Research Paper

Implementing Inquiry-based Learning through Sustainable Development Goals: A didactic Approach to Foster Learn-ing-to-learn and Citizenship Competencies in EFL

Aplicación del aprendizaje basado en indagación a través de los Objetivos de Desarrollo Sostenible: un enfoque didáctico para fomentar las competencias de aprender a aprender y de ciudadanía en EFL

https://doi.org/10.54104/papeles.v16n32.1970

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To cite this article: Bravo Luque, M., & Alcantud-Díaz, M.ª (2024). Implementing inquiry-based learning through sustainable development goals: A didactic approach to foster learning-to-learn and citizenship competencies in EFL. *Papeles*, *16*(32), e1970. https://doi.org/10.54104/papeles.v16n32.1970

Peer-reviewed version

Received: July 19th, 2024
Accepted: November 25th, 2024
Published: December 19th, 2024

Abstract

Introduction: This study employs a mixed-method approach to examine the integration of the Inquiry-Based Learning (IBL) approach with the thematic framework of the Sustainable Development Goals (SDGs). **Methodology:** Conducted in a fourth-year secondary school EFL class at a state school in Spain, the research focuses on a didactic implementation spanning three sessions. This initiative addresses the societal need to make classes more engaging and impart knowledge about our planet's current state and society. **Results and Discussion:** Despite limitations in time and the number of participants, the results indicate that IBL, when combined with Agenda 2030, provides numerous benefits. These benefits include motivating students to engage in their learning process actively, enhancing communication through active participation, and fostering a sense of optimism about potential outcomes. **Conclusions:** The findings, derived from both qualitative and quantitative data, offer significant contributions to the field of education, particularly EFL, by demonstrating that the methodological alternatives and thematic focus can help students form meaningful connections with their learning, thereby increasing their involvement in their studies.

Keywords
Inquiry-based learning (IBL); Sustainable Development Goals (SDGs); English as a foreign language (EFL); secondary education; teacher training

Resumen

Introducción: este estudio emplea un enfoque de métodos mixtos para examinar la integración del aprendizaje basado en la indagación (ABI) con el marco temático de los Objetivos de Desarrollo Sostenible (ODS). **Metodología:** realizado en una clase de inglés como lengua extranjera (ILE) de cuarto curso de secundaria en un colegio público de España, la investigación se centra en una implementación didáctica que abarca tres sesiones. Esta iniciativa responde a la necesidad social de hacer las clases más atractivas e impartir conocimientos sobre el estado actual de nuestro planeta y nuestra sociedad. **Resultados y discusión:** a pesar de las limitaciones de tiempo y de número de participantes, los resultados indican que el ABI, cuando se combina con la Agenda 2030, proporciona numerosos beneficios. Estos beneficios incluyen la motivación del alumnado para implicarse activamente en su proceso de aprendizaje, la mejora de la **comunicación** a través de la participación activa y el fomento de un sentimiento de optimismo sobre los posibles resultados. **Conclusiones:** las conclusiones, derivadas de datos tanto cualitativos como cuantitativos, ofrecen importantes contribuciones al campo de la educación, en particular al de la ILE, al demostrar que las alternativas metodológicas y el enfoque temático pueden ayudar a los estudiantes a establecer conexiones significativas con su aprendizaje, aumentando así su implicación en sus estudios.

Palabras Clave
Aprendizaje por indagación (IBL); Objetivos de Desarrollo Sostenible (ODS); inglés como lengua extranjera; educación secundaria; formación del profesorado

1. Introduction

This article addresses the need to propose alternatives to the current teaching methodology in English as a Foreign Language (EFL) instruction at the secondary school level. It also holds the promise of significantly improving students' learning experience, instilling a sense of hope and optimism. In this case, an implementation that utilizes the Inquiry-based learning (IBL) approach to encourage and motivate students to learn EFL is proposed. The thematic focus on the Sustainable Development Goals (SDGs), namely SDG 3, plays a crucial role in fostering students' Citizenship Competence, inspiring and motivating them to be active global citizens, thereby instilling a sense of purpose and direction in their learning journey.

This didactic implementation arose for two main reasons. The first one is the pressing issue of the growing disconnection that secondary school students in Spain have with the English language and, consequently, with EFL classes. Therefore, we tried a method, IBL, to make students active participants in their learning process. Additionally, we worked on various crucial cross-curricular topics due to the new competencies added to the Spanish secondary education curriculum. Among these, the topic of the SDGs was particularly noteworthy due to its practical application and the urgent need to address it, given the current state of our planet and society. Ultimately, the advantages of both this teaching methodology and this thematic axis were explored to work on the citizenship and learning-to-learn competencies, new additions to the Spanish secondary education curriculum.

This paper is also based on the observations made of the educational reality the authors had the chance to live in their internship. The belief that students attend school out of genuine interest rather than obligation seems out of a utopic book. Today's secondary students belong to a generation with access to new technologies and constant information overload. Consequently, traditional textbook-based lessons are challenging for them to follow and implement for us teachers. Therefore, this paper introduces the IBL approach, using relevant topics in our current society, such as the SDGs, to foster Learning-to-Learn and Citizenship Competencies. The recent Spanish educational law, the LOMLOE reform, highlights that, while curriculum content is essential, it is insufficient for the demands of 21st-century society, thus advocating for cross-curricular topics such as the Agenda 2030. Students must develop critical thinking, problem-solving, and collaborative skills in all subjects, including EFL. To achieve this, a methodological shift is necessary to ensure students become active agents in their learning process. Therefore, this project arises from classroom observations considering students' and teachers' perspectives. This study is a valuable contribution to learning EFL in secondary education, as it explores and evaluates the effectiveness of innovative and alternative teaching approaches to engage students in their educational journey. Moreover, this investigation also encourages further research about different pedagogical methodologies that could benefit other secondary school teachers. As described by Unesco (2014), young people are the future of our country, and thus, it is of the utmost importance to provide them with the necessary tools to tackle current global issues. Therefore, using the Agenda 2030 is not only a necessity but an obligation for Spanish teachers, as it is established as a thematic focus within Citizenship Competence in the LOMLOE: Organic

Law 3/2020, of December 29, amending Organic Law 2/2006, of May 3, on Education (BOE, 2020).

This article aims to design and implement a didactic proposal in an EFL class based on the IBL methodology and to enhance students' motivation to work on Personal, Social, and Learning-to-Learn competence. Secondly, it is essential to encourage EFL students to work on citizenship competence (CC), targeting content related to the SDGs, namely SDG 3: Good health and well-being.

Considering the information above, two research questions were set as the starting point of this dissertation: 1. Can students' autonomy and motivation be enhanced by using IBL and interactive activities in EFL classes? 2. Can students' involvement in the EFL class be increased by including content related to SDGs?

Additionally, during the creation of the implementation, two specific objectives were considered: (1) to determine whether IBL would prove to be an effective teaching method in a Spanish secondary school classroom, observing its impact on students' motivation and learning outcomes. (2) To explore the potential connections between IBL and Agenda 2030, particularly how IBL could integrate the aims and topics of the SDGs now that they are compulsory cross-curricular topics that should be tackled during the secondary school trajectory.

For all these reasons, it was decided to implement a didactic sequence about SDGs in a 4th year ESO class at a state secondary school in Valencia, Spain. This implementation consisted of three sessions corresponding to two cycles of IBL, known as Inquiry Cycles. The proposal included an introduction to the SDGs and IBL, which involved a small group research activity on the Agenda 2030. Afterward, a proper IBL group research was implemented on the arguments for and against video games and their subsequent debate. This was related to mental health and, thus, to SDG 3: Good Health and Well-Being.

