

Integrative Learning and Interdisciplinary Practice

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Abstract. In an increasingly interconnected world, the traditional boundaries between academic disciplines are becoming less relevant and education systems are gradually shifting toward approaches that reflect the complexity of real-life problem solving, where knowledge is rarely applied in isolation. Integrative learning, defined as the ability to connect skills and knowledge from multiple sources and experiences, has become a logical pedagogical framework. Education sector plans should include environment-related themes to show high-level prioritization, impact the direction of learning content as well as promote whole-sector approaches to sustainability.

To illustrate how integrative learning can be structured in practice, the following is a sample lesson plan designed for B2 learners, focusing on a scientific activity. The lesson is centered on the topic of water purification. The objective is for students to understand basic concepts of water filtration while developing their reading, speaking and writing skills in English. The lesson begins with a warm-up discussion where students share their knowledge about water sources and pollution, applied on their living areas. This activates previous knowledge and introduces key vocabulary. In the final stage, students analyze the results of the experiment and create a report of the experiment, thus reinforcing both writing skills and scientific understanding

The results demonstrate that when students do practical work, the reception and awareness are at their best. English was used as an instrument and learning was done without effort but remained a successful, unforgettable acquisition. The focus on teaching interdisciplinary had best results and the main success of the lesson was the participation of all students.

Understanding nature and its principles while working and experimenting at early ages is the key to building a safe environment. School is an environment itself and practising good examples should be a must do in any opportunity of study. Environmental learning should be integrated across the curriculum, with a holistic pedagogy that goes beyond an exclusive cognitive knowledge focus and aims to engage students socially and emotionally and in action-oriented learning and participation. Syllabuses are guidelines, while teachers' creativity is primordial when it comes to educating. Foreign language classes are the best occasion to connect students to everything related to the real world and allow them to understand that their own role and actions are accountable.

Keywords: Interdisciplinarity; Integrative learning; English; Chemistry; Natural world.

1. Introduction

Environmental and society challenges require education to integrate a wide range of perspectives from different disciplines (i.e., interdisciplinary integration), as well as from research, policy, and practice (i.e., transdisciplinary integration) (Vienni-Baptista & Hoffmann 2024).

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Within English language education, particularly at the upper-intermediate level, integrative learning offers a meaningful way to develop linguistic competence while enhancing critical thinking, creativity, and scientific literacy (Sari & Khoiriyah, 2025).

Integrative learning encourages students to use language skills with knowledge from other domains such as science, technology, social studies, or arts (Kindelan, 2022). Instead of practising language in an abstract system, students use English as a tool for research, communication, and discovery (Aka, 2025), and knowledge is actively built through experience and interaction rather than passively received.

The following is a sample lesson plan built on the topic of water purification. In the input phase, students read a short scientific text explaining different methods of water purification. The teacher guides comprehension through targeted questions and highlights important language structures, such as passive voice and sequencing expressions. The main activity involves a hands-on experiment. Students work in small groups to design a simple water filter using materials such as sand, gravel, charcoal and cloth. They follow instructions written in English and are encouraged to discuss each step using appropriate language. As they conduct the experiment, they record observations and note any changes in the water's appearance.

Following the experiment, students analysed their results and compare them with other groups. They are asked to explain why their filter was effective or ineffective, using scientific reasoning and evidence. This stage emphasizes the integration of language and content knowledge.

In the final phase, students write a short report describing their experiment. The report includes an introduction, a description of the procedure, results, and a conclusion. This reinforces academic writing skills and encourages reflection.

Assessment is based on both language use and content understanding (Salamoura & Ellman, 2025). Students are evaluated on their ability to communicate clearly, use appropriate vocabulary, and demonstrate comprehension of the scientific concepts.

