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Designing and assessing virtual learning objects to foster english for specific purposes in higher education

Diseño y evaluación de objetos virtuales de aprendizaje para promover la enseñanza del inglés para propósitos específicos en educación superior

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Abstract

Four Virtual Learning Objects (VLO) were designed to incorporate English for Specific Purposes (ESP) learning at a public university in Colombia. Each VLO comprised a series of Virtual Learning Scenarios (VLS), including a vocabulary bank, a set of activities related to the six linguistic competencies (listening comprehension, oral interaction, oral production, reading comprehension, writing production, writing interaction), and an assessment and feedback sections. The impact of the VLO on students' perceptions of their progress was measured through entry and exit surveys composed of a 5-point Likert scale, multiple choice and open-ended questions. 139 students from Software Engineering (18), Journalism (22), Bachelor of Arts in Natural Sciences (50) and Nursing (49) enrolled in the University English Courses (UEC) and five teachers participated. The results reveal that students' perceptions of the VLS are positive, as each VLO is innovative and motivates learning strategies. Additionally, each VLO improved students listening and speaking skills. Therefore, the researchers recommend that teachers who design and implement VLOs focus on providing their students with skills and knowledge necessary to their specific study fields.

Keywords: Virtual Learning Scenarios (VLS), English learning, English for Specific Purposes (ESP), University English Courses (UEC), Educational Technology.

Resumen

Se diseñaron cuatro Objetos Virtuales de Aprendizaje (OVA) para incorporar el aprendizaje del inglés de Propósitos Específicos (IPE) en una Universidad pública en Colombia. Cada OVA comprendía Escenarios Virtuales de Aprendizaje (EVA) con un banco de vocabulario, actividades relacionadas con las seis competencias lingüísticas (comprensión oral, interacción oral, producción oral, comprensión escrita, producción escrita, interacción escrita), y una sección de evaluación y retroalimentación. El impacto del OVA en la percepción de los estudiantes sobre su progreso se midió mediante encuestas de entrada y salida compuestas por una escala Likert de 5 puntos, preguntas abiertas y de opción múltiple. Participaron 139 estudiantes de Ingeniería de Software (18), Periodismo (22), Licenciatura en Ciencias Naturales (50) y Enfermería (49) matriculados en los Cursos Universitarios de Inglés (CUI) y cinco profesores. Los resultados revelan que la percepción de los estudiantes sobre los EVA es positiva al ser estrategias de aprendizaje innovadoras y motivadoras. Además, cada OVA mejoraron las habilidades de escucha y habla de los estudiantes. Los investigadores recomiendan a los profesores que diseñen e implementen OVA enfocarse en proporcionar a los estudiantes habilidades y conocimientos necesarios en sus respectivos campos de estudio.

Palabras clave: Escenarios Virtuales de Aprendizaje (EVA), Aprendizaje de inglés, inglés de Propósitos Específicos (IPE), Cursos Universitarios de Inglés (CUI), Tecnología Educativa.

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Introduction

The world began to be connected and thus started its globalization and learning a language is no longer a hobby but a necessity. Today, "English is the dominant international language of the 21st century and it is spoken at a functional level by some 1.75 billion people. Moreover, as the language of communications, science, information technology, business, entertainment and diplomacy, it has increasingly become the operating system for global conversation" (British Council, 2013, p. 2). Besides, English proficiency and communicative ability play a vital role to get hired or pursuing a scholarship abroad (Singh & Singh, 2008). For these reasons, teaching English is paramount in most primary and secondary schools and universities worldwide to boost the personal and academic life of students.

Additionally, technology impacts every aspect of our life, including education, Prensky (2001) states, "our students have changed radically. Today's students are no longer the people our educational system was designed to teach" (p. 1) as students now spend most of the time using technological devices. Therefore, it is essential to know that teaching should adapt to this reality since the outbreak of COVID-19 has led to changing from face-to-face classes to remote teaching through technological devices, which entailed different perspectives in teaching languages.

Hence, using Virtual Learning Objects (VLO) can be an approach to implement alternative strategies in language learning and teaching to foster autonomy and active learning. In this sense, articulating VLOs can boost critical thinking in specific areas or focus on social problems. Moreover, such an approach can match the learner-centred English for Specific Purposes (ESP) approach demands because "all decisions as to content and method are based on the learner's reason for learning" (Hutchinson & Water, 1987 as cited in Laurence, 1997, p. 2). Thus, it can be incorporated when designing VLOs.

Technology is "a system created by humans that uses knowledge and organization to produce objects and techniques for the attainment of specific goals" (Volti, 2009, as cited in Carroll, 2017, p. 6). From the birth of the motion picture in 1922 to the advent of computers in the mid-1970s, educators have been intrigued with the potential of technology to help transform education and improve student learning (Davies & West, 2014). Currently, technology is a need in the governments' agenda because "an economy which is poor in technology can never grow in today's scenario" (Raja & Nagasubramani, 2018, p. 33). In such ways, technology has supported students and teachers in their learning process as it opens the path to many opportunities that were absent in the last two decades.

Nowadays, teenagers and children learn new experiences with their technological gadgets to implement them in everyday life from an early age; they learn interactively with more flexibility and with ever-evolving updates. According to Raja & Nagasubramani (2018) technology fulfils a fourfold role: "it is included as a part of the curriculum, as an instructional delivery system, as a means of aiding instructions and also as a tool to enhance the entire learning process" (p. 34). This entails that technology helps education to be interactive, diverse and innovative.

At this public university in Colombia, all faculty students should take four levels of English except for the faculty of education which offers six levels as a degree requirement. The purpose of the University English Courses (UEC) is to train future professionals in an L2 to strengthen their professional profiles. However, students think that the teaching strategies are ineffective, as evidenced in a recent digital survey designed by the UEC bureau to measure the perception of these courses between 2018-1 and 2022-1. Interestingly, 18 % of the students suggest that the teaching strategies in the classes should improve, while 28% suggested implementing new teaching materials. For that reason, it was necessary to implement a new strategy related to students' needs, likes and study context.

To do so, we provided a set of digital resources as new alternative strategies in the UEC, for the learners of English as a Foreign Language (EFL) to explore tailored materials aligned with their specific professional fields. This project aimed to design, conceive, implement, and assess the effectiveness of VLOs for four undergraduate programs using the ESP approach.

