The Implementation of ICTs in the English Reading Process in the subject Aqueducts and Sewers of the academic program Civil Engineering at UIS

Andrea Camila Tarazona Mejia

Degree work to obtain the Bachelor's Degree in Foreign Languages with Emphasis in English

Director

Carolina Isabel Montes Perea

Master's Degree in Human Rights

Co director

Edgar Ricardo Oviedo Ocaña

PhD in Engineering with Emphasis in Environmental and Sanitation Engineering

Universidad Industrial de Santander

Faculty of Humanities

School of Languages

Bachelor's Degree in Foreign Languages with English Emphasis

Bucaramanga

2025

Acknowledgments

I am deeply grateful to God for guiding me through this journey and strengthening my spirit throughout the process. HE is the one who can give us the power and guidance.

I sincerely thank my family—my mom, dad, brother, and aunt—as well as my pets, Tina and Shaki, for their unconditional love and support.

I appreciate my friend J for staying by my side during late nights of work, and my loyal and loving partner for his constant encouragement, patience, and caring help during difficult moments. Likewise, my dear classmates and friends who care about the process and in their own ways, contributed in the success of this work.

I extend my thanks to the university for the opportunity to explore this topic and to the UIS professors and facilities that supported my academic and professional growth.

Lastly, I thank myself for staying committed and giving my best until the end.

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Abstract

Title: The Implementation of ICTs in the English Reading Process in the subject Aqueducts and Sewers of the academic program Civil Engineering at UIS*

Author: Andrea Camila Tarazona Mejia**

Key Words: ICT, MOODLE, reading comprehension, ESP

Description:

This degree work explores the implementation of Information and Communication Technologies (ICTs) to enhance English for Specific Purposes (ESP) reading comprehension among Civil Engineering students at the Universidad Industrial de Santander (UIS). Recognizing the challenge that students face with technical English in scientific articles, the study designed and implemented an online unit on the Moodle platform to improve their skills in a term course of three weeks. The methodology involved an intervention with approximately 23 students in the "Aqueducts and Sewers" course. The course unit included a series of interactive activities aimed at academic reading comprehension. Quantitative and qualitative data were collected and analyzed using tools like Google Forms and a Moodle forum. The results indicate that the intervention was effective, particularly in improving students' performance in multiple-choice questions and vocabulary matching. While students showed an initial lack of confidence in their English skills, they maintained a positive attitude towards learning and improvement. This study demonstrates that incorporating ICT tools like Moodle can effectively assist students in mastering technical English reading for their specific academic field. It is also highlighted the need of focus regarding availability of time for class interventions, friendly use of the platform and the offer of technological facilities.

*****Bachelor Thesis

** Faculty of Humanities. School of Languages. Director Carolina Montes Perea

Resumen

Título: La implementación de las TIC en el proceso de lectura en inglés en la materia Acueductos y Alcantarillas del programa académico Ingeniería Civil en la UIS*

Autor: Andrea Camila Tarazona Mejia**

Palabras clave: TIC, MOODLE, comprensión lectora, inglés para fines específicos

Descripción:

Este trabajo de grado explora la implementación de las Tecnologías de la Información y la Comunicación (TIC) para mejorar la comprensión de lectura en inglés para fines específicos en estudiantes de Ingeniería Civil de la Universidad Industrial de Santander (UIS). Reconociendo el desafío que los estudiantes enfrentan con el inglés técnico, el estudio diseñó e implementó una unidad en línea en la plataforma Moodle para potenciar sus habilidades. La metodología consistió en una intervención con aproximadamente 23 estudiantes de la materia "Acueductos y Alcantarillados". La unidad del curso incluyó una serie de actividades interactivas enfocadas en la comprensión de lectura académica, como pre y post-test, ejercicios de vocabulario, predicciones basadas en los títulos y un mapa mental final. Se recolectaron y analizaron datos cualitativos y cuantitativos utilizando herramientas como Google Forms y un foro. Los resultados indican que la intervención fue efectiva, particularmente al mejorar el desempeño de los estudiantes en preguntas de selección múltiple y asociación de vocabulario. Aunque los estudiantes mostraron una falta de confianza inicial en sus habilidades de inglés, mantuvieron una actitud positiva hacia el aprendizaje y la mejora. Este estudio demuestra que la incorporación de herramientas TIC como Moodle puede asistir de manera efectiva a los estudiantes en el dominio de la lectura de inglés técnico para su campo académico específico.

* Trabajo de Grado
** Facultad de Ciencias Humanas. Escuela de Idiomas. Director Carolina Montes Perea

Introduction

Currently, the integration of Information and Communication Technologies (ICT) in higher education is acclaimed by the academy for its well-known improvements in the learning process that have transformed traditional learning paradigms. For instance, according to Lara, J., & Magraner, F. (2017), ICT and gamification in classrooms improve students' motivation and learning, which is directly related to their motivation. This can be highly perceived in actual university classrooms, where the resources provided by the academy enable the implementation of these tools due to the improved access to resources that the university offers. Besides, based on Robin, S., & Aziz, A. (2022), digital tools effectively improve vocabulary acquisition in language teaching, enhancing reading, writing, speaking, and listening skills. This is exemplified in the implementation of the Moodle platform, which has a variety of tools that facilitate understanding and diversify reading comprehension.

Additionally, Ferrero, A., & Sainz, M. (2023) stated that ICTs facilitate efficient and effective access to digital information, promoting collaborative learning and turning students into protagonists of their learning process. Then, this points out the valuable collaborative work that characterizes UIS students, which is a principle included in the institutional project:

> **Trust and collective intelligence:** UIS is an area of mutual recognition in intersubjective relations. This makes it possible to define, elaborate, and integrate purposes, effectively mobilize knowledge and skills, and open assertive and creative channels of interaction and collaborative and transdisciplinary work,

> to support institutional management and community life, and face complex challenges. (UIS, 2018, p. 35).

Despite the potential benefits, there remains a significant challenge in effectively utilizing ICT to enhance the development of reading skills in English for Specific Purposes (ESP) for university students who do not go through exhaustive English input, as is the case for Civil

Engineering scholars. For the sake of this paper, it was previously decided that this subset of

English as a foreign language, due to the main focus, is oriented to the specific and technical English articles handling as the main resource.

Students of ESP often require specialized vocabulary and reading comprehension skills pertinent to their specific field, making the general approaches to reading instruction insufficient. While ICT offers innovative tools and resources tailored to individual learning needs, the implementation and impact of these technologies on reading proficiency in ESP contexts are not well understood. This gap in understanding poses a critical problem: How can ICT be effectively integrated into ESP curricula to improve reading skills? Addressing this issue involves examining the types of ICT tools available in the platform to employ, their implementation in educational settings, and their effectiveness in enhancing reading skills among ESP students. Additionally, it is important to consider the training and support needed for educators to utilize these ICT tools in their instruction effectively. Research on the best practices for integrating ICT into ESP reading instruction can provide valuable insights for educators looking to enhance their students' reading

skills.

Without a clear understanding of these factors, educators may struggle to adopt ICT in a way that maximizes its potential, thereby limiting students' ability to acquire the necessary reading skills for their specific academic and professional needs. For this reason, Professor and co-director Ricardo Oviedo, on behalf of the School of Civil Engineering, proposed to jointly design a Moodle course that provides his 8th-semester students with tools that support the process of reading in English. To accomplish this goal, the knowledge of support strategies by the undergraduate student will be put to the test, along with the support of the head professor and director, Carolina Montes Perea, who has extensive experience in the field thanks to her previous work.

Justification

The foundation for the realization of this project consists of two main components, the first one based on the main participation of the student practitioner. Thanks to her integral formation offered in the academic program, the apprentice is honored to provide assistance to colleagues in the academic field who require support in the management of the use of ICT tools. The path that has been traveled to reach this point has gone through periods of academic inconvenience, political strikes, the global pandemic of COVID-19, numerous physical and mental health struggles, and familial and financial issues. All of these have developed reliable autonomous work and adaptation skills, which strengthen the person who has traveled this path and have prepared her in multiple facets of life to direct and fulfill projects as expressed here. Hence, the role that the student will take is not one-dimensional, but on the contrary, will put into practice all her knowledge acquired through life, the academy, experience in pedagogical practices and working environments with the accompaniment of

supervisory professors, to demonstrate its extensive management in the use of technological applications and strategies for improving reading.

The second component is based on the real need to focus on improving reading skills in the population of UIS Civil Engineering students. This is mainly evidenced in the objective of this project, which had its origin in the initiative of Professor Oviedo (teacher of the subject Aqueducts and Sewers in the Civil Engineering program) that was looking for extra support that provide more appropriate training in linguistic aspects of the English language thus taking more advantage of the material used through the course. It was possible to establish contact with Professor Ricardo thanks to the Didactics Professor from the School of Languages UIS, Luz Mary Quintero, since she provided the access bridge to the realization in the initial stage of the project.

Throughout his career, Professor Oviedo has acquired a high level of mastery in his respective field of study and has presented great scientific contributions that have been shared in scientific journals that, for wider outreach, submit the written documents in English. Therefore, it is clear the importance for future engineers to master texts in English that are written principally with specific vocabulary for their field of study, which mainly concerns them, since these astonishing contributions cannot be missed and deserve to be fully understood.

By enhancing their English language skills, engineers can effectively communicate their ideas and collaborate with colleagues from around the world, ultimately leading to greater advancements in their field. This proficiency will also open up opportunities for engineers to participate in international conferences and publish research in prestigious journals, further solidifying their impact on the global

engineering community. This is also evidenced in many in the work of Yudistira et al. (2018), the researchers conducted a needs analysis for English for Civil Engineering students, emphasizing the importance of reading and writing skills over speaking and listening.

To improve learning, recommendations included introducing real texts and genre-specific writing tasks into the curriculum. Thus, the value of English for Specific Purposes (ESP) cannot be emphasized in a globalized world where specialized language abilities are essential for professional success. Some recent studies have analyzed the impact of ESP courses through Moodle or other instructional digital platforms. A study by Prasetya (2021) demonstrated positive results in providing specific and culturally applicable instruction, as well as in developing mastery of vocabulary in various contexts and improving reading comprehension. Other studies have shown the success of the implementation of the use of Moodle and an ESP approach. According to Humeniuk et al. (2021), students improved their language skills after participating in an ESP online course using Moodle. Additionally, another study focused on teaching English language for specific purposes for master's in mechanical engineering showed that the course it implemented "had a significant positive impact on the level of English proficiency of the experimental group students" (Shalatska et al., 2020, p. 429).

ESP students frequently encounter particular hurdles, including the requirement to comprehend complicated, field-specific vocabulary and concepts. Traditional teaching methods may fall short of meeting these needs, requiring the exploration of novel ways, as the one intended to be shown through this paper.

1. Objectives

1.1 General objective

To assist the ESP reading process in the subject Aqueducts and Sewers to achieve academic reading comprehension through the use of ICT tools

1.2 Specific objectives

To design an online unit in the Moodle platform course through the use of ICT that enhances Civil Engineering students' reading skills.

To incorporate Moodle interactive activities with the support of gamification strategies.

To contribute to the understanding of scientific articles in English for Civil engineering students with the usage of strategies that target essential vocabulary for their field of study.

2. Main work

2.1 Theoretical framework.

2.1.1 ICT relevance in university teaching

Integrating Information and Communication Technologies (ICTs) in higher education has become essential to pedagogical innovation. The use of ICTs in teaching and learning has reshaped traditional educational models and promoted new forms of knowledge construction (Emezirinwune, 2024).