2. Review of Literature

2.1. Inquiry-based Learning

The Foundations of Inquiry-based Learning (IBL)

IBL is a pedagogical approach deeply rooted in the constructivist theories of scholars such as Lev Vygotsky, Jean Piaget, and John Dewey (Berg & Simonson, 2024). The letter stated that "learning is best accomplished by having children perform tasks rather than memorize facts" (Berg & Simonson, 2024, para. 11). This perspective later contributed to the idea that genuine knowledge arises from experiential learning, which is the central tenet of constructivism. All of this aligns closely with the core principle of the IBL approach, which is "focused on students building their own knowledge through critical interactions with their environment" (Alcantud-Díaz & Lloret-Catalá, 2023; Becker et al., 2020; Chang et al., 2016; Gokalp & Can 2022; Wale & Bishaw, 2020). Concretely, IBL was initially introduced in STEAM subjects (science, technology, engineering, arts, and maths) since it heavily relies on the scientific method: The primary goal is

for students to pose questions or inquiries –hence its name–and to investigate the answers and analyze the information subsequently gathered, thereby actively and autonomously constructing their knowledge (Alcantud-Díaz & Lloret-Catalá, 2023, p. 4). Nevertheless, in recent years, there has been a trend towards using IBL in language learning, particularly in the instruction of second and foreign languages. Two of the main reasons are that it facilitates working with the different linguistic components such as vocabulary, grammar, and syntax, thereby enhancing both the learning and teaching processes related to language acquisition (Alameddine & Ahwal, 2016; Alcantud-Díaz & Lloret-Catalá, 2023); and that it promotes creativity, autonomous discovery and encourages reflection, which aligns with the pedagogical demands of the second language and foreign language learning instruction (Lee, 2014).

Moreover, IBLs possess the capacity to create a communicative learning environment among students. The main driver of the approach is the questions posed by the teacher and the learners (Alcantud-Díaz & Lloret-Catalá, 2023, p. 3). The goal of IBL is not just finding the correct answers but also actively engaging with a community of learners where everyone can learn from each other (Kuhlthau et al., 2007, p. 133). Thus, this approach encourages students to learn by collaborating and developing curiosity (Kuhlthau et al., 2007, p. 133). Likewise, it is essential to highlight that a prominent attribute of IBL lies in placing the student as an active agent of their knowledge. This helps them learn meaningfully using materials and situations grounded in real-world contexts, enhancing their motivation (Ludwig, 2021, p. 72).

Nonetheless, although this approach prioritizes the agency of the learner, teachers play an active role in cultivating a culture of inquiry, guiding learners, and providing necessary resources (Dobber et al., 2017, p. 204, as cited in Ludwig, 2021, p. 72). As Cotton (1988) stated, teachers should also supervise the inquiry process, offering guidance and feedback to support the students' progress (p. 2). That being so, IBL enriches learners' educational journey and equips them with essential skills such as evidence-based reasoning and problem-solving. These skills are crucial for navigating today's complex society, especially regarding sustainability issues and other challenges caused by technological advancement, such as misinformation and fake news (Ludwig, 2021, p. 73).

Inquiry-based Learning Cycle or How to Implement It

Notably, IBL involves concrete phases, making it easy to apply in the EFL classroom, as it has been done in the didactic proposal described in this paper. Although there is no common consensus on the number of phases or steps in this approach, unanimity prevails regarding the core content. A good example that summarizes it ideally would be the one described by Ludwig (2021, p. 72):

1) To open a field of awareness (spark curiosity in learners if they have questions or are not yet aware).
2) To develop questions that learners want to answer.
3) To research the topic in and out of class, using real-world materials.
4) To present results and give feedback.
5) To reflect on results.

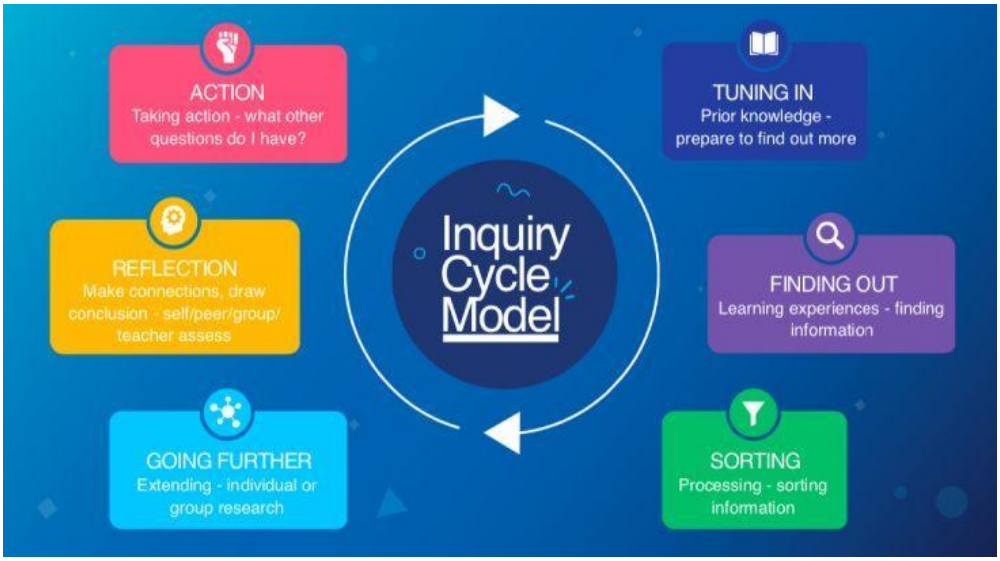
6) To open a new field of awareness (ideally, learners develop questions based on previous research).

In turn, Pedaste et al. (2015) presented another perspective on the inquiry cycle by proposing the following stages: activating prior knowledge (Orientation), questioning and hypothesis building (Conceptualization), researching information, testing the hypothesis—reformulating it if need be—and result interpretation (Investigation), conclusions (Conclusion), and reflection (Discussion).

Both models show that IBL functions cyclically. Consequently, the inquiry and knowledge acquisition process raise more questions and investigates topics related to the explored subject. Figure 1 below shows the IBL cycle proposed by the OWIS Communications Team (2020), who segmented the research into three stages: Finding out, sorting, and going further. In addition, they add a 6th phase in which acting and inquiring further about similar topics is incentivized:

Figure 1

Inquiry Cycle (OWIS Communications Team, 2020)



2.2. Sustainable Development Goals (SDGs) and Education for Sustainable Development (ESD)

The Agenda 2030 comprises seventeen objectives to be implemented before that designated year. All member states of the United Nations have collectively embraced these goals since 2015. According to the official website of the UN, it is delineated as follows:

> […] The 17 Sustainable Development Goals (SDGs), which are an urgent call for action by all countries - developed and developing - in a global partnership, […] recognize that ending poverty and other deprivations must go hand-in-hand with strategies that improve health and education, reduce inequality, and spur economic growth – all while tackling

> climate change and working to preserve our oceans and forests. (United Nations, n.d., para. 1)

Figure 2

Sustainable Development Goals (United Nations, n.d.)

These objectives (see Figure 2 above) can be studied as cross-curricular topics since they are essential in our society. As contemplated by the Education for Sustainable Development (ESD), they should be integrated into many subjects across primary, secondary, and higher education, given that achieving the targets of the Agenda 2030 requires inculcating these values in children from an early age. This early exposure builds the basis for creating a generation equipped with the awareness and commitment needed to address global challenges effectively. Right now, this action plan from the educational sphere is ambitious yet promising in terms of global prosperity and sustainability (United Nations, 2015). Moreover, as Unesco (2014) envisions, education is increasingly focusing on values education rather than academic knowledge

Education for Sustainable Development (EDS)

According to Wals et al. (2017), EDS has been categorized under "education in relation to people and planet" (p. 74) and, thus, a recent addition to educational initiatives. This suggests that ESD serves as a suitable mechanism for mixing a better understanding of the Sustainable Development Goals with their integration into higher education subjects, as stated by Unesco:

> [It] gives learners of all ages the knowledge, skills, values, and agency to address interconnected global challenges […] ESD is a lifelong learning process and an integral part of quality education. It […] encompasses learning content and outcomes, pedagogy and the learning environment. (Unesco, 2024, para. 1)

Considering this, it is not surprising that the LOMLOE (BOE, 2020) provided a legal framework for the Agenda 2030 topics, including them as cross-curricular content in the secondary and

baccalaureate stages. This has made the SDGs a valuable cross-curricular basic knowledge in most subjects of Spanish secondary education since they can include "[…] Real-world issues such as poverty, hunger, health and well-being, education, gender equality, clean water and energy, climate change, inequalities, decent work, innovation, responsible consumption, peace and justice, that is, the SDGs scope of action" (Alcantud-Díaz & Lloret-Catalá, 2023, p. 3).

