Empowering youth for sustainability in universities: service-learning and the willingness to act

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Abstract

Purpose – Service-learning (SL) shows potential to respond to the global policy agenda of education for sustainable development (ESD) by increasing pro-sustainability competences through direct involvement of students in projects that satisfy identified community needs. Nevertheless, there is a scarcity of studies that attempt to measure the impact of SL on students' sustainability competences, especially the action competence. This study aims to address this gap by examining the experiences of higher education students.

Design/methodology/approach – A pre-post survey design based on the Self-Perceived Action Competence for Sustainability Questionnaire was conducted on an interdisciplinary group of 219 students of two courses (Sustainable Development and Ecology) in Medellin, Colombia, half of which (109) participated in SL projects.

Findings – Sufficient empirical evidence was found to suggest that SL boosts the impact of academic courses regarding action competences in students (specially their willingness to act).

Research limitations/implications – The statistical analysis shows some contradictions that should be addressed in further research.

Practical implications – These results can encourage more educators and universities to implement strategies such as SL to move forward with ESD and thus help overcome the current socioecological crisis.

Originality/value – This paper not only discusses the theoretical potential of SL but also contrasts theory with empirical observations of 13 SL projects assessed in terms of self-perceived action competence for sustainability.

Keywords Service-learning, ESD, Experiential learning, Transformative action, Higher education, SDGs

Paper type Research paper

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1. Introduction

Higher education institutions play an essential role in transforming societies by educating decision-makers, leaders, entrepreneurs and academics (Lozano *et al.*, 2013). In terms of sustainability, there is evidence that they have raised awareness in favour of sustainable development (Lee *et al.*, 2013), have contributed to the pursuit of regional sustainability initiatives in collaboration with other local actors (Karatzoglou, 2013) and have begun to make more systemic changes towards sustainability (Wals, 2014). Conversely, it has been noted that universities are responsible for putting development on the track of unsustainability as "mainstream higher education is implicated in the crises we are experiencing through training world leaders" (Sipos *et al.*, 2008, p. 70) and because the types of and ways in which academic institutions produce knowledge have been seen as insufficient to contribute to a timely transition to sustainability (Miller *et al.*, 2011).

Universities can leverage changes towards sustainability by educating students to become responsible citizens rather than educating them solely for gainful employment. In other words, they are expected to focus "on more than simply delivering employability or servicing the business as usual economy" (Blewitt, 2010, p. 481), using their capacity to generate and exchange relevant and valuable knowledge while students are trained to contribute to a sustainable future (Barth *et al.*, 2016). Overall, universities need to find ways to exploit their untapped potential to contribute to regional and global sustainability initiatives (Zilahy and Huisingh, 2009). But how can this be done?

Education for sustainable development (ESD) proposes a reorientation of education systems towards sustainability, following a whole-institution approach (Kohl *et al.*, 2021). Universities can transform their physical facilities, include sustainability criteria in their organisational and operational tasks, strengthen research related to sustainability challenges, enhance their service to the community and update contents and didactic approaches to foster sustainability competences. It is in the fields of didactics and competences that this paper focuses its attention, specifically in terms of how the implementation of a service-learning (SL) approach favours the development of the action competence.

SL and other real-world learning experiences have been thought to positively impact cognitive, socioemotional and potentially behavioural learning dimensions (Sipos *et al.*, 2008). These action-oriented approaches connect learners with challenging situations faced by real people, enabling interaction with the problem and the search for solutions to alleviate it. The effect of real-world experiences is twofold: part of a solution to a pressing problem is provided, and the students' learning is more meaningful because, as Fals-Borda(1987, p. 332) described, "through actual experience of something we intuitively apprehend its essence, we feel, enjoy and understand it as reality, and we thereby place our own being in a wider, more fulfilling context" (p. 332).

Although the construct of SL is rather ubiquitous in the literature, a great deal of this theoretical construct and its application in terms of action competence, when applied in practice, remains to be examined. To achieve the latter, two courses related to sustainability were evaluated in terms of the self-perceived action competence of two populations of students within higher education courses: those who participated in an SL project and those who did not. The authors hypothesise that the SL project will make the courses more adequate to promote the action competence.

In Section 2, ESD concepts, UNESCO's sustainability policies and the importance of action competence and SL are introduced. Section 3 details the research methodology, including the Self-Perceived Action Competence for Sustainability Questionnaire (SPACS-Q) and the experiment design, as well as SL project elements. The findings are presented in Section 4 and Section 5 contains the conclusions.

2. Background

2.1 Sustainability and education

Education should help us find and build our place in society and the natural world, acknowledging "that humans are embedded within ecosystems and that we are ecological, not just social, beings" (Common Worlds Research Collective, 2020, p. 4). Moreover, a quality education should equip us with skills, values, attitudes and behaviours to solve the world's problems and thrive individually and collectively. A new learning culture is required "which does not confirm academic tradition but examines its potential for a sustainable future, in an open-minded, reflexive and participative process" (Rieckmann, 2011, p. 128). Without these critical reflections, education will be a process of reproducing the current values that have led us through a path of unsustainable development.