ICTs are a broad technical instrument category that facilitates dynamic and interactive teaching and learning. According to Gulavani (2020):

> ICTs for education refer to the development of information and communication specifically for the teaching and learning process. ICTs in education involve the adoption of general components of ICTs in the teaching and learning process. New technologies like web-based PCs, mobile phones, satellites, Wi-Fi technology, and the internet are helping teachers and students to gather and disseminate information.
>
> (p. 1769)

ICTs are also essential for raising the general standard and effectiveness of academic procedures. Ulugov and Turayev (2022) affirm that "by applying information and communication technologies to education, it is possible to achieve the effectiveness of the educational process for teachers, students, and other interested parties who are directly or indirectly involved in the educational process" (p. 163). This emphasizes how digital technologies influence aspects of academic effectiveness. In the context of this paper, ICTs are not only supplementary tools but also essential elements for the intervention, as Moodle was used to foster autonomy, accessibility, and flexibility. These tools can improve teamwork and communication.

2.1.2 Instructional strategies to achieve academic reading comprehension

This concept is essential to this project as it reflects the key work that will be done for the fulfillment of the final goal, which is to improve the reading ability of students. It is mainly supported by the work of Chen (2023). This paper briefly explored various instructional strategies for improving reading comprehension among English language learners (ELLs). Qualitative research and systematic reviews demonstrated the efficacy of balanced reading education, translanguaging instruction, and flipped learning

in increasing ELLs' reading comprehension abilities. The report mentions several effective ways for improving ELLs' reading comprehension skills, including systematic vocabulary instruction, the use of visual aids to connect essential concepts, opportunities for peer exchanges about reading content, and the implementation of flipped learning methodologies.

The main and fundamental results, which will be the basis for the implementation of activities together, are the emphasis on vocabulary, visual aids, such as images and graphic organizers, and group learning in improving reading comprehension. Additionally, it is mentioned that vocabulary instruction is crucial for enhancing reading comprehension, with a focus on teaching academic vocabulary systematically and incorporating relevant words explicitly.

2.1.3 Use of Moodle as an instructional platform to enhance English skills

The use of Learning Management Systems, also known as LMS, e-learning platforms or instructional digital platforms, is crucial in today's educational landscape. Universities have adopted the use of these platforms in recent decades to improve and support the learning process of their students. Among these platforms, there is one called Moodle that stands out as a very used e-learning platform due to its flexibility and variety of helpful tools. These features support the learning experience and facilitate English language learning in different educational contexts.

Nowadays, technology is an essential part of education; for this reason, and especially in higher education, teachers rely on the Moodle platform to provide students with classes that are engaging and interactive. Moodle also allows students to develop writing,

reading, listening, and speaking skills through different tasks and technology-enhanced practice.

Many studies have highlighted the effectiveness of Moodle in recent years. According to Zen et al. (2023), students through Moodle tend to be more engaged and autonomous than those in traditional classes, due to its method that fosters active and independent learning (p. 7). In a similar way, Nabila, Mustofa, and Awaliyah (2022) emphasized that "the students' engagement can be pushed through the teacher's role in selecting a teaching tool. Moodle is one of the alternative teaching tools that can be used in the classroom" (p. 207). Other recent studies showed in their results how Moodle can help students with their English acquisition. For instance, Prasetya (2021) highlights that through Moodle, teaching can shift traditional pedagogical approaches toward more student-independent learning, improving English skills. Similarly, Luna et al. (2023) concluded that the use of e-learning platforms significantly influenced the process of English language learning and improved its outcomes. These findings confirm that Moodle is, in fact, an effective tool that can enhance the English skills of students, regardless of their area of study.

In the context of this paper, Moodle was used to support Civil Engineering students at UIS in enhancing their academic reading comprehension in English. The capacity of the platform enabled the use of interactive modules and digital readings; this was helpful to provide students with authentic scientific texts in the subject of Aqueducts and Sewers. These texts are mostly in the English language, and for this reason, it was essential to use this instructional platform to help students in their reading skills

development. They were guided through tasks to enhance their comprehension of the texts in English, encouraging them to work independently.

2.1.4 English for Specific Purposes (ESP)

English for Specific Purposes (ESP) is "an approach to course design and teaching that targets groups of learners who have a common goal or purpose in learning English. This may be an educational or occupational focus" (Woodrow, 2018, p. 5). This approach can be used in fields such as the one being worked on in this paper, civil engineering. Different from traditional English teaching, ESP emphasizes the use of specific vocabulary and functional language in the context of what the students need. This approach is practical and useful for learners who seek better educational and professional results.

ESP was used in the intervention that this paper discusses, and also, the main objective is to assist the ESP reading process in the subject Aqueducts and Sewers to achieve academic reading comprehension through the use of ICT tools, more specifically, through Moodle. The ESP component was the main focus in designing a Moodle course for Civil Engineering students at

Universidad Industrial de Santander. The students were exposed to real scientific publications in English that had technical terminology and structure unique to their field. The Moodle course included ESP-oriented strategies that helped the students have a better comprehension of these

texts.

3. Methodological design

3.1 Profile

For the development of the design of the didactic unit in the course of Aqueducts and sewers subject, under the guidance of the magister director, it was paramount to take the course “Teacher Training for ICT-Supported Teaching”, conducted by the Centre for Teaching Development at UIS - CEDEDUIS. The content was mainly about the Moodle 3.5 platform's functionalities as well as pedagogical strategies for implementing digital content in class, while also becoming familiar with other technological tools available for free online or that both teachers and students can use thanks to Microsoft licenses granted through institutional mail. To put into praxis, an initial sketch of the Moodle unit was designed. Nevertheless, this design was completely changed due to multiple suggestions from the directors and new ideas, as well as the update of Moodle services for 3.5 to 4.4. It is worth clarifying that the course was straightforward, relevant, and familiar to the user, even if it is designed for professors who have already graduated. However, due to the same characteristics, it was not possible to obtain the final certification. This was not a significant inconvenience, as it could be resolved by writing to the responsible professional's email to clarify the situation. Nevertheless, it should be revised so that in the future, if any university student wants to choose this form of teaching practice through Moodle, they can receive the respective certification, which took time and dedication to achieve.

A general and more specific understanding of the management of the Moodle platform was accomplished through the units, jointly with the audiovisual material and reading articles. It also includes an approach of recognition and appropriation of

information related to the institutional framework, which considers the university's mission and vision, as well as the principles and values expected by its students. Likewise, taking the CEDEDUIS training course, there were a series of virtual and in-person meetings with directors to arrange the details and the plan to follow. Initially, Professor Ricardo arranged in-person meetings in the Civil Engineering building to start planning the intervention, the schedules, and the assessment instruments. Only virtual meetings were arranged with Professor Carolina to provide guidance, order, and structure to the outline to craft the Moodle feed.

Similarly, in the Aqueducts and Sewers subject, skills and learning outcomes of the subject are presented, such as applying principles of fluid mechanics, designing with teamwork a water supply and sewerage system, and explaining the criteria used for the layout of water supply systems. In the initial sketch, it was proposed to include an infographic summarizing these learning outcomes, plus a graduate profile, since students who take this subject should be taking eight semesters of classes. Nonetheless, this design was not included in the final version of the Moodle feed.

Figure 1

Head banner of the course on the Moodle platform proposed in the initial sketch

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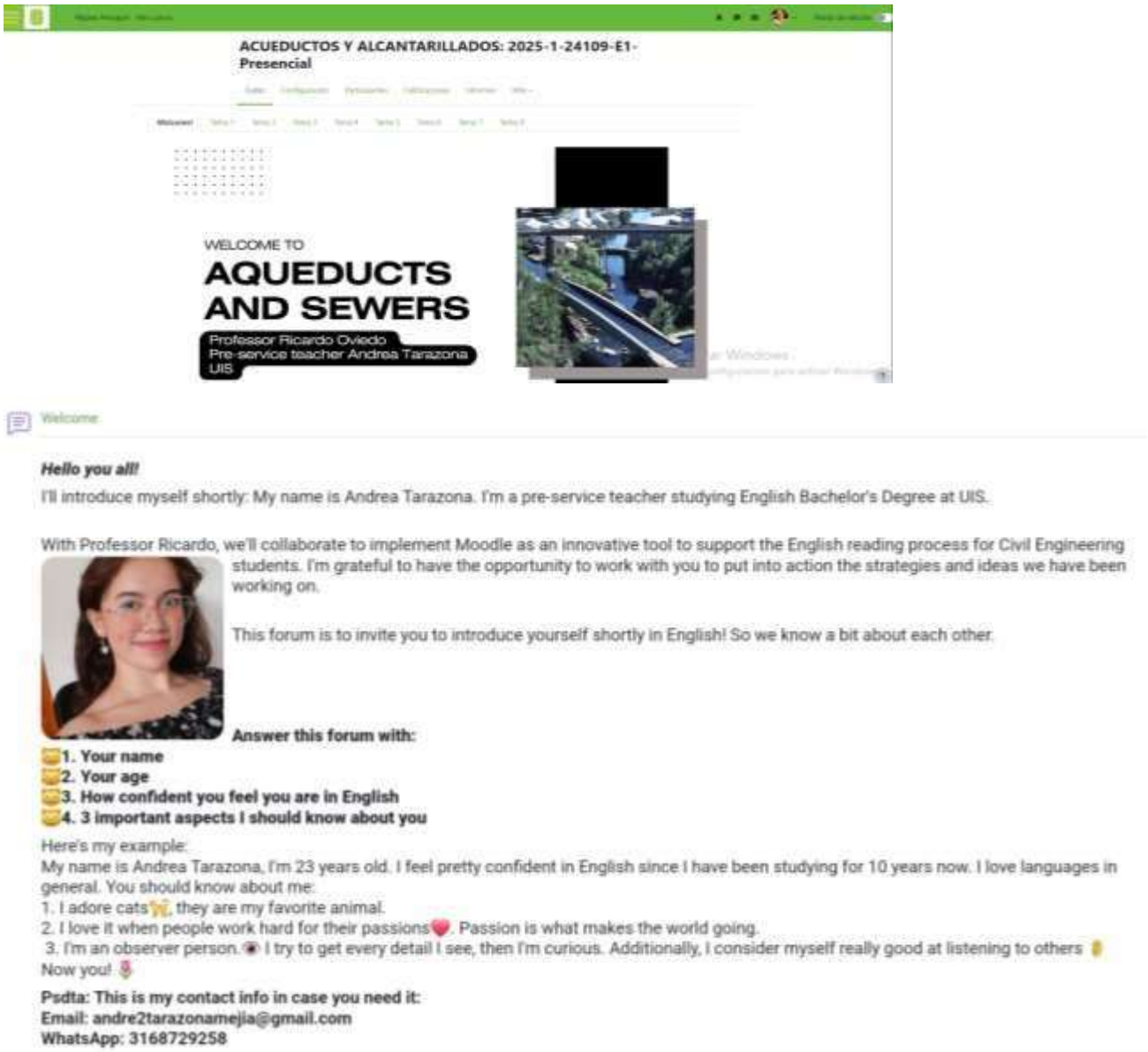
Figure 2

Infographic and forum proposed in the initial sketch

Figure 3

Final Moodle feed presentation



In the subject curriculum, the professor decided to use material that was initially written in the English language, which is essential to use in the subject as it adds

academic value to the subject and provides more opportunities for students to expand their basic concepts to carry out evaluation activities. The reading chosen to employ was the scientific article “Assessing Sustainability in Rural Water Supply in Developing Countries using a novel tool based on Multi-Criteria Analysis” (2020), having as authors Isabel Domínguez, Edgar Ricardo Oviedo Ocaña, Karen Hurtado, Andrés Barón, and Ralph P. Hall. Briefly, this document discusses the evaluation of participation in water resource management by developing a tool based on Multi-Criteria Analysis to assess the sustainability of rural water supply systems in developing countries. The tool consists of 17 attributes with 95 quantifiable indicators and was applied to a case study in Colombia. Data collection methods included interviews, social cartography, technical inspections, household surveys, and water monitoring. The study emphasizes the importance of community involvement and the long-term functionality of rural water systems for sustainability assessments and improvement. Challenges in sustainable water provision align with those observed in other contexts, emphasizing the importance of addressing training, knowledge, and legal compliance. Both qualitative and quantitative data analysis methods were used to assess compliance levels using Excel spreadsheets.

