of the knowledge improvement (Figure 2) show a total of 15% increase in sustainability and SDGs knowledge, while a high level of knowledge improvement was observed mainly on the “sustainability” concept. This result demonstrates that considering the SDGs as a group of integrated goals (5Ps), not only raises the knowledge of the goals independently but also mainly expands the awareness of participants on sustainability as the main concept behind the SDGs. The results are aligned with the experience of an SDGs course at Netherlands university, where after the training on the SDGs, the students were able to develop a certain degree of critical, creative, and innovative thinking first about sustainable development in general and then the SDGs in particular (Kopnina, 2018, p. 1280).

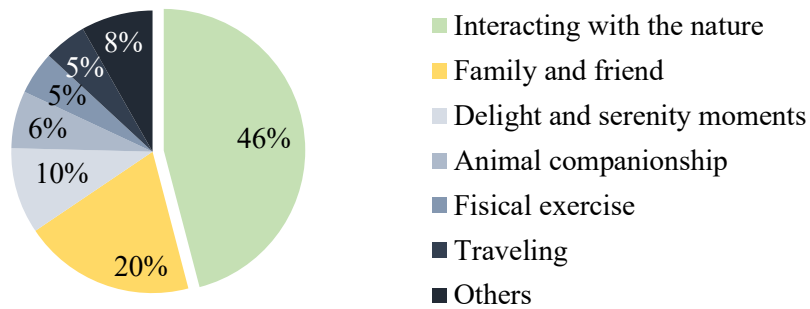
Notably, since the participants in the pilot phase were environmental science students, most of them already had an initial knowledge of the subject. Therefore, achieving a total of 15% improvement was a success for the pilot phase, although the background and natural interest of the participants could somehow have biased these results.

Figure 2. Participants' knowledge improvement



The results of the "Wall of Happiness" (Figure 3.) show that "interacting with nature" and "family", are the main contributors to developing positive-thinking approaches to achieving a sustainable life. Among those, around 60% of the indications pivoted on green conceptions (such as forests, natural parks, etc.), while the rest 40% of the indications, emphasized the blue conceptions (such as the moments of happiness in front of the oceans, seas, or lakes) which also highlights the effect of local and cultural issues on participants sense of wellness and happiness, where the participants were Portuguese and they mainly grew near the green and blue areas existing in the country. These results could be approved by the studies of Bullock and Hitzhusen (2015, p. 14076), that demonstrates culture is among the most important tenets of social responsibility, and "Sustainability has multiple cultures, approaches, and dimensions, there's not one exact path or one way to look at it."

Figure 3. The main themes addressed by participants on the "Wall of Happiness"



At the end of the training, the students were asked to back to the ice-breaking activities ("Wall of happiness") and make the link between the shared photos with the 5Ps. Based on their responses, the People and the Planet were the pillars that were mainly addressed in the wall, jointly followed closely by peace. These results are aligned with Nisbet and Gick (2008, p. 296)'s study which demonstrated the strong connection between health, happiness, and the environment so that well-being has been correlated with sustainability goals in such a way that happy people may be more likely to act environmentally and with a holistic understanding of the world (Albrecht, Albrecht, and Cohen., 2012, p. 7).

Also, the students emphasized that in addition to the planet - where they find their moments of happiness (such as nature, oceans, etc.) - the people who might join them in these moments can change positively their degree of happiness. The students' statements can be accredited by Trembly et al. (2020, p. 1590)' study that showed among the SDGs, SDG3 (good health and well-being) is one of the most compatible SDGs with the pillar of "People".

As the results showed, the team successfully implemented the module in the pilot phase. The Module is now ready for refining and to be taught in the next semesters by addressing a wider community inside and outside the University, thus contributing to the progress toward the 5Ps approach and UN agenda 2030, particularly SDG4, target 4.7. Some improvements will be added, based on lower scores of effectiveness, namely related to reducing the number of mandatory activities. Following Nah et al. (2014, p. 403) it will also be considered adding some gamification activities to students as motivation to those that participate in activities that will not be mandatory.

5. Conclusion

Micro-credentials have been growing significantly in the context of higher education, however, still, the trace of micro-credentials covering the concept of sustainability centered on an integrated approach of all 17 SDGs is in its early stages. Based on a pilot case study at Universidade Aberta, this study aimed at developing a micro-credential e-learning module entitled “Sustainable Development Goals”, conceptualized by a multidisciplinary team, as well as assessing the effectiveness of the pilot training and its different educational materials on participants’ knowledge growth. In particular, the study explored how considering the SDGs as a group of integrated goals, instead of addressing them as independent goals, affects the level of participants’ knowledge achievement on sustainability issues as a general concept.

Based on the participants’ perceptions, among the 5Ps, the pillars associated with people and the planet, in line with interacting with nature and family/friends, have been acknowledged as the main influencing factors in developing positive-thinking approaches toward achieving a sustainable life. Rating the “diversified learning resources” as the most qualified aspect of the training, the narrative presentations, and the introduction videos were acknowledged as dominant materials. In terms of topics, all topics reached a high degree of learning effectiveness, particularly Peace, closely followed by Prosperity and Partnerships.

Future work of the UAb Sustainable Campus Group includes offering the SDGs micro-credential, from Oct 2023 onwards to the wider community, targeting also public and private organizations, and later as a formal curricular unit in various degrees, thus enhancing the commitment of UAb on the “involving the community” element. The pedagogical model and the 5P approach can be used and tested in other HEI hoping to contribute to the effective SDGs education.

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