Virtual Service-Learning in Higher Education. A Theoretical Framework for Enhancing its Development

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The last decade have witnessed the unprecedented development of information and communication technologies. This has, in turn, enabled the growth and development of other sectors, such as, for example, that of distance and on-line learning. In this context of technological expansion in education it is appropriate to reflect pedagogically about technological resources and their educational purpose. That is, how to deploy the available technological resources and media in a fashion consistent with the desired educational objectives and aims. Virtual Service-Learning has emerged as a particular modality of this methodology that combines and reinforces two elements: technology applied to education and service as a pedagogic tool. This format then, reveals itself as an appropriate methodology through which to channel both technical and pedagogic innovation. In this work and, taking as reference a study focusing on two virtual Service-Learning projects, we will address the construction of a theoretical framework that will allow us to understand and improve the development of these practices through this pedagogic modality.

Keywords: virtual service-learning, digital technologies, human values, global citizenship, virtual mobility, intercultural dialogue

ICT IN SERVICE-LEARNING PROJECTS

Over the last years, we have witnessed an unprecedented growth in distance and virtual learning. Beyond the specifications and clarifications that these concepts require, they reflect the richness and diversity that education can reach when it is crossed or hybridized with information and communication technologies. Today, if it is unimaginable for any profession to be undertaken without the help of a computer, information management programmes and an internet connection, then these are totally indispensable in the case of education. The use of such technologies has meant the introduction not only of the acquisition of necessary digital skills into teacher training programmes, but also the construction of their own modality, with particular elements and characteristics that are in contrast to face-to-face modalities. The possibilities of virtual and distance education demonstrate their full potential in the case of university teaching not only due to the appearance of courses offered by virtual universities, but also with the translation of educational processes and methodologies into cyberspace.

Moreover, the structural reforms in higher education that have occurred in the last decades have promoted a greater awareness amongst the university teaching faculty of their pedagogic responsibilities. This has been reflected in a greater concern for the type of learning experience undertaken by students and its ethical and civic dimensions. Here, we need look no further than

certain international declarations such as those contained in the Bologna Process[1], or others, more locally focused, linked to the direction that particular territories wish to give their higher education systems as, for example: the 'Declaración sobre institucionalización del aprendizaje-servicio como estrategia docente dentro del marco de la responsabilidad social universitaria para la promoción de la sostenibilidad en la Universidad' (CRUE, 2015); 'the Campus engagement charter for civic and community engagement' (Campus Engag, 2014); and 'the Declaració de la Xarxa d'Aprenentatge Servei de les Universitats Catalanes ApS(U)CAT' (ACUP, 2018). What is more, university networks such as the Red Talloirs or TRUCEN, are examples of how higher education is taking on board societal needs and demands, such as civic engagement, social responsibility, and sustainability (JHEOE, 2012).
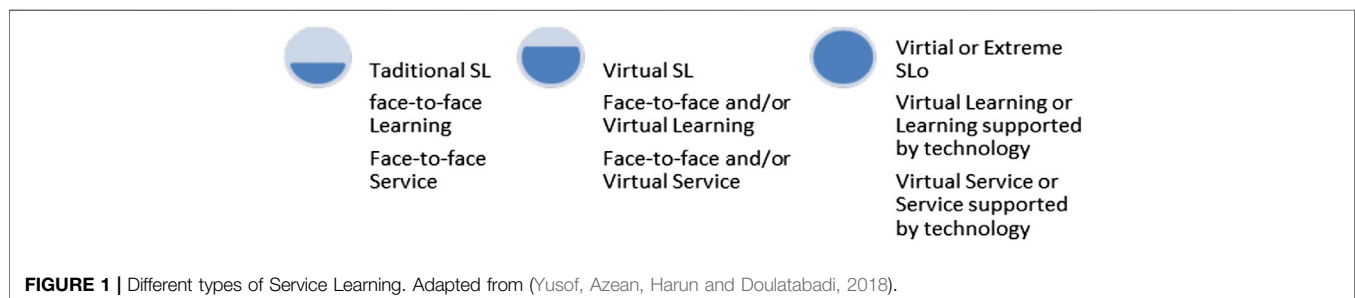
In this way, the incorporation of Service-Learning (SL) projects, across all university degree courses, stands out amongst the different initiatives aimed at the ethical and civic training of students, and this is the focus of our work. There is no doubt that this methodology constitutes a paradigmatic example in which all initiatives to renew university teaching are condensed. Thus, from within the different training frameworks in which the SL methodology is included in subject areas and degree courses, little by little, a new modality is emerging, supported by digital technologies. In effect, there are many ways in which digital technologies can enrich and have a role in the success of SL projects. Without doubt, however, the most innovative of these and the one that has most pedagogic potential appears to be virtual SL (VSL) which supports both the project's learning and service components through the different ways in which technology intervenes or forms part of the project design. How?