Furthermore, extra details regarding the subject, the scheduled classes were performed in semester 2025-1, Tuesdays and Thursdays in the afternoons, covering the groups E1, E2, and E3. Approximately 23 students were enrolled in these groups.

3.2 Moodle feed and activities

In the initial sketch of the Moodle course (to fulfill the CEDEDUIS training course), a folder was presented with three readings selected by Professor Ricardo.

Attached to this folder is a file containing keywords for the articles that have been added for reading support. This document aims to support students with the reading process and avoid using a literal translation that distorts the complex meaning of the reading. Secondly, an evaluation tool is attached, in this case, a checklist specifically designed to evaluate the final evidence. Finally, a digital tool selected for its easy handling for the design of mental or conceptual maps is annexed, which can serve as support when sketching the graphic organizer. It is highlighted that a summative evaluation is performed. Therefore, the last section is an open window for the students to load documents for the final design of the conceptual map for its subsequent qualification.

However, in the final version of the Moodle feed, none of these designs were used, and various changes were made. One of the most remarkable changes is that it was jointly decided only to implement the article mentioned previously to study, since time would be a restriction. The actual time available in class was 30 minutes, and a total of 4 in-person interventions were made.

Figure 4.

Initial sketch of the Moodle feed

Figure 5

Checklist provided by CEDEDUIS to assess the final output

UNIVERSIDAD INDUSTRIAL DE SANTANDER
VICERRECTORÍA ACADÉMICA
CENTRO PARA EL DESARROLLO DE LA DOCENCIA – CEDEDUIS

LISTA DE COTEJO
EVIDENCIA: Mapa conceptual
ORGANIZACIÓN: GRUPAL _____ INDIVIDUAL ___x__
COMPETENCIA EVALUADA: Identifica y soluciona problemas de abastecimiento de agua y alcantarillado mediante la aplicación de conceptos de mecánica de fluidos, hidráulica e hidrología.

AUTOR/GRUPO:
_____

FECHA DE EVALUACIÓN _____

INSTRUCCIONES PARA EL DILIGENCIAMIENTO:
1. Realice la revisión del XXXXX de su compañero.
2. Para cada uno de los aspectos, señale con una X si el cuadro analizado lo cumple o no. Incluya las comentarios que justifiquen su apreciación.
3. Cuente el número de X que cumple y busque en la Tabla de valoraciones la valoración cualitativa y el rango en la calificación.
4. Proporcione la valoración cualitativa y la calificación al cuadro, en las casillas correspondientes.

ASPECTO	CUMPLE	NO CUMPLE	OBSERVACIONES
1. El mapa mental cubre todos los conceptos principales y subtemas discutidos en el texto			
2. La información está organizada de manera lógica, con conexiones claras entre las ideas principales y los detalles de apoyo			
3. Los conceptos importantes están visualmente resaltados mediante el uso de color, tamaño o ubicación dentro del mapa mental			
4. Los conceptos e información en el mapa mental son representaciones precisas de los del texto			

In the final version, students were presented with a more complete course to study the reading in a step-by-step order. As shown in the illustration, the online course had banners made with the support of Canva that guided the students through the steps to accomplish the process. A total of 8 steps were proposed to follow, each one with a specific task to develop. In the following chapters, more information and details will be presented.

3.3 Steps

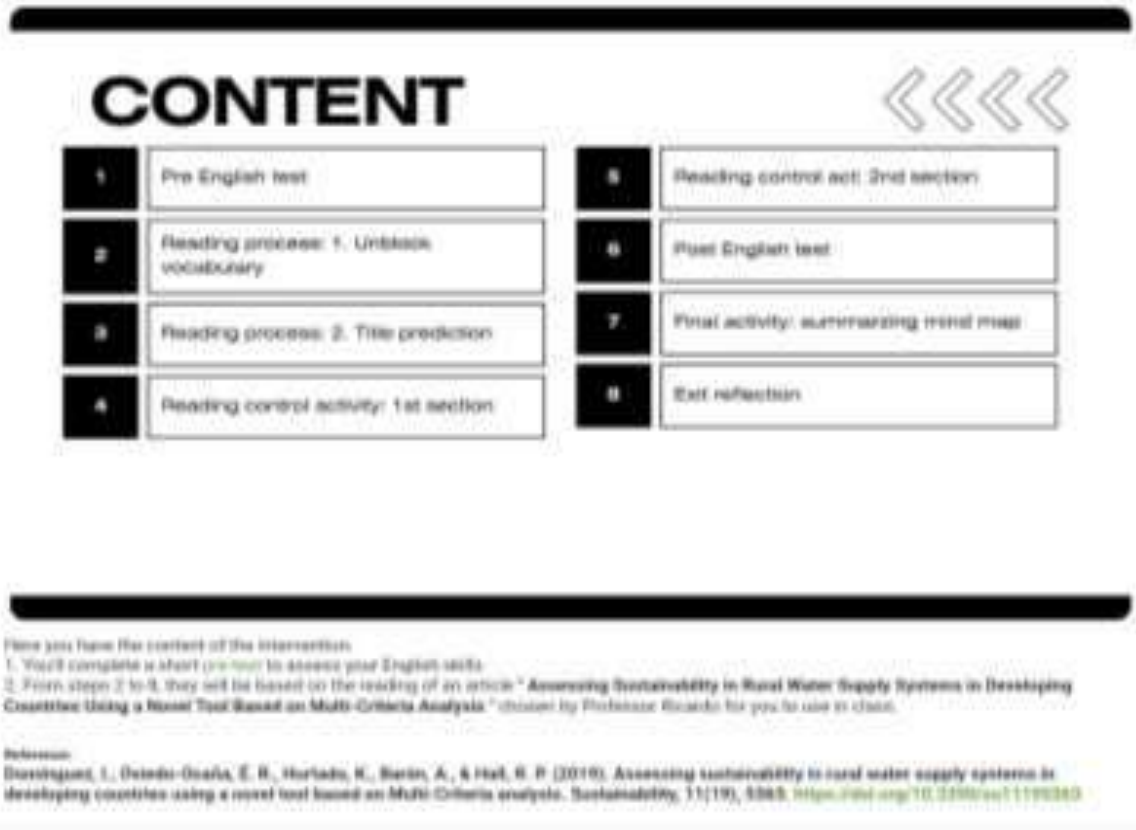
To fulfill the objective of contributing to the understanding of scientific articles in English for Civil engineering students with the usage of strategies that target essential vocabulary for their field of study, these steps were designed:

1. Pre test
2. Reading process 1: unblock vocabulary
3. Reading process 2: title prediction
4. Reading control 1st section
5. Reading control 2nd section
6. Post test
7. Final activity: summarizing mind map
8. Exit reflection

In each step, different tasks were proposed to be done before reading, at the time, and after the students read the article.

Figure 6.

Content of the Moodle feed



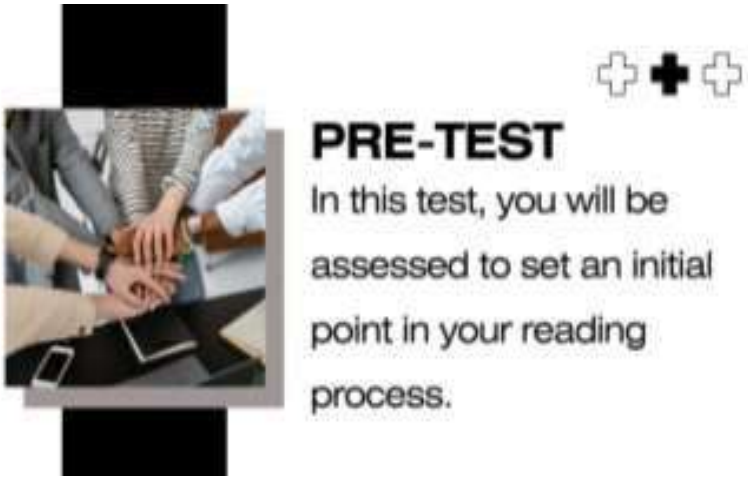
3.3.1 English Pre-test

In the section of the pre-English test, a Google Forms link was added with the objectives of first, assessing the level of proficiency the students were able to manage, and second, presenting the type of tasks they were going to face in the post-test. This test was done in the first session with a short slide presentation on the importance of this intervention. The pre-test includes questions such as multiple-choice options, open questions, true or false, and vocabulary matches.

Additionally, students were informed that their performance on the pre-test would not affect their final grade, but rather serve as a diagnostic tool to tailor instruction to their needs.

Figure 7.

First step: Pre-test



To begin with, you will complete this Googe form to provide the initial point in your reading skills in English.
To do this:

1. In your phone, go to this **link:** https://forms.gle/pgvQKnheVXcNiwZs6
1. Complete with your email, complete name and UIS code
1. You will have 30 minutes to complete the test

3.3.2 Reading process 1: unblock vocabulary

In the next intervention, the second step was addressed. This was the first reading process: unblock vocabulary. To do so, in class, the pre-service teacher organized another slideshow and, with the help of Quizizz, created a set of flashcards with keywords to associate before starting the reading. The students had to join the word with the definition, and they could do the activity as many times as they needed to. After doing that, they were presented with a quiz to reinforce their knowledge. The content of the flashcards is presented in Figure B. After finishing the activity, students had to

upload the evidence through a screenshot with their corresponding name and UIS code to the Moodle course in the window: Tema 2. This interactive and engaging approach to learning vocabulary not only helped students familiarize themselves with the key terms but also allowed them to practice and reinforce their understanding in a fun way. By uploading their evidence to the Moodle course, students were able to track their progress and receive feedback from the English teacher, promoting a more personalized learning experience.

Figure 8.