ESD represents a change in educational paradigms by highlighting the elements of the learning process that foster societal transformation towards sustainability (Barth *et al.*, 2016). ESD supports "individuals in reflecting on their own actions by taking into account their current and future social and environmental effects – from a global perspective – and to intervene productively in shaping them in a sustainable manner" (Barth *et al.*, 2016, p. 1). Therefore, it is a process of critical reflection and action rather than a tool for indoctrination.

ESD uses a holistic and transformational approach to education that addresses not only content and learning outcomes, but also the field of pedagogy and the learning environment (Rieckmann, 2018). The ESD agenda also seeks to enter the policy arena to gain support and impulse. Nonetheless, the need to go from rhetoric to action has been identified. In this sense, Leal *et al.* (2015, p. 121) posited that for ESD "one of the major stumbling blocks is the overuse of and obsession with technical jargon that detracts attention from what is really important, i.e. action".

2.2 UNESCO and education for sustainable development: calling for action

In 2015, the Global Action Programme on ESD was launched with the aim of generating concrete actions on ESD that could be scaled up for rapid progress towards sustainability. Five priority action areas (PAAs) were defined to gain strategic focus and ensure the inclusion of all relevant actors. These PAAs are related to advancing policy; transforming learning and training environments; building capacities of educators and trainers; empowering and mobilising youth; and accelerating sustainable solutions at local level (UNESCO, 2014).

The current policy roadmap of UNESCO for ESD (ESD for 2030) keeps these five PAAs and emphasises education as a pivotal contributor to the achievement of SDGs. It also declares three key notions or key reflections for ESD:

(1) transformative action;

(2) structural changes; and

(3) the technological future (UNESCO, 2020).

Furthermore, UNESCO requires ESD to embrace "action-oriented, innovative pedagogy to enable learners to develop knowledge and awareness and take action to transform society into a more sustainable one" (UNESCO, 2020, p. iii) and stresses the "particular emphasis on competences related to empathy, solidarity and action-taking" (UNESCO, 2020, p. 14). For actions for sustainability to occur, it is essential to have relevant knowledge and information, and to possess the abilities and the willingness to apply that knowledge in a specific context. This brings us to the concept of competence.

2.3 Competences and action

A competence is a "cluster of specific and interrelated individual dispositions comprising knowledge, skills, motives and attitudes, i.e. combining cognitive, affective, volitional and motivational elements" that "facilitates self-organised action, a pre-condition to achieving successful performance and a positive outcome in various complex situations, responding to the specific situation and context" (Brundiers *et al.*, 2021, p. 17). The term "action competence" has been used to highlight an action component under the argument that it is something "voluntary and targeted at bringing about change or solving a controversial issue", thus different from "mere" behaviour (Olsson *et al.*, 2020, p. 744).

The action competence is a competence "of individuals and/or groups, focused on solving sustainable development issues" (Sass *et al.*, 2021, p. 3) that has been linked "to democratic, political education and to a radical version of the notion of 'Bildung'" (Mogensen and Schnack, 2010, p. 60), which aims at the "full development of the capacities and powers of each human individual to question preconceived opinions, prejudices, and 'given facts', and intentioned participation in the shaping of one's own and joint living conditions" (Mogensen and Schnack, 2010, p. 61). As the action competence has been considered an enabler of outcomes related to knowledge of action possibilities, confidence in one's own influence and the willingness to act, Olsson *et al.* (2020) developed a research instrument in the form of a questionnaire to explore the operationalisation of the concept of action competence for sustainability. This instrument is used in this paper and will be explained within the methodological section.

UNESCO emphasises the intention of fostering sustainability competences. Indeed, based on different frameworks (see De Haan, 2010; Rieckmann, 2011; Wiek *et al.*, 2011), UNESCO proposed in 2017 eight key competences for sustainability:

(1) systems thinking competence;
(2) anticipatory competence;
(3) normative competence;
(4) strategic competence;
(5) collaboration competence;
(6) critical thinking competence;
(7) self-awareness competence; and
(8) integrated problem-solving competence (UNESCO, 2017).

Although the action competence is not present as such, three of these competences (strategic, collaboration and integrated problem-solving competences) highlight the importance of action (UNESCO, 2017).

Brundiers *et al.* (2021) proposed an updated reference framework for key competencies for sustainability in higher education. This framework includes an implementation competence, which is considered "essentially action competence, using actionable knowledge that has been created through strategic-thinking competence" (Brundiers *et al.*, 2021, p. 21). It is further described as "taking conscious action, i.e. doing the actions associated with the solution process that is the (intellectual) result of integrated problem-solving competency in the first place" (Brundiers *et al.*, 2021, p. 21).