Furthermore, to educate on sustainability, educators must consider the concept of "sustainable literacy," as defined by Stibbe and Luna (2009). This term includes essential skills, attitudes, competencies, dispositions, and values for navigating the challenges of our changing world (Stibbe & Luna, 2009, pp. 10-11). Sustainable literacy holds particular significance around education, emphasizing the importance of integrating themes related to actual environmental and social issues across the different school subjects (Ludwig, 2021, p. 70). One of the areas where this can be addressed is language learning, particularly in the case of EFL. This is because foreign language learning opens a wide range of possibilities in which any current topic can be combined with specific language knowledge, creating a meaningful learning context.

2.3. Employing IBL for educating on the Agenda 2030

According to Alcantud-Díaz, M., and Lloret-Catalá (2023), incorporating Interdisciplinary IBL into teaching SDGs in the EFL classroom can enhance authentic and meaningful learning experiences (p. 3). This is supported by Alghamdi and El-Hassan (2020), who emphasize that authentic learning is strengthened when interdisciplinary contextualization is integrated with IBL (p. 126). In addition, as the Science Learning Hub (2017) mentions, "when used effectively, it increases student agency in learning and can strengthen authentic connections to the world around them" (para. 4), in which the effectiveness of IBL is highlighted regarding sustainability matters. (p.125).

In turn, Lee Baraquia (2018) introduced the concept of "interdisciplinary contextualization," in which the importance of educators situating lessons within socio-cultural and historical contexts of learners' real lives is emphasized (p. 54). Doing so makes students more likely to retain information because it holds personal significance. Furthermore, he recommends combining interdisciplinary contextualization with IBL since it ensures that learners have the opportunity "to make connections, draw conclusions or generalizations, explore and work cooperatively, discuss and debate, express knowledge in a variety of ways, and use multiple intelligences" (Baraquia, 2018, p. 54). As mentioned earlier, EFL classes provide a suitable setting for this, as these topics can be addressed and used to motivate students to engage in conversations and reflections, thus also working on developing Communicative Competence.

This methodological and thematic combination has already been tested across diverse classrooms in various countries, facilitated by educators of different academic disciplines. A common conclusion among these studies is the recognition that, except for different modifications that must be made to suit specific contextual nuances, IBL works effectively when integrating cross-curricular themes such as sustainability into different subjects. For instance, Ludwig (2021) tackles the topics of e-waste and sustainability through an IBL approach, allowing

students to independently explore and learn these pertinent real-world issues (pp. 70-71). Furthermore, he emphasizes that education about sustainability prioritizes learning over teaching. This shift, the core principle of IBL, allows for a departure from the instructor's preferences, empowering learners to explore personal interests, which is crucial, considering that technological advancements are present in their realities (p. 71).

Similarly, Govender and Pillay (2022) prove that utilizing IBL in urban ecological studies offers an optimal environment for students to engage with real-life material. Thus, through observation and theoretical connections, students can formulate deductions and recommendations, fostering the development of research skills. Furthermore, according to them, SDGs are better understood when students participate actively and propose solutions to real challenges. That is why this theme works well when included in an IBL approach to teaching. Ultimately, Alghamdi and El-Hassan (2020) address introducing the sustainability theme at a university in Saudi Arabia, underscoring the significant acceptance of this approach by Pre-Service Teachers (PST). Completing the research task heightened their understanding of the localized impacts of climate change, fostering a more profound awareness among participants. To be more specific, they confirmed that they felt engaged in investigation, exploration, and research, enabling them to delve into the subject matter extensively (p. 135). They also highlighted that "teacher education programs should orient all PSTs to IBL from the interdisciplinary contextualization perspective" (p. 135).

Concerning the value of IBL in EFL classes, a study conducted in 2020 by Banquet Galindo and Urrea Arcila confirms the effectiveness of IBL in an EFL class since this approach promotes active participation in classes, the development of critical thinking, alongside communicative competence, and fosters students' autonomous learning. Additionally, it is beneficial when dealing with oral skills, even if the level of English is low, due to its engaging nature.

In summary, working with sustainability-related themes reinforces necessary skills in our current society, such as a critical attitude towards global issues and problem-solving ability. For all these reasons, it is considered essential to incorporate these cross-curricular topics in educational institutions as soon as possible and from an active perspective, as these are necessary to navigate 21st-century society.

3. Methodology

Context and design

The didactic sequence implemented for this study occurred over one week at a Spanish secondary school. The chosen group was a 4th ESO class, which had 19 students. Demographically speaking, all of them were born in Spain. Thus, their English learning journeys were practically similar during their educational trajectories. Furthermore, that group had a good level of English, with around 4-5 students whose English proficiency exceeded the class level and only three whose English proficiency fell below the expected level.

A key focus of the lesson plan was the urgency of addressing the state of our planet's environmental condition and humanity's well-being. Considering this, the most fitting option was SDGs, precisely SDG number 3: "Health and Well Being." Moreover, this topic is fascinating to explore with 4th-year ESO students, as it encourages them to reflect on mental health —which is an especially significant subject during the teenage years.

The chosen methodology, IBL, combined with the SDG-based topic would be particularly compelling for students, given that both are relatively new in the educational paradigm. Thus, the intention was to assess first-hand whether IBL could effectively teach foreign languages such as English, fostering reflection about global issues.

Description of the Implementation

The didactic proposal described further on, in order to harmonize with the primary and secondary objectives of the present article, was designed under the following principles: First and foremost, to observe the IBL functionality in a real didactic space with learners aged between 15 and 17. Secondly, to demonstrate whether SDG topics could be efficaciously understood using a didactic sequence. Then, to assess the topic's compatibility with the chosen method. Additionally, to determine if the students were interested in learning more about the policies enacted by the United Nations to address the ongoing environmental issues and prevent further harm.

Methodological and Legislative Justification

Since the implementation was conducted at a Spanish secondary school, Decree 107/2022 (DOGV, 2022), which is an autonomous law that regulates the bases of secondary school, was considered in developing the didactic proposal, highlighting the SDGs' importance, especially around EFL. The SDGs are a crucial part of the educational curriculum of secondary education and baccalaureate in Spain, given that the Decree above 107/2022 has given a legal framework to SDGs for the first time in the history of Education (Alcantud-Díaz & Lloret-Catalá, 2023; García Vaquero & Alcantud-Díaz, 2023). In addition, this Decree has established that SDGs are indispensable in the second purpose of the stage: "The curriculum development of this stage must […] educate critical and committed individuals about the improvement of their environment and achievement of a sustainable future for all by the Sustainable Development Goals." (p. 9).

This is also deeply linked to the sixth pedagogical principle set out in the same Decree (DOGV, 2022), which again emphasizes the need to educate in global awareness: "Democratic citizenship and global awareness will be promoted across all subjects or fields." (p. 11). Moreover, in this Decree about Compulsory Secondary Education, sustainability matters and SDGs are recognized as cross-curricular topics in almost every subject. Finally, SDGs are contemplated within the Citizenship competence (CC), which again stresses the need to educate critically to achieve a sustainable future (pp. 628, 650). This is also covered similarly in Decree 108/2022 of the Baccalaureate curriculum (DOGV, 2022), strongly advising to use it as a thematic thread in learning situations (p. 1449).

Similarly, the Royal Decree 217/2022 (BOE, 2022) specifies that, concretely in the Foreign Language Subject, emphasis must be placed both on educating about the challenges of the times in which we live and making students feel in charge of their learning journey:

> Students are expected to be able to apply all basic knowledge [...] using texts […] close to their experience that include aspects related to the Sustainable Development Goals and the challenges of the 21st century. […] The competency-based nature of this curriculum encourages teachers to create interdisciplinary, contextualized, meaningful, and relevant tasks and to develop learning situations where students are considered progressively autonomous social agents and gradually responsible for their learning process (p. 145).

This reinforces the idea that the SDGs are needed in the English as a Foreign Language (EFL) classes and underpins that learners must be active agents, as proposed in approaches such as Inquiry-based learning.