This paper is structured in four sessions. It first discusses the concepts of VLO, VLS and ESP. Secondly, it relates to the methodology implemented in the study. In the third place, it presents the results and discussion. Finally, it describes the conclusions of the research process.



Virtual Learning Objects (VLOs)

The VLO first came from the idea of a Learning Object (LO) settled by Wayne Hodgins (2002) when he realized that as LEGO blocks are assembled creating a specific form to perform a function, similarly, a set of materials composing contents can be useful for a purpose. His idea consists of having any content at the lowest size possible to conform to a whole. As LEGO pieces can be broken down to build a specific structure, a set of reduced content creates an object that provides learning. At the same time, these LOs can be reused and transformed to implement into different contexts according to the necessities of learning (Hodgins, 2006 as cited in Chiappe, 2016). Hodgins (2000) defines LO as a collection of assembled information objects using metadata to match the necessities and personality of a particular learner. Those multiple learning objects can be assembled in bigger groups and can be incorporated to create LOs of infinite varieties and sizes (as cited in Chiappe, 2011).

Although the LO gives a notion of what it means, it has received many interpretations over the years by numerous authors and organizations. The Institute of Electrical and Electronics Engineers (IEEE, 2002) defines them as: "any entity, digital or non-digital, that is used for learning, education, or training" (p. 3). Similarly, Tovar (2014) sees it as "a set of digital resources that can be used in a diversity of contexts, it has an educational purpose and it is made up of at least three internal components: content, learning activities and contextualization elements" (as cited in Albarracín et al., 2020, p. 4) limiting its definition only to a digital form. Even though LO can be understood by many as digital and others as a non-digital form, it is necessary to distinguish when one only refers to Virtual Learning Objects (VLO).

The Ministry of Education (MEN, 2005) defines a VLO as any structured material in a usable form related to an educational purpose that corresponds to a digital resource easily distributed and searched through the Internet (as cited in Morales et al., 2016). Those objects can be videos, text, images, or documents that fit in a context with the purpose of learning.

Accordingly, Morales et al. (2016), propose an explicit definition of VLO as basic units of learning which contain theories, explanations, didactic sources, activities, exercises, and evaluations to facilitate the study and the understanding of a topic in a subject of programmatic content. Furthermore, these VLO are conceived to facilitate its use through a computer or a digital device. Wiley (2002) also adds that: "the fundamental idea behind learning objects is that instructional designers can build small (relative to the size of an entire course) instructional components that can be reused several times in different learning contexts" (p. 4) by anyone since they are delivered on the Internet.

This means that the VLOs can be included in a broader space called VLS, in which technology is a mediator for learning (Alavi & Leidner, 2001) and e-learning comes to light as a concept that includes "learning strategies, learning methods, and lately is very much directed to the vast possibilities of content diffusion and connection" (Aparicio et al., 2016, p. 295) considering both technology design and human interaction (Piccoli et al., 2001) as the backbone in the pursuits of our study.

Virtual Learning Scenarios (VLEs)

To develop tasks, we used Virtual Learning Scenarios (VLS) as the main micro-teaching and learning environment. The VLS can be similar to "purposely constructed learning path[s] that search for students' encouragement and empowering through the use of digital, mediated technologies" (González & Fernández, 2019, p. 81). These scenarios are effective strategies to produce meaningful teaching blended and flipped practices from the Learning Technologies Knowledge (LTK) perspective. However, its focus is not necessarily to boost "critical strategic thinking on contemporary global issues from the perspectives of teaching and learning of languages for life or the promotion of glocal actions to achieve urgent social changes (González & Fernández, 2019, p. 81). Instead, the focus is to personalize microlearning VLO experiences that foster vocabulary acquisition and skills in specific professional fields.

According to Soler et al., (2013) didactic sequences include "learning activities set in a specific order which takes into account the student's progress. The didactic sequence starts with an initial production; it is followed by a series of workshops and ends with a final production" (p. 32). Likewise, we adapted this concept to creating and implementing a device for learning English for specific purposes to provide

digital resources that strengthen the L2 autonomous and active learning process of students of four undergraduate programs offered by a state-run university in Colombia.

English for Specific Purposes (ESP)

According to Laurence (1997), ESP is an approach to language learning designed to meet specific learners' needs and is centred on the language appropriate to activities related to specific fields. It is not solely based on grammar, lexis, register, study skills, discourse and genre, but also on the learners' knowledge of the language and the necessary abilities to communicate in particular contexts. Strevens (1977) highlights that ESP is conceived to meet specific needs of the learner concerning contents and topics of disciplines or occupations, so the language is appropriate to those activities in syntax, lexis, discourse and so forth (as cited in Azza, 2013, p. 19).

The materials for the English classroom are usually designed with general topics that may not be interesting to certain students and are generally used for tests. In this sense, ESP is a learner-centred approach because the content is based on the learners' needs. Hutchinson & Waters (1987) affirm that ESP can be a learner-centred approach that "sees learning as the active construction of meaning and teaching as the act of guiding, scaffolding and facilitating learning" (p. 59). The contents are based on the learners and what interests them, and this can bring benefits to learners in language acquisition.

Wright (1992) explains that there are benefits in three ways: speed, efficiency, and effectiveness in learning (as cited in Tahir, 2009). The author relates that in learning speed, ESP results in faster acquisition of required linguistic items; this means that learners learn exactly what they may need in authentic, content-based contexts (p. 108). Regarding learning efficiency, the author highlights that learners use their learning resources focused on specific vocabulary. Finally, in terms of learning effectiveness, the author pinpoints that in this stage "learners are ready to use language appropriately and correctly in job-related tasks, which have been identified prior to the course by means of a needs analysis" (p. 109). This embraces that the ESP is an approach that is highly beneficial when learning an L2.

Finally, the implementation of ESP approaches requires conducting prior explorations as Tahir (2009) suggests, it is crucial to conduct a needs analysis as it "involves the assessment of the needs for which a learner or group of learners may require language and those skills which learners perceive as being relevant to them" (p. 109). People want to learn a language for different reasons, and it is essential to know them and design the content based on those premises.

