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Preparing Vulnerable Populations for Science Literacy and Young Adults for Global Citizenship through Service Learning

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Abstract: The establishment of links between the University and the community in which it is embedded is a permanent challenge. Exploring new ways to open university doors to vulnerable populations is a means of developing young adults' civic responsibility and global citizenship. This relationship of enrichment and mutual benefit does not only crystallize through the transfer of knowledge but also through service. When, within the community, this service is aimed at students with specific needs of educational support (SNES), we enter fully into the field of inclusive education, developing competencies and reaching sustainable development goals, which go far beyond those of mere knowledge-sharing. This paper presents service-learning (SL) projects carried out in English class by undergraduate Engineering and Education students at a Special Education Center for adults. The main goal was to develop a basic linguistic competence in English so that SNES students could understand science texts and technological instructions to handle ICTs with some autonomy. Face-to-face versus online modality use, forced by the pandemic, are contrasted and results are compared over a three-year period. University students' perceptions on how this pedagogical approach of service learning contributes to their personal growth and consolidation of global citizenship are presented.

Keywords: service learning; higher education; soft skills; specific needs of educational support (SNES); science literacy; global citizenship; transformation

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Citation: Muñoz-Alcón, A.I.; Tejedor-Hernández, V.; Lafuente-Nafría, M.B. Preparing Vulnerable Populations for Science Literacy and Young Adults for Global Citizenship through Service Learning. *Sustainability* **2022**, *14*, 6775. https://doi.org/10.3390/su14116775

Academic Editors: Karmen Erjavec, Marija Klopcic and Abele Kuipers

Received: 3 May 2022
Accepted: 30 May 2022
Published: 1 June 2022

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1. Introduction

In recent decades, different programs based on the service-learning methodology (SL) have been fostered in higher education. They combine learning processes with community service in educational projects which promote social transformation. Rather than a methodology, service-learning springs from an educational philosophy which envisages institutions as spaces open to social needs and with a clear educational purpose. Social transformation is searched for not as a mere change of structures or institutions but as a complex process of personal training and sustainable integral development [1].

This study explores the impact made by and on undergraduate Engineering and Education students who took part in a Service-Learning project titled Learning Communities through Technology (LCT) over three academic years (2018–2019, 2019–2020 and 2020–2021). This SL activity was voluntary and performed in the context of English as their common six-credit curricular subject for a semester. The project involved the design of sessions of basic English on different topics related to science. For safety reasons, in 2020–2021 due to the COVID-19 pandemic, face-to-face presentations and interaction with students with specific needs of educational support (SNES) were completely discarded. Instead, audio-visual materials were used for presentations of English content, which was taught to students with intellectual disabilities by means of the Blackboard Collaborate as Learning Management System (LMS). Necessary adaptations of materials and activities were made in order to make them more accessible to students with intellectual disabilities.

The use of digital tools and a virtual classroom on an online platform for the first time was a real breakthrough in the Special Education Centre.

The objectives of the present study are:

1. check the impact of the service-learning project on the target community's science literacy.
2. assess soft skills developed by undergraduate students participating in the project.
3. identify motivational factors in university students to achieve Sustainable Development Goal 4 (Quality Education) with the service-learning project.
4. compare the impact of service-learning in both face-to-face and online modes.

2. Literature Review

Studies evidence that SL experiences make a positive impact on students [2], in particular on the perception of their role as agents of social change [3,4] as well as on faculty [5]. It is a first step towards responsible and global citizenship, particularly when SL projects are targeted to communities with disabilities or specific needs of educational support [6,7]. People with intellectual disabilities are especially vulnerable regarding accessibility and achievement of competencies and learning objectives included in the ordinary educational system. This fact justifies the election of communities with specific needs of education support as focus groups in order to propose experiences which let them acquire achievable competencies [8]. According to previous experiences, both target communities and community partners impact each other [9,10]. Service to these communities must be carried out providing the necessary cognitive accessibility so as to be able to communicate with their social environment and undertake daily activities with no discrimination regarding their age, language, emotional state or cognitive capabilities [11].

As regards assessment, new challenges arise because of the multi-faceted nature of SL projects. Universities are often preoccupied with academic outcomes [12], but many other constitutive aspects are equally essential to measure. Some authors offer assessment models to measure the impact of SL on four constituencies: students, faculty, community and institution [13,14]. Lau and Snell (2020) propose a model which assesses the impact on a community partner in terms of enhancement of capacity, new knowledge and insights gained, and whether the service-learning project assists in advancing the community partner's goals and values [15]. Steinke and Fitch (2007) considered cognitive outcomes, including critical thinking and problem solving, to assess SL projects [16]. As it is shown in the literature, most assessment tools designed to evaluate SL experiences are meant to be used by SL participants themselves. In order to carry out a formative assessment, SL assessment tools must be meaningful to them and adapted to each specific project [17] since nobody better than participants know the key elements for self-assessment and improvement [18,19]. In the present study, students' self-assessment and instructor's assessment are contrasted.