Second step: Key vocabulary banner

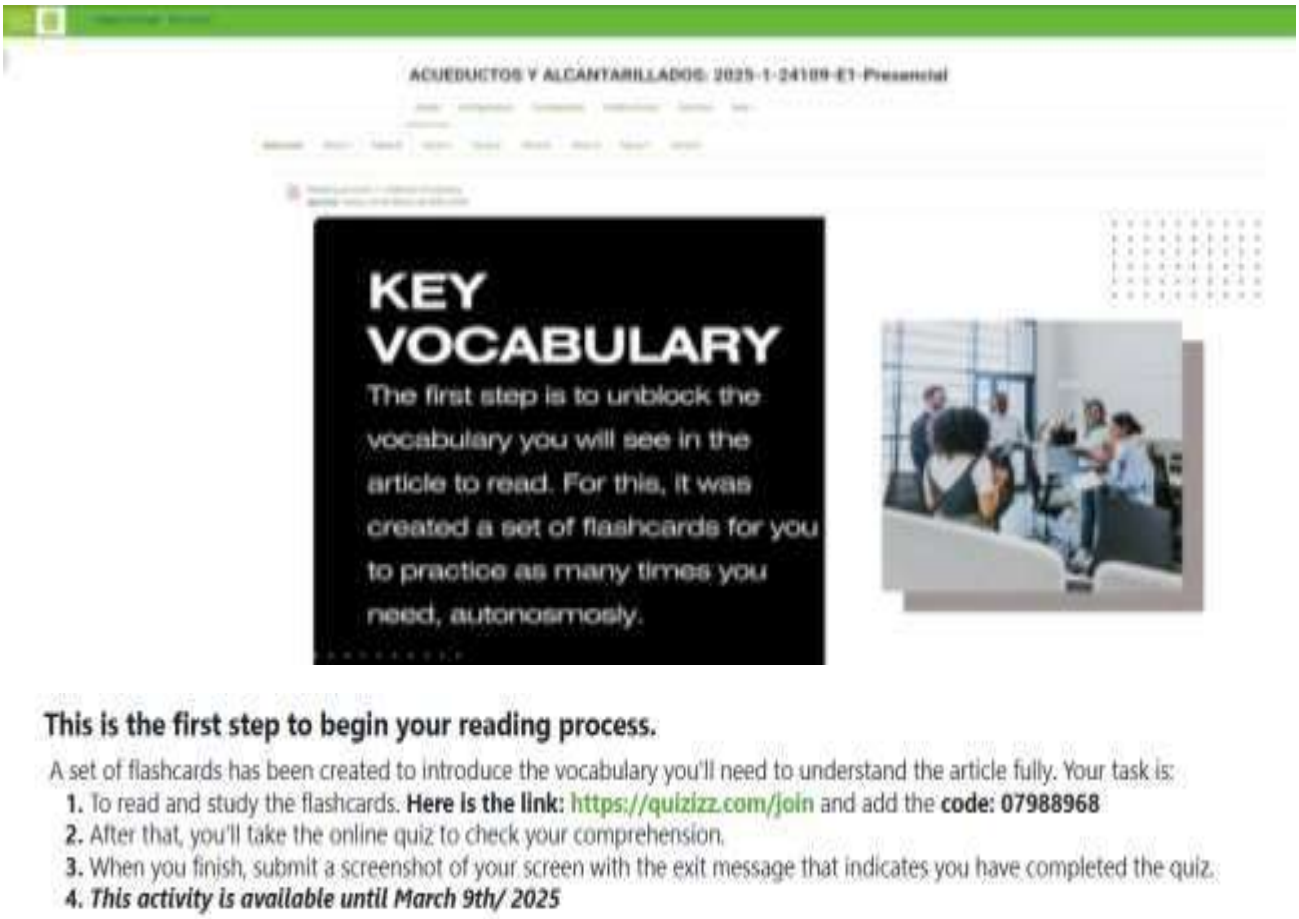
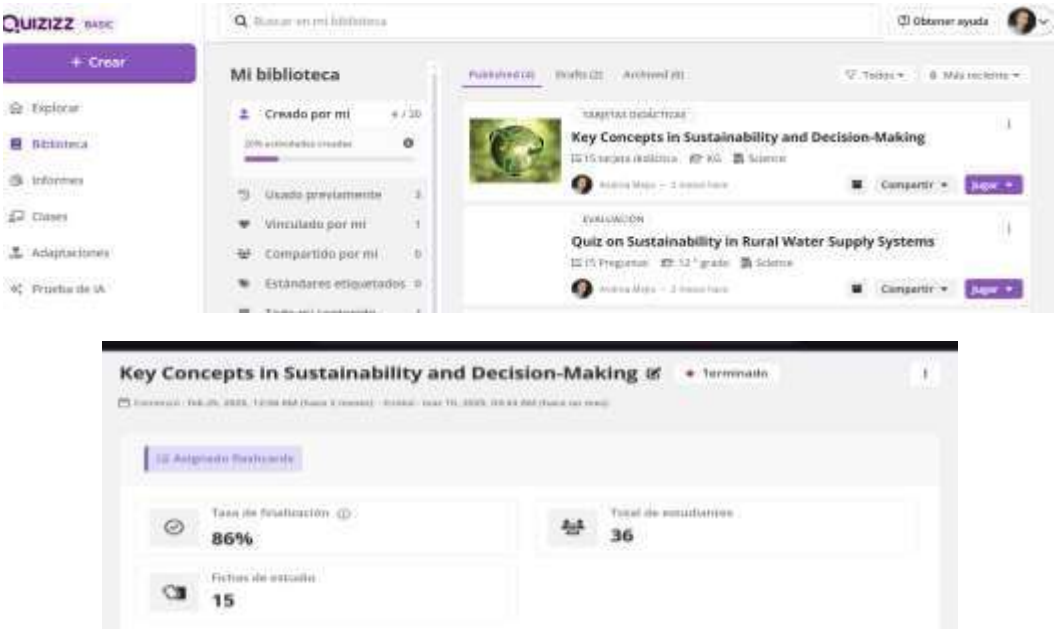


Figure 9.

Quizizz reports



3.3.3 Reading process 2: Title prediction

According to the reading's title and keywords, students were to publish their predictions in a Moodle forum as part of the scheduled activity for this segment. This was made in the third intervention class. The purpose of this exercise was to encourage critical thinking and collaboration among students, as well as to provide an opportunity for peer feedback and discussion. The Moodle forum allowed easy access to all predictions and facilitated a more interactive learning experience. Overall, the activity aimed to enhance students' analytical skills and promote a deeper understanding of the subject matter. By sharing their predictions and engaging in discussions with peers, students were able to broaden their perspectives and learn from each other's insights.

Figure 10.

Third step: Title prediction

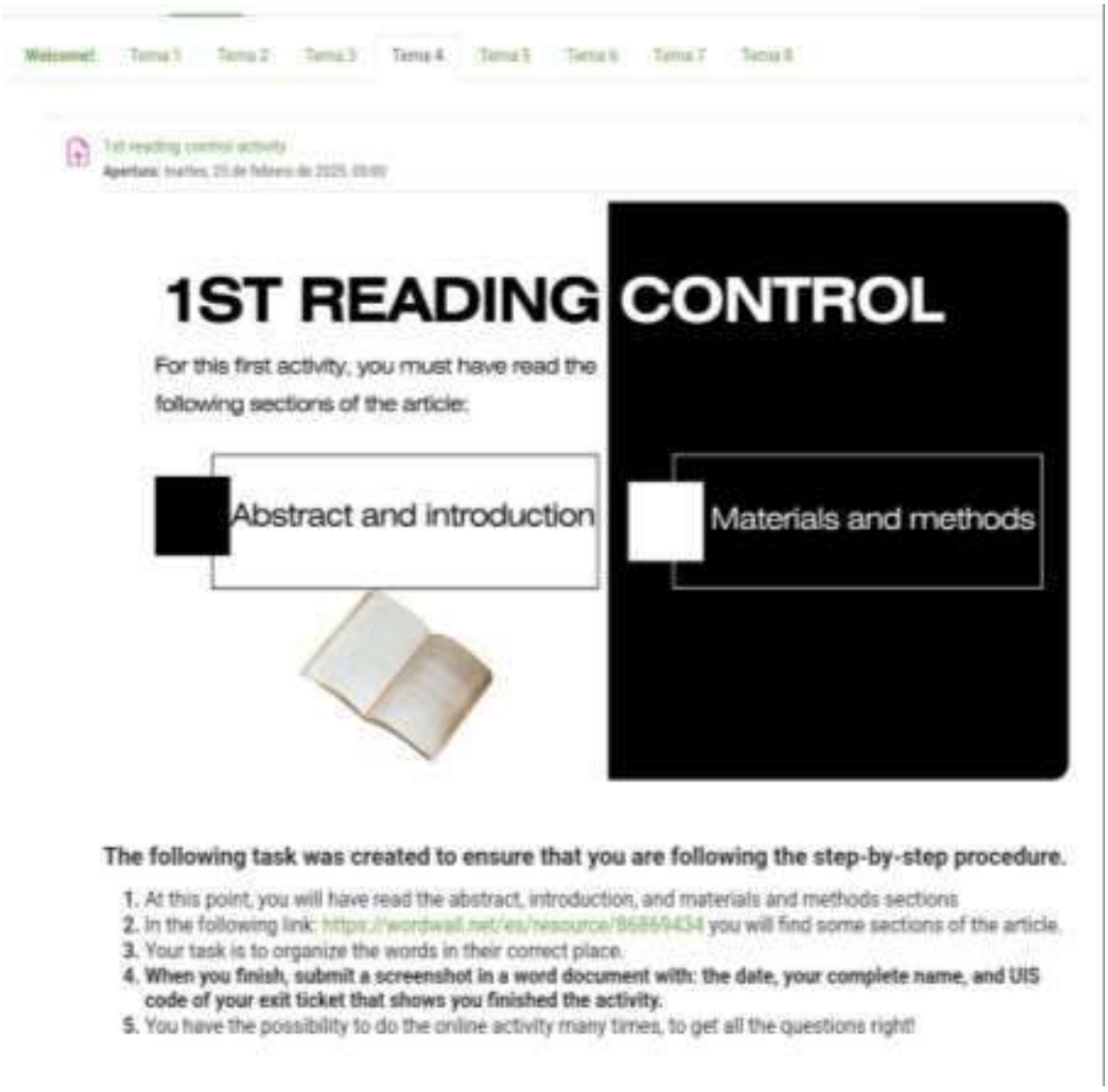
3.3.4 Reading control 1st section

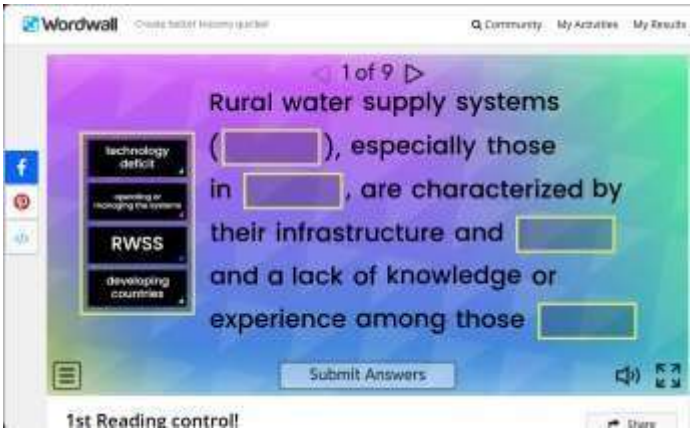
In this section, 2 activities were proposed while the students read, for which the content of the article was divided to get a more controlled and guided reading process. The intention with this approach was to encourage deep reading with interactive comprehension checks to ensure that students were actively engaging with the material and fully grasping the concepts presented. This interactive approach not only enhanced their comprehension skills but also fostered a more interactive and engaging learning environment. The first activity covered the sections: abstract, introduction, materials, and methods from the article. The English teacher designed a Wordwall cloze gap

activity to test students' understanding of key concepts and vocabulary in these sections. This interactive exercise required students to fill in the missing words from the text, reinforcing their comprehension and retention of the material.

Figure 11.

First reading control



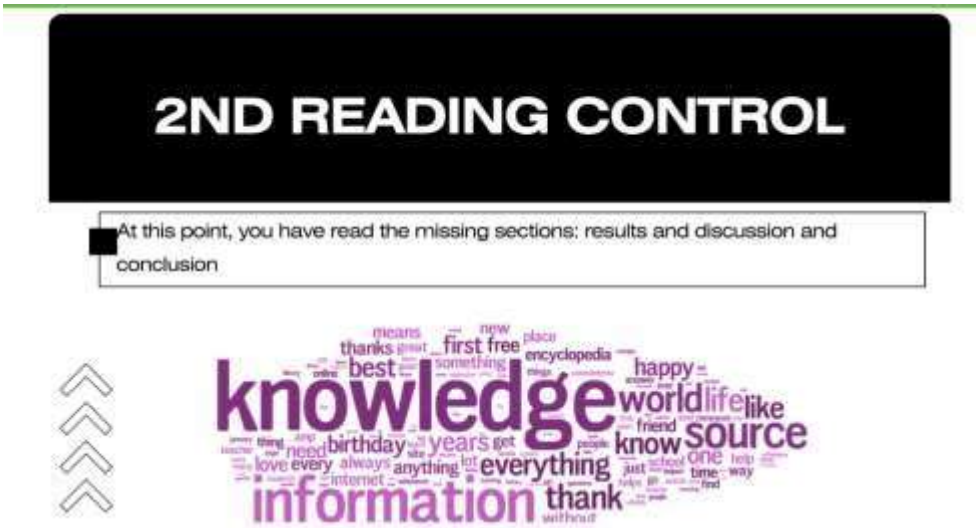


3.3.5 Reading control 2nd section

For the second activity, the students were asked to summarize the results section with a word cloud. This visual representation allowed students to identify and prioritize the most important information from the results section, enhancing their analytical skills. By incorporating these interactive activities, the English teacher was able to create a dynamic and effective learning experience for the students.