Methodology

We adopted a Design-based Research (DBR) with a quantitative research approach. The project focuses on collecting data from the results obtained through the perceptions, interests, opinions, and experiences collected from the students and teachers who tested the VLS environment and it "necessarily involves intervening to change and enhance [the] learning experience" (Hall, 2020, p. 165). The analysis included quantitative instruments applied in different moments as it allows us to test the prototypes designed and look at causes and effects that help us predict (Apuke, 2017) the effectiveness of the approach.

We considered the quantitative approach the most suitable research design for our present investigation to explore peculiarities in our participants' perceptions as our actual scope with the VLS approach was yet unclear (Sue & Ritter, 2007). This means that the aim was to gain a deeper understanding of the experience instead of generalizing results to answer the research question: To what extent does the implementation of Virtual Learning Scenarios (VLS) in four undergraduate programs of the faculties of Education, Engineering, Health, and Human and Social Sciences impact the English language learning process?

The participants of the study included 139 students from the undergraduate programs of Software Engineering (18 students), Journalism and Mass Media (22 students), Bachelor of Arts in Natural Sciences and Biology (50 students) and Nursing (49 students) who were enrolled in the English III and English IV subjects of the UEC during the second term of 2020.



Considering DBR and our research question, the methodology was segmented into 6 phases to conceive, design, pilot and assess the VLOs and students' and teachers' acceptance:

- 1) Drafting of the preliminary draft, diagnosis and entry surveys: we wrote the first draft of the project to determine its feasibility and the population to work with and assigned roles and responsibilities to the research team members. The following 3 instruments served to gather the data for the study:
 - ✓ Diagnostic survey: to obtain preliminary data to analyze the perception of the UEC offered to students in the university.
 - ✓ Entry survey for students: to determine students' digital resources, communicative competencies to foster, alternative strategies to learn English and specific areas to deepen.
 - ✓ Entry survey for teachers: to determine teachers' digital resources, the English focus utilized, the alternative strategies to teach English and other suggestions to improve the learning and teaching experience.
- 2) The first pilot of the four VLO and testing: Using Exelearning, the researchers created a VLO focused on the contents of the specific purposes of the curricular study plans of four undergraduate programs. Each VLO included the following information:

Two main subjects were divided into general discipline contexts and specific contents suggested in the student entry survey. Half of the contents (3 activities and 12 tasks) included and dealt with general contents familiar to future graduates. The other half incorporated more specific topics from three subjects suggested by the students in the entry survey. The English descriptors focused on the Common European Framework of Reference for Languages (CEFR) levels for elementary and intermediate English learners.

In their first phase, the digital devices included a cover page, an introduction, the learning objectives, the vocabulary bank, six English skills with one activity and two tasks, and an assessment section. The VLO targeted ICT descriptors and English descriptors. The ICT descriptors established objectives in terms of technology to make students aware of the digital abilities they need to work in learning digital environments. The English descriptors were organized according to the Common European Framework of Reference (CEFR) and considering students' English level. Each VLO included twelve activities and twenty-four tasks of varied contents. Various educational resources were incorporated to make the experience more appealing: Genially, Canva, Educaplay, Vocaroo, Powtoon, Youtube, among others. After the suggestions and modifications, the VLOs were implemented in the UEC of the four programs. Each prototype was posted online on the website "Interactive Interlingua" which served as the Virtual Learning Scenario repository.

- 1) Surveys implementation to students and teachers: After the testing of the virtual objects, surveys were implemented to know teachers and students' perceptions with the exploration of the first VLO versions. The results include modifications to improve the user's perception of the device. In this phase, we applied surveys as instruments to determine the degree of satisfaction in terms of contents, ergonomics and scaffolding of the VLOs tested.
- 2) Update of the VLOs: The devices were modified regarding contents, ergonomics and scaffolding. The first prototypes focused on general English content related to the 4 professions. The second version included content related to specific subjects proposed by the students. For each VLO 12 more activities and 24 tasks were included. More focus was put on the inclusion of more interactive tasks as requested by the survey respondents.
- 3) Second pilot of VLOs: The VLOs were implemented and tested by the teachers and students.
- 4) Online publication of the devices and evaluation: the VLOs were posted on the "Interactive Interlingua" website to benefit the university's UIEC users.

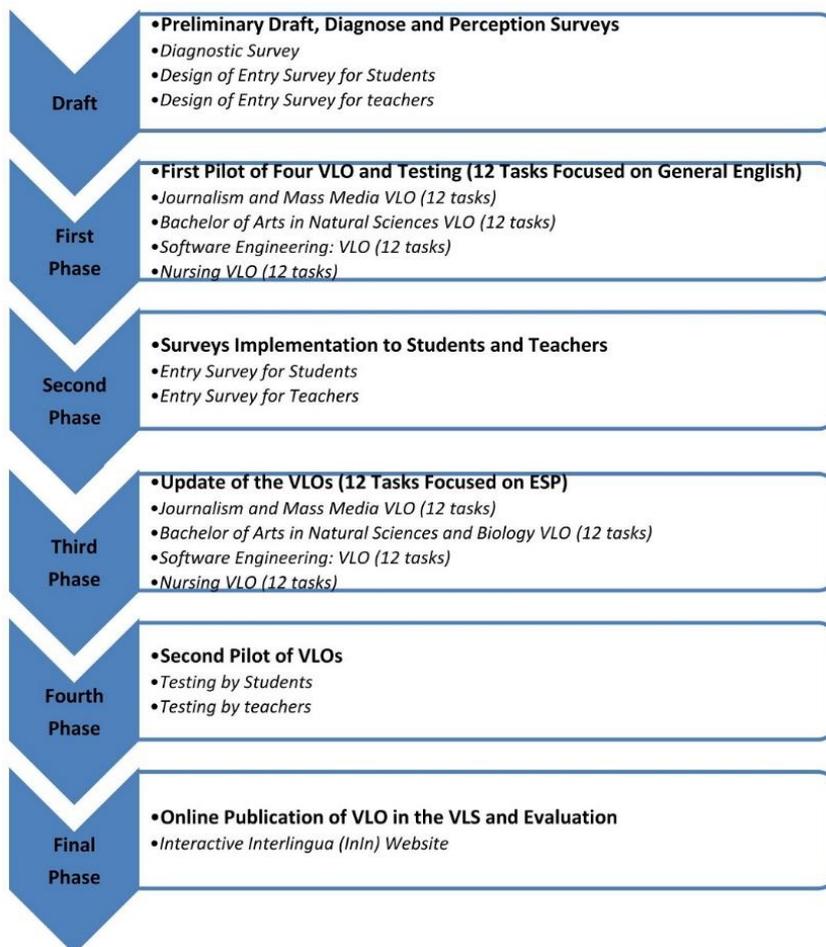


Figure 1. Scheme of the Phases Developed from the Conception to the Evaluation of the VLOs.