Description of the Intervention

The activities designed and materials chosen for the three sessions, in which the didactic proposal was divided, will be described in-depth. It should be noted that each of the sessions lasted 55 minutes in total. It is also worth highlighting that during the implementation, the phases of the Inquiry Cycle described by Pedaste et al. in 2015 were considered. As previously mentioned, these phases include Orientation, Conceptualization, Investigation, Conclusions, and Discussion. Additionally, a similar definition by the OWIS Communications Team (2020) was also considered, which includes "taking action" as the final stage that helps to discover a new field of research. Figure 3 below shows an explanatory image of the number of cycles per session and the parts of the Inquiry Cycle that were addressed in each:

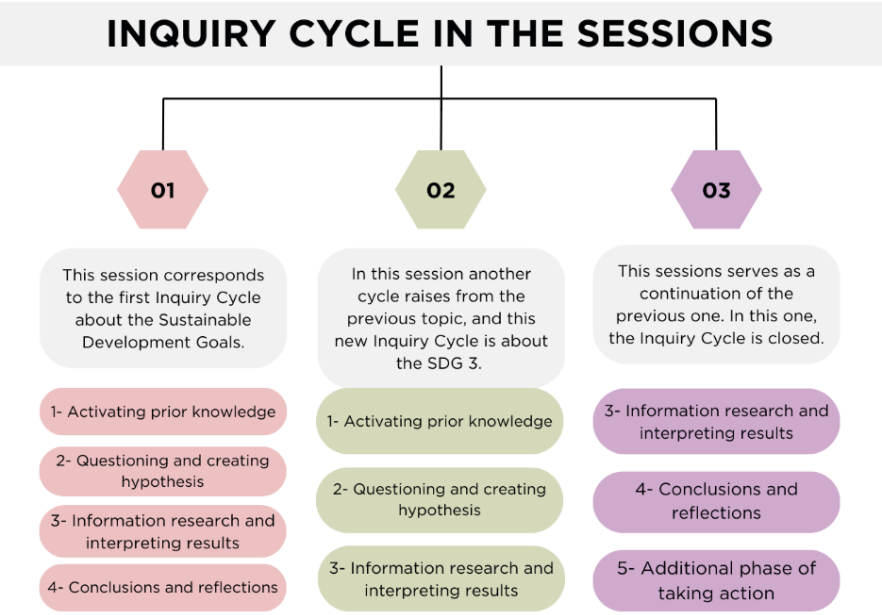
The first session was an introductory lesson on SDGs. This opened the first Inquiry Cycle about the SDGs in general, which is comprised of just one session to set the ground for the upcoming ones. To do this, students were shown comics from a website called World's Largest Lesson, which, in collaboration with Unicef and Unesco, published one-page cartoon comics for each Sustainable Development Goal. This refers to the Inquiry Cycle phase, which consists of activating prior knowledge and is called "Orientation" (Pedaste et al., 2015). This visual resource made it easier to understand the complexity of some of the goals. After showing them, the researchers prompted the participants to share insights about Agenda 2030 using the provided materials. This was an Inquiry-based activity linked to what Pedaste et al. (2015) would define as the "Conceptualization" phase of the cycle, in which the students questioned and raised hypotheses about the topic given.

As the knowledge achieved through the previous activity was very general, a task in which the characteristics of each SDG had to be explained was carried out so they could be better analyzed. To do this, students were divided into work groups, as this fosters communication and the search for information. Each group was assigned a certain number of SDGs, the characteristics they had to look for on the internet. Students could use one mobile per group to ensure they were not distracted and did their assigned work. Finally, the students chose a spokesperson and

presented the work done. This activity was also within the lines of IBL, as it required students to seek information independently without the teacher's guidance and subsequently present their findings to the rest of the class so that that research nourished everyone. Thus, the first part of this activity corresponds to the third stage of the Inquiry Cycle, the so-called "Investigation," and the last part to the "Conclusion" and "Discussion" since the information was shared and reflected upon.

Figure 3

Inquiry Cycle in the Sessions of the Implementation (Own Design)



To finish the session, there was a vocabulary comprehension exercise (see Figure 4 below) to consolidate the concepts covered earlier. To achieve this, students were given a handout designed for this didactic proposal with a table that they had to complete, containing key terms found in their textbooks. These vocabulary words were deeply related to some of the objectives of the Agenda 2030, enabling students to learn and reinforce the specific vocabulary in order to acquire it in a way that was meaningful to them.

The second session began with an exercise that served as a preparation to delve into the focal topic of SDG number three: Good health and well-being, which was also the central research theme in the second Inquiry Cycle. It entailed an interactive activity hosted on the Mentimeter platform, specifically a word cloud generated from their answers to the question, "What comes to your mind when I tell you the topic 'mental health'?". Students could provide their answers through their mobile devices: They scanned a QR code displayed on the classroom screen and wrote three words responding to the given question. This corresponded to the first part of the Inquiry Cycle, the "Orientation" (see Figure 5 below).

Figure 4

SDG-Handout: Table Completion Activity of Specific Vocabulary about SDGs (Own design)

SUSTAINABLE DEVELOPMENT GOALS TABLE

Name:

Listen to your classmates' explanations and complete the table with the names of each goal. Afterwards, complete the last column with the vocabulary you consider related to the SDG.

Vocabulary words: proteins, fossil fuels, cold spell, scarcity, mild temperature, herd, deforestation, overfishing, bleed, oil spill, food chain, solar energy, get better, global warming, take action, calf, flood, bottled water, calories, pipe, pollution, vitamins, contaminate, potable, microplastics, hotter weather, get worse, bandage, thirst, be sick, wholemeal, frost, waves, factories, trade, fisherman, heatwave, wind power, marine life, tide, predator, nutrients, healthy, hunt, landscape, carbohydrates, extinction, customer, plastic straws, wildlife, prey, renewable energy, drought, oil spill, hygiene, nuclear energy, consumerism.

Number	Name of the SDG	Vocabulary related to it
3		
6		
7		
12		
13		
14		
15		

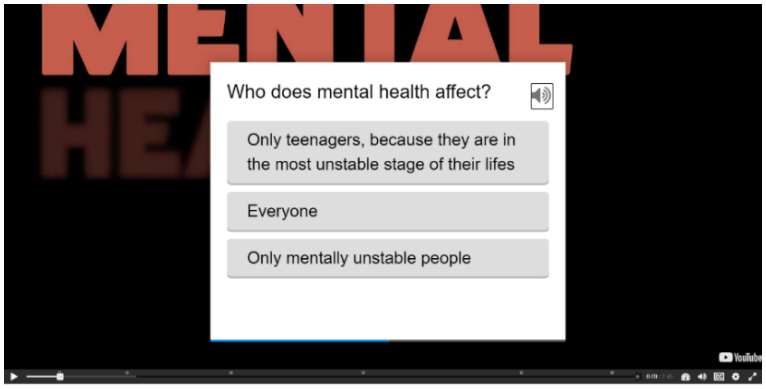
Figure 5

Mentimeter Word Cloud about Mental Health (Own design)

Once the answers to the activity were revealed, they served as a basis for raising questions that made students reflect on mental health, psychology, and other pertinent contemporary issues. This part of the activity is deeply linked to the "Conceptualization" phase of the Inquiry Cycle. After the round of questions and general discussion, students were presented with a video named "Teen Health: Mental Health", created with H5P[1] on the Lumi platform, which addressed this same topic but focused on the adolescent mind. The video explores subjects such as depression and mental illness detection to raise awareness of the importance of being informed about these issues. During the video, listening comprehension questions appeared to ensure that students remained engaged and attentive (see Figure 6 below).

Figure 6

Lumi interactive video about teenage mental health (Own design)



The next exercise was introduced to conclude the session, a debate for and against video games in relation to SDG 3. Students were separated into two groups and provided with "for and

[1] H5P is a tool that uses JavaScript in order to simplify the creation of interactive content, such as online activities.

against" debate handouts outlining guidelines to aid their independent research. Cooperation with the team was essential in this activity, given that every individual oversaw one of the parts of the debate, and every one of them had to speak since they were all evaluated afterward. To ease the embarrassment that sometimes comes with public speaking, they were also provided with a sheet of useful expressions for introducing, countering, agreeing, and concluding. The rest of the session was dedicated to research, role assignment, and team organization, which correspond to the third stage of the Inquiry Cycle, the "Investigation."