Including action in the policy mission for ESD and defining key competences for sustainability that include action are important steps, but further operationalisation is required in the form of pedagogical approaches and didactic strategies. The following section discusses SL, a pedagogical approach analysed *vis-à-vis* the potential to foster

sustainability competences (mainly the action competence) and the accomplishment of the ESD agenda.

2.4 Service-learning

UNESCO identifies three sustainability learning dimensions: cognitive, socioemotional and behavioural. The latter emphasises practical action in personal, societal and political spheres (UNESCO, 2020). In this line, Sipos *et al.* (2008) proposed the framework of transformative sustainability learning, oriented by the simultaneous inclusion "of learning objectives corresponding to cognitive (head), psychomotor (hands) and affective (heart) domains of learning that facilitate personal experience for participants resulting in profound changes in knowledge, skills and attitudes related to enhancing ecological, social and economic justice" (p. 69).

SL is aligned to these purposes, as it integrates tangible community service or engagement (heart) within the educational curriculum (head), offering students academic credits for their active involvement (hands) in community initiatives and providing an avenue for the community to tackle real-world issues (Brundiers *et al.*, 2010; Preradović and Čalić, 2022). Regarding the emotional domain, SL encourages an action-reflection approach for social change, unlocking intellectual, emotional and moral potential for self and societal transformation and fostering critical moral awareness and a sustainability mindset in higher education (Margaret *et al.*, 2010).

2.4.1 Definition and characteristics of service-learning. SL has acquired renewed relevance as demands for action for sustainability and thus for more active pedagogical approaches are made. As an approach that fosters student engagement with the local community to instigate beneficial transformations (Helicke, 2014), it puts classroom-acquired knowledge into practice and cultivates leadership competencies while contributing to real-world community endeavours (Ferdiansyah *et al.*, 2022). Specifically, SL has been defined as a "credit-bearing educational experience in which students participate in an organized service activity that meets identified community needs and reflect on the service activity in such a way as to gain further understanding of course content, a broader appreciation of the discipline, and an enhanced sense of civic responsibility" (Bringle and Hatcher, 1996, p. 222). Relatedly, Barth *et al.* (2014, p. 6) considered "SL programmes have an academic context and are designed in such a way that both the service aspect enhances learning and the learning process enhances service in an integrated way, not merely as a supplementary activity".

SL focuses equally on the service being provided and the learning occurring (Bringle and Hatcher, 2000). It is considered an effective pedagogical approach *vis-à-vis* real-world transformations towards sustainability: it is action-oriented as it helps solve existing sustainability problems while it allows students to become more aware of unsustainable realities and more capable of examining them critically and actively tackling their causes (Álvarez-Vanegas *et al.*, 2024). This is aligned with the perspective of Deeley (2016), who posits that the main effects identified in the literature of SL can be categorised into three groups:

(1) improvement in the sense of citizenship;

(2) an accelerated intellectual development; and

(3) better personal development.

SL projects involve the stages of preparation, action and reflection, in a process that includes establishing partnerships with community organisations, diagnosing sustainability problems, developing solutions and concluding the service activity, and reflecting on the whole

experience (Rey-Garcia and Mato-Santiso, 2020). Another interesting perspective on the phases or characteristics of SL is provided by Godfrey *et al.* (2005), who present a model outlining essential components for successful SL, referred to as the 4 Rs: Reality, Reflection, Reciprocity and Responsibility. Respectively, these elements relate to the practical grounding, the introspective aspect of effective experiential learning, the two-way interaction with the community and the ethical commitment to enhance community well-being in SL.

2.4.2 Service-learning in universities' practice for sustainability. Tejedor *et al.* (2019, p. 1) considered SL to be one of the pedagogical strategies "most relevant for training in sustainability competences in college students, according to the guidelines commonly accepted by the international academic community". Examples of applications of SL in relation to ESD include a great variety of areas, involving urban sustainability and social responsibility in engineering (Biberhofer and Rammel, 2017; Cabedo *et al.*, 2018; Hirsch *et al.*, 2023). SL has also been implemented in the fields of coastal sustainability, circular economy and infrastructure (expanding and refurbishing indoor and outdoor learning spaces in public high schools) (Kawabe *et al.*, 2013; Montiel *et al.*, 2021; Sánchez-Carracedo and López, 2021). SL has also been successfully implemented SL in the fields of art (Jacobs, 2023; Laven, 2023), analytical chemistry (Tong *et al.*, 2023), accounting (Lee and Perdana, 2023) and economics (Arnold, 2021). In the latter, it is considered that SL "makes an essential contribution to the teaching of economics at universities, as it enables a wide range of competencies and can combine meaningful practical work with scientific demands" (Arnold, 2021, p. 118).