Finally, we evaluated and measured the impact and the perception of the VLOs used by the students applying an exit survey composed of 5-point Likert scale questions, multiple choice questions and open-ended questions (α de Cronbach = 0.95) taking into consideration some aspects of the Learning Object Review Instrument (LORI) (Nesbit et al., 2009). We also applied the exit survey (α de Cronbach = 0.93) to the 5 teachers of the UEC who implemented the VLO (See Figure 1).

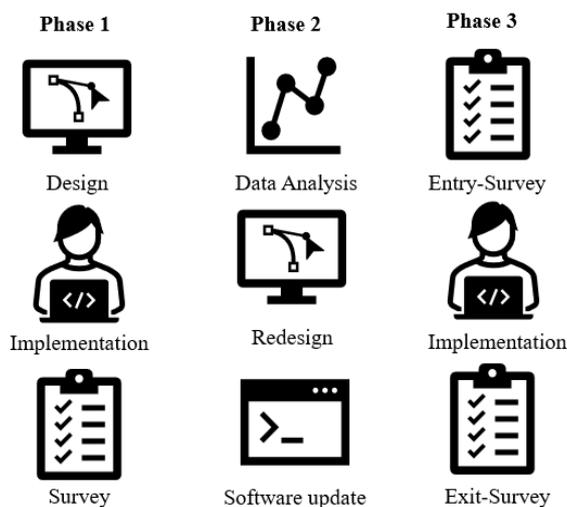


Figure 2. Research Process

Presentation of the VLOs Second Version

As stated earlier, four VLO were designed and uploaded in the VLS environment. All four VLO included a left chart as the menu through which learners could access the introduction, English and ICT learning goals, vocabulary banks, the activities proposed for each one of the six linguistic competencies, the assessment, and the feedback tasks (see Figure 2, 3, 4, 5 and 6).

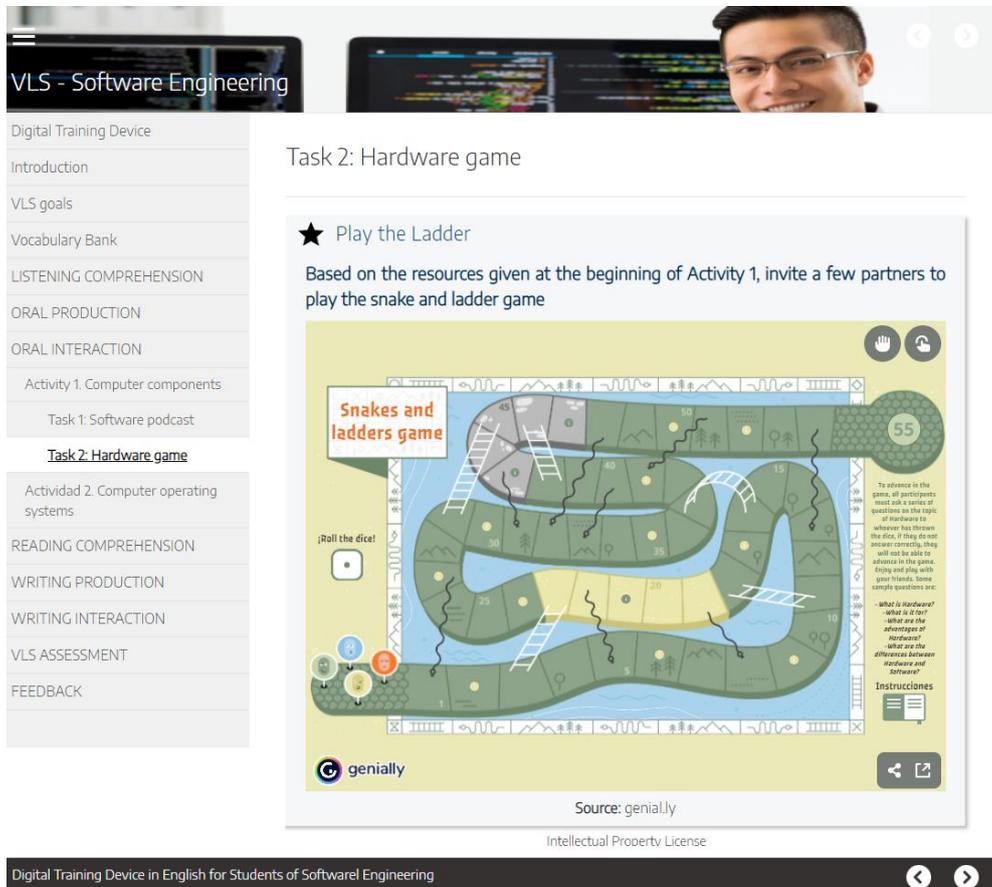


Figure 3. VLS for Software Engineering Undergraduate Students.

The Software Engineering VLO was based on two main subjects from software engineering settings: software engineering and its importance and the future of programming and web design languages. Half of the contents included and dealt with general content familiar to future web developers. The other half incorporated more specific topics from subjects related to programming, database, and object programming particularly. The English descriptors focused on the B1 level in the CEFR as the VLS users were intermediate English learners.



Figure 4. VLS for BA in Natural Sciences Students.

The Bachelor of Arts in Natural Sciences VLO included the subjects of the biology of plants and the biology of animals to boost effective learning. Half of the contents included and dealt with general contents familiar to BA in natural sciences students. The other half incorporated more specific topics from the subjects: biology, botany and physics suggested by the students in the entry survey. The English descriptors focused on the B1 level in the CEFR as the VLS users were intermediate English learners.