According to the classical motivational theory of self-determination [20], intrinsically motivated behaviors are those which are carried out for pleasure and satisfaction derived from their realization. Studies reveal that this is the level of motivation and involvement that students participating in a SL project usually achieve [21,22]. This is so due to the level of prominence they play in the teaching-learning process of the specific population they work with, the opportunity to relate the theoretical content acquired in the classroom with practice in real educational contexts, the resolution of problems that they must address in those contexts or the cross-cutting attitudes and competencies they acquire during the process and which they could hardly acquire otherwise [23–25]. Motivation is directly related to one's personal goals, which are translated into different levels of commitment to the task that can predict the processes of students' achievement and results [26,27].

As a result of the pandemic caused by COVID-19, educational communities have found themselves in the need to introduce substantial modifications with respect to the methodology used in face-to-face teaching. Thus, they have had to move much or all their teaching to the virtual environment. In particular, some studies show that SL projects based

on digital technologies allow, in addition to the development of digital skills, to offer an ethical and civic adaptation of them, which promotes a humanistic and humanizing vision of digital technologies [28–30]. Integrating technology with service learning catches and holds the attention of students who have grown up in the digital age and rely on computers, video games, cell phones and digital music players for their information and entertainment. Besides, many of the abilities that students acquire through technology-integrated, project-based service learning are 21st century interpersonal skills, which empower them as global citizens. These include teamwork and problem-solving skills, as well as effective oral and written communication skills [31]. All these have been recently recognized as soft skills in the educational field [32,33]. There is much opportunity in working alongside community partners in the development of distance service-learning [34]. Whether in-person or through a virtual medium [35], providing opportunities for students to participate in projects that directly benefit community members is important as we strive for students to learn from and be transformed by those who may have different backgrounds and life experiences [36]. Many experiences of SL involving teaching others have been carried out during the pandemic with excellent results for both the partner community and university students [35–37].

3. Materials and Methods

The present study was carried out during academic years 2018–2019, 2019–2020 and 2020–2021 using a mixed-method research approach (MMR). This was chosen because it reflects a unified view of research since this approach involves collecting, analyzing, and interpreting qualitative and quantitative data in a single study or series of studies that investigate the same underlying phenomena (Caspersz & Olaru, 2015) [27]. Quantitative data were collected by means of participants' assessment based on rubrics, a final survey with questions to be answered on a Likert scale and a validated motivation questionnaire. The source of qualitative data was an open question included in the survey and participants' final essays.

3.1. Focus Groups

The focus groups consisted of 52 undergraduate students from the Engineering and Education programs in their first and second year at university whose ages ranged between 20 and 40. Their sex composition was 67.3% male and 32.7% female students. Their background and distribution in the three academic years is shown in Table 1.

Table 1. Focus groups distribution.

	2018–2019	**2019–2020**	**2020–2021**
n Engineering students	12	17	7
n Education students	-	2	14
Total *n* participating students	12	19	21
n teams	4	8	8

The target community consisted of 48 young adult students with intellectual disabilities receiving education and occupational therapies in a Special Education Center, "La Casa Grande" ("The Big House"), located in a rural area next to Avila, a city in the middle of Spain. Their ages ranged from 25 to 45. Each academic year, a group of 16 students with SNES were selected to participate in the SL project.

3.2. Procedure

The project was conducted in collaborative groups of 2–4 students, who were in most cases from the same class and undergraduate program. Undergraduate students who volunteered to participate in the service-learning project were taking English as a curricular 6-credit subject for a semester. They had to group themselves in teams and prepare a topic on Science English vocabulary at an elementary level. They could pick the topic from

a list given by the professor beforehand. They were given basic information related to the students with SNES and the characteristics of their educational institution. In year 2020–2021, with virtual SL modality, specific guidelines were provided to design their lessons with a digital format which was suitable and accessible to students with SNES. Once teams were organized, they would present their topics in weekly sessions in the fall term from October to December. In the years 2018–2019 and 2019–2020, lessons were presented face-to-face in the Special Education Center. In 2020–2021, due to the pandemic, lessons were delivered via the online platform Blackboard Collaborate. Presentations would last no longer than 15 min and the rest of the session (another 30 min) would be devoted to playing games based on the vocabulary and grammar and doing practical activities. Each team would present their topic twice in successive sessions on the same day: first to a group of eight SNES students and then again to a different group of eight other SNES students. Other SL experiences of university students teaching a foreign language to a target community have been reported [38], but no one was found in a Special Education Center, which adds interest to our study.