In the first place, in a collaborative fashion, digital technologies are enabling: from the acquisition and compilation of information through to its dissemination and communication. This factor helps and facilitates the initial stages and the development of VSL projects. From applications for cloud-archiving data, to email,

inclusion of digital technologies is instrumental. One example of this is the use of a web page or blog to showcase a project or perhaps to gather results. In this way both project management and the dissemination of results can be enabled. However, as we said, this form of exploiting the technology is purely instrumental and has no explicit pedagogic aim.

In the second place, we find the purposeful integration or inclusion of digital technologies, that is, when these technologies contain a pedagogical intent as much in the process of learning as in the element of service. In effect, digital technologies constitute active elements in the design of VSL projects. For example, some proposals concerning intergenerational dialogue use digital technology to bring youngsters and older people together. In this way, the younger generation "teach" the older to use a diverse range of programmes to improve their management of the digital environment, while the older generation contribute their knowledge in specific areas. Other projects focus on relationships between equals and emphasize the responsible and critical "use" of technologies. Projects such as "cibermanagers" produced by Pantallas Amigas (2010), where the intention centers around education in the responsible and critical use of social networking sites.

Digital technologies are no longer merely instrumental resources, rather they create, as we have said, a new teaching environment and, in addition, promote solidarity and human values. This brings us to a third level, those digital technologies that favor immersion and development of new projects within a new environment: cyberspace. In this space, technology is not only integrated into the project with a pedagogic aim, but also the project itself is designed from a digital perspective, that is, focusing the whole process from, in and for this space. This kind of technological immersion has led some to categorize projects that are developed to this level as "extreme" VSL (Waldner et al., 2012), given that both the learning and service components develop entirely within cyberspace, on the net (see **Figure 1**).

FIGURE 1 | Different types of Service Learning. Adapted from (Yusof, Azean, Harun and Doulatabadi, 2018).

web pages and many more, digital technologies generate new spaces for teaching to take place entirely in the virtual world. At this first level we find a basic kind of integration where the

Consequently, in line with this third level, the virtualization of SL implies a step beyond the mere translation of processes into cyberspace. It involves consideration of the online-offline continuity of processes and of designing teaching and service components with this premise in mind in addition to certain conditions and characteristics that we shall address in the next section of this work.

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[1]EHEA Ministerial Declarations and Communiqués, http://ehea.info/page-ministerial-declarations-and-communiques.

Indeed, if we look at the state of play in the field of VSL, we find that the first studies on this topic gave priority to the conceptualization of this emergent modality (Strait and Sauer, 2004; Guthrie y McCracken, 2010; Waldner et al., 2010; Waldner et al., 2012). In contrast, in the last few years, broader, plural or hybrid lines of investigation have opened up (Bringle, 2017; Bringle and Clayton, 2020) that address a more varied range of issues such as, for example, the relationship between SL and digital technologies (Escofet, 2020; Tapia Tasot, 2020) and its engagement with the promotion of human values (Ruso, 2012; Gasper-Hulvat, 2018; Ruiz-Corbella and García-Gutiérrez, 2020); its experiential and practical dimension within the virtual environment (Stefaniak, 2020); civic and community engagement (Laury, 2020); the particular form of mediation that this type of project produces in the field of distance learning (Bourelle, 2014; Harris, 2017); the analysis of more specific facets such as the analysis of the social networks associated with SL projects (Moeller and Nagy, 2013); projects involving on-line tutorials (ChanLin, et al., 2016), and studies on leadership (Goertzen and Greenleaf, 2016; Purcell, 2017). Lastly, a further line of investigation into SL has opened up as a result of the situation caused by COVID-19 (Culcasi, 2020; Meija, 2020; Tian and Noel, 2020).

Gradually this new modality is consolidating, pushed by the strong impulse of an emergent web 3.0. The volume of work in this area is so high that it has prompted some authors to dedicate their research to the analysis of this diversity of publications and to providing as thorough a characterization as possible of the state of the art in VSL (Salam, et al., 2019; Marcus, 2020).