The initial fifteen minutes of the last session were dedicated to continuing the research activity, followed by the commencement of the debate in front of the teacher, who had a rubric with which to evaluate each group. The debate itself is considered the "Conclusion" and "Discussion" parts of the Inquiry Cycle since the students shared the information they had gathered with their classmates and, thereby, were able to reflect on and discuss it. Once the debate had concluded, the teacher explained the most common or serious errors, considering the level of the students. This feedback was provided anonymously to avoid exposing people who had made mistakes.

To conclude the intervention, the last activity consisted of a video screening in which students engaged in oral comprehension exercises regarding violence in relation to video games, featuring perspectives from various experts. This would have been a supplementary part of the Inquiry Cycle, which OWIS Communications Team (2020) contemplated. This final phase is known as "Action", and it enables students to take further steps by exploring additional questions related to the main topic, which is beneficial to foster their curiosity. This allowed students to re-examine and synthesize what they had learned during the debate activity, thus completing the IBL cycle.

Strategies for Data Collection and Evaluation

A mixed-method strategy for the analysis of data was used. Thus, four different data collection tools were used, aiming for great diversity to enhance the accuracy of the collected data (see table 1):

The first data collection method employed involved distributing a diagnostic questionnaire via Google Forms. In a class before the sessions to implement the didactic sequence, students were presented with a QR code (see Figure 7 below) to facilitate access to the questionnaire. The questionnaire consisted of eight questions of varied formats: Likert scale, multiple choice, and open-ended. All of them were formulated in the two official languages of the Valencian Community, alongside English, given the subject in question. This was done to facilitate the questionnaire for everyone and thus avoid misunderstandings that could hinder the answers' veracity.

Table 1

Strategies for Data Collection and Evaluation

	Type of Assessment	Type of tool employed	Type of questions	Evaluation
Formal	Diagnostic assessment of previous knowledge about the topic	Diagnostic questionnaire	Likert scale Multiple choice Open-ended	Quantitative/ qualitative
	Performance assessment of vocabulary acquisition, oral skills, cooperation, and engagement	Rubric	Numerical rating scale according to specific criteria	Quantitative/ qualitative
Informal	Evaluation through direct observation	Research Journal	Open-ended	Qualitative
	Self-evaluation of the proposal	SWOT analysis	Open-ended	Qualitative

Figure 7

QR of the Google Forms Questionnaire (Own design)

The questions were as follows:

1. Do you like English? Why or why not? (Open-ended)
2. Do you think you have a good level of English? (Likert scale)
3. Do you think you will use English in the future? What for? (Open-ended)
4. Have you ever been questioned about the theory before it has been explained by the teacher? (Multiple choice: yes/ no/ I don't think so)
5. Do you think students learn more when they must search for their answers? (Multiple choice: yes/ no/ I don't know)

6. Do you think you work better in groups? (Multiple choice: yes/ no/ Both individually and in groups)
7. Do you know what SDGs (Sustainable Development Goals) are? If so, please explain it briefly. (Open-ended)
8. Do you know any SDG? If so, please write its name or what it is about. (Open-ended)

With this variety of questions, the aim was to assess the student's level and motivation regarding the subject and make a diagnosis before the intervention to determine how much they knew about the topic (SDGs) and the type of exercises related to the methodology that would be employed.

Another assessment method was the evaluation rubric at the end of the implementation of the didactic proposal. This included questions about the level of understanding of the SDGs, the specific vocabulary, the involvement in the information research and teamwork, the quality of their oral interventions, the adherence to the debate expressions, and finally, the motivation and engagement the participants showed throughout the intervention. In each of these sections, a result could be determined according to this scale: needs work (1), sufficient (2), very good (3), or excellent (4). The sum of these variables, about the criteria specified in the rubric, added up to a number that determined the overall score. This score, depending on the sum given, indicated the final performance of the students: 6: Needs work, 7-12: Sufficient, 13-18: Very good, and 19-24: Excellent.

This rubric was designed to make a general assessment for the whole class but was eventually applied individually. The result of this rubric, which has both evaluation criteria and an equivalent numerical mark, constitutes an exemplary method for qualitative and quantitative evaluation. It was used to determine if this specific group achieved the expected linguistic objectives and to numerically contrast their performance with other study subjects or similar studies. The third method of evaluation involved direct observation via a research journal. This informal assessment was composed entirely of the notes that were taken during the classes, covering aspects such as what worked well, what did not, whether the timing was appropriate, if activities required more time, and whether students were following the lesson effectively, including the most common mistakes students committed (see Figure 9 below). Despite their subjective nature, these notes were taken with a highly critical perspective on the implementation. Moreover, they were used to conduct a subsequent SWOT analysis, serving as an evaluation for the entire proposal. To conclude the evaluation section, since the SWOT analysis exhaustively considers all the factors that have contributed to the success or failure of the different parts of the didactic sequence, it seemed reasonable to conduct one as a self-evaluation. As described in the study by Satria and Shahbana (2020), the description of the strengths that contributed to the proposal, the weaknesses that have hindered it, the opportunities that can be generated by it, and the potential threats that could hamper its future implementation with other students constitute a critical and valuable analysis that helps to evaluate the proposal accurately. Therefore, a table structured similarly to the one shown in the study was made.

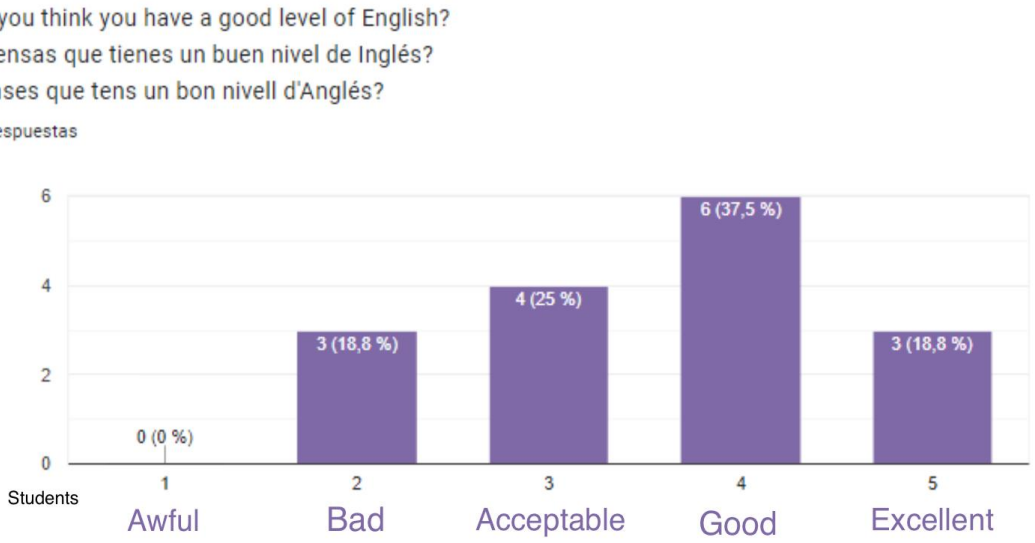
4. Results and Discussion

4.1. Diagnostic Questionnaire

The questionnaire was conducted via Google Forms and allowed the explanation of the SDGs to be adapted to the student's current level of knowledge on the topic. Overall, their understanding was good, although they lacked specific knowledge, such as the names of the objectives. Additionally, the second aim of this questionnaire was to assess their relationship with the language and the subject: Most of the answers to the first and foremost question, "Do you like English? Why or why not?" were positive, highlighting reasons such as practical utility, professional opportunities, and facility of learning. Some participants mentioned feeling comfortable and enjoying the language, while the negative responses focused on the difficulty of learning a new language and their poor performance. Mixed responses also indicated a partial understanding of the language or disliking the learning process. Overall, the perception of English was favorable, although some challenges were found in learning it. Furthermore, regarding the questions concerning their future use of the language, students mostly thought it was helpful and highlighted its use on a job or in communicating with others. When asked about their perception of their English proficiency, as shown in Graphic 1 below, 37.5% rated their level as very good, although not excellent. Only 18.8% considered their level to be excellent, while 25% believed it to be average. On the contrary, 18.8% felt their level was not very good, and, on the bright side, no one rated their level as awful.