3.3. Quantitative Data

There were three different sources of quantitative data: (i) assessment of teams' performances and students with SNES; (ii) a final survey administered via Google Forms and (iii) results from the Situational Motivation Scale questionnaire (SIMS), validated by Guay, Vallerant and Blanchard [39].

3.4. Qualitative Data

Qualitative data were provided by responses to an open question included in a final survey and from the participant students' final essay, the purpose of which was to collect their personal impressions on the experience.

4. Results and Discussion

Results will be presented and discussed in different subsections depending on the data sources.

4.1. Formative Assessment of Teams' Performances

In the preparation of teams' sessions, tutoring by the foreign language professor was crucial, providing feedback during the process. Teams' performances at the special education center were assessed by the professor and by the university students themselves (self-assessment), using the same holistic rubrics as shown in Table 2. Sharing rubrics proves to be a reliable and more objective way to assess teamwork projects [40].

Table 2. Rubrics for teams' assessment of session performances.

Assessment Components	Max.
Team's participation in the session preparation	10
Team's participation in the presentation	10
Digital resources used	10
Structure and sequencing of activities	10
Materials selected for SNES students	10
Adaptation to SNES students' level and pace during the class	10
Interaction with SNES students	10
Ability to motivate SNES students	10
Gestures, facial expression	10
Time control	10
Total score	**100**

The final overall grades in the three-year period were weighed as follows: 80% professor's assessment + 20% teams' self-assessment.

4.2. Students with SNES' Assessment

At the end of each of the learning periods, a final test was designed and adapted to students with SNES so that their development of English linguistic competence was checked. It contained items which involved identification, recognition, spelling and relation of science basic terms and concepts in English. Tests were graded on a scale 0–10, five being the minimal score considered to pass. Figure 1 shows the percentage of students who achieved learning goals and passed.

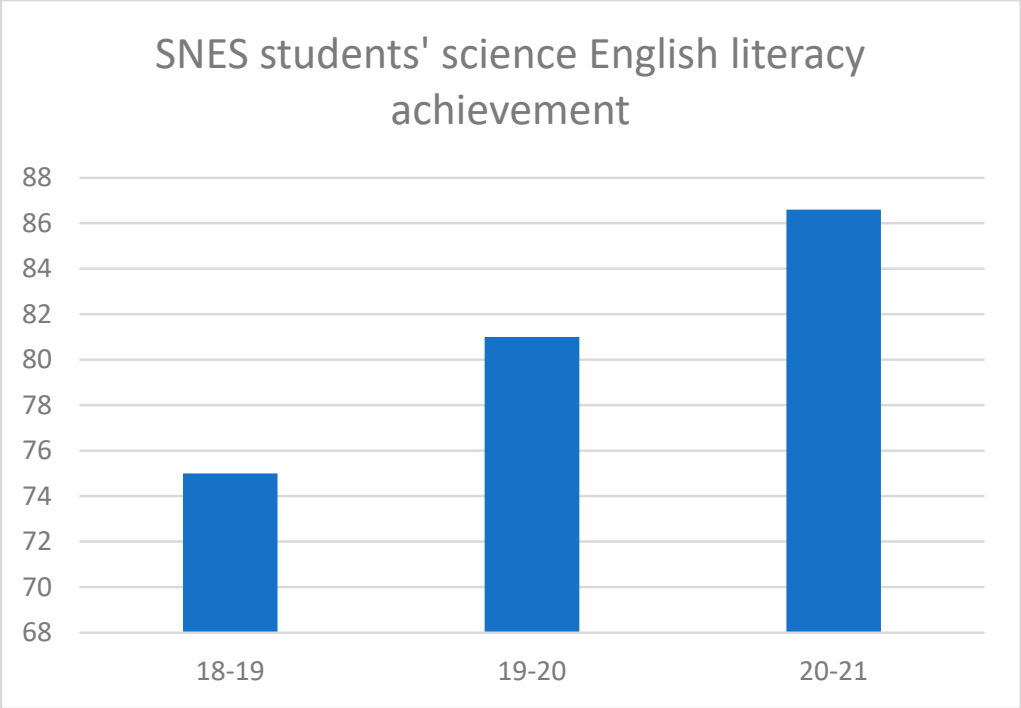


Figure 1. Results from the SNES students' assessment in years 2018–2021.

4.3. Final Survey (Close Questions)

Participant students were invited to answer a final questionnaire after the SL project was completed. The final survey was delivered via Google Forms, and it was anonymous. The response rate was 100%. The first set of questions were closely related to personal satisfaction and general motivation (Table 3). The second set of questions, structured as a Likert scale of five values, was meant to check subjective perception of soft skills development in the service-learning experience (Figures 2–4).

Table 3. Students' responses to yes/no questions.