It is important to highlight that the incorporation of SL in higher education practices related to sustainability often include critical perspectives about the current paths of development, calling for social inclusion (LeBlanc and Odegard, 2023), non-hegemonic perspectives (Espinet *et al.*, 2023) and critical (eco)feminist approaches. The incorporation of SL in universities is also related to the purpose of promoting civic engagement and prosocial behaviours (Colio *et al.*, 2023; McDougle and Li, 2023).

In the Peruvian context, Severino-González *et al.* (2023) explored the students' perception of SL impact and find that its application encourages a shift in students' social imagery by promoting a comprehensive perception of society, a sense of life transcendence and territorial belonging. Also in the Latin American context, Fonseca and Jovchelovitch (2023) documented the experience of the critical service-learning course "Community Psychology Applied to Post-Conflict Settings" in Colombia. The authors report that "the encounter between students and former combatants in the safe space of a service-learning initiative can produce remarkable transformations in representations of self, other and peace and reconciliation" (Fonseca and Jovchelovitch, 2023, p. 13). Also in the conflict-affected context of Afghanistan, Franklin *et al.* (2023, p. 1328) argued that SL implementation in the field of tourism education leads to the "empowerment of students to contribute to local solutions which serve a role in stabilization efforts".

Measured against specific sustainability metrics, SL has been considered to have the potential to enhance and fortify understanding, awareness, empathy and collaboration concerning the SDGs (García-Rico *et al.*, 2021; Martín-Sánchez *et al.*, 2022; Ribeiro *et al.*, 2023; Villacé-Molinero *et al.*, 2023). In addition, Molderez and Fonseca (2018) analysed the impact of a SL project on sustainability competences, but due to the framework chosen, the focus on action (which is one of the most promising aspects of SL) was not visible.

Given this context, the significance of SL in universities becomes evident. It spans various disciplines, acting as a catalyst for tackling sustainability challenges, steering universities away from a reductionist professionalisation role. Instead, they become places where students strengthen their civic responsibility and are equipped with competences that enable them to contribute to sustainability from their personal and professional lives.

Nonetheless, despite its applications and relevance to action, to date, the impact of SL on ESD is largely unexplored or tested against the background of the action competence in the empirical literature. For this reason, this paper examines the impact of SL projects on students' action competence for sustainability.

3. Methodology

Two courses were evaluated *vis-à-vis* the action competence and the implementation of SL projects. To do so, the SPACS-Q (Olsson *et al.*, 2020) was used in a pre-post survey design. This instrument fits the purpose of this research, namely, to analyse to what extent SL fosters action competences for sustainability. The SPACS-Q has also been validated in the academic literature and is divided in three sections or subscales:

(1) knowledge of action possibilities (KAP);

(2) confidence in one's own influence (COI); and

(3) willingness to act.

In total, it consists of 12 questions, each for one sub-scale (questions shown in Table 2).

3.1 Service-learning projects and experiment design

A set of experiments with 13 SL projects was developed in the second semester of 2021 with the hypothesis that participation in these projects would positively impact the students' action competence for sustainability. The target population consisted of students from two elective courses (Ecology and Sustainable Development) at Universidad EAFIT in Medellin, Colombia, who worked together with community leaders to address problematic issues within their communities. The courses are elective and attended by undergraduate students who come from various disciplines.

The recruitment of the population occurred once students chose to attend the courses. To compare the effect of the SL strategy, not all students participated in the SL projects. A division in two groups was done in the second week of class, when students were offered the possibility of participating in an SL project related to the contents of the courses to do the final project of the course. Surveys were applied to both groups of students (baseline and treatment) immediately after starting the course (i.e. in the first week of the semester) and right before completing the course (week 16). Figure 1 shows the timeline and division in this intervention.

The SL projects covered topics related to the courses in question (Ecology and Sustainable Development). The specificities of the projects were defined in conversations between the researchers and the community leaders before the start of the courses, but they could vary depending on the emerging needs of the community partner. For instance, a project was offered together with the Low Carbon City Foundation and was initially oriented towards urban agroforestry, but ended up involving additional activities such as building a playground for children. Other projects were directed to planting trees in a place affected by deforestation, to help eradicate *Thunbergia alata* – an exotic and highly invasive species in Colombia, or to compost organic waste together with community partners.

A list of 13 SL projects, a summary of their rationale and the community partners involved (which could be individuals, organisations and collectives of citizens, NGOs and governmental bodies) can be found in Table 1.