Graphic 1

Graphic of the answers about the student's level of English (Own design)

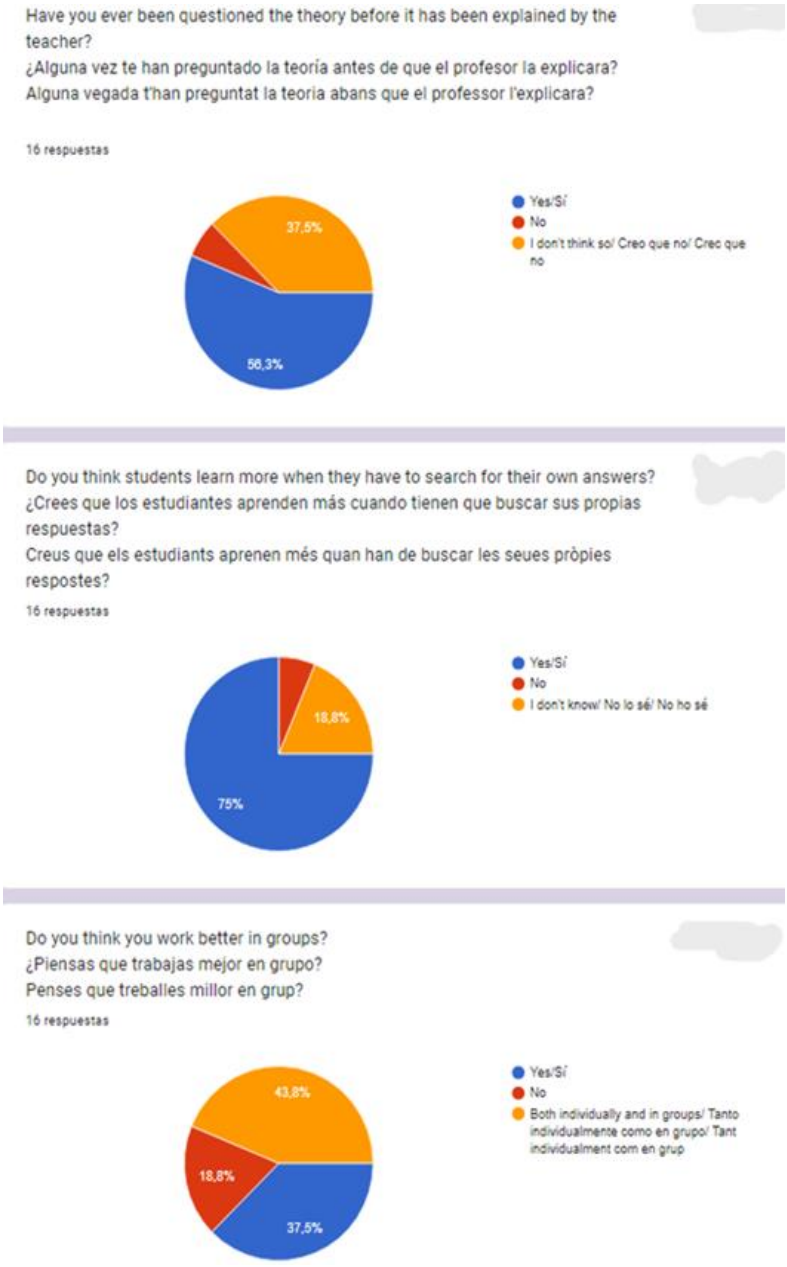


Regarding the IBL-related questions, the students' responses indicate different experiences with this approach. Some have been questioned about the theory before the teacher explained it (see Graphic 2 below), suggesting a teaching practice oriented toward inquiry where students are

challenged to think critically. Additionally, most students believe they learn more when they must search for their answers (see Graphic 3 below), supporting the notion that self-directed learning promoted by the IBL approach can be effective. Nevertheless, regarding group work, responses are mixed since some prefer to work individually, while others see benefits in both individual and group work (see Graphic 4 below). This suggests that the inquiry approach may offer opportunities for collaboration but also acknowledges the importance of independent work in the learning process.

Graphics 2, 3 and 4

Graphic of the answers about the students' previous experiences with IBL (Own design)



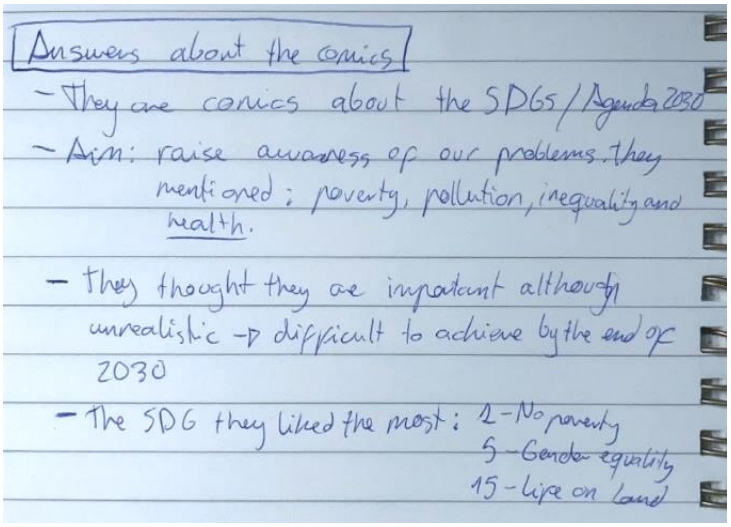
Finally, the responses about SDGs show a varied understanding of the topic. Some of the participants had basic knowledge, recognizing them as objectives for 2030 and associating them with poverty, inequality, and environmental issues. Others do not remember any SDGs, but they had heard of them before and understood their general purpose. Nevertheless, some responses indicate a lack of knowledge or confusion about the meaning of SDGs. In summary, the responses indicate that the activation of the prior knowledge phase in the Inquiry Cycle would be shorter since the vast majority were familiar with and understood the primary purpose of the SDGs. It is important to emphasize that out of the 19 people in the class, only 16 answered the questionnaire because they did not have a phone, did not pay attention, or were absent that day. Therefore, the responses to this questionnaire are purely indicative since they are biased due to the lack of cultural and ethnic diversity and the low number of respondents.

4.2. Informal Evaluation through Direct Observation

Participants were shown comics about the SDGs and asked questions to know what they could remember about them. Thanks to the notes taken in the research journal, which were of great help in the non-assessable oral activities, it can be determined that there was significant participation when doing group discussions and answering questions. Their responses were accurate, mentioning some of the SDGs. However, as already perceived in the questionnaire, the names of the objectives had to be explained one by one to refresh this information. After this, students concluded that these objectives were very ambitious, although functional. In the end, they highlighted SDGs 1 (No Poverty), 5 (Gender equality), and 15 (Life on land) as their favorites and the ones they considered most essential to address, as seen in Figure 8 below:

Figure 8

Notes on the research journal of the comic activity about the SDGs (Own design)



The students initially seemed lost during the research activity, which was the first phase of investigation in the Inquiry Cycle they faced within the implementation. Conversely, with the help of the supervising teachers, they managed to understand what was expected of them and

finally provided good explanations about the SDGs assigned to each group. Except for basic grammar corrections, such as verbal tenses and wrong translations of some words, their discourses met the expectations of their level. It is worth noting that they were encouraged to be creative, so one of the groups even staged a somewhat comedic theatrical representation of SDGs 14 (Life below water) and 15 (Life on land). Apart from being amusing and entertaining, this helped everyone understand these objectives.

Contrary to the previous one, the vocabulary review activity became much more prolonged and denser for them. Less participation and an increase in boredom were noticed, as it involved translating vocabulary. Nonetheless, students followed the explanations successfully because they were encouraged to discuss the translations aloud and correct each other. Many of the words were already familiar to them, and for those that were not, most of them wrote down their meanings on the paper. Eventually, everyone completed the table at their own pace and finished having an adequate study sheet for vocabulary.

The following activity, corresponding to the second session, was the Mentimeter word cloud, whose results were fruitful. The responses matched the exercise requirements, except for a few instances where some students tried to be funny. However, this possibility was anticipated because they are teenagers and need to stand out and fit in with the group. Ultimately, the responses led to a very productive debate, which highlighted the importance of taking care of mental health today. Thus, the words "psychology" and "seek help" were the most exciting and significant to them.