Figure 12.

Fifth section: 2nd reading process



For this second reading control activity, your task is to create a word cloud to summarize the attributes identified as relevant to characterize the sustainability of RWSS.

To do this, follow the steps:

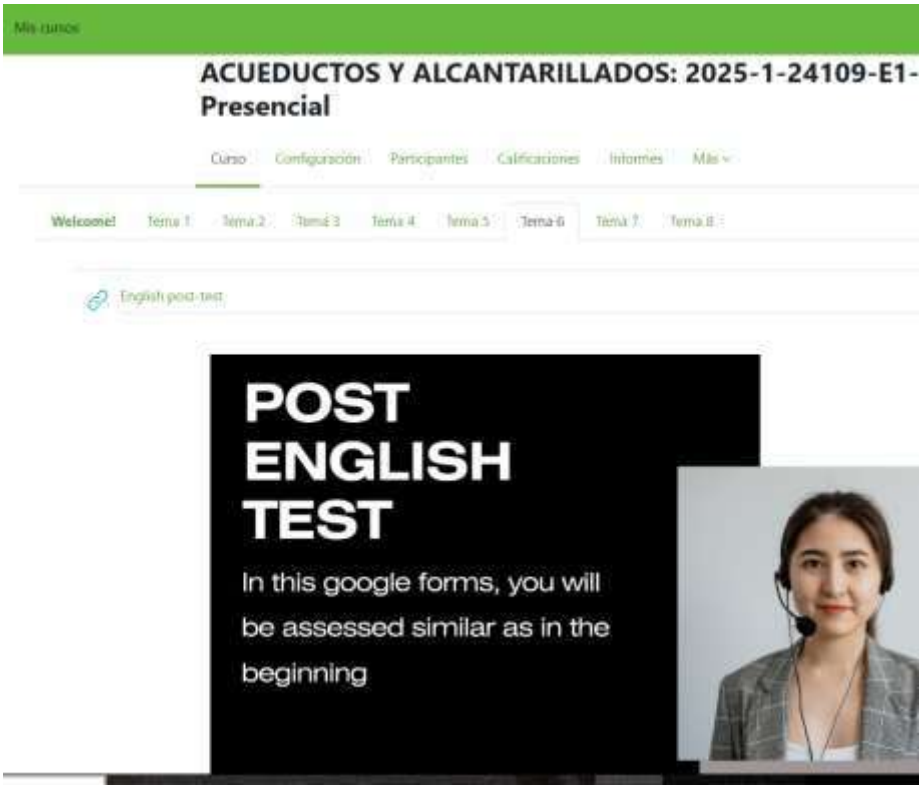
1. Choose your favorite word cloud online marker, I recommend this one: https://www.nubedepalabras.es
1. Individually create the word cloud and submit it in a PDF document with your name and UIS code.

English Post-test

Finally, the post-reading section aimed to reinforce learning through assessment with an interactive quiz through Google Forms. This questionnaire included multiple-choice questions (to test comprehension), fill-in-the-blanks (for key terms), and matching exercises (linking definitions to concepts).

Figure 13.

Sixth section: Post English test

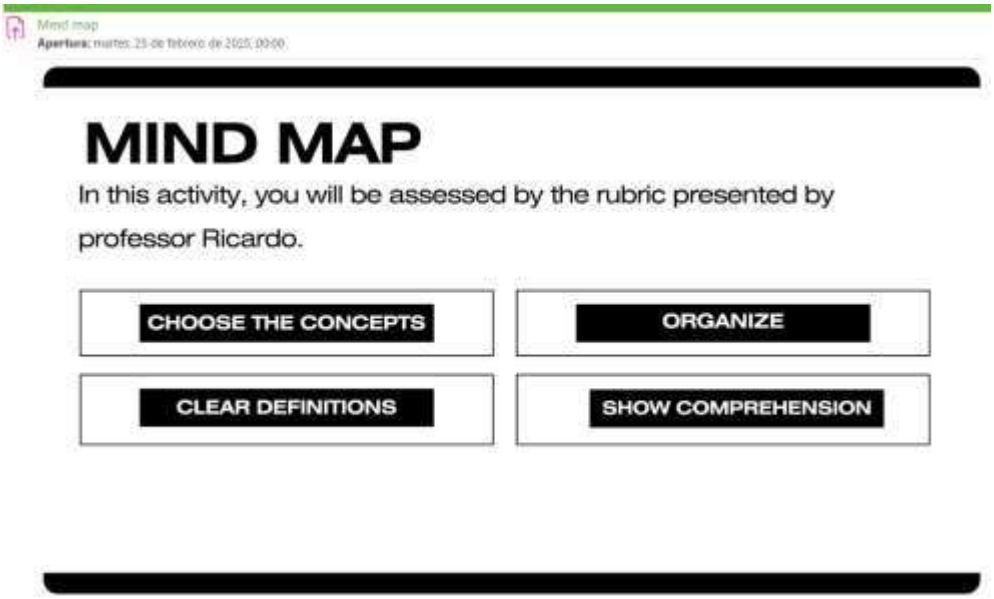


3.3.6 Final activity: summarizing mind map

In agreement with Professor Oviedo and following his suggestions, the work done with reading should be evidenced in the design of a conceptual map that synthesizes the information so that the student deepens into the concepts handled. This visual representation will help students connect ideas and see the bigger picture of what they have learned. This activity had a grade that was calculated using a rubric that was shared and reviewed in class with the students. One of the criteria highlights the follow-up to the reading process, which also includes structure, style, readability, and creativity.

Figure 14.

Mind map



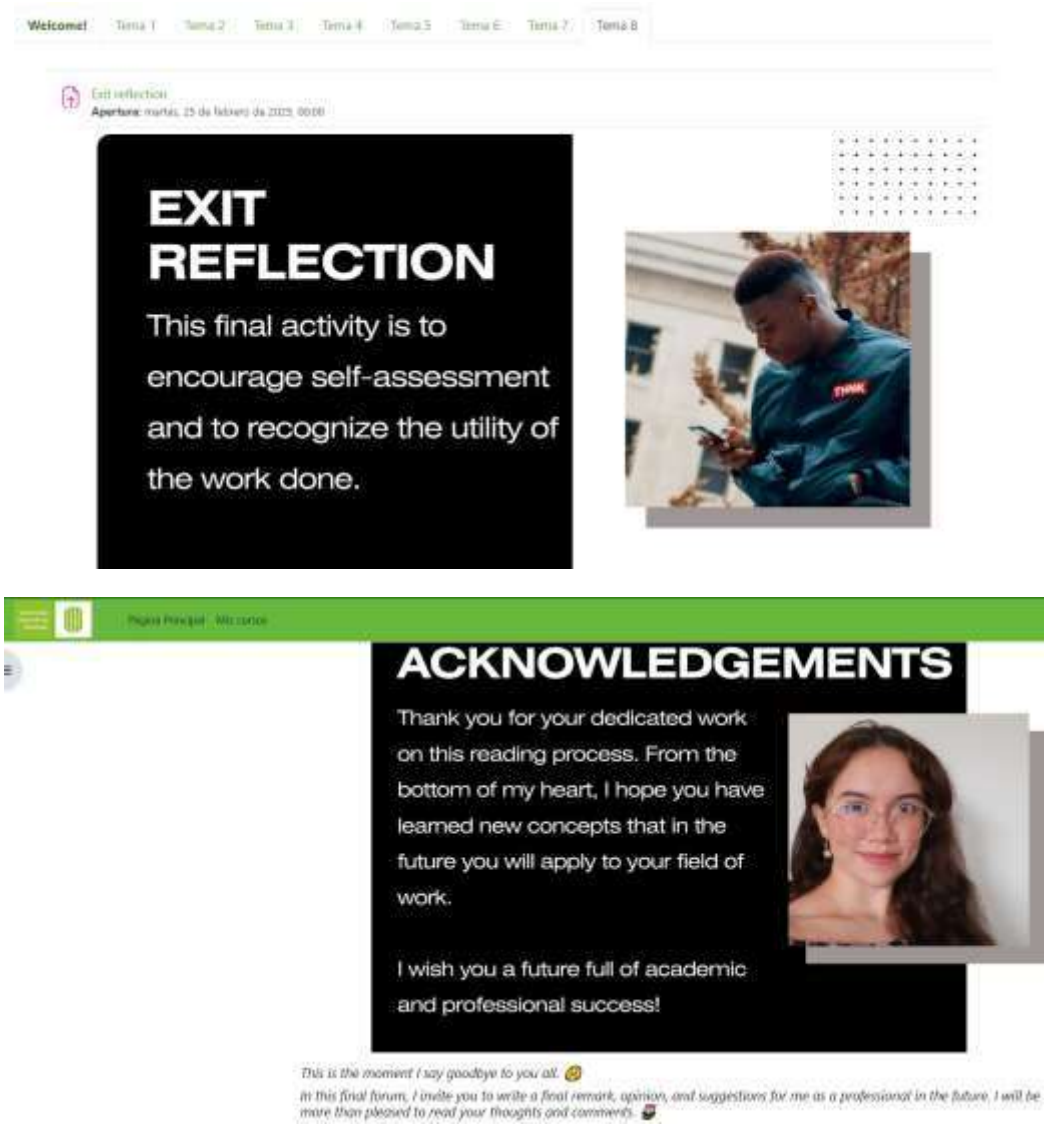
3.3.7 Exit reflection

This final activity had the objective of encouraging metacognition and continuous improvement. It was originally designed to take place through a Moodle forum, however, by time measure, open questions were included in the post test so that

students could take time to reflect on their performance and the impact of the Moodle course in general to their knowledge in the university program subject and their ongoing process of learning English. Finally, a banner was presented to thank the students for their valuable collaboration in the realization of this project.

Figure 15

Final section: exit reflection and acknowledgements



3.4 Assessment strategies

As assessment instruments were integrated, a checklist and one rubric were used to grade the corresponding activity. The rubric was made taking into account the rubric Professor Oviedo uses to assess the mind map. The pre-service teacher added a new criterion to value the process used to achieve the design of the map. This rubric was included in the Moodle course after being socialized with the students. The checklists were used to grade the reading controls throughout the process. These activities had a grade, different from the reading process activities. The integration of assessment instruments helped to ensure that students were able to demonstrate their understanding of the material in a variety of ways. This approach also provided students with clear expectations for how their work would be evaluated, promoting accountability and motivation.

Figure 16.

Assessment checklist

MOODLE COURSE CHECKLIST

NAME:_____

DATE:_____

Criteria	Applies	Does not apply
Completed the assigned activity (Wordwall or Word Cloud)		
Uploaded a screenshot to Moodle		
Submitted the activity on time		
Followed the instructions provided in the task description		
Used relevant vocabulary or content from the reading materials		

Final grade:_____

4. Results

The results presented below are organized according to the activities carried out and the answers given by the students. The data is displayed clearly and concisely, allowing for easy interpretation of the findings. It is pertinent to mention that this analysis was done with the support of analyzing AI to have more precise data, to identify trends and patterns in student responses, aiding in the analysis of the results.

4.1 First forum

The “introduce yourself” forum set the tone to define the initial view of students regarding English. In terms of age, the forum responses came from 18 students aged between 20 and 26, with most of them being around 21 or 22 years old. When it comes to their confidence in using English, the students mostly reported feeling low to moderately competent, especially when it comes to speaking. To the question: How confident do you feel in English? phrases like *“I don’t feel confident,” “I find it hard to speak,*” and *“I feel insecure”* popped up quite a bit. While many students described themselves as struggling, a few were able to distinguish their skills in different areas: *“ I don't feel confident speaking English, but I'm not bad at it. I like the language, but I don't practice as much as I would like”, “I feel confident with my English skills but I know that I need more practice if I want to be fluent*”. Some felt more at ease with reading or writing compared to speaking, showcasing a mix of language abilities: “ *I feel confident in English sometimes, it depends if I have to speak, read o write, most of the time I feel more confident when I write”, “I am comfortable using the English language, I’m not good speaking English, but, I’m feel good reading and writting”.*

Even with this general sense of insecurity, there was a noticeable positive attitude towards improvement. Several students highlighted their motivation to learn, sharing thoughts like *“I try to learn it each day,” “I’m working on getting better,”* and *“This activity will really help me.”* These comments reflect a growth mindset, showing that they recognize their challenges but are eager to enhance their skills.