VIRTUAL SERVICE-LEARNING MODEL (VS-L): CONCEPTUALIZATION AND PEDAGOGIC CARACTERISTICS; THE "EMERGENCE" OF VIRTUAL SERVICE-LEARNING

The arrival of VSL to the context of SL is no accident, rather, several factors have collaborated in its origin and development that help to delineate its particular path and theoretical framework. The factors to which we can attribute its present impulse can be seen to align with two convergent dynamics present in higher education.

Furthermore, there is no doubt that the health emergency produced by COVID-19 has obliged educational institutions and other organisations of civic society to re-think the face-to-face format of their learning programmes and, in many instances, initiate alternatives to presential learning through the use of virtual models that are equally capable of achieving educational goals. On the other hand, we cannot ignore the consolidation of the various modalities of virtual solidarity, which are a huge influence on the current expansion of SL in its virtual format (EASLHE, 2020).

While one dynamic centres on reflection about the current role that universities play or should play and their relationships with wider society, highlighting that these institutions should recognize, and indeed assume a social responsibility. Another addresses the changes occurring in teaching and learning in higher education, giving greater importance to the practical, the innovative, as is the case regarding the irruption of digital technology in higher education which, without doubt, also involves the transmission of values to students and provides them with opportunities for character formation. This direction of travel finds a point of convergence in SL, fertile ground which has, simultaneously, enabled the growth and development of SL not only at higher education but also at every other level of education.

The cause for this growth is at the heart of an institutional dynamic where, for various reasons, higher education institutions are faced with the need to reform or evolve. This is due to both national needs as much as international pressures, spearheaded by international organisations. In this vein, we find, for example, the European Union's vision for the future of the university sector, envisaging institutions that are integrated and connected in a European higher education zone linked to local needs. Specifically, "that higher education institutions should not be ivory towers, but rather, communities of learning with a civil conscience, connected to their communities (COM 2017 247 final, 30/5/2017). This has seen universities extending their mission to focus on responsibility and social engagement, introducing ideas about the university's social responsibility, and its social and civic engagement, not simply into its management structures but into academic discourse.

On the other hand, there is a further set of dynamics at work that must be added to the institutional dynamics; centered largely on the improvement of learning we have termed these the "pedagogical" dynamics. In this way, for example, the introduction of information and communication technologies, a process that has been amplified with the ongoing COVID-19 pandemic, has highlighted the real possibility of establishing hybrid educational programmes: neither totally online nor exclusively presential. What is more, the technological tools also offer the possibility of greater learning autonomy for students, just as is established in the pedagogic principles developed through the Bologna Process: the centrality of the education of the student; the integration between theoretical knowledge and practical skills favoring a notion of competence; the inclusion of ethical and civic elements in training programmes for students, among others.

In this regard, we should highlight two experiences that have served as a reference for the implementation of SL projects. Specifically we refer to the development of 'virtual practices" (curricular and extra-curricular practices, remote or virtual laboratories, etc.) and 'virtual mobility' (Gallego Gil and Valdivia Guzmán, 2013; Ruiz Corbella and Álvarez González, 2014) which, in Spain, are led by the Universidad Nacional de Educación a Distancia (UNED). In effect, these experiences show that it is also possible to 'learn by doing' and enjoy the benefits of international mobility through digital technologies, with programmes conducted exclusively in cyberspace. No doubt can remain that the participation of students in practices and actions of internationalization and interchange are fundamental

to their training. Having said this, whether for physical, financial, family or any number of other reasons, clearly, not all students have equal access to this type of experience in a face-to-face format. In this way, the virtual world constitutes a fundamental pedagogic resource by facilitating access to this type of learning experience, removing barriers, and thereby enabling it to take place. In the case of virtual mobility, for example, the student might be able to take up any placement without having to leave their own home or their everyday duties and without having any particular time constraints on completing said placement, making it possible to tailor experiences to personal situations (Ruiz Corbella and García Aretio, 2010).

From the virtual perspective, the notion of internationality has a central role in educational processes. This role is made more active and dynamic through technology's ability to blur geographical and temporal boundaries. Nevertheless, while this may seem like a positive at first glance, it can generate other problems, helping to "blur" the very educational experience itself. Here, we refer to the concept of cultural homogeneity and the "monetization of education", that is, considering the learning experience from an exclusively economic standpoint. In effect, on one hand, the net marginalizes all discussion, experience and reflection that is not in the English language, this being the most widely used language on the net. The end result of this is that, via the language, an Anglo Saxon model of culture is transmitted and perpetuated to the detriment of cultural and linguistic pluralism. Moreover, the need of these digital platforms and processes to "objectivize" or "virtualize" the practices and processes of education means that, in many cases, the pedagogic experience of the student is seen purely in terms of the market. Education becomes a "user experience" and is not an authentic educational experience in which interaction with others is a key element.