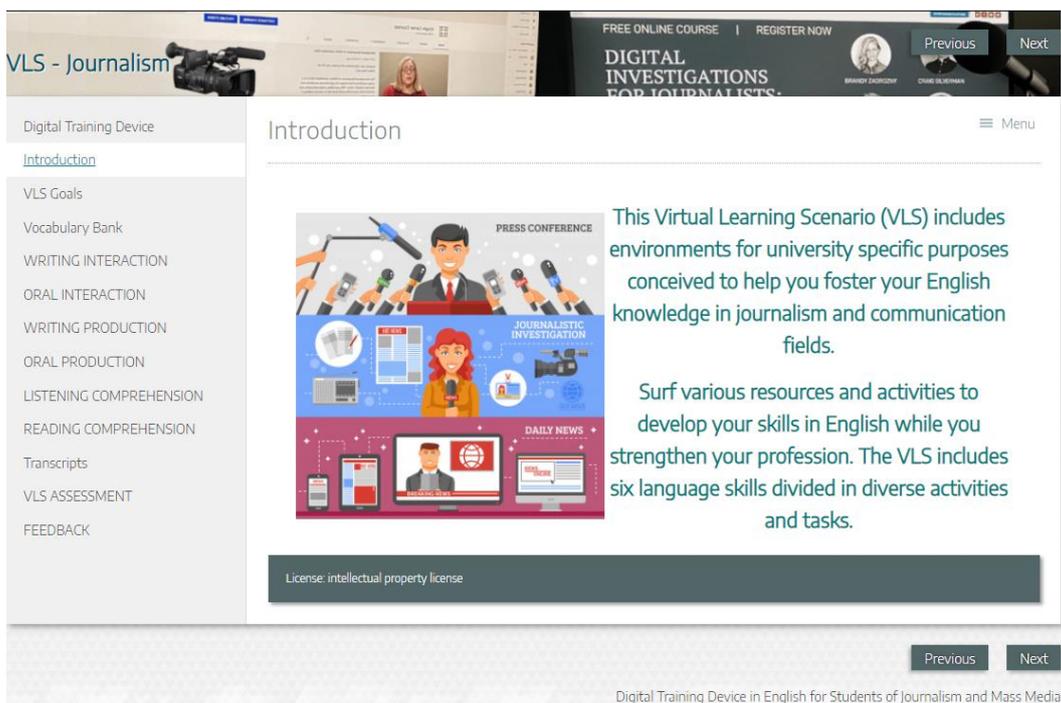


Figure 5. VLS for Journalism and Mass Media Undergraduate Students.

The Journalism and Mass Media VLO dealt with principles of journalism and social media and press freedom, ethics of journalism and travel journalism. Half of the contents included and dealt with general contents familiar to future journalists. The other half incorporated more specific topics from three subjects: Orality and writing, digital communication and epistemologies of interaction and digital

journalism suggested by the students in the entry survey. The English descriptors focused on the A2 Common European Framework of Reference for Languages (CEFR) level as the VLS users were elementary English learners.

Figure 6. VLS for Nursing Undergraduate Students.

The Nursing VLO was based on two main subjects from nurse settings: fundamentals of healthcare and morphology and body systems. Half of the contents included and dealt with general contents familiar to future nurses. The other half incorporated more specific topics from the three subjects: anatomy, pathophysiology, and morphology. The English descriptors focused on the B1 level in the CEFR as the VLS users were intermediate English learners.

Results and Discussion

We implemented a new strategy to incorporate into the UEC and determine the approach's feasibility for further implementations. Therefore, the results of this paper will be specifically related to the data gathered during phase 3, in which information from the entry and exit surveys will be conveyed to build knowledge upon implementing VLO using the ESP approach. As stated in the methodology, the exit survey was applied to both teachers and students. Hence, results will display comparisons between those participants.

In the entry-survey students responded that the smartphone was the preferred electronic device. Nevertheless, it turned out that only a quarter of students used a smartphone to access the VLO, 8.3% used their desktop computer and 66.7% used their laptops (see Table 1). This implies that 75% of the students used the VLO through big-size screens. These results are supported by Nesbit et al., (2009) who state that the presentation design of the VLO should provide meaningful headings, legible texts, and clear writing to have better and effective results in students' learning and efficient mental processing.

Table 1.
Students' usage of electronic devices

Devices	Entry-Survey	Exit-Survey
Mobile	50%	25.0%
Tablet	3%	0.0%
Desktop Computer	10%	8.3%
Laptop	37%	66.7%

Note. Own work

Additionally, in the entry survey students related that the focus of the UEC was mostly on general English rather than on specific contents related to their study fields. As can be seen in Figure 6, 95% of students from the Journalism and Mass Media program, 84% of students from the BA in Natural Sciences and Biology, and all the students from the Nursing and Software Engineering programs affirm that the UEC is mainly focused on General English, and they do not conceive teaching from the perspective of ESP.

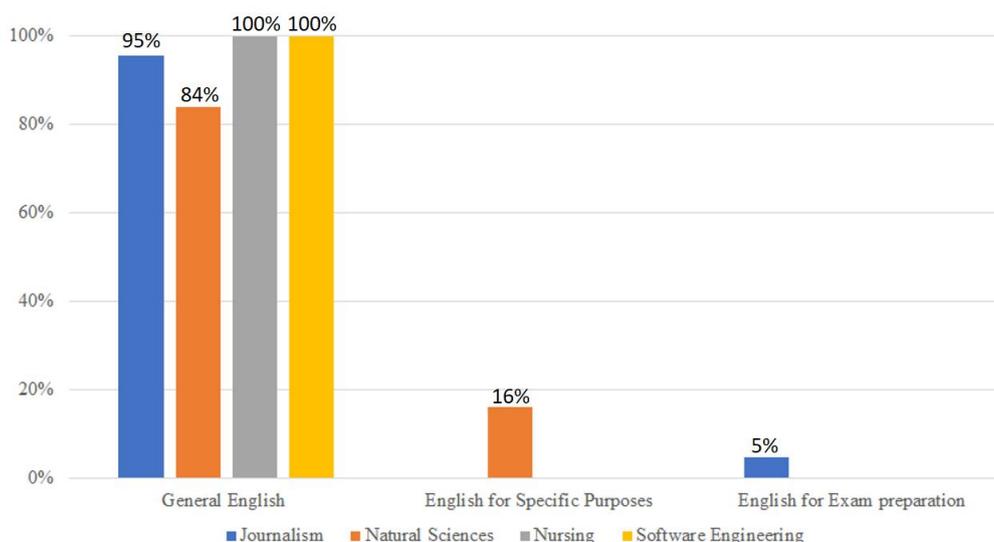


Figure 7. The approach of the UEC.