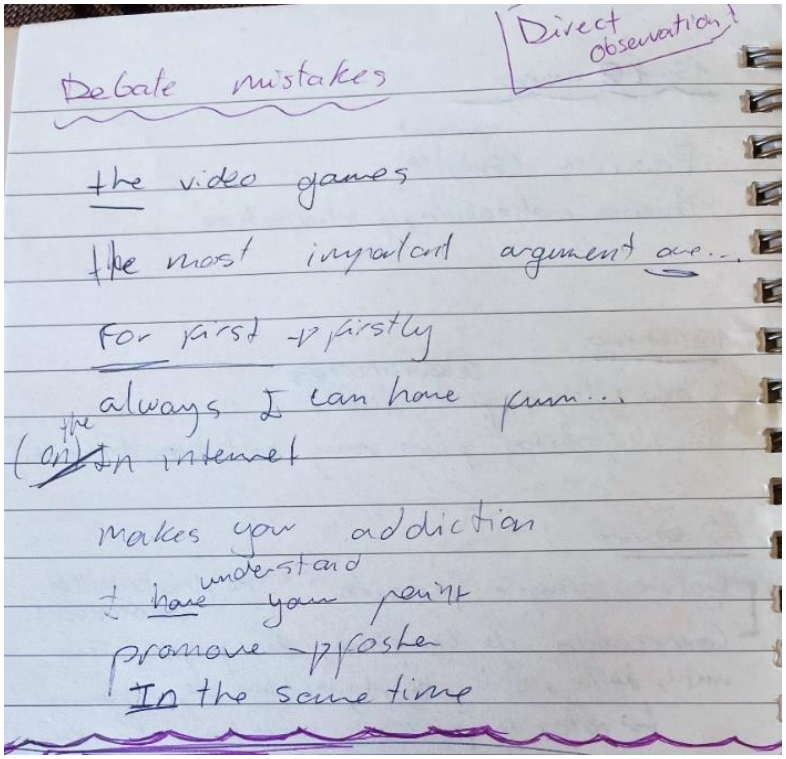
The activity that benefited the Conceptualization or hypothesis creation phase of the Inquiry Cycle was the video on Lumi. This video, through easy-to-answer questions, encouraged reflection on more complex mental health topics, such as what to do if you or someone around you has a psychological disorder. The students received this activity well, as videos are highly engaging stimuli, resulting in high participation when answering the questions. Consequently, they managed to answer all the questions correctly together.

Finally, the students started gathering information in groups for the debate for and against using video games for mental health. There were no issues when it came to forming groups, as they divided themselves into heterogeneous groups —boys and girls with different levels of English— based on their own beliefs and actual stances on the debate. The groups were relatively balanced, with those having a higher level of English taking on the more demanding roles and helping their peers with lower levels with the information research and translation. Furthermore, the fact of having to present in front of their classmates incentivized them to do more exhaustive research. This type of cooperative activity following the IBL methodology works very well in heterogeneous groups as it promotes giving and receiving help among classmates, as mentioned by Sánchez i Peris (2010): "The incorporation of cooperative learning in the classroom legitimizes the behaviors of asking for and providing help, thereby enhancing students' social repertoire with new learning opportunities" (p. 421). As a result, when it came to the debate, everyone could speak and present their arguments in an organized manner, with

the help of the teachers who acted as timekeepers and moderators. As Cotton (1988) asserted, teachers are pivotal in IBL as they guide and supervise students, a role confirmed in this activity. In addition, it is essential to mention that the anonymous verbal corrections of the mistakes made during the debate (see Figure 9 below) were very well received by the students. The mistakes were either grammatical or translation errors, with the prepositions and verbal tenses being the most significant ones. Everyone participated in correcting the errors of their peers or even their own, thereby reviewing the grammatical theory provided throughout the school year.

Figure 9

Notes on the research journal of the mistakes made in the debate about video games (Own design)



4.3. Rubric: Evaluation of the Student's Whole Performance

At the end of the intervention, the evaluation rubric was filled out, which adequately captured all the key aspects necessary for a thorough assessment of the student's performance. Furthermore, given that this evaluation method encompassed qualitative aspects and assigned numerical values to each criterion to scrutinize it quantitatively, the grades became visually more transparent, comprehensible, and more analyzable in numerical terms. This type of assessment was so effective that it allowed the teacher in charge of speaking grades to use the results to assign individual oral skills grades according to the criteria specified in said rubric:

1. Students understand and can explain the SDGs.
2. Students have acquired and used vocabulary regarding SDGs (especially SDG 3).
3. Students have conducted good research with valid and interesting information.

4. Students have effectively utilized debate expressions to make their points.
5. Students have cooperated with their classmates in group activities.
6. Students have shown motivation and engagement in the activities.

These criteria were well-chosen because they allowed the evaluation of students in different areas, which balanced the results significantly. Moreover, due to the student's good performance, most received good grades, all falling within the "very good" to "excellent" range, with three achieving the highest grade possible.

4.4. Self-evaluation: SWOT Analysis

Additionally, a SWOT table was made to evaluate the whole implementation, emphasizing the strengths and high points of the didactic sequence and the weaknesses or vulnerabilities the sessions presented. Furthermore, it summarizes the opportunities that would have a significant impact on future implementations and the threats that could jeopardize them (see Table 2 below):

Table 2

Self-evaluation of the proposal using SWOT analysis

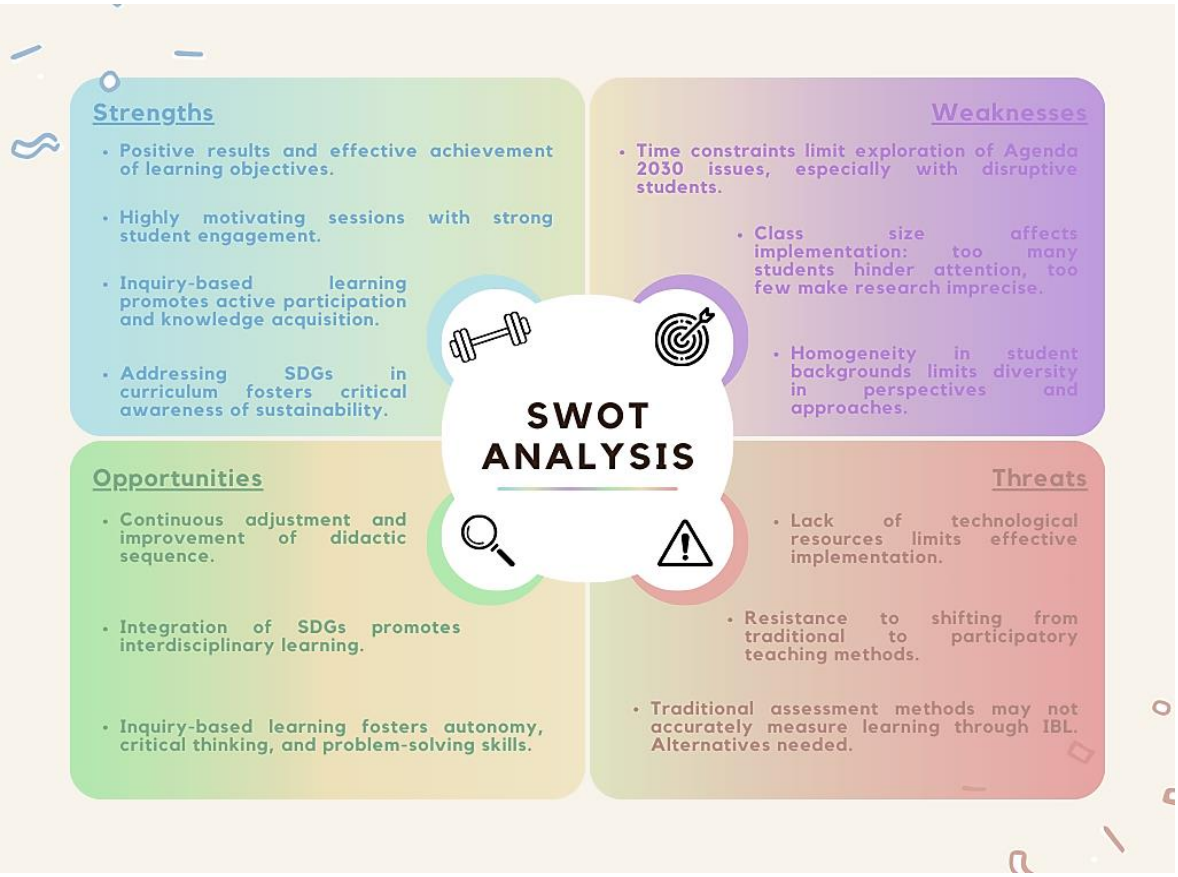
Strengths	● The proposal has had very positive results, showing that it has effectively achieved the learning objectives. ● The proposal sessions genuinely motivated students, indicating high engagement and participation. ● The Inquiry-based learning approach promotes active student participation, which can improve the acquisition of new knowledge. ● Addressing the SDGs in the education curriculum is doubtlessly relevant, as it addresses current global issues and fosters a critical awareness of sustainability.
Weaknesses	● Time constraints can limit exploring issues related to Agenda 2030, primarily if the didactic sequence is implemented in a classroom with disruptive or very talkative students. ● Both large and small numbers of students can make a significant difference in the outcome of the implementation. On the one hand, having many students would impact the students' attention and hinder the monitoring of their progress. On the other hand, a smaller number of students could make the research results less precise. ● Homogeneity in student background can limit the diversity of perspectives and approaches to learning, and thus, the efficacy of this study could be biased.
Opportunities	● The didactic sequence can be continuously adjusted and improved to address previously identified constraints and optimize learning. ● The SDGs offer the opportunity to integrate different areas of knowledge, promoting an interdisciplinary approach that enriches the educational