Interestingly, only one student expressed a clear dislike for English, which might point to an emotional barrier that isn’t commonly seen in the rest of the group. This

stands in contrast to other responses that, while cautious, still showed a determination to push through and make an

effort.

In summary, the feedback reveals a group of students who generally feel insecure about their English skills, especially in speaking. However, most of them are keen to improve and maintain a positive outlook on learning. These insights suggest a need for teaching strategies that focus on building confidence, enhancing oral communication, and providing tailored support, especially for those who are stronger in reading and writing.

4.2 Google Forms pre- and post-tests

One of the questionnaire's main concerns was the nature of the tasks, as mentioned in the stages section. Significant variations in student performance across a range of task categories, including multiple-choice questions, true/false statements, open-ended questions, and vocabulary matching, are revealed by analyzing the pre-test and post-test replies. It is crucial to note at this moment that the pre-test evaluated the students based on a distinct concept from the base concept, which covers the scientific article—the main component of this intervention. Because the post-test deals with scientific and technical terminology while the original test may be at a very easy level, the results may differ.

The results are shown first in a quantitative approach, starting with the performance in each type of task:

4.2.1 Multiple choice questions

In the pre-test, there was a 100% accuracy on the main purpose of bridges (e.g., "To help people and vehicles cross rivers") and on materials used to build bridges ("Steel and concrete"). In the post-test, it was an 87% accuracy on the purpose of the assessment tool ("To evaluate sustainability of rural water supply systems"). Additionally, there was a variability in specific details: for instance, the number of households served: 53% chose "95," 33% chose "85," and 13% chose "65." For the most important attribute, 80% selected "Water quality," while 20% chose "Population characteristics."

It is interpreted that in the Pre-test, multiple-choice questions were nearly flawless, indicating strong foundational knowledge. Nevertheless, the Post-test introduced variability, suggesting some difficulty in retaining precise numerical or contextual details.

4.2.2 True/false statements

For true/false statements, performance was consistently high in both tests. In the pre-test, students correctly identified statements like "Engineers must check bridges for safety" (True) and "All bridges are the same length" (False). Since in the pre-test there were less questions, 100% of assertions was achieved. Similarly, in the post-test, most students accurately judged statements about the Berlin páramo water system, such as its altitude ("3200 meters above sea level") and operational challenges (85% accuracy on factual statements (e.g., altitude of the water system)). However, approximately a 65-75% of the respondents struggled with nuanced statements, such as whether the community received regular government support, indicating variability in interpreting contextual details.

4.2.3 Open-ended questions

The biggest performance discrepancy was found in the open-ended questions. A 95% of responses to the pre-test were consistent and succinct, frequently replicating the given text (e.g., listing supplies for bridge construction mentioned in the reading extract: steel and concrete). Posttest responses, on the other hand, were more detailed but inconsistent. Regarding the difficulties facing the water system, 50% of respondents gave detailed responses (e.g., "Poor water quality and lack of policies"), 30% provided vague or incomplete answers (e.g., "La aducción") and 20% left responses blank or unclear. This demonstrates how challenging it is to summarize and express complicated ideas in unstructured formats.

4.2.4 Vocabulary match

Lastly, the accuracy of the vocabulary matching tasks was consistent between the two tests. Students reflected a solid grasp of basic engineering concepts on the pre-test by properly matching terms like "Foundation" and "Beam" to their definitions. The post-test introduced students to sophisticated terms (such as "Sustainability," "Multi-criteria decision analysis"), which they largely matched correctly. However, a few mistakes (such as switching "Sustainability" with "attributes") suggested minor confusion under time constraints or with similar-sounding definitions. Overall, the results indicate that students were able to successfully apply their knowledge of engineering terminology in both familiar and more complex contexts. This suggests a strong foundation in understanding key concepts within the field.

Overall, students performed well in structured tasks (multiple choice, true/false, and vocabulary matching), indicating strong foundational knowledge and comprehension. Open-ended questions, on the other hand, highlighted difficulties with critical thinking and detailed exposition, especially when dealing with new or complicated subjects. The increased cognitive demands of the post-test exposed gaps in synthesis and precision, indicating that although students adjust well to simple tasks, they require more assistance with analytical writing and complex material. These results highlight how crucial it is to balance task types to properly evaluate recall and higher-order thinking abilities. To summarize the results, take a look at Table 1.

Table 1.

Summary of performance in Google Forms pre- and post-tests

Task type	**Pre-Test accuracy**	**Post-test accuracy**	**Key Observation**
Multiple choice	95-100%	80-87%	Slight drop in precision with complex content
True/False	100%	65-85%	Context-dependent statements were more challenging.
Open-ended question	95% (simple answers)	50%(detailed)	Greater depth but higher variability
Vocabulary match	100%	90%	Strong retention, minor errors in advanced terms

4.3 Performance in reading activities (process and control)

Overall, the population that completed the full course was approximately 10-15% of the group of respondents. There were some situations regarding motivation outside the classroom to fulfill the activities, and some issues accessing the Moodle platform from their smartphone devices. Despite these challenges, it is encouraging to see that a portion of students still demonstrated enthusiasm and engagement in the course. The examples provided in the annexes will offer further insight into their perspectives and experiences.

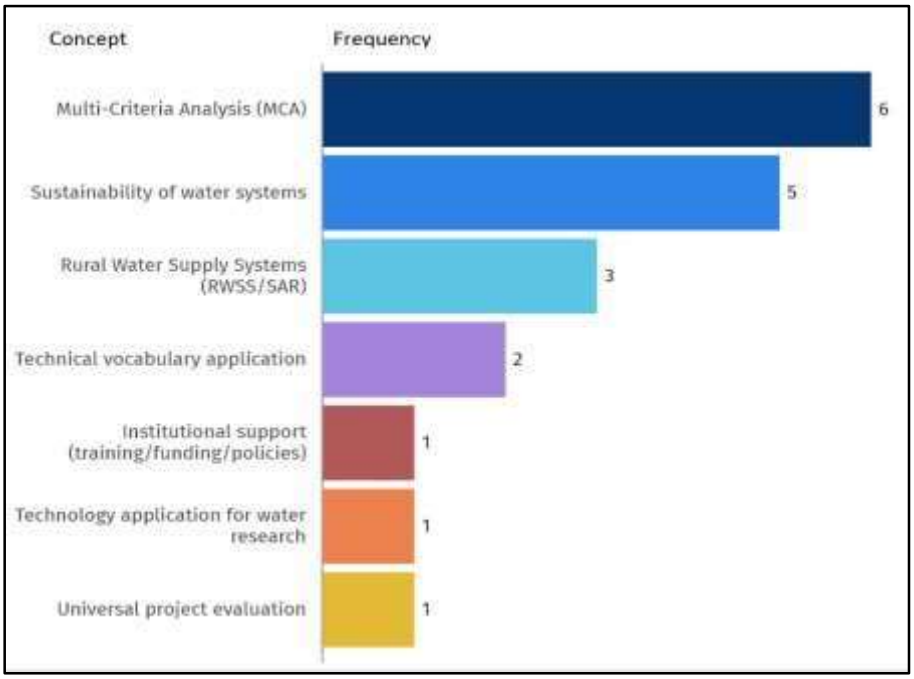
4.4 Exit reflection

The reflections from the exit reflection included in the post-test show that students understood the key concepts surrounding sustainable rural water systems. For the question “What was the most important concept you learned?", they particularly recognized how important MultiCriteria Analysis (MCA) and Sustainability are for assessing the technical, social, and financial aspects, *“The most important concept I learned was how Multi-Criteria Analysis (MCA) can be used to evaluate the sustainability of rural water systems by considering different factors like water quality, governance, and community input”, “ es la evaluación de la sostenibilidad de los Sistemas Rurales de Abastecimiento de Agua (SAR) mediante un Análisis Multicriterio (ACM). Esto resalta la importancia de medir diferentes factores (como calidad del agua, políticas y aceptabilidad)” and “ I learned that the sustainability of rural water supply systems can be evaluated using a*

Multi-Criteria Analysis (MCA) approach" . A graphic is presented to summarize the most mentioned words in their responses for this question.

Figure 17.

Frequency of the most important concepts



To the question: "Which part of the reading was most challenging? Why?" Approximately 60% of respondents pointed out that they struggled with some of the technical terms, like "95 indicators" and "Analytical Hierarchy Process," as well as interpreting data. Moreover, as it is expected, one of the challenges was the English language barrier. Overall, it was identified 6 main challenging aspects which students faced when reading the scientific article. These vary from technical terminology/vocabulary to numerical calculations. Also it is highlighted the search for more advanced concepts managed from the program: *"la parte mas desafiante … fue comprender los aspectos técnicos del sistema de abastecimiento de agua… se debe a*

que algunos conceptos requieren conocimientos avanzados en ingeniería y gestión de recursos hídricos". In the following table, the analysis of the most common difficulties students had is expressed in a more specific and compact picture. It is also included a graphic representation for visual aid.

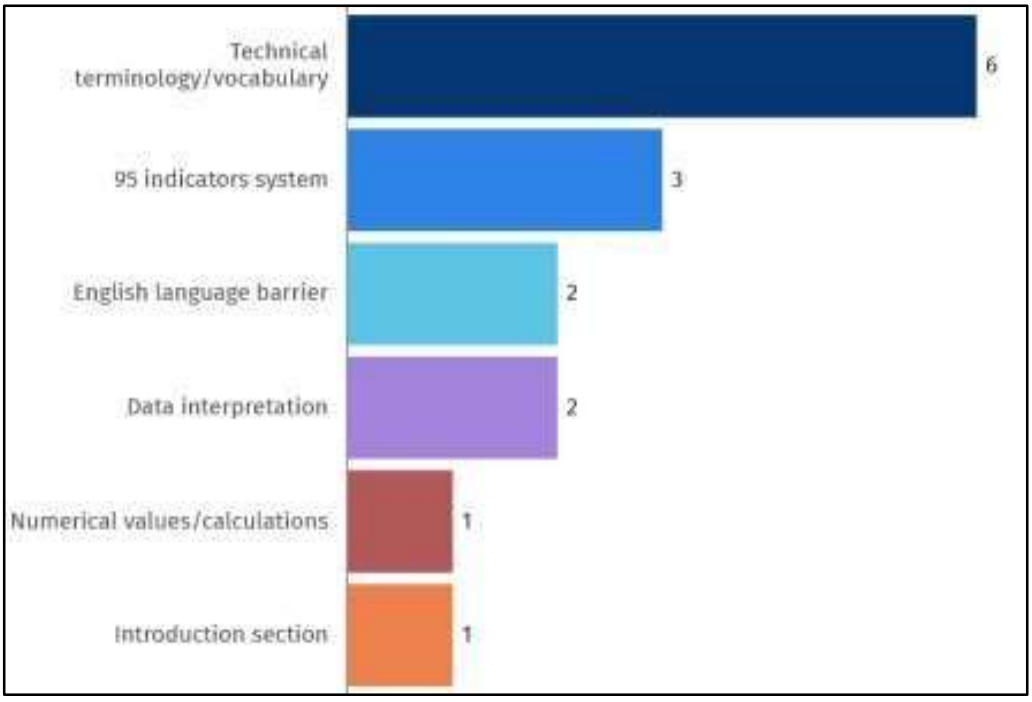
Table 2.