Understandably, ESP projects give students a “concrete real-life experience, providing them with first-hand encounters within authentic contexts to apply concepts and principles to a new situation” (Kırkgöz, 2019, p. 23). This confirms that the UEC do not accomplish the goal to provide students with sufficient knowledge in their fields of study.

In the exit survey, we included six criteria to evaluate the VLO, in which some of the LORI aspects are included: sobriety, accessibility, usefulness, speed, interactivity, and readability. For *sobriety*, we meant variables like the simplicity of navigation, menu availability and ease of navigation between the activities. For *accessibility*, we included variables such as easiness of access, clarity in instructions, and interoperability (works well on different devices and web browsers). Regarding *usefulness*, we measured the easiness of navigation and accessibility to contents and links. *Speed* criteria included fast content loading and graphic quality thereof. For *interactivity*, we meant a variety of exercises, a balance between text-image-audio and video content. Finally, regarding *readability*, we analysed the organization, structuring and clarity of all content included in the resource. Table 2 summarizes the results obtained from students' and teachers' responses.

Table 2.
Evaluation of Students' and teachers' responses using the LORI Scale.

Criteria	Students		Teachers	
	Mean	SD	Mean	SD
Sobriety	3.83	0.83	3.60	0.55
Accessibility	4.17	0.72	3.80	0.84
Usefulness	4.17	1.34	3.60	0.55
Speed	4.42	0.67	4.20	0.45
Interactivity	3.92	1.16	4.40	0.55
Readability	4.50	0.90	4.00	0.71

Note. Own work

In Table 2, we observed that students considered that readability, speed, accessibility, and usefulness are the criteria better fulfilled by the VLOs. According to Falcão et al., (2016), VLOs should provide clear instructions to the user and the interface. The authors assert that a VLO considered with a high accessibility level should have a good design to “offer a number of means of access and interaction to the educational content” (p. 69). The VLSs were composed of didactic sequences that enabled the learners to easily understand the organization and the structure of the device via the menu and the variety of specific contents related to their study fields (Figure 8).

However, teachers' perspective was that interactivity was the aspect that the VLO accomplished better, followed by speed and readability. For teachers, "navigation through the object is easy, intuitive and free from excessive delay" (Nesbit et al., 2009, p. 8). This can be observed in Figure 8, which provides a VLO screenshot for the Nursing undergraduate program, in which the aspects highlighted by teachers are evidenced.

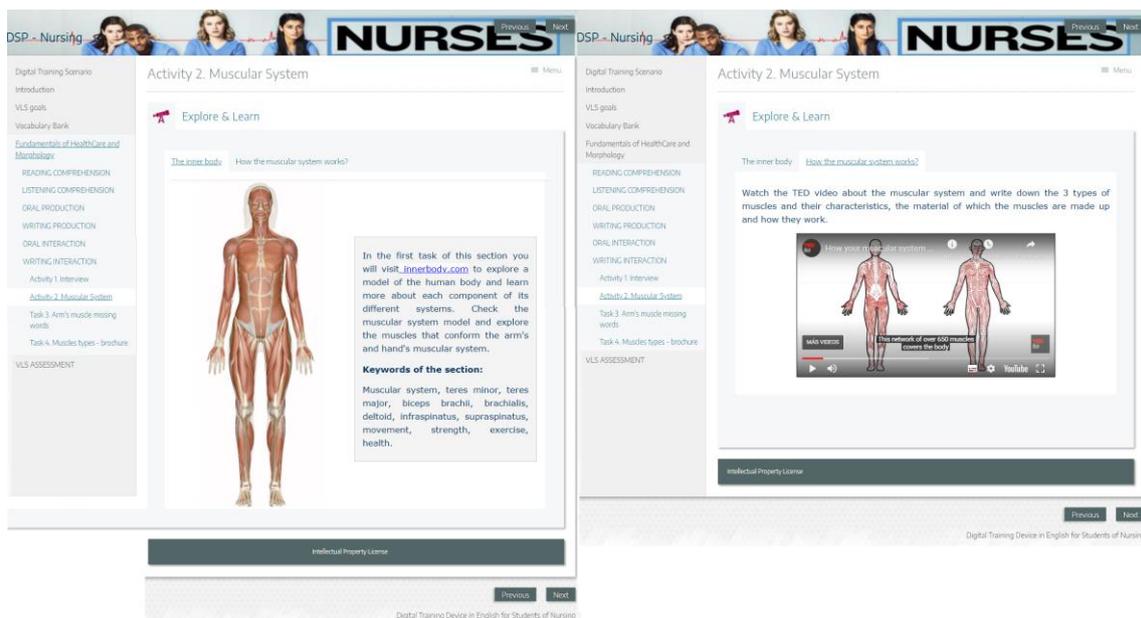


Figure 8. VLS for Students of the Nursing Undergraduate Program.

Researchers of environments in which technology acts as a mediating model suggest that tech-based environments may eliminate barriers as they provide flexibility, material currency, extrinsic motivation, satisfaction, individualized learning, and feedback over traditional classrooms (Maheshwari, 2021). Nevertheless, it is impossible to make a general measure of the effectiveness of technology-mediate learning because each framework points to particularities and has a limited view of learning through technology.