The 13 SL projects are considered a unique intervention or variable. All the projects followed the same instructions and, thus, the same structure and phases described in the previous section (preparation, action and reflection) with an equivalent intensity and in a very similar proportion. In the preparation phase the procedure was the same: meetings with

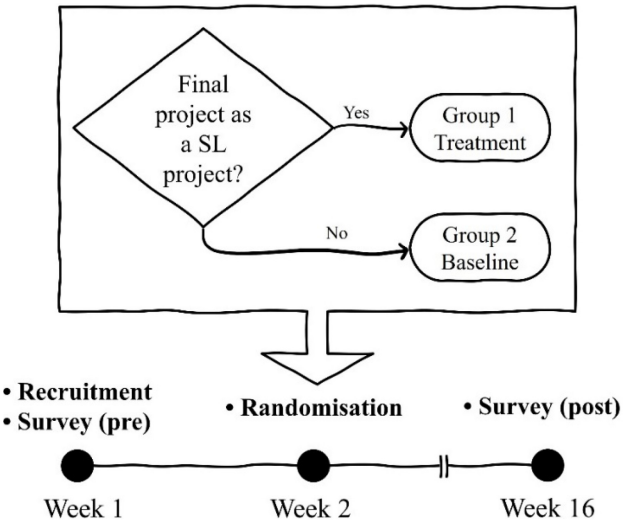


Figure 1.
Steps of the research process for the pre-post survey design

Source: Authors' own creation

the community partners were organised and those partners that the author had previously identified (in other projects or initiatives) were considered for the SL projects, using the same selection criteria for choosing the partners (which included genuine interest, multiplier effect and leadership and experience of the partner, as well as logistical feasibility, safety and security in the territory of action).

The consistency of the approach between projects was present not only in the preparation but also during the action and reflection stages. All the projects included not only one day of action, but following the structure of preparation, action and reflection, all students would also participate in at least one conversation with the community leader, write an essay about the specific topic of the project (its relevance in their region and globally, against the background of sustainability principles and the 2030 Agenda) and develop and share with their classmates a reflection around their personal experience and the most important lessons they learned, as shown in Figure 2.

In summary, the SL programmes used in this study exhibited consistent characteristics and adhered to a uniform structure in terms of activities and time commitment.

3.2 Statistical analysis

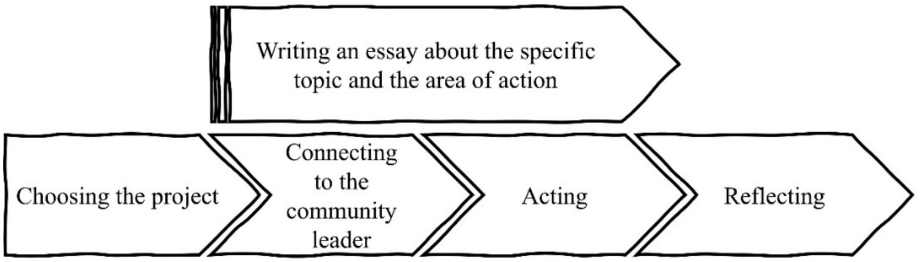
Univariate and bivariate statistical analyses were performed to describe the sample. This was done at a general level ($n = 219$) and separating the sample two groups: students who participated in the SL project ($n = 109$) and those who did not ($n = 110$). A general comparison analysis of paired or related samples was carried out with the null hypothesis that the difference between the means of the responses of the first and second questionnaire was equal to zero, i.e. that there were no differences between the responses in both questionnaires (final and initial). An alpha level below 0.05 would indicate the rejection of this hypothesis. For this analysis, the student's *t*-test for related samples was used.

Then the difference in the responses to the questionnaires was calculated, considering social and academic variables such as gender, the undergraduate programme, the professor

Project(s)	Rationale	Community partner(s)
Planting trees (2)	Trees were planted in different places (urban and rural) affected by deforestation	Community leaders in Guarne and Envigado, environmental authorities (in Envigado)
Control of an invasive species (2)	Helping to eradicate *Thunbergia alata* – an exotic and highly invasive species in Colombia	Community leaders
Tactical urbanism (1)	Creation of gardens and urban equipment, playing music and other activities to disincentivise people from throwing garbage in a neighbourhood	Community centre, music band, collective (Más Urbano)
Community vegetable garden (1)	Maintenance of a community vegetable garden, an initiative that started during the pandemic led by an elderly woman	Community leader, collective (La Savia)
Strengthen urban biodiversity (4)	Planting different species of flowering plants to attract and host pollinators. These projects were done in different parts of the city (e.g. a cemetery where victims of violence are honoured with a garden)	Community leaders, collectives, cultural organisations, academic centres (Partido de Las Doñas, Corporación Otraparte, urbam)
Peasants for one day (1)	Helping a family that runs a small agroecological farm to see the importance of sustainable agriculture and value the work of those who do it	Agroecological peasants
Urban agroforestry (1)	Planting different species of trees and edible plants as a part of a celebration of the first decade or a marginal neighbourhood	Community leaders, NGO (low carbon city)
Composting and gardening (1)	Working together with a couple who process organic waste and maintain a garden in the community where they live	Community leaders

Source: Authors' own creation

Table 1.
SL projects included in this research



Source: Authors' own creation

Figure 2.
Phases of the 13 service-learning projects

who taught the course and whether or not they had participated in the SL project. A chi-square test of independence was used, the null hypothesis being that the difference between the responses from one questionnaire to another was independent of the variable analysed, i.e. that no relationship exists between the difference in the responses from one questionnaire to another, with the variable studied (gender, undergraduate, professor and

SL course). For this analysis, the statistical software Stata 15 was used. The issue of self-selection bias was identified. To address it, depending on whether students participated in SL or not, two subpopulations were created to analyse the impact of the courses separately.