Basic Elements of Virtual Service-Learning

We understand VSL as a specific modality where learning and service take place together in cyberspace. That is to say, it concerns a combined teaching-research offer that integrates service to the community with academic learning in the form of a compact online project, enabling teaching staff to transfer knowledge with social value and enabling students to develop on a foundation of experience acquired from tackling real-life needs and problems. From this perspective, VSL combines research, teaching and the transfer of socially valuable knowledge so achieving the linkage and coordination of the three pillars or missions of the university, directing the activities of that institution to the social good (García-Gutiérrez and Corrales, 2020). In this definition we find several elements that were already present in other conceptualisations (ACUP, 2019), but with the addition of a key component that was previously absent: the transfer of knowledge, specifically that with social value.

On the other hand, to develop an adequate model for VSL it is necessary to take into account the technical support that will underpin the project, such as the personalized progress tracking that needs to take place for all participants, especially students. Technological support will vary as a function of the principle objective to which the "service" to be provided is addressed.

However, in the case of learning, the majority of teaching institutions have their own platforms to facilitate progress tracking and student participation in their different subject areas and courses. In both cases, technological support from the web 3.0 generation enables the acquisition of information and knowledge, as well as communication and interaction between collaborators on a project. In these projects, the interconnection between the technological dimension and the human is key; we cannot forget that behind the screens and applications there are always people. The transmission and experience of human values through technological media is central to the success of VSL projects. Values such as empathy, listening and respect, but also creativity, imagination and solidarity can be developed and experienced through cyberspace.

From experience in conducting VSL projects (García-Gutiérrez et al., 2020) we can say that this pedagogical modality not only integrates those values that are typically human, but also those elements that are characteristic and belong to other modalities of SL, such as internationalism and globality (Santos-Rego et al., 2020). In effect, and as we saw earlier, internationalism is reinforced in the virtual environment, not only due to the blurring of territorial boundaries but also because the virtual element can give the student opportunities to approach a range of problems and not just those of other regions (more or less distant) but also those that affect the whole of humanity globally. This is the reason that VSL is especially suited to the development of global citizenship. That is, not only in how it raises awareness of global or common problems but also in the way it forms identity and a sense of global responsibility in that we are all members of the same human community.

As might be expected, the principal characteristics upon which VSL projects are built are determined, naturally, by the purpose given to the technological or digital elements within them–as already occurs in distance learning (Kinshuk, 2012). Thus, the characteristics that emerge in these projects can be defined by the following elements:

Ubiquitous Learning (U-Learning)

This type of learning alludes to the idea that any circumstance can become, at any moment, an educational opportunity and all the more so if we consider the pedagogic possibilities of connectivity via devices and apps, something which implies an understanding of cyberspace as an immersive learning environment. In this way, the key element to unlocking ubiquitous learning is the pedagogic intentionality with which project activities are conceived. Díez-Gutiérrez and Díaz-Navafría (2018) describe three characteristics of this type of learning. The first refers to the dissolution of spatiotemporal frontiers, and indeed, curricular and methodological boundaries; the second concerns access to and production of knowledge in a more horizontal, participatory format; and the last addresses the ability to interact and work collaboratively on the internet. In this way, the internet and social networking sites not only facilitate an expanded, permanent form of learning, but they also constitute a resource and an opportunity for participation, and for social and civic engagement, one of the fundamental goals of VSL projects. For this reason a coming together of education and technology is needed, not simply in an instrumental form but thinking from a pedagogic stance, how to

incorporate and make use of it in a given project. Questions as to whether it helps to implement some activity or enables communication or whether it also facilitates ways of relating, or even, whether it develops certain socio-affective values or attitudes, and so on, will offer answers to the true meaning of the inclusion of technology into educational project design.

A Human Focus to Technology

If the starting assumption of all VSL projects is that both learning and service elements take place entirely in cyberspace, we must be wary of the technological element eclipsing the human. Therefore, as a pedagogical premise, we must ensure the presence of those values and virtues that are specifically human and that most humanize us, precisely in order to promote them through this type of project. In other words, information and communication technologies must aid the conversion of information into knowledge and learning, and communication into relationships or links of solidarity. In the same way that technologies can "depersonalize", and do depersonalize, human beings, they can also ensure personal development through the design of formative processes that foster responsibility in the face of global concerns, dialogue, discovery, reflection, etc. Looking toward the virtual horizon, it is important not to lose sight of the need to cultivate creativity, critical thinking and empathy.