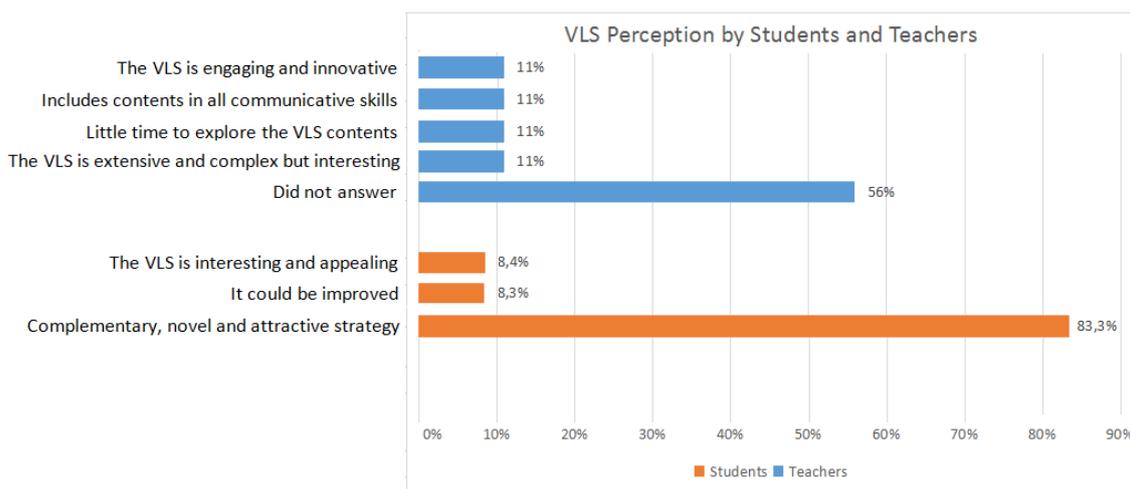


Figure 9. VLS Perception by Students and Teachers.

Overall, 83.33% of the students highlighted that the VLO is a complementary, innovative, and appealing strategy and all students agreed that the contents of the VLO were specifically related to their undergraduate programs, 8,4% said that VLS was interesting and appealing which resulted in most of the population appreciating the VLS. On the other hand, 8.3% of students thought that the VLS might need some improvement. 11% of teachers think this digital resource is innovative and engaging. Another 11% think it included contents in all communicative competencies, whereas 11% reckon that there was little time to explore the contents of the VLS, and other 11% see that the resources are interesting, but some activities are extensive and complex. Finally, 56% of teachers did not provide any answer.

Students added comments and general recommendations regarding the VLO content. Most of the students agreed that it was interesting to experience the ESP approach of the VLO, which means they appreciated the alternative strategy of the VLO. However, some constraints in the first prototypes are reported including that the VLO should be more dynamic, less complex, and not restrained by time limits, and that it should include a score or mark for each task developed (See Figure 9).

Piccoli et al., (2001) indicate that a virtual learning environment should accomplish a human and design dimension to be considered effective. As to the human dimension, the authors include students' and instructors' characteristics such as motivation, technology attitudes, and technology control, among others. In regards to the design, they mention the learning model, the technology, the learner control, the content, and the interaction. In this sense, the design dimensions proposed by Piccoli et al., (2001) were highly accomplished as discussed earlier.

Concerning the English skills covered in the VLO, in the entry-survey students were asked about the English skills they considered the easiest to learn. Most of the students agreed that reading was the easiest subject, as can be seen in Figure 9. Accordingly, a study conducted by Hernández Urrego (2019) found that their VLO made students aware of the importance of using reading strategies and evidenced an increase in reading comprehension because of using their VLO.

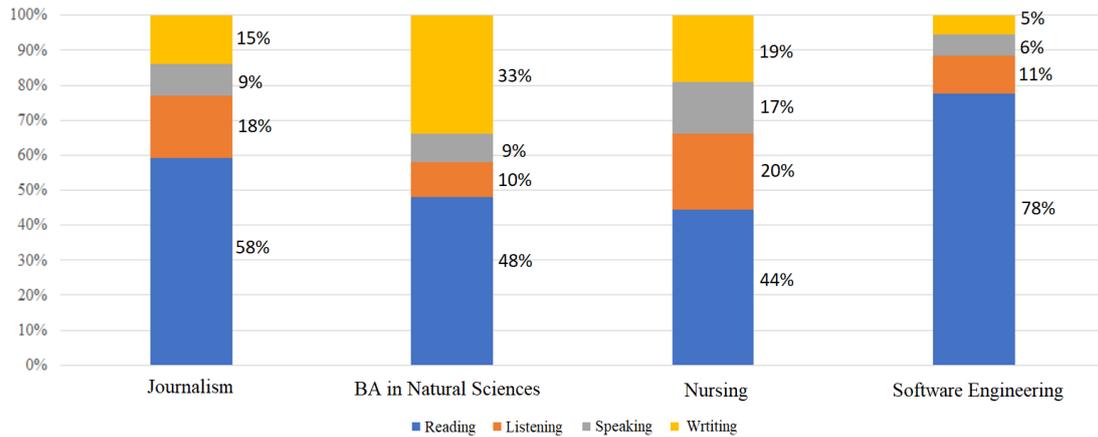


Figure 10. Students' Responses regarding English Skills Easiness.

Additionally, learners in our study said that the skills they would like to improve and foster with the use of the VLO were the speaking skill, followed by the listening skill (see Figure 11).

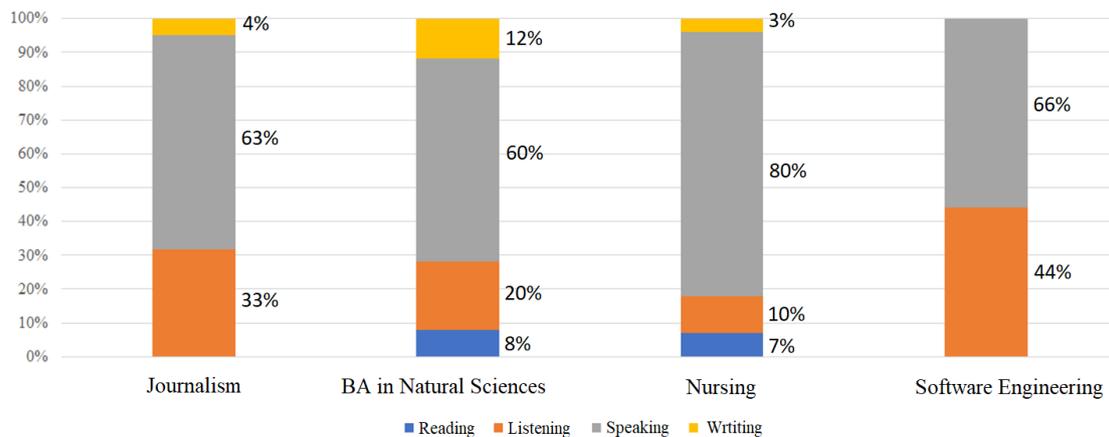


Figure 11. Students' Responses regarding the Skills They Would Like to Improve.