Close Questions	2018–2019		2019–2020		2020–2021	
Would you repeat this SL experience?	Yes No	100% -	Yes No	100% -	Yes No	100% -
Would you recommend it to other students?	Yes No	100% -	Yes No	100% -	Yes No	100% -
Would you repeat it even if it did not count for your final grade?	Yes No	92% 8%	Yes No	90% 10%	Yes No	100% -

Responses manifest an outright satisfaction with the SL experience since 100% of participants in the three academic years would be willing to repeat the experience and recommend it to other students. As regards motivation, low percentages corresponding to negative responses indicate that few students would do service learning just for an external

reward. Contrarywise, most students would participate even though their service did not influence their subject final grade.

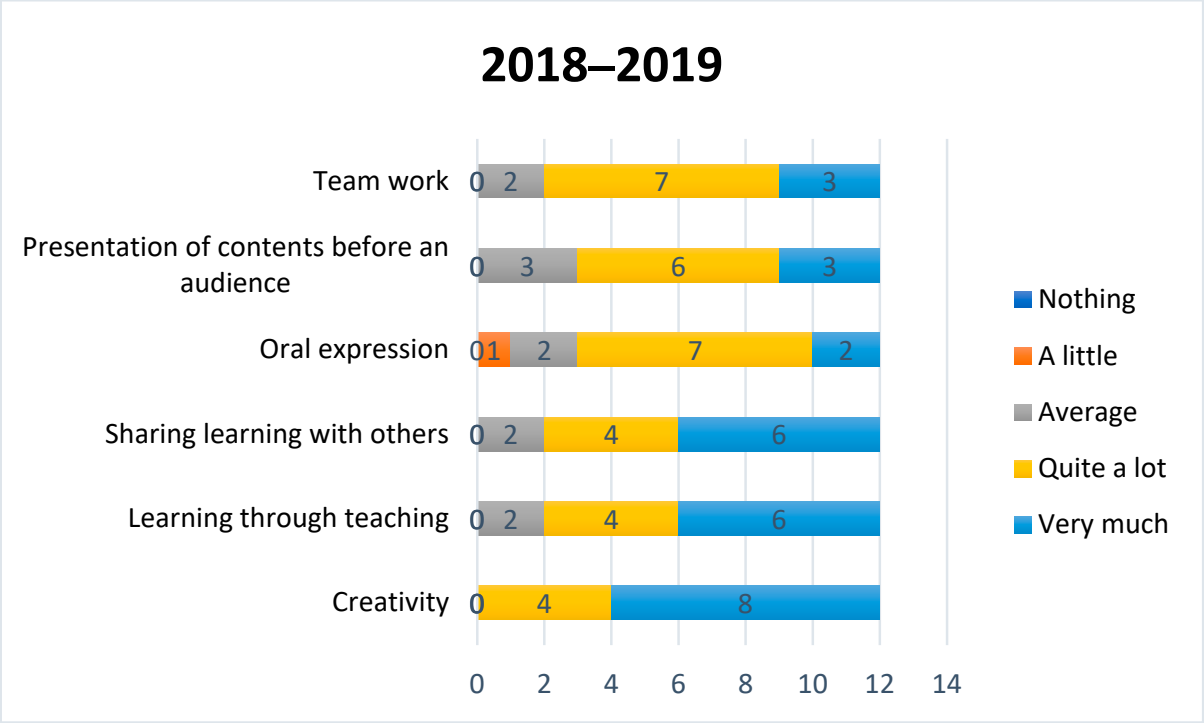


Figure 2. Students' perception of soft skills development in year 2018–2019.