Global Citizenship

Related to the previous point and from the perspective of the internationalism that can be generated by web 3.0 technologies we take a step further in linking those specifically human values with the notion of global citizenship, international solidarity, responsibility and care in a global, interdependent world. In effect, and in this context, we can understand the concept of citizenship in the broadest and most complex terms, and not simply as the acquiring of a legal status but, above all, as a moral practice in which we are able to identify ourselves and engage with the things that affect us and unite us all as human beings. A moral practice in which we are all capable of assuming the Kantian ethical imperative of: "So act as to treat humanity, whether in your own person or in another, always as and end and never only as a means". Thus, VSL projects should help us to recognize the relationships of interdependency and reciprocity that link human beings to one another and to our "common home".

VIRTUAL SERVICE-LEARNING: A VENUES FOR ITS DEVELOPMENT AND IMPLEMENTATION

Having outlined the process of configuring and consolidating the VSL paradigm, and with its theoretical framework defined, we will now examine some of our successful experiences. Specifically, we will look at two projects, 'Español *en vivo*' (Spanish Live) and 'Virtu@l-aps', both of which were developed by the 'Grupo de Innovación Educativa' (educative innovation group) COETIC[2] at UNED. Both

projects arise from UNED's defining notions of civic engagement and social responsibility, that, at present, include a concern for promoting life-long learning for all (SDG 4), as set out in the United Nations' Agenda 2030. Taking this as a reference point, the 'Grupo de Innovación Educativa' COETIC was set up in the 2015/6 academic year with the purpose of launching innovative online projects, supported by community based methodologies and focused on the development of ethical skills and civic engagement in higher education.

Virtual Service-Learning and the Promotion of Global Citizenship

The VSL Project 'Español *en vivo*' is aimed at improving skills in communication and spoken Spanish amongst students at certain universities in Africa and Spain at the same time as promoting ideas of global citizenship and intercultural dialogue. The African universities involved include: the Ecole Normale Supérieure, in Benin; Abomey-Calavi University and Strathmore University in Kenia; and Dschang University in Cameroon, while the Spanish institutions include UNED (Faculty of Education and Faculty of Computer Engineering) and the Universidad Complutense of Madrid, Faculty of Education).

This project is developed through online conversations and interviews during which students from the African institutions mentioned practice Spanish by speaking to natives and the Spanish students deepen their subject knowledge from an intercultural, global citizenship perspective. The project is an immersive experience that takes place entirely in cyberspace, supported by a diversity of digital resources and applications: Skype, Hangout (Google), Zoom, Facetime and Whastapp which facilitate communication and interaction between all participants and that each group chose on the basis of their own available resources both in terms of access to the net and devices.

On the other hand, all information about the project is available on a dedicated website, in which participants can find examples of best practices for this type of project, the video presentations recorded by the African students to introduce themselves, the "intercultural field diaries" produced by every student, and links amongst other things.

The project was designed such that the key learning objectives of this initiative included students being capable of: defining their own ideas and motivations concerning their experience; identifying the most significant values and initiate their own action in accordance with these; and internalizing what they have learned not simply as content, but as a way of approaching reality. That is, to see knowledge not as 'packed bags' but as, 'something that allows us to travel with a different vision' (Esteve Zarazaga, 2012, *p*. 48). It was decided that, in this project, the most appropriate methodology to encourage reflection would be a biographical-narrative, in the form of a personal "field diary". Termed the 'Intercultural Field Note-book', this instrument, specifically developed for this initiative, actively encourages reflection, at the same time as enabling access to the type of experience and the acquisition of ethical competence and civic engagement within the established parameters of the project (García-GutiérrezRuiz-Corbella and del Pozo, 2020).