After implementing the VLO, 66,7% of the students reckoned that the English language level of the VLO was appropriate and easy to understand. Accordingly, in the exit survey, students agreed that listening and speaking activities were the most exciting and engaging (See Figure 11). This means that their aim, as described in Figure 11 was satisfied. These results are in line with Bossman & Agyei (2022) who argue that when technology mediates learning, there is an interactive process between the learner, instructor, methodology and the technological tool which influences the learning outcome and boosts performance.

Interestingly, for half of the teachers, all skills are equally important, and even if reading comprehension excels over oral production and oral interaction, the less appealing skills were writing interaction and writing production as seen in Figure 11. Undoubtedly, the teachers suggested that the approach was insightful, but the contents were extensive and the time to test with students was short to assess in depth the possibilities of the VLOs.

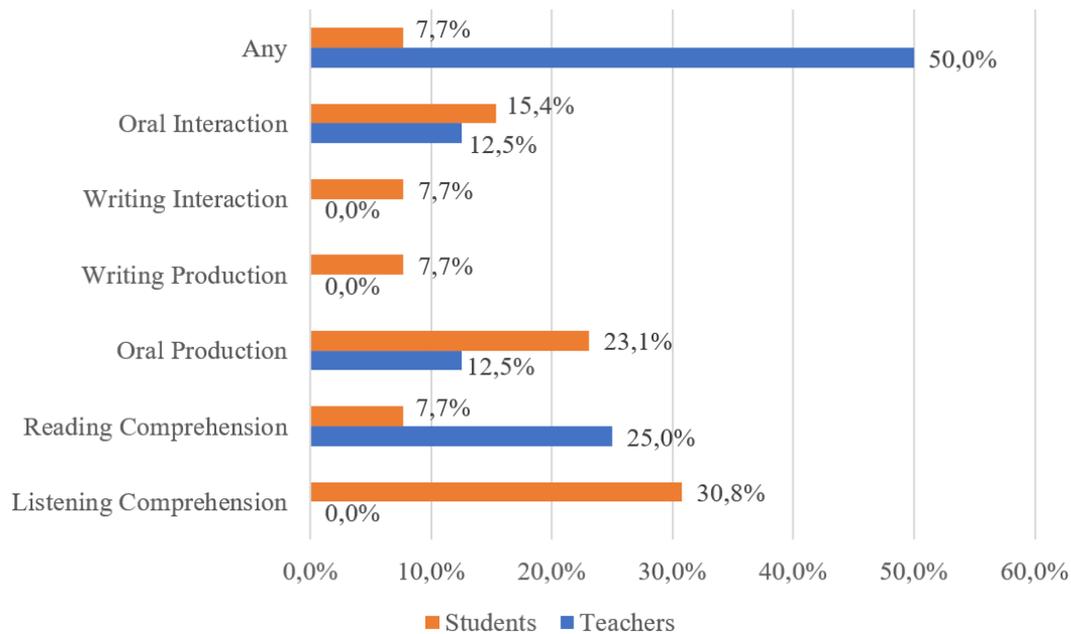


Figure 12. Students and Teachers' Responses About the Skill They Like the Most.

Regarding specific contents from the undergraduate programs, students suggested that aspects such as the inclusion of more technical vocabulary, activities with scientific articles, putting the VLO in all the UEC, and more appealing graphics, among others should be included in VLO future implementations.

Conclusions

Considering the results presented, it can be concluded that VLOs enhance ESP courses. This is related to the fact that the VLOs were designed taking into consideration students' needs, context and likes and included tasks that students found engaging and effective for learning at their own pace. Consequently, the VLOs served to "mediate and ease the interaction between students, teachers, and texts" (Hernández Urrego, 2019, p. 119) in remote settings. Both teachers and students perceived the VLS as useful devices to trigger motivation to learn a foreign language since the activities included English content related to their study fields.

Regarding the LORI framework, it can be asserted that the VLOs designed in this study constituted and provided students and teachers with sufficient resources to enhance English language learning. Even with the new conditions that the Coronavirus incorporated in the teaching classes and methodologies in most places around the world, the VLOs helped to continue the teaching and learning process in remote settings. Accordingly, Davies & West (2014) mention that "future efforts to improve instruction and learning using educational technologies will still need to focus on providing students and teachers with ubiquitous access to new technologies and educational resources" (p. 853). This means that more technological tools should be included in the L2 classroom and that there is still a need to design, implement and evaluate more tools that enhance active and autonomous learning.

We assert that the development of VLO using the ESP approach constituted an effective pedagogical intervention in language learning environments that other upper education teachers and researchers can use widely. However, it is well known that the methods to assure quality in learning resources are constantly changing and adapting to distinct contexts and that the quality criteria of evaluation have the potential to lead to improvements in teaching practice (Falcão, et al., 2016, p.72). This implies that there is still a necessity to have adequate tools to evaluate and determine the value of the VLO (Pinto et al., 2017).

Some limitations of this study include the fact that most of the students were not able to fully interact with the second VLO prototypes to verify if the changes incorporated satisfied them because the semester ended, and the vacation break started unexpectedly. Besides, these resources were only explored by a few

students, for which further research in this area should include more participants to check the generalization of the results. Additionally, because of pandemic constraints which affected the semester, we lacked time to implement interviews with students and teachers, which could have added important information for the updated versions of the four VLO.

Undoubtedly, more research should be carried out to track students' learning outcomes when exposed to virtual environments and to deepen information about the infusion of technology in ESP learning and teaching settings. Such research will guide how teachers may design tailored VLO to meet near future students' professional fields (Hew & Brush, 2007). Furthermore, checking students' engagement and motivation levels and their relation to the time, effort, and commitment they put in when exploring the VLOs in autonomous settings could also be vital.

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