4. Findings

4.1 Results

Among the 219 students who participated in the courses, the three undergraduate degrees with the highest number of students were International Business (16.4%); Business Administration (16.0%) and Product Design Engineering (7.8%). Conversely, the undergraduate programs with the lowest number of students were Biology (1.4%); Process Engineering (1.4%) and Music (0.9%). Three groups were formed for analysis: Humanities (17,.%), Business and Economics (43.8%) and Science and Engineering (38.4%). The sample was balanced in terms of gender (52.5% female and 47.5% male participation) and the type of course (48.9% in Sustainable Development and 51.1% in Ecology).

As shown in Table 2, the analysis of means for the general population indicate there were statistically significant differences between the answers (final and initial) in all the items of the SPACS-Q. Regarding the analysis by study variables, statistically significant differences were found when gender was analysed, as greater differences were observed between the final and initial responses of women in two statements: "I know how one should take action at home in order to contribute to sustainable development" and "I want to engage in changing society towards sustainable development". A further analysis indicated that the undergraduate programme approached significance ($p = 0.057$) for changes in the item "I know how one should take action together with others in order to contribute to sustainable societal development". There was no statistical difference regarding the professor instructing the course. This was also the case when the influence of SL in the general population was analysed: no statistical difference in any of the items of the survey was found.

In the subsequent analysis of subpopulations of participants (SL) and non-participants in SL (NO-SL), a different behaviour in each sample was identified. The last two columns in Table 2 summarise the statistical significance for each one of the items of SPACS-Q in the SL and NO-SL populations. The item "I want to take action for global sustainable development" showed no significant statistical difference in any of the separated samples.

In the final survey, SL participants were asked additional questions about their project involvement. To the question "How was the SL experience for you?", 102 students (93.6%) stated that they found it "Excellent", 4.6% (5 students) thought it was "Good" and 1.83% (2 students) rated the experience as "Not so good". Furthermore, these students were asked three questions related to the theoretical benefits of SL with regard to the head-heart-hands model:

(1) more appropriation of concepts;

(2) greater sensitivity against the world's problems; and

(3) motivation towards action.

Figure 3 shows that students answered in a positive way to these questions: 95.4% somehow and totally agreed to; also 95.4% somehow and totally agreed to; and 98.2% somehow and totally to c).

In addition to answering closed questions, participants in SL also had the opportunity to share their thoughts about SL and 45 of them offered their thoughts on the open-ended questions. Forty-one of these comments strongly supported their

Table 2. Results of the SPACS-Q for the general population and SL and NO-SL subpopulations

Area	Questions	*p*-value						
		General population					Subpopulations	
		General	Sex	Discipline	Professor	SL	NO-SL	SL
Knowledge of action possibilities	I can see different points of view on issues when people think differently	0.0001	*0.7010*	*0.4160*	*0.6860*	*0.3360*	0.0046	0.0110
	I know how one should take action at school to contribute to sustainable development	0.0000	*0.3130*	*0.5090*	*0.8320*	*0.1950*	0.0000	0.0000
	I know how one should take action at home to contribute to sustainable development	0.0000	0.0430	*0.2830*	*0.8510*	*0.3050*	0.0000	0.0000
	I know how one should take action together with others to contribute to sustainable societal development	0.0000	*0.9920*	*0.0570*	*0.9670*	*0.5860*	0.0000	0.0000
Confidence in one's own influence	I believe I can influence global sustainable development through my actions	0.0000	*0.5380*	*0.9530*	*0.2520*	*0.4070*	0.0185	0.0000
	I believe I can influence sustainable development in my community	0.0000	*0.6670*	*0.2990*	*0.2150*	*0.9320*	0.0002	0.0011
	I believe I have good opportunities to participate in influencing our shared future	0.0000	*0.8640*	*0.3600*	*0.5210*	*0.1600*	0.0190	0.0000
	I believe what each person does matters for sustainable development	0.0092	*0.3980*	*0.1800*	*0.5260*	*0.0920*	*0.7465*	0.0007
Willingness to act	I want to take action for sustainable development in my community	0.0003	*0.1260*	*0.8770*	*0.7000*	*0.2540*	0.0070	0.0146
	I want to take action for global sustainable development	0.0153	*0.3020*	*0.2430*	*0.7790*	*0.2760*	*0.0789*	*0.0957*
	I want to engage in changing society towards sustainable development	0.0119	0.0270	*0.4840*	*0.4490*	*0.5500*	*0.2660*	0.0146
	I want schoolwork to be about how we can shape a sustainable future together	0.0078	*0.0800*	*0.8020*	*0.4120*	*0.6870*	*0.2467*	0.0062