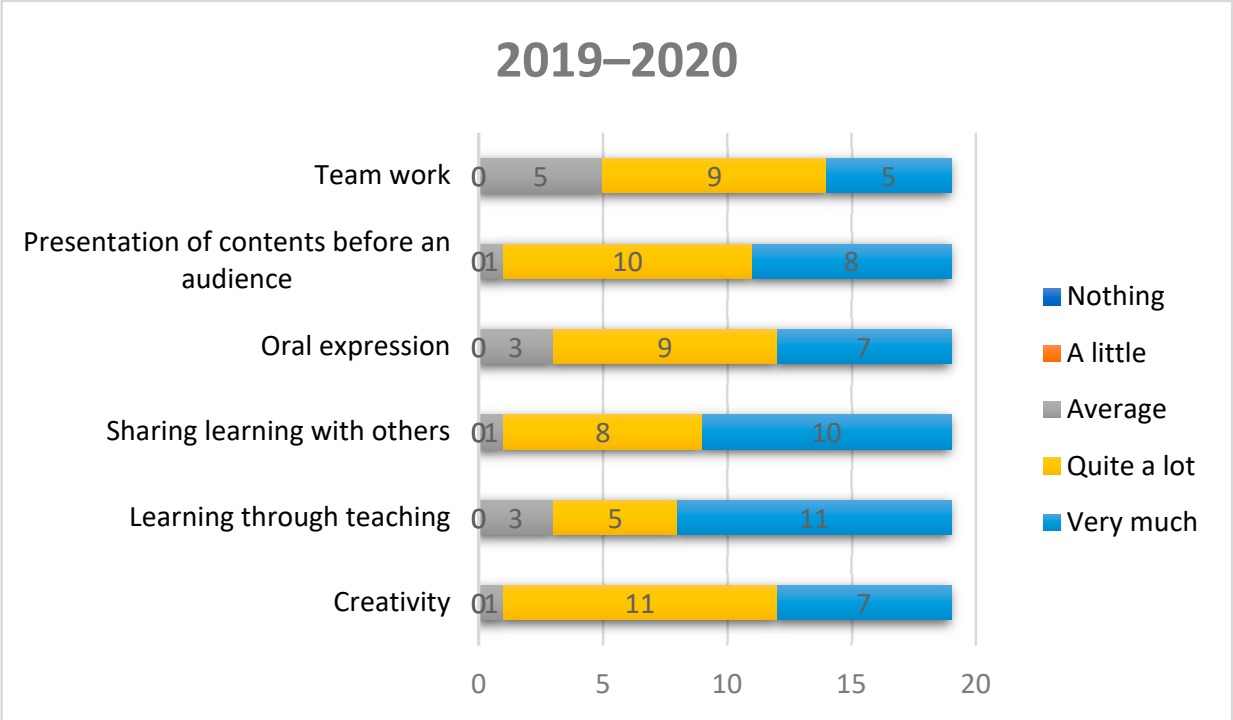


Figure 3. Students' perception of soft skills development in year 2019–2020.

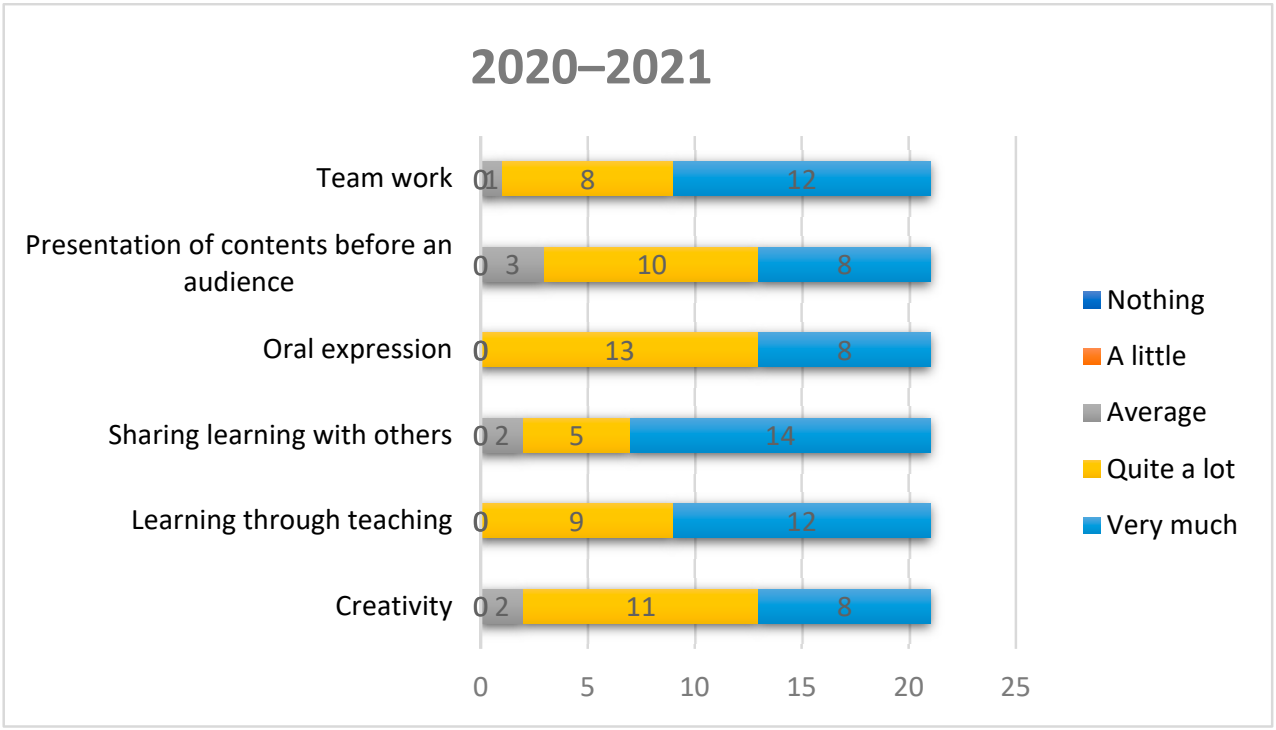


Figure 4. Students' perception of soft skills development in year 2020–2021.