Challenging aspects found

Challenging aspect	Frequency	Percentage	Representative quotes
Technical terminology/vocabulary	6	40%	"muchas palabras que no conocía", "vocabulario fue bastante complejo"
95 indicators system	3	20%	"understanding the 95 indicators", "how indicators work together"
English language barrier	2	13%	"no domino el ingles", "new English concepts"
Data interpretion	2	13%	"how variables work together", "interpreting results"
Numerical values / calculations	1	7%	"valores numéricos... no conocía significado"
Introduction section	1	7%	"La introduccion... mayoría de términos desconocidos"

Figure 18.

Frequency of challenging aspects for respondents



Finally, for the third question: "How can you apply this knowledge to your studies or future career?" students shared that this intervention changed their viewpoint—from focusing solely on technical solutions to embracing more holistic, community-focused approaches: *"... how we could improve the life quality, this is a inspiration for me because try to help to other people".* Additionally, they acknowledged how valuable these tools will be for their future engineering projects. Several mentioned their intention to incorporate sustainability frameworks into their careers: *"... en mi futura carrera, será util para desarrollar soluciones sostenibles que mejoren el acceso al agua potable en comunidade rurales".* Consequently, it was designed 6 categories that cover the application areas of the results of this intervention, from design focus, social impact, and academic utility. In the following table and graphic are statistically

presented the findings, categorized in the areas selected. Overall, their reflections indicate meaningful learning outcomes, but they also point out that vocabulary development and analytical skills are areas that still need some extra attention.

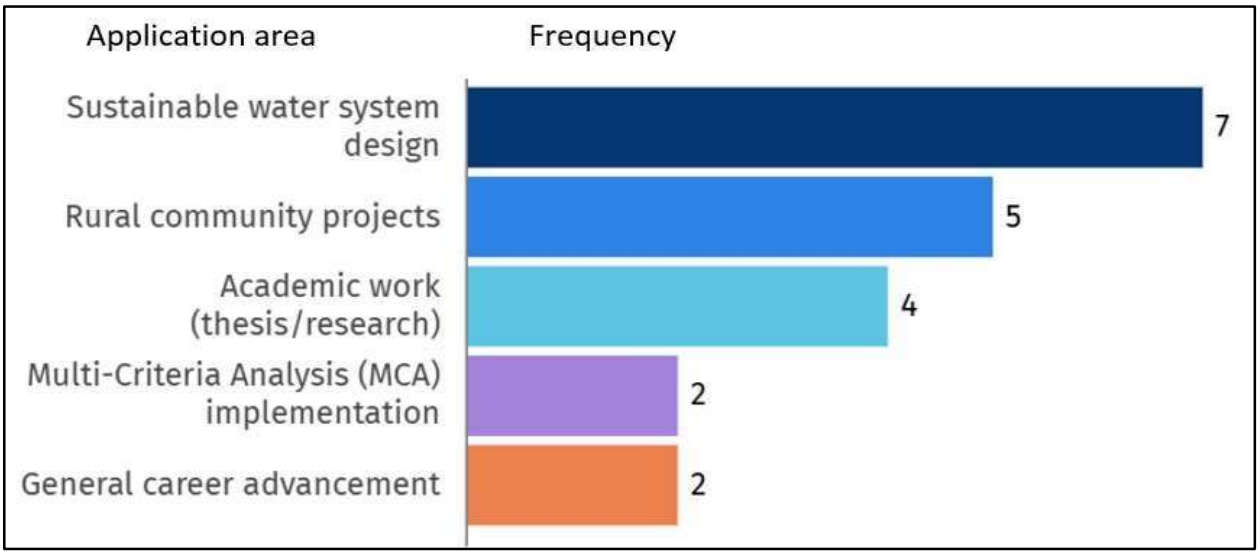
Table 3.

Application areas

Application area	Frequency	Percentage	Representative quotes
Sustainable water system design	7	39%	"desarrollar soluciones sostenibles", "consider sustainability indicators
Rural community projects	5	28%	"water supply projects in rural communities", "comunidades carentes del servicio"
Academic work	4	22%	“· Cuando vaya a hacer mi trabajo de grado, me servirá para redactar”
Multi-Criteria Analysis	2	11%	"using tools like MCA", "considering
General career advancement	2	11%	“get better jobs” “aplicar a todos mis proyectos”

Figure 19

Application areas with the frequency



5. Conclusions

This study aimed to assist the ESP reading process in the subject Aqueducts and Sewers by integrating ICT tools, specifically the Moodle platform, to enhance academic reading comprehension among Civil Engineering students at UIS. The intervention followed a structured methodology, including pre- and post-tests, vocabulary reinforcement, guided reading activities, and reflective tasks, all designed to improve students' involvement with technical English texts. The project succeeded in meeting the general objective as it provided a structured, interactive framework for students to engage with scientific articles in English. The platform's flexibility allowed for gamified vocabulary exercises (Quizizz), guided reading activities (Word wall), and self-paced learning, aligning with modern pedagogical strategies. Moreover, quantitative results showed that students performed well in structured tasks (e.g., 90% accuracy in vocabulary matching), demonstrating improved retention of technical terms.

According to the specific objectives, to design an online unit, the Moodle course effectively organized reading tasks into sequential steps (pre-reading, while-reading, post reading), fostering a systematic approach to academic texts. Likewise, gamification strategies were perceived in the usage of interactive tools like Quizizz and Word wall that increased engagement, as evidenced by higher participation in vocabulary tasks compared to open-ended responses. Finally, the focus on ESP Vocabulary Mastery: Post-test results indicated that students retained field-specific terminology (e.g., "Sustainability," "Multi-Criteria Analysis"), though contextual application (e.g., open-ended answers) remained challenging.

Recommendations

Based on the experience gained, I would like to share some recommendations for anyone interested in carrying out this kind of modality as an undergraduate thesis or something similar. Firstly, it would be helpful to provide access to the CEDEDUIS certification. This course, which is focused on using the Moodle platform for teaching, is currently aimed at teachers. However, it could also be offered to undergraduate students or pre-service teachers in the final semesters of the Bachelor's Degree in Foreign Languages with Emphasis in English program, since they often get the chance to implement this type of intervention. Therefore, students should not only take the course to meet a requirement but also receive formal certification, which would add value to their professional profile.

Another recommendation is to improve the functionality of the Moodle platform, as some students had issues utilizing it. Many students use their phones to access and complete the activities, and that's something that should be taken seriously. Not everyone has a computer at home and in class, and students come from different economic backgrounds. For this reason, Moodle must work well on all types of devices, especially smartphones, to make sure everyone can participate fully and without issues.

Exploring the possibility of collaborating with other programs, subjects, or teachers to expand this type of project would also be helpful. It would be a great opportunity for students in the foreign language teaching program to apply what they've learned in real contexts, not only to grow as future teachers but also to support university students in other fields, like engineering, where academic content in English is widely

used. In those cases, counting on the guidance of a pre-service English teacher who can guide them with the language can make a big impact.

If this kind of intervention is implemented again in the future, it might be a good idea to adjust the time available for each session. If possible, having longer or more sessions would give students more time to develop their English skills. For instance, including some peer-reviewed forum discussions, which get the conversation around the reading text being studied. This would probably lead to even better results when working with materials written in English, however, it's something worth discussing with the professor in charge of the subject.

Finally, it would be helpful to think about incentives to encourage participation from university students. Sometimes, not many students get involved in these types of activities, probably due to motivational barriers and potential technical difficulties at home or in the classroom. Providing rewards or recognition for active participation, such as extra credit or certificates of achievement, could help overcome these barriers. Additionally, offering technical support and resources to ensure students have the necessary tools and knowledge to participate effectively could also increase engagement.

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Annexes

Annex A Google form pre- test

https://forms.gle/vMiD67S3MWJ9DapT7

Annex B Flashcards Quizzis

https://quizizz.com/join?gc=42876132&autostart=true

15 tarjetas didácticas

Frente	Atrás
Sustainability	**The ability to maintain or support something over the long term.** 

2. TARJETAS DIDÁCTICAS

Frente	Atrás
Compliance	**Conforming to rules, regulations, or standards.** 

3. TARJETAS DIDÁCTICAS

Frente	Atrás
Indicators	**Quantifiable measures used to assess performance or progress.**

4. TARJETAS DIDÁCTICAS

Frente	Atrás
Attributes	**Characteristics or qualities of a system that contribute to its overall performance.**

5. TARJETAS DIDÁCTICAS

Frente	Atrás
Reliability	**Reliability is a direct measure of the functionality of a water supply system**

6. TARJETAS DIDÁCTICAS

Frente	Atrás
Multi-criteria decision analysis MCA	**A method used to evaluate and compare multiple criteria or alternatives.**

7. TARJETAS DIDÁCTICAS

Frente	Atrás
Analytical Hierarchy Process	**A decision-making tool that helps prioritize criteria by pairwise comparisons.**

8. TARJETAS DIDACTICAS

Frente		Atrás
Water quality		The chemical, physical, and biological characteristics of water that determine its suitability for various uses.

9. TARJETAS DIDÁCTICAS

Frente		Atrás
Financial knowledge		The understanding of financial concepts, such as budgeting, saving, investing, and managing money, to make informed financial decisions

10. TARJETAS DIDÁCTICAS

Frente	Atrás
Funding	Money provided for a specific purpose, like a project or business.

11. TARJETAS DIDÁCTICAS

Frente		Atrás
Environmental impact of Technology		The effects of a system or activity on the surrounding environment.

12. TARJETAS DIDÁCTICAS

Frente	Atrás
Gravity-fed system	A water supply system that relies on gravity to move water without the need for pumps.

13. TARJETAS DIDÁCTICAS

Frente	Atrás
RWSS	Rural Water Supply Systems

14. TARJETAS DIDÁCTICAS

Frente	Atrás
Multi-Attribute Theory (MAUT)	A method used to interpret and analyze attributes within a decision-making framework.

15. TARJETAS DIDÁCTICAS

Frente	Atrás
Analytic Hierarchy Process (AHP)	AHP is a non-linear framework that considers several factors simultaneously and allows for dependence and feedback, making numerical trade-offs to arrive at a synthesis or conclusion

Annex C **Word wall cloze gap 1st while-reading**

https://wordwall.net/resource/86869434

.Annex D **English Post-test Google Forms**

https://forms.gle/wLWioMP1YirtC2tD6

Annex E **Mind map rubric**
https://docs.google.com/document/d/18THaTlMUFHE_5diwXxj46nWOVX5CEtcfd2qURP