Note: Values in italics indicate absence of statistical significance
Source: Authors' own creation

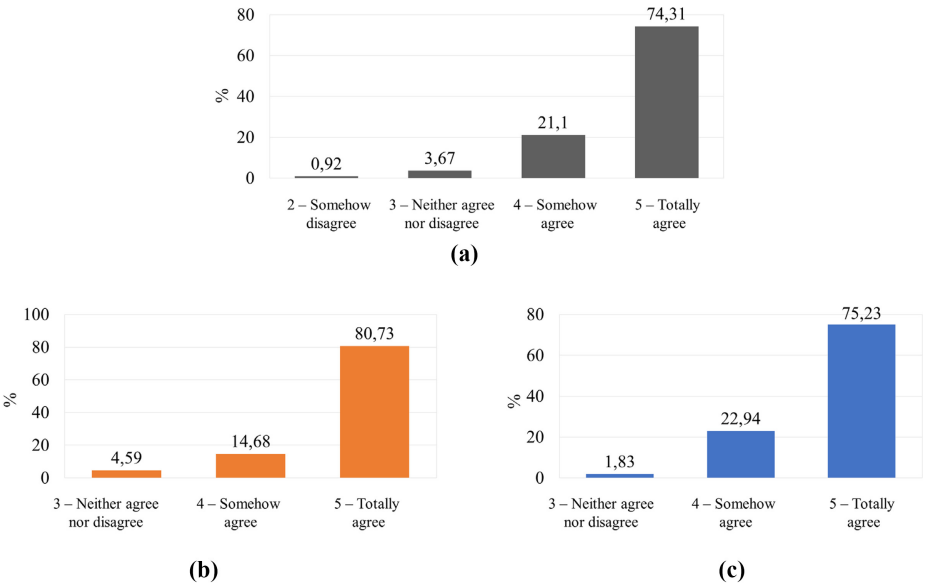


Figure 3.
Self-perception of the impact of SL in head, heart and hands

Notes: (a) SL helped me strengthen the concepts of the course; (b) SL made me more sensible to the worlds social-ecological problems;(c) SL motivated me to take action to help building a more sustainable world
Source: Authors' own creation

participation in the SL project. Student 3 wrote that "this type of activity is excellent, as it moves away from common assessments and makes the classes more dynamic". Student 10 commented that "true learning is obtained in practice and [learning] by serving others generates a beautiful sensitivity towards our surroundings, in this case with regard to the peasants and the environment".

In some cases, students highlight that the SL project is interesting or entertaining and their comments suggest an improved willingness to act. Examples of this were: Student 16 wrote "It was a very entertaining experience that allowed me to take a step on this path towards sustainability" or Student 18, who mentioned that it was "A very interesting experience that took me out of the routine, I would like to continue doing this type of activity in my community and other corners of the city". This emphasis on the outreach to the community was also made by other students who commented that "It is great to be able to do more than a project or research that remains on a simple piece of paper[. . .] the opportunity to live [the project] in one's own flesh and help a community was something incredible" (Student 21) and that "I was very impressed by the work that was done in the cemetery, not only having restored the garden but also feeling the connections in the community" (Student 28).

Student 109 recommended the university "continue doing it [SL] with all the groups [of students] and try to get all the members of the course to participate since this helps to raise awareness and change a little the bad habits that we have". Finally, Student 45 even mentioned that "Service-Learning is a project that should be shared in the city or even in the country, it is a project that helps you to open your eyes and shows how you can contribute to [improve] a place with enormous environmental problems".

4.2 Discussion

The fact that the influence of SL in the general population showed no statistical difference suggested a rejection of the main hypothesis, namely, that SL could have a positive impact in terms of the action competence for sustainability. However, the analysis of subpopulations indicated that SL did have a positive impact in the courses. As it can be seen in Table 2, in the case of NO-SL, the courses had an impact on the students in eight of the twelve statements. This number rises to 11 for the SL population. These results suggest that due to the SL projects, the courses might have had a greater impact, specifically in relation to three items: "I believe what each person does matters for sustainable development", "I want to engage in changing society towards sustainable development" and "I want schoolwork to be about how we can shape a sustainable future together".

These results suggest that courses related to sustainability using SL could indeed have a more positive impact in the self-perceived action competence for sustainability, especially in terms of the willingness to act, which is an indicator of better possibilities of action. The negative result of the item related to take action for *global* sustainable development ("I want to take action for global sustainable development") might suggest that the SL projects may have caused a strong focus on local issues, weakening the global perspective crucial for sustainability. However, the negative result was also seen in the NO-SL group, maybe due to the fact that students are willing to act locally, but are overwhelmed by the global scale of sustainability challenges, probably thinking that at this level only extremely powerful decision-makers can make a difference.