Comparing the three academic years, an overview reveals high levels of development in competencies recognized as soft skills (teamwork, communication, sharing, learning from others, creativity), but some specific differences identify each of the participating groups.

4.3.1. Teamwork

Students who participated in SL online mode (2020–2021) perceived a higher degree of development in this skill. 95% of students recognized to have developed that competency quite a lot or very much, versus 83% (2018–2019) and 73% (2019–2020). This result is consistent with some studies on SL through digital technologies [41]. Their easy access and interconnection facilitate participation and teams can communicate more fluently and work together even if they are physically quite distant.

4.3.2. Communication

When communication soft skill refers to presentation of contents before an audience, namely, speaking in public, students in group 2019–2020 reported a higher degree of development: 94.7% (quite a lot or very much), followed by students in 2020–2021 (85.7%) and those in 2018–2019 (75%). Regarding oral expression in general, it was the online group in 2020–2021 that considered 100% to have developed this soft skill at a high or very high level, followed by 2019–2020 group (84%) and 2018–2019 (75%). This result is consistent to studies on technology-enhanced learning, which claim the beneficial role of technologies to create communities of practice where students feel less anxious to speak and interact than in face-to-face learning environments [42,43].

4.3.3. Sharing Learning with Others

This competence reached its highest level of development among 2019–2020 students, since 94.7% reported to have developed it quite a lot or very much, compared to 90.4% in 2020–21 students and 83.3% in 2018–2019. However, it is the greatest number of students in year 2020–2021 (online mode), 66.6%, that claim to have developed this competence in its highest level possible, compared to 52.6% of those in 2019–2020 and 50% in 2018–2019.

Digital platforms as Learning Management Systems (LMS) seem to be effective means for SL participants to teach partner communities and share their knowledge and skills [44].

4.3.4. Learning through Teaching

Students participating in face-to-face SL modality perceived similar levels of this competence development: 83.3% students (in 2018–2019) and 84.2% (in 2019–2020) reported to have learnt through teaching others quite a lot or very much. Moreover, the same high levels of competence development were stated by 100% of students in online SL modality (2020–2021). Such high levels of development perceived by students in "learning through teaching" competence is consistent with those found in literature [45].

4.3.5. Creativity

The highest values of development for this soft skill have been reported in year 2018–2019, when 100% of participants claimed to have developed it to a high or very high extent. Likewise, years 2019–2020 and 2020–2021 offer high values for creativity development, with 94.7% and 90.4% respectively. In this case, SL modality does not seem to affect creativity. As it can be found in different research studies on SL carried out in a variety of undergraduate programs and community scenarios, this soft skill is greatly developed in all SL projects no matter what modality is chosen [46,47].

4.4. Situational Motivation Scale Questionnaire

The SIMS questionnaire was applied to participant students at the end of the SL project, since situational motivation provides a useful understanding of a person's current self-regulatory processes. The questionnaire consists of 16 items, each of which is rated on a seven-point Likert scale ranging from one (does not correspond at all) to seven (corresponds exactly). Results pertaining to each of the academic years of the study are presented in Tables 4–6.

Table 4. Situational Motivation Scale results academic year 2018–2019.

Factors	Activity Motivation	Total Range: 12–84	Mean $\bar{x}$	Median (M_e)	Mode (M)	(SD)
Intrinsic	It is interesting	69	9.85	6	6	1.58
	It is pleasant	73	6.08	6	6	0.86
	It is fun	68	5.67	6	6	0.94
	It makes one feel good	72	6	6	6	1.35
Identified Regulation	It is for one's own good	56	4.66	4.5	4	1.54
	It is good for oneself	75	6.25	6	6	0.82
	By personal decision	78	6.5	7	7	0.65
	It is important for oneself	72	6	6	6	0.82
External Regulation	One is supposed to do it	31	2.58	2	1	1.89
	It is one's obligation	20	1.67	1	1	1.37
	There is no choice	12	1	1	1	0
	One feels that has to do it	66	5.5	6	6	0.96
Amotivation	One cannot see any reason	17	1.41	1	1	0.86
	Not sure it is worth it	16	1.33	1	1	0.85
	One cannot see any utility	15	1.25	1	1	0.82
	Not sure if it is a good thing	14	1.17	1	1	0.55

Table 5. Situational Motivation Scale results academic year 2019–2020.