2. Research methodology

The present study is the result of classroom-based research, designed to investigate the effectiveness of an integrative English lesson centered on the topic of water purification. There were four different lessons performed in the common classroom environment, which involved upper-secondary school students aged 16–17 years, from four different profiles (Natural Science, Computer Science, Social Sciences, Philology), all demonstrating a B2 level of English. The educational context was an Integrative English Class (B2 Level), in which language learning was combined with scientific content, critical thinking, collaborative learning, and problem-solving activities (Summit K12, n.d). The lesson was implemented following a structured lesson plan designed to develop students' communicative competence while increasing their understanding of water purification methods and environmental sustainability. The 90-minute lesson included vocabulary-building tasks, reading and listening activities, group discussions, collaborative analysis of water purification techniques, and oral presentations. Acting mainly as a guide and an observer, the teacher used multiple qualitative instruments to increase methodological efficiency, including systematic classroom observations focusing on student participation and interaction, student reports evaluating their learning experiences and perceived language

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development, teacher reflective notes documenting classroom dynamics and instructional effectiveness, and post-lesson questionnaires measuring students' engagement, motivation, perceived difficulty, and overall satisfaction with the lesson. The effectiveness of the integrative approach was evaluated according to several criteria such as students' active participation in communicative tasks, accuracy and fluency in English language use, successful integration of scientific content with language objectives, quality of collaborative work, critical thinking demonstrated during discussions and presentations, and positive attitudes toward interdisciplinary learning. Questionnaire responses and teacher reflections were further analyzed to identify learner motivation, confidence, and the lesson's impact on both language acquisition and content understanding, offering valuable answers on the efficiency of integrative English classes for promoting meaningful, authentic, and interdisciplinary learning experiences.

3. Implementation of activity: Earth and Terra through Experimentation

This lesson integrates English language learning with Earth science by exploring how soil composition affects water filtration, linking the concept of “Terra” to the geosphere and environmental sustainability (UNESCO, 2021). The lesson combines scientific inquiry with language practice, allowing students to learn through observation, discussion, and analysis. The inclusion of an experiment made the lesson interactive and encouraged students to use English in a meaningful, real-world context, while the best success was the fact that all students were involved and participated at the same time.

By the end of the lesson, students were able to explain basic concepts related to the Earth's geosphere and soil composition, use scientific vocabulary in context, describe an experimental process, and interpret results using clear and structured English. Students developed their ability to collaborate and communicate ideas effectively, in an organized, logical way.

Materials

- Transparent plastic bottles cut in half
- Soil or sand, small stones or gravel
- Charcoal
- Cotton or cloth
- Dirty/ muddy water prepared in advance
- Beakers
- Worksheets for observations and conclusions

Procedure

The teacher wrote the word “Terra” on the board and asked students what they associated it with. The discussion led to the idea of Earth as a system, focusing particularly on soil and land. Students were asked questions such as: “How is soil formed?”, “Why is it important for life on Earth?” This stage activated prior knowledge and introduced the topic.

To introduce key vocabulary, the teacher wrote on the board words such as soil layers, filtration, absorb, particles, and *contamination*. Students explained the words and created short example sentences. The teacher also introduced useful language for experiments, including sequencing

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expressions like *first, then, after that, and finally*, as well as passive structures such as *the water is filtered*.

During the input phase, students read an adapted scientific text (Keesstra et al., 2021) about soil composition and its role in filtering water naturally.

As groundwater is an essential source of water for drinking and irrigation, and often has a rapid connection to surface waters, it is vital to gain insights into how the groundwater recharge and quality is influenced by the soil it flows through. The behaviour and transport of polluting substances strongly depend on the filtering function of soil. Applied nutrients or pesticides can be retained by the soil. Organic and inorganic compounds, which can originate from agricultural, municipal or industrial by products, can be filtered, buffered and immobilised by clay minerals and the organic matter and degraded by soil biota. The efficiency of the soil as a buffer and filter for pollutants is determined by the adsorption and degradation rate in the filter and the residence time, which depend on the transport processes of the soil and concentration of the pollutants. There is an enormous number of organic and inorganic pollutants in the environment that reach the soil via dry/ wet deposition (e.g. acids, persistent organic pollutants, heavy metals) or directly through human application (e.g. agrochemicals). The fate of these pollutants depends upon the specific adsorption, degradation and leaching processes they are subjected to. Transport of pollutants which are adsorbed to soil particles occurs through soil erosion, colloid transport in macropores, and deposition downstream. In addition, metabolites resulting from degradation may behave differently than the original substances, for example they may be very soluble and therefore leach out to the groundwater or surface water. Keesstra et al., 2021)