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[2]www.uned.es/coetic

TABLE 1 | Virtu@l-ApS Functionality

Basic functionalities	• There is an area of registered users in which different profiles are defined for the different actors (teacher, student, service beneficiary, . . .). The user's profile determines his or her subscription, search and publication capabilities, and the private project spaces to which he or she has access. • Interactions between users are to be carried out through web forms, forums and email. For example, NGOs may offer topics for projects, students may express their interest in participating in projects, lecturers may offer to tutor them, supervise them, or co-supervize them with NGO staff or companies etc.
Functionalities to support the community in the sharing of experiences and resources, and establishing partnerships	• Services for the publication of experiences, initiatives and material of all kinds related to VSL in higher education. • Services for the dissemination of offers and requests for participation in SL project proposals.
Functionalities to support the definition of SL projects and, especially, VSL projects	• A service connecting requests and offers of participation in SL projects will provide search for requests or offers with the possibility of filtering according to different characteristics, depending on the user's profile. • A subscription will enable to receive notices about offers or demands in a certain area of interest, also depending on the user's profile. • Support for the parties involved in SL project proposals to refine them and make them more concrete will take place through connection to, or integration of, software tools for the support of collaborative work such as tools for videoconferencing or audioconferencing, cooperative edition, shared blackboard, shared screen, wiki, chat, calendar forums. . .
Functionalities to support the development of SL projects	• A formal framework to guide a development in coherence with SL methodologies will be provided, thus favoring its systematic application and the delimitation of roles of the different actors involved. • Connection to, or integration of, software tools for the support of collaborative work, as well as tools for the support of software project management, which facilitate planning, task assignment, generation of reports, etc. These tools should be adapted to assist the processes and work dynamics characteristic of SL. Support tools for project development in specific disciplines will also be integrated. By way of example, regarding software development projects, attention should be paid to design support tools that are "user-centered", "community-based", "context-oriented", "participatory", "sensitive to cultural aspects", etc.
Functionalities for the support of teaching work	• Assessment, both of students and of SL projects will also be supported by different means: Connecting project activities with curricular content, suggesting assessment criteria and tools appropriate to each case, including selected rubrics from those referenced in the SL literature, providing support for alternative assessment tools as discussion groups. . . • Online questionnaires, designed and validated according to recognized methodological practices will be incorporated as well for several different purposes, including the measurement of attitude toward SL, and assessment both of the students' competences and of the SL projects, on the part of all the actors involved etc.
Resource management functionalitie	• The management of the SL project proposal and project versions will also be supported through a version control system. This system will give support for project tracking, through tools that automatically generate reports of activities carried out using the collaboration tools and of the submission of project documentation. • Automatic tracking tools and assessment tools based on the tracking information would also provide continuous feedback to the student.
Functionalities for the usability of the application	• A recommendation module (as a basic chatbot-like virtual assistant), will guide the members of the SL community through the different phases of an SL action, e.g. in the case of students, starting with helping them to choose a suitable project, adapted to their interests and personal profile.
Other needs	• Forums and blogs. • Access to a document repository on VSL, which should include academic articles, multimedia pedagogical resources, project reports, etc.; documentation, in particular user manuals. . .

In the case of the Artificial Intelligence MSc students, interviews were part of a requirements-engineering process aimed at the development of customisable online learning environments, adapted to the idiosyncrasies of the educational context and the needs of the students, taking an ethical and human rights approach. In particular, in the academic years 18/19 and 19/20 the students had to design, develop and implement a prototype 'mentor conversational chatbot' for students at the University of Dschang in Cameroon. The function of this chatbot was to help beginner students, by emulating an experienced student, guiding and advising them through the difficulties and doubts that commonly arise when starting studies. One of the learning objectives was to reflect on how the knowledge codified in the chatbot revealed some of Cameroon's

development priorities, and to place these priorities within the framework of Agenda 2030, the United Nations Sustainable Development Goals, drawing conclusions on how Artificial Intelligence can contribute, in the context of Cameroon, to their satisfaction. The students were tasked with identifying the relevant factors for developing the educational environment (personal, community, cultural, ethical, economic and social factors, pedagogical and organizational practices, resources that condition viability and sustainability, foreseeable impact, etc.), as well as identifying suitable indicators for evaluating its success.

An "App" to Promote the Development of Service-Learning in Spain

Virtual Service Learning (VSL) has to be mediated by Information and Communication Technologies, both for the provision of the service, and for the support, monitoring and assessment of the learning by teachers. This is why COETIC has proposed the development of not only methodological but also technological tools to support this pedagogical approach. As far as we know, there is no web App dedicated specifically to the support of the SL in the higher education sector providing the aforementioned functionalities. There is no doubt, however, of the interest of such an application, given the growing expansion of the SL methodology in the Spanish higher education sector and the relevance of VSL, in both face-to-face and distance-learning modalities, in the context of the global health crisis that emerged in 2020, as we write before.