Factors	Activity Motivation	Total Score Range: 19–33	Mean $\bar{x}$	Median (M_e)	Mode (M)	(SD)
Intrinsic	It is interesting	113	5.94	6	6	0.94
	It is pleasant	113	5.94	6	6	0.88
	It is fun	102	5.36	6	6	1.49
	It makes one feel good	121	6.36	6	7	0.66
Identified Regulation	It is for one's own good	93	4.89	5	6	1.33
	It is good for oneself	111	5.84	6	6	0.87
	By personal decision	117	6.15	7	7	1.08
	It is important for oneself	104	5.47	6	6	1.5
External Regulation	One is supposed to do it	47	2.47	1	1	1.95
	It is one's obligation	46	2.42	1	1	1.87
	There is no choice	27	1.42	1	1	0.81
	One feels that has to do it	85	4.4	5	7	2.20
Amotivation	One cannot see any reason	37	1.94	1	1	1.76
	Not sure it is worth it	32	1.68	1	1	1.29
	One cannot see any utility	21	1.10	1	1	0.30
	Not sure if it is a good thing	21	1.10	1	1	0.30

Table 6. Situational Motivation Scale results academic year 2020–2021.

Factors	Activity Motivation	Total Score Range: 21–147	Mean $\bar{x}$	Median (M_e)	Mode (M)	(SD)
Intrinsic	It is interesting	135	12.2	7	7	0.7
	It is pleasant	131	11.9	7	7	1
	It is fun	103	9.3	5	5	1.7
	It makes one feel good	126	11.4	6	7	1.1
Identified Regulation	It is for one's own good	100	9	5	4	1.7
	It is good for oneself	126	11.4	6	6	0.9
	By personal decision	134	12.1	7	7	0.8
	It is important for oneself	127	11.5	6	7	0.9
External Regulation	One is supposed to do it	57	5.1	1	1	2.2
	It is one's obligation	62	5.6	2	1	2.3
	There is no choice	41	3.7	1	1	2
	One feels that has to do it	106	9.6	6	7	2
Amotivation	One cannot see any reason	41	3.7	1	1	2
	Not sure it is worth it	46	4.1	1	1	2.3
	One cannot see any utility	40	3.6	1	1	2
	Not sure if it is a good thing	42	3.8	1	1	2

Considering the three-year results for students' self-perceived motivation, similarities can be found. Plainly, students manifest to have participated in the SL project moved by purely intrinsic motivation or identified regulation. They acted for the pleasure and personal satisfaction of the activity itself, or with the awareness of choosing to participate by their own decision. This is consistent with the literature on service learning [26,48]. Voluntary participation in SL projects is often preferred by university students and guarantees

a greater engagement and involvement [49]. Identification represents behaviors that are performed because they are recognized as important and valued by the individuals. These forms of motivation are self-determined because when performing behaviors with these underlying types of motivation, individuals feel volitional [50]. Yet, some slight differences can be perceived regarding intrinsic motivation throughout the period. Unlike the previous face-to-face editions of the SL project, in 2020–2021 students did not consider so much that they were participating for fun. Just because the activity was interesting and pleasant and made them feel good.

Comparing the values for external regulation, it is interesting to point out the coincidence in the feeling that "one has to do the activity" over the three-year period. It reveals a high sense of duty in students, who felt impelled to participate in the project not only for the pleasure or enjoyment of the activity as such, but for a more ethical reason and sense of social responsibility towards the partner community.

Finally, as far as amotivation values are concerned, it is unanimously discarded from the participants' volitional field. Unlike other studies which present variations in motivation along a period [51], intrinsic motivation was maintained in the three-year SL experiences since each of the teams prepared and performed one session in the program.

4.5. Final Survey (Open Question)

In the final survey, delivered via Google Forms, an open question was included: "*Add your personal impressions on this SL experience*". Table 7 shows a selection of students' responses classified by topic.

Table 7. Summary of university students' personal impressions.

Topic	Comments
Personal satisfaction	*It was highly rewarding both personally and professionally. Everyone should have the opportunity to experience it.* *Time flew. I wished it had last longer.* *You feel really good.* *A wonderful experience I strongly recommend.* *An amazing experience that I would love to repeat and I undoubtedly recommend.* *Teaching and helping students with disabilities made me feel good. A highly satisfying experience.* *We received more than we gave.* *A great personal experience.* *The best experience I have had in this semester.* *It has been a highly satisfying experience. I have been able to experience the value of a well done job, a job put at the service of others without seeking individual recognition.*
Interpersonal relationships	*You can approach and interact with these people.* *I would have loved to live this experience face-to-face, but technology worked fine.* *It was the first time I could interact with people like these and I loved helping them.* *It has been a plasure to help them. They are great people.* *It is a shame that we could not interact face-to-face, but even so I would love to repeat it.* *I have loved participating in this project, I have been very comfortable with my classmates and interacting with people with disabilities. Getting closer to them has been a mutual learning. I totally recommend the experience.*
Target community's response	*To see how they learn and have fun is very satisfying.* *I have learnt a lot from the people that wanted to learn a bit of English from my classmates and me.* *It is great to see how these students enjoy the activities we prepare for them.* *It was incredible to see the effort they make and the desire they have to continue learning despite their difficulties.* *I have learnt that if you make people happy, you will be happier.*
Expectations	*It far surpassed all my expectations.* *It is a great project.* *It was worth spending time on this activity. I feel fortunate to have had this opportunity to work on this service-learning project.*
Teamwork	*Working collaboratively with my classmates was great. We helped one another.* *We learnt how to work together as a team.*

Participation in the SL project proved to be highly satisfactory and surpassed students' expectations both at the personal and interpersonal level. Soft skills such as teamwork and interpersonal communication and interaction were developed so that participants felt rewarded and willing to repeat the experience. Stakeholders' effort to understand and adapt to one another was an achievement, considering specific conditions of students with SNES. This was a contributing factor to remove barriers to community inclusion and grow in global citizenship, as studies show [52].