RPZsE/edit?usp=sharing

Annex F **Checklist for reading control activities**

MOODLE COURSE CHECKLIST

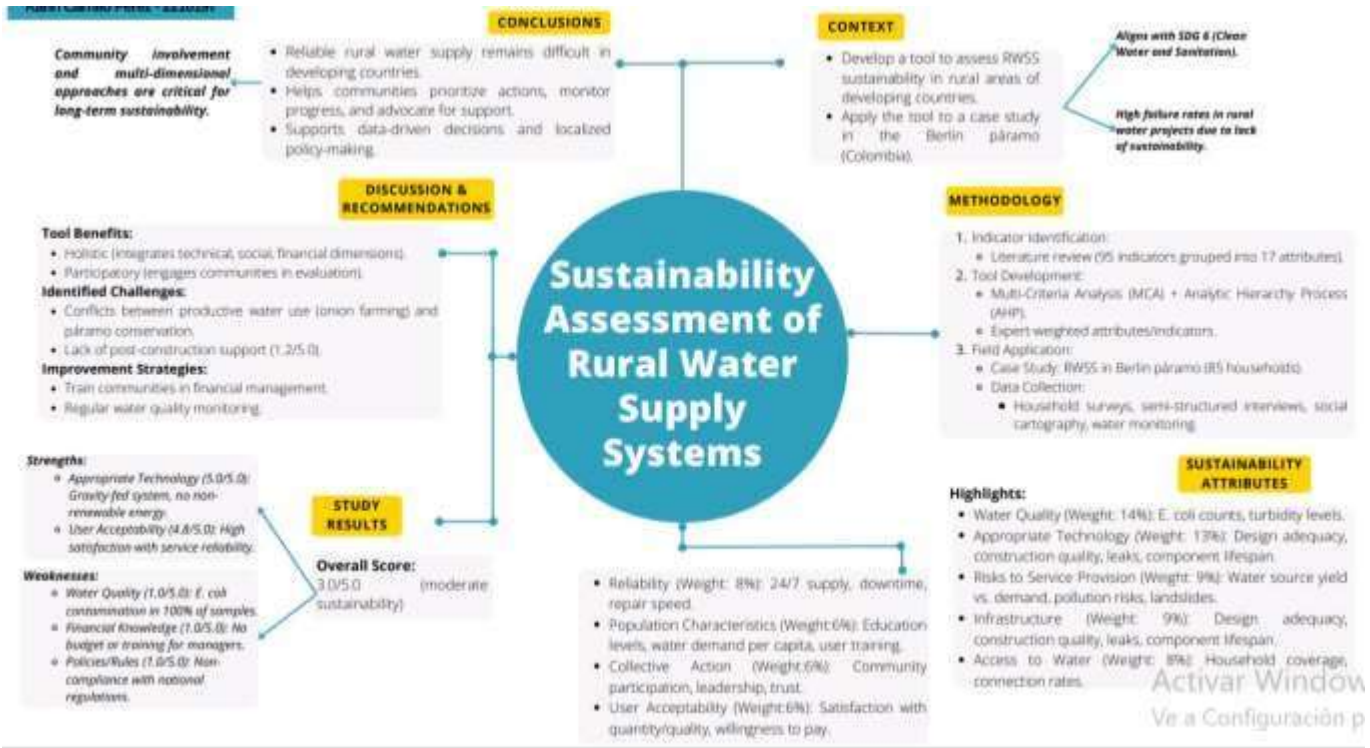
NAME:_____

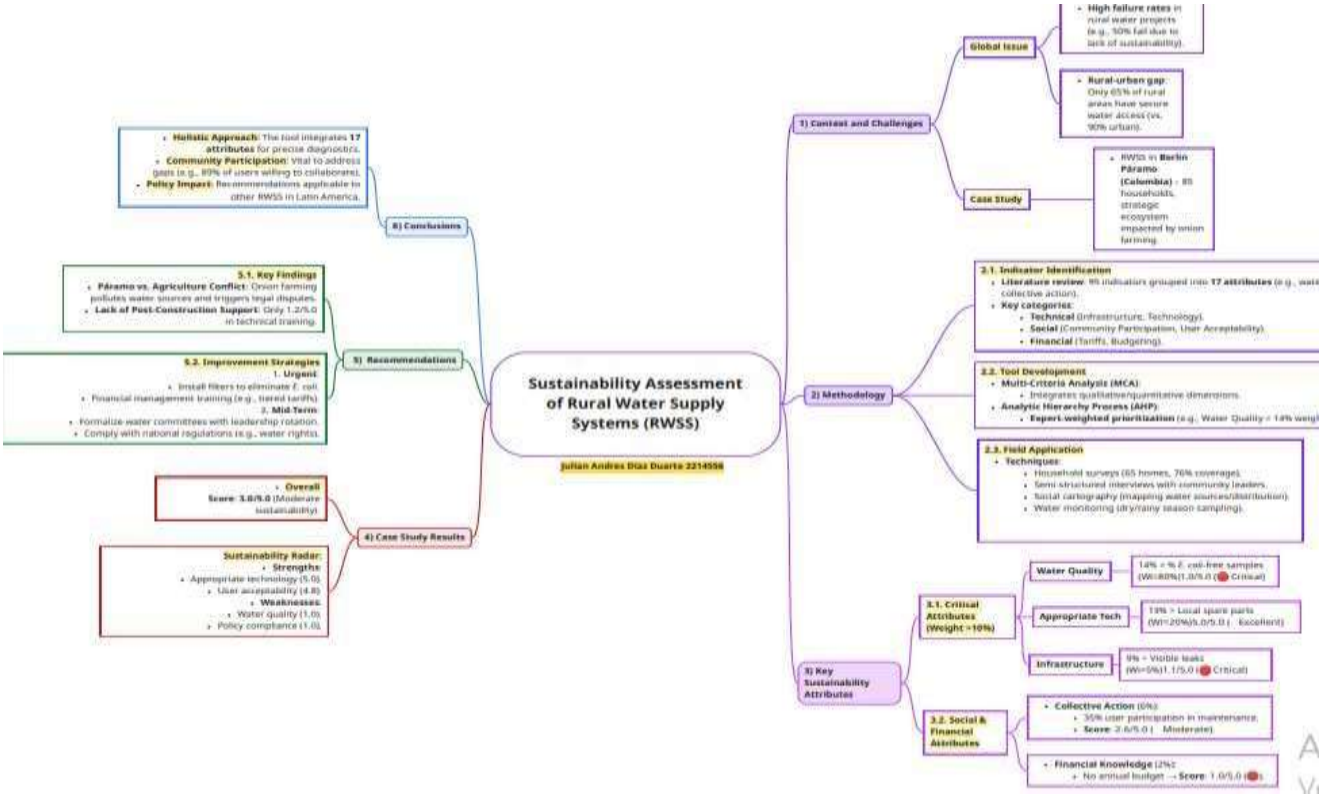
DATE:_____

Criteria	Applies	Does not apply
Completed the assigned activity (Wordwall or Word Cloud)		
Uploaded a screenshot to Moodle		
Submitted the activity on time		
Followed the instructions provided in the task description		
Used relevant vocabulary or content from the reading materials		

Final grade:_____

Annex G **Evidences of some answers for the reading activities**


Sustainability Assessment of Rural Water Supply Systems
CONCLUSIONS
Community involvement and multi-dimensional approaches are critical for long-term sustainability.
Reliable rural water supply remains difficult in developing countries.
Helps communities prioritize actions, monitor progress, and advocate for support.
Supports data-driven decisions and localized policy-making.
CONTEXT
Develop a tool to assess RWSS sustainability in rural areas of developing countries.
Apply the tool to a case study in the Berlin páramo (Colombia).
Aligns with SDG 6 (Clean Water and Sanitation).
High failure rates in rural water projects due to lack of sustainability.
METHODOLOGY
1. Indicator Identification:
Literature review (95 indicators grouped into 17 attributes).
2. Tool Development:
Multi-Criteria Analysis (MCA) + Analytic Hierarchy Process (AHP).
Expert weighted attributes/indicators.
3. Field Application:
Case Study: RWSS in Berlin páramo (85 households).
Data Collection:
Household surveys, semi-structured interviews, social cartography, water monitoring.
SUSTAINABILITY ATTRIBUTES
Highlights:
Water Quality (Weight: 14%): E. coli counts, turbidity levels.
Appropriate Technology (Weight: 13%): Design adequacy, construction quality, leaks, component lifespan.
Risks to Service Provision (Weight: 9%): Water source yield vs. demand, pollution risks, landslides.
Infrastructure (Weight: 9%): Design adequacy, construction quality, leaks, component lifespan.
Access to Water (Weight: 8%): Household coverage, connection rates.
Reliability (Weight: 8%): 24/7 supply, downtime, repair speed.
Population Characteristics (Weight:6%): Education levels, water demand per capita, user training.
Collective Action (Weight:6%): Community participation, leadership, trust.
User Acceptability (Weight:6%): Satisfaction with quantity/quality, willingness to pay.
STUDY RESULTS
Overall Score:
3.0/5.0 (moderate sustainability)
Strengths:
Appropriate Technology (5.0/5.0): Gravity fed system, no non-renewable energy.
User Acceptability (4.8/5.0): High satisfaction with service reliability.
Weaknesses:
Water Quality (1.0/5.0): E. coli contamination in 100% of samples.
Financial Knowledge (1.0/5.0): No budget or training for managers.
Policies/Rules (1.0/5.0): Non-compliance with national regulations.
DISCUSSION & RECOMMENDATIONS
Tool Benefits:
Holistic (integrates technical, social, financial dimensions).
Participatory (engages communities in evaluation).
Identified Challenges:
Conflicts between productive water use (onion farming) and páramo conservation.
Lack of post-construction support (1.2/5.0).
Improvement Strategies:
Train communities in financial management.
Regular water quality monitoring.



Annex H **Exit reflections**

EXIT REFLECTION

What was the most important concept you learned?

Sustainable rural water systems require careful balance across technical, social, financial and environmental dimensions. While community participation is essential, these systems remain vulnerable without institutional support through training, funding and policy frameworks.

Which part of the reading was most challenging? Why?

The most challenging part was understanding the 17 attributes and their 95 indicators because they involved many unfamiliar English terms (e.g., "Analytical Hierarchy Process," "Multi-Criteria Analysis"). The study uses complex methods to weigh these factors and connecting them to real-world water systems in rural areas required careful reading. The radar diagram helped summarize results, but the technical language made it hard to follow at first.

How can you apply this knowledge to your studies or future career?

As a civil engineering student, this study gave me valuable perspective on water system design. It's not just about technical solutions; we need to equally consider social and financial factors to make projects sustainable.

1. What was the most important concept you learned?

15 respuestas

New ways to applicate technology to research about the water and how we could improve the life quality, this is a inspiration for me because try to help to other people.

El concepto más importante que aprendí fue la importancia de la sostenibilidad en los sistemas de abastecimiento de agua en comunidades rurales. Comprendí cómo diferentes factores, como la infraestructura, la calidad del agua y el apoyo gubernamental, influyen en la eficiencia y el mantenimiento de estos sistemas a largo plazo.

Los conceptos mas importantes, el mas importante es como usar correctamente las palabras técnicas.

RWSS, sistema de suministro de agua rural

I learned that the sustainability of rural water supply systems can be evaluated using a Multi-Criteria Analysis (MCA) approach, which considers multiple quantifiable attributes and indicators.

El concepto de sostenibilidad

The importance of assessing the sustainability of water systems in rural communities and how they can be improved.

2. **Which part of the reading was most challenging? Why?**

15 respuestas

In my point of view,the most difficult part was collect the data and tried to understand how the variables works one with other.So,try to use new methods could help us to get better results.

La parte más desafiante de la lectura fue comprender los aspectos técnicos del sistema de abastecimiento de agua, especialmente en lo relacionado con su mantenimiento y sostenibilidad. Esto se debe a que algunos conceptos requieren conocimientos avanzados en ingeniería y gestión de recursos hídricos.

cuando se empieza a hablar de la calidad del agua, el vocabulario fue bastante complejo.

Entender el desarrollo de la nueva herramienta , porque tenía muchas palabras que no conocía

The most challenging part was understanding the terminology used for different attributes and indicators, as well as correctly interpreting the results of such a study.

La parte donde hablaba de los valores numéricos,porque no conocia el significado de algunas palabras

Some technical aspects of sustainability indicators can be complex without prior knowledge of the subject.

3. **How can you apply this knowledge to your studies or future career?**

15 respuestas

En todo sentido

I can use this new knowledge to learn about water systems.it will help me in my future to get better jobs and help to other people,

Puedo aplicar este conocimiento en mis estudios de ingeniería civil, especialmente en áreas como el diseño y la gestión de sistemas de abastecimiento de agua. Además, en mi futura carrera, será útil para desarrollar soluciones sostenibles que mejoren el acceso al agua potable en comunidades rurales.

Cuando vaya a hacer mi trabajo de grado, me servirá para redactar

Enfocándome desde la línea de agua podría apoyarme en este estudio para de esta manera avanzar.

As a student and future professional in civil engineering, sustainable development, and environmental management, this knowledge will help me assess and enhance water supply projects in rural communities, ensuring their long-term sustainability.

Aplicando el concepto de sostenibilidad a todos mis proyectos