In the academic year 2016/17 COETIC launched then a development project for a web application, Virtu@l-ApS, to support and promote VSL in various academic contexts (bachelor's degree projects, Msc degree projects/theses, doctoral theses, internships, etc.) and teaching areas (engineering, law, education, sciences, for example). In this project COETIC counts on the collaboration of lecturers from the Sistemas Informáticos y Computación department of the University Complutense de Madrid. To date, this software-development project has been carried out in the context of four collaborative and interdisciplinary UNED bachelor's degree projects, one of them from the Social Education degree (Rodriguez, 2017) and the others from the Computer Engineering degree (Alonso, 2018; Jiménez, 2020; López, 2020), and the project 'Portal de soporte a la implementación de la metodología ApS en la UNED' (Portal to support the implementation of the SL methodology in UNED), project approved in the Call for Computer Applications of the UNED Vice-Chancellor of Digitalization in Innovation 2019. Virtu@l-ApS further development and deployment is also subject of an ongoing collaboration between COETIC and the Sistemas Informáticos y Computación department of the University Complutense de Madrid (see, Manjarrés et al., 2020).

The web-application development was conceived in itself as a VSL project in which students from different disciplines would participate, documenting themselves in depth on SL, compiling existing SL pedagogical tools, conducting studies on potential enabling technologies in consistency with SL pedagogical principles and

objectives, and performing software engineering tasks, including requirements engineering, design, implementation, and testing. Service recipients were members of the educational community including the project supervisors, drawing on years of experience of voluntary work in technology-oriented NGOs and in SL projects, in both the face-to-face and distance education contexts.

Pilot VSL projects that had been promoted and implemented by COETIC in different UNED degrees in previous years (García-Gutiérrez et al., 2016) have also provided feedback for the specification of the Virtu@l-ApS functionality. The AI MSc part of these VSL projects helped to clarify the technological needs that arise when SL involves computer engineering processes. Finally, all the lecturers involved in the project participated in the validation of the application, testing the application as a potential user in order to detect problems and weaknesses, and to assess its usability.

Virtu@l-ApS Functionality

Virtu@l-ApS could facilitate the identification of potential partnerships as well as the collaboration between the potential service provider and receiver in the task of refining an initial idea and turning it into a realistic project proposal that meets the needs of both parties. Additionally, this computer support could serve to guide and coordinate the work of the different stages of SL projects already underway, providing a formal framework for their development. Such a framework would promote a systematic and rigorous approach to SL methodologies, facilitating the monitoring and continuous evaluation of the students and of their learning, as well as that of the SL projects themselves. This monitoring and evaluation is particularly important for the implementation of VSL in distance-learning institutions. The functionalities of the application are described by distinguishing different categories in **Table 1**.

The current prototype of Virtu@l-ApS provides the following main functionalities:

- Services for the publication of experiences, initiatives and material of all kinds related to VSL in the University, as well as offers and requests for participation in specific projects.
- A service for the connection of demands and offers of participation in ApS projects, and search of demands and offers with the possibility of filtering by several characteristics according to the user's profile.
- Private access to areas according to the user's roles, to participate in the development of an SL initiative until its completion in a project.
- A discussion area within the areas of each project, partnership and initiative respectively. The access to this discussion zone will be defined by the roles of the participants.
- Support for the refinement and concretion of SL project proposals between the parties involved.
- Management of an historical archive of the information exchanged between the parties within the framework of an SL project: messages, files. . .
- Collection of project information in structured fields, using forms designed for this purpose, so that in the future this

information can be converted into the official project documentation required in different formats.

- Historical archive of all the initiatives, partnerships and projects that have taken place over time.
- Forums and blogs.
- A VSL document repository, which would include academic articles, multimedia pedagogical resources, project reports, etc., and a respository of SL experiences.
- A chatbot developed for the Telegram messaging platform that guides students, teachers and organizations interested in participating in an SL project, helping them to access the information contained in Virtu-ApS about the experiences developed, new project initiatives and ongoing projects, classified by each of the fields of study. The chatbot integrates a recommendation module, which recommends new initiatives in SL to users according to their interests (based on projects, past or present, that the user has previously seen using the chatbot).

Virtu@l-ApS Further Development and Deployment

Though the currently available version of the web application lacks important functionality, the experience of developing it has been extremely useful, in particular, in helping to clarify the requirements for a fully operational application which we expect will contribute to the support and expansion of SL in the Spanish higher education sector. In the ongoing development, partnership relationships will be established with possible future beneficiaries of SL services by asking representatives of third-sector organisations to participate in the development of the application, at least in its validation and verification and hopefully also in the elicitation of additional requirements.

Regardless of the technological aspects, it will be necessary to draw up and implement an application deployment plan that will involve, among other things, establishing contacts and agreements with NGOs, and with different university departments for collaboration in the management of multidisciplinary projects.