	experience. Thus, more activities related to the different objectives can be developed similarly. ● IBL fosters autonomy, critical thinking, and problem-solving skills, which are fundamental to their educational journey and future professional life.
Threats	● The lack of technological resources in the classroom, including an internet connection, may limit the proposal's effective implementation. ● Some students or teachers may resist shifting from traditional teaching methods to more active and participatory approaches. ● Assessment based on traditional methods may not accurately measure the learning acquired through the IBL approach. Thus, alternatives to exams or tests should be contemplated.

This information is summarized visually in Figure 10 below:

Figure 10

Key points of the SWOT analysis (Own design)



5. Conclusions

Generally, it can be inferred that the students received the implementation of IBL in conjunction with the SDG-related topic very well, and the results were more than favorable. Firstly, the exercises were more appealing than the monotonous review of textbooks. It is worth mentioning that, in this case, the IBL approach was combined with cooperative and interactive exercises that could be completed using their mobile devices. One of the main problems for secondary school teachers mentioned in the introduction of this paper was the students' difficulty paying attention for a certain period, as they are used to receiving constant stimuli from their mobile phones. In this intervention, the students associated using these devices with something genuinely educational, and the fact that new technologies were used in the class proved attractive, given their high level of participation in the activities. Additionally, since they had to work in teams, giving and receiving help significantly improved their performance, concentration, and outcomes, as evidenced by the results obtained in the general evaluation rubric.

For all these reasons, it can be confirmed that the first main objective proposed in this paper, which was to prove IBL's functionality in an EFL class, has been achieved. As predicted by authors such as Alameddine and Ahwal (2016) and Alcantud-Díaz and Lloret-Catalá (2023), IBL has worked very well in a language learning class, especially when developing Personal, Social, and Learning-to-Learn competence. This is because the activities were engaging and developed communicative skills in English. Among these activities, there were questions, open discussions, group debates, and presentations in which the students effectively used the provided tools (vocabulary, useful expressions, and specific knowledge of the SDGs field) to express their opinions, thus reinforcing their oral and interpersonal abilities, along with the critical thinking. Consequently, it can be determined that the answer to the first research question is affirmative: IBL can successfully enhance students' autonomy and motivation, as previously confirmed in other studies such as Banquet Galindo and Urrea Arcila's in 2020.

This is deeply linked to the first specific objective: to see if this methodology worked in a Spanish secondary school class. Even considering the results of the questionnaire that show that Spanish students are not entirely confident regarding their English language skills, IBL is adaptable to all proficiency levels, including classes with varying levels among students. This was evident in the debate, where the sense of group and camaraderie led them to help each other, resulting in favorable outcomes for all students, including those who mentioned struggling with English in the diagnostic questionnaire. Often, these low levels of oral proficiency are due to the embarrassment of speaking a language they are not fluent in, and these exercises have improved their motivation and engagement with the subject, making them want to improve their English communication skills.

The thematic thread of the SDGs was also very well received, as it was a topic the participants were partially familiar with, and they found researching about it genuinely interesting and necessary, according to their responses noted in the research journal. This highlights that

Baraquia's (2018) "Interdisciplinary Contextualization" is essential for bringing students closer to the EFL classes. It can be observed that students specifically found the goals related to reducing or eliminating poverty, hunger, inequality, and pollution relevant. This may be due to the immediacy and importance given to these topics in the media; a great example is the news about what is happening in Gaza. Therefore, it can be stated that the second general objective of this paper has been fulfilled, as participants have learned about the global reality and have become involved in it, thus fostering the much-needed Citizenship Competence mentioned in the latest Spanish education law. In addition, SDG 3 was particularly motivating for the students. Even though they did not choose it as their favorite, it is a topic that is increasingly present in the reality of young people and on social media, encouraging their participation in debates and discussions. This was especially evident in their involvement in the debate on the advantages and disadvantages of playing video games, as they chose sides according to their opinions. This led to very diverse arguments, in which the students demonstrated being aware of the psychological implications of excessive video game playing. Therefore, in response to the second research question, "Can students' involvement in the EFL class be increased by including content related to SDGs?", the answer is affirmative, demonstrating the significant positive effects of ESD in secondary school classes, as Unesco stated in 2024.

It was also proven that the IBL methodology works suitably with cross-curricular topics, as in this way, students become more involved in searching for information, understanding it better, and subsequently being able to explain it orally to their classmates, as previously seen in Govender and Pillay's (2022) study. This was evident in the first Inquiry Cycle of the intervention's initial session, where they performed theatrical representations of the SDGs. This implies that not only did the students correctly understand the general characteristics of the objectives they had to explain, but they also found it interesting to learn and share it with their classmates. Thus, it can be concluded that a helpful way to promote meaningful learning about these cross-curricular themes demanded in the current Spanish educational curriculum is to employ the IBL approach since it fosters students to become active participants in their learning process, creating deeper connections with the topic.

Nevertheless, this paper has faced various limitations, the biggest ones being the lack of time to create a longer Learning Situation —as recommended in the new Spanish curriculum— or to test it in different groups, with more participants and greater diversity, as this would have yielded more reliable results. However, despite the small-scale results and the modest group, it can be confirmed that, in general terms, it has been a success. Nonetheless, it is worth noting that the exact implementation in another context, with different participants or limitations in obtaining the necessary material, may not result in such good outcomes.

We consider it advisable to continue studying this field since, due to the time constraints imposed on this article, many alternative lines of research remain to be explored. These include the behavior of IBL in a disruptive or culturally heterogeneous class, how to employ IBL without the use of new technologies, or if it is possible to raise awareness about the SDGs with other alternative methodologies such as the highly appealing gamification or even if it exists the

possibility of extending this small didactic sequence and creating a proper learning situation that also involves other subjects. All of these are very intriguing study topics to delve into thoroughly.

Funding

This work is part of the R&D&I project "Contenido interactivo H5P y ODS en la enseñanza de lenguas extranjeras, de las ciencias sociales y en la formación de futuros/as docentes" (CIGE/2021/131) funded by the Conselleria de Educación, Cultura, Universidades y Ocupación from 01/01/2022 to 31/12/2023.

Conflict of Interests

The authors declare that they do not have conflict of interest.

Ethical Implications

The participants belonged to a secondary education class and took part in activities related to an internship with one of the authors. Privacy has been maintained.

Authors' contribution

Research design, Both authors; Data analysis (Bravo Luque); methodology (both authors); manuscript review (Alcantud-Díaz). All the authors have read and approved the submitted version.

Declaration of generative AI-assisted technologies in the writing process

While preparing this work, the authors used Grammarly solely to correct the use of the English language since neither of them is a native English speaker. After using this tool/service, the authors reviewed and edited the content needed and took full responsibility for the publication's content.

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