The answers to the questions in the final survey regarding the cognitive, socioemotional and behavioural domain (respectively, "SL helped me to strengthen the concepts of the course"; "SL made me more sensitive to the world's socioecological problems" and "SL motivated me to take action to help building a more sustainable world") support the view that SL has a positive impact the action competence for sustainability. It is interesting to note that the percentage of those who totally agree with the three questions was the highest for the third item ("SL motivated me to take action to help building a more sustainable world"). Collectively, the comments from SL participants also suggest that SL does have a positive impact in terms of ESD competences, especially the action competence. As indicated in the literature, SL seems to stimulate not only the cognitive but also the affective and psychomotor domains (Sipos *et al.*, 2008). As suggested by Barth *et al.* (2014), the experience of service does not seem to be a mere supplementary activity, but an integrated part of the learning process. Also, stimulation of the sense of citizenship (Deeley, 2016) is indicated by the fact that students recommend the replication of SL experiences in the institution and at country level and highlight the value of helping the community. Finally, the comments indicated that the SL projects improved conscious action by showing action possibilities, as well as by fostering confidence and increasing the willingness to act (Brundiers *et al.*, 2021; Olsson *et al.*, 2020).

The implications of this research are relevant because the present results support the theoretical potential of SL to contribute to sustainability in terms of fostering sustainability competences, specifically in terms of the action competence, which is urgently required against the background of critical sustainability challenges that can only be solved if transformative practices accompany the theory. This means that SL can foster the transition of higher education towards sustainability and thus the progress of the ESD and SDGs Agendas.

It is also worth noting that in SL projects, it is highly advantageous for students, community partners and educators to collaborate from the beginning. This early collaboration establishes a robust and fresh connection, enabling the identification of community needs and the subsequent planning of SL actions through a deeply collaborative process. Nevertheless, forming a respectful and genuine relationship with the community is a time-consuming

endeavour. Therefore, the approach taken in this study is worth considering, where the primary connection is initially forged between the educator and the community partners. Subsequently, the educator acts as a bridge, nurturing trust and empathy.

Finally, it is essential to recognise educators' limitations and challenges in implementing such practices in their teaching. Educators may need more sustainability competences, or even if they possess them, they often juggle multiple responsibilities like teaching, research and outreach facilitation (including securing financial resources for their projects). These competing demands can leave educators with insufficient time to promote and oversee pedagogical strategies that involve intricate planning processes and relationship-building. As a result, another indirect implication of this study, both in practical and academic terms, is to explore avenues to motivate educators. This could be achieved through capacity-building initiatives or incentives, ultimately supporting their engagement in and commitment to SL and sustainability-focused pedagogy.

5. Conclusions

Although the analysis of the general population did not reveal a statistically significant association between participation in SL and the difference in answers (final and initial) for each item of the SPACS-Q, a difference was observed in the analysis of separate samples. This finding indicates that SL can indeed enhance courses in terms of students' self-perceived action competence for sustainability. This conclusion is further supported by the direct evaluation of the SL experience and the positive feedback provided by the students in their comments.

Although the present study provides an important contribution to the existing literature, there are important limitations that should be considered when interpreting the findings. Firstly, the research is geographically restricted to Medellin, Colombia, which may limit the generalisability of the findings. It would be helpful to examine how cultural differences could affect the impact of SL. A second limitation concerned the length of the post-assessment period, which may not provide sufficient evidence to establish whether the improvement in action competence will persist in students over time. In addition, the instrument used in this research measures self-perceived action competence, which may yield incomplete information, given that there may be a discrepancy between intention and action. It is also worth noting that the development of competences is a gradual process that cannot be easily quantified.

Despite these limitations, the authors conclude that the hypothesis of the study was largely validated, although with some important cautions. In other words, by implementing SL projects and assessing their impact, the results support the theoretical potential of SL to contribute to sustainability in terms of fostering the action competence. The fact that the analysis of the general population was not statistically significant does require additional research to further confirm the higher education strategies and factors that influence this relationship. The implementation of SL projects in universities has the potential to contribute to the ESD agenda, mostly in terms of two priority action areas (empowering youth and implementing solutions at community level) and one of the key notions (transformative action).

Further research could evaluate the impact of SL through a qualitative analysis of the perspectives of educators, community leaders and students, as well as the interplay among them. The educators directly involved in these projects agree on the positive impact of SL on the students' attitudes and the learning atmosphere. Partners and community leaders expressed their joy for having the chance to share their knowledge and for having more hands and hearts to help them in their quest of making their communities (and the world) a better place.

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