LESSONS LEARNED FROM THE VSL EXPERIENCE

It cannot have escaped anyone that one of the factors that has recently catalyzed the increased use of information and communication technology in education has been the lock-down suffered by nations across the world as a result of the COVID-19 pandemic. In this case, these technologies have demonstrated themselves to be inextricably linked to people's sense of wellbeing and of achieving a good quality of life. It has enabled many to make the best of the situation, although we also recognize this is not always the case. Indeed, it is certainly true that digital technologies, social networking sites and artificial intelligence can be a source of alienation, but it is also undeniable that they can help to improve the living conditions of communities. Through the COETIC project, we have achieved the latter by designing and using technology with the intention of serving people and their goals independently of where they live, their cultural or other differences.

In this way, we will conclude by enumerating certain quality criteria that must be observed in the development of VSL projects and, more generally, in the inclusion of technology in this educational modality.

1 Human (and Humanistic) Orientation

The human should take precedence over technology in two areas. On one hand, pedagogically, it is relevant in VSL, as in any other type of education or training, that we do not lose sight of the importance of full human development and, as a result, the humanizing dimension that learning should have even in virtual environments. This is especially so because, 'the most difficult things to automate are precisely all those things that are inherent to being human: creativity, critical thinking, emotional intelligence, the ability to inspire and work collaboratively and other human skills (…)' (Escamilla, 2018, pp. 13–14). Quite properly, these are the elements to which we should pay most attention.

2 Wholistic and Balanced Personal Development

In this way, educational purpose should always be aimed at the whole person and not simply at enabling or training them to manage the ever greater range of devices to which people are exposed or at the development of particular skills. VSL projects are about widening the horizons of training to encompass the global person and not simply addressing specific aspects of personal development. For this reason, while SL projects, including those that are virtual, may be directed toward 'objects' or 'relationships', in one way or another, our capabilities as people are what need to be central to project design.

3 Meaningful Integration of Technology

There is no doubt that information and communication technologies, in all and every one of their manifestations, are a part of our lives and education cannot continue to ignore them. Now, their integration into the processes of teaching and learning needs to be meaningful, with a clearly specified educational objective. The pedagogic dimension should predominate over the instrumental, such that in every project design we must be able to explain and justify the technology's educational purpose, i.e., the pedagogic contribution of the technology to the achievement of the objectives designed into each proposal.

4 The Value of Virtual Education

Although, little by little, programmes of virtual learning and training are being consolidated, from the design perspective we still focus on their instructive value rather than their formative value. Virtual education is not only a powerful tool for teaching, but also, a channel for learning, facilitating the social, emotional and ethical development of the person. The problem that we need to avoid is that these are often invisible, thus we need to include them explicitly into the design of our virtual training programmes.

5 The Reality of Global Citizenship

Let's go back to Agenda 2030 which stated that a clear objective was the creation of a successful education strategy for sustainable development and sustainable ways of life, human rights, gender equality, promoting a culture of peace rather than violence, world citizenship and valuing cultural diversity and the contribution of culture to sustainable development. SL and VLS are an obvious and practical solution that favors this kind of learning, and enables students to put into practice, in real-life situations, the knowledge acquired in a learning environment that promotes the culture of global citizenship.

In sum, the objective of this article has been to highlight the formative potential of the internet, of the emerging situations where we interact in ever more diverse human contexts, and in which it is ever clearer that we are immersed, throughout our lives, in a continuous process of learning, in which, 'perhaps more than ever, today, education is on a round trip during which we can all be, simultaneously, students and teachers' (Furman, 2020, *p*. 55).

Finally, it is important to underline the new perspective for institutionalization of SL in Higher Education Institutions as it is followed by Farnell (2020) and the recent EHEA Ministerial Conference (Rome, 2020) about the role of community engagement and SL into the Social Dimension of Higher Education in the EHEA:

"Community engagement should be considered as a process whereby higher education institutions engage with external community stakeholders to undertake joint activities that can be mutually beneficial. Like social dimension policies, community engagement should be embedded in core missions of higher education. It should engage with teaching and learning, research, service and knowledge exchange, students and staff and management of higher education institutions. Such engagement provides a holistic basis on which universities can address a broad range of societal needs, including those of vulnerable, disadvantaged and underrepresented groups, while enriching their teaching, research and other core functions (*p*. 8)".

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

ETHICS STATEMENT

Ethical review and approval was not required for the study on human participants in accordance with the local legislation and institutional requirements. The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

JG-G, MR-C, and AMR contributed to the conception and design of this pedagogical experience. JG-G, MR-C, and AMR wrote and edit the manuscript.

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