4.6. Students' Final Essay

After the teams' performances, a written composition in English (target language) was required from every student to express his/her personal impressions about the SL experience. Table 8 summarizes the frequencies of most recurrent ideas found in students' final essays.

Table 8. Summary of participant students' most recurrent ideas about their SL experience.

Students' Recurrent Ideas in Final Essay	2018–2019	2019–2020	2020–2021
Impact of the target community's attitude towards servers	55.5%	46%	4.7%
Impact of the target community's gratefulness	11%	7.6%	-
Impact of the target community's attitude towards learning	66.6%	77%	9.5%
Empathy	66.6%	46%	71.4%
Development of soft skills	55.5%	61.5%	33.3%
Development of human values	44.4%	38.4%	100% [1]

[1] Percentages over the total number of respondents.

One of the students' words succinctly illustrate the learning and service outcomes of the course: "*The most important thing that we have learnt is that it does not matter what capabilities one has, because all of us are human people and the most important capability we all share and we should live up to is humanity, the art of helping people in need.*" (D.C. 2018–2019).

Finally, as regards limitations of the present study and suggestions for future research, it can be stated that due to the multi-faceted nature of SL assessment, in future studies assessment by other participants in the SL project should be considered, apart from the instructor's assessment and students' self-assessment. Also, the recording of online sessions might be a useful tool to help students assess their performances more objectively and accurately. The only possible limitation is the image permission required by law from the partner community. At present, video recording of sessions at the Special Education Center is not allowed.

Future research could explore other means of assessing the SL project with the application of other validated questionnaires so that its impact can be measured in terms of the target community outcomes and the acquisition and development of human values.

5. Conclusions

A comprehensive diachronic study of a SL project to achieve Sustainable Development Goal 4 as well as the impact it had on both the target community's Science English literacy and the undergraduate participants' soft skills and competency development were presented in this paper.

Different forms of formative assessment guaranteed the inclusion of different perspectives and participants' involvement, thus achieving a more objective and overall evaluation of the service-learning project. Results from the final assessment of Special Education students' English reveal that learning goals were achieved at a high level.

Among soft skills, the ones most highly developed in the SL project when the target community consisted of students with SNES, were teamwork, communication, sharing learning with others, learning through teaching, and creativity. Except for speaking in public, the rest of soft skills were more boosted in online SL, creativity being equally enhanced in both face-to-face and online modes.

Results from the Situational Motivation Scale reveal that students participated in the SL project moved by intrinsic motivation or identified regulation in both modalities. As a voluntary activity, they acted for the pleasure and personal satisfaction of the activity itself or chose to participate by their own decision. They expressed that they participated not so much for fun, particularly in the online mode, but because the SL project was interesting, pleasant and it made them feel good. Also, because it was good and important for them and for their own good. Free from external pressure, however, university students felt the duty to participate out of a sense of social responsibility towards the partner community.

Students' personal testimonies expressed in open questions and their final essays reflect their high degree of satisfaction with the SL project no matter what modality it was carried out in, though those participating online would have desired to have a face-to-face service-learning experience. Empathy, soft skills, and human values were developed as well as citizen responsibility and an open attitude towards a global citizenship education in safe, nonviolent, inclusive, and effective learning environments both in face-to-face and online modalities by participants in the SL project Learning Communities through Technology.

Author Contributions: A.I.M.-A., V.T.-H. and M.B.L.-N., literature review; A.I.M.-A., methodology design and data collection; V.T.-H. data analysis; A.I.M.-A. and M.B.L.-N. writing—draft preparation; A.I.M.-A. and V.T.-H. writing—review and editing. All authors have read and agreed to the published version of the manuscript.

Funding: This research received no external funding.

Acknowledgments: Authors would like to thank all university students who voluntarily participated in this service-learning project and enthusiastically devoted their time and efforts to help students with SNES to achieve English learning goals. We also appreciate the Managing board, educators, and professionals at the Special Education Centre "La Casa Grande" ("The Big House") for their warm welcome and unconditional support to students and professors from the Catholic University Saint Teresa of Avila who worked on this project.

Conflicts of Interest: The authors declare no conflict of interest.

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