Students answered comprehension questions and identified key ideas. The teacher highlighted how Earth's geosphere interacts with the hydrosphere through processes like filtration.

The experiment

During the experiment stage, students were divided into small groups. Each group constructed a simple water filter using a plastic bottle. Students were provided with transparent plastic bottles, cotton, gravel, sand, active charcoal and samples of muddy water. They discussed the purpose of each filtering material (Sormunen & Köksal 2014), made predictions and recorded their ideas on a worksheet. During the practical activity, students assembled their own filtration systems by arranging the materials in different layers. They then poured the muddy water through the filters, carefully observing the changes in water clarity after each trial. Throughout the experiment, students communicated in English by asking questions, describing procedures, comparing results, and explaining their observations. The teacher encouraged the use of target vocabulary to support meaningful interaction and scientific reasoning. After completing the experiment, students analysed their results within their groups. They discussed questions such as why the water became cleaner, which layer was most effective, and how this related to natural processes on Earth. Each group prepared a short explanation using scientific vocabulary and clear language.

During the presentation stage, groups shared their findings with the class. They described their procedure, presented their observations, and explained their conclusions. Other students asked questions, creating a collaborative and interactive environment similar to a scientific discussion.

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To complete the consolidation stage, students wrote a short report describing the experiment. They included an introduction, a description of the method, observations, and a conclusion about the role of soil in water filtration, thus reinforcing both writing skills and scientific understanding.

Students were assessed based on their participation in the experiment, their use of English during group discussions, and the clarity and accuracy of their written report. The teacher focused on both language use and understanding of the scientific concept.

4. Results

Students responded enthusiastically to the experimental tasks, demonstrating high levels of engagement and collaboration. Most groups actively negotiated the order of the filtration layers, discussed unexpected results, and modified their designs after reflecting on the effectiveness of their first attempts. For example, one group discovered that placing activated charcoal above the sand produced clearer water than their initial arrangement and explained the reasoning behind their revised design in English.

Evidence supporting the reported outcomes included completed observation sheets and short oral group presentations. Qualitative classroom observations also showed increased confidence in using English during authentic communication, effective teamwork, and improved understanding of the water filtration process and the benefits in the daily life. Students frequently used newly introduced vocabulary accurately and demonstrated their learning by explaining both the practical procedure and the scientific principles underlying the experiment.

One of the most obvious advantages of integrative learning in English classes is the development of authentic communication skills. When students are asked to explore real-world topics, such as climate change, artificial intelligence, or the medical world, they are required to use English in ways that mirror real-life discourse, as they must interpret data, evaluate sources, formulate arguments, and present findings. As a result, this not only strengthens their application of vocabulary and grammar but also raises their ability to use language strategically and purposefully.

The benefits of such integrative approaches are numerous. Students become more engaged because they see the relevance of their learning. In addition, they develop a broader range of competencies, including collaboration, problem solving, and digital literacy. Importantly, they also gain confidence in using English as a medium for learning and communication beyond the language classroom.

5. Discussion

Among other aspects, an integrative syllabus would be particularly beneficial because it would organize learning around themes or problems rather than discrete linguistic items, and would make it more efficient for teachers to create a project for the lesson. For example, a unit centered on environmental sustainability might incorporate reading scientific articles, analyzing graphs, writing persuasive essays, and participating in debates, while grammar and vocabulary are not taught in isolation but are incorporated within related contexts, leading to deeper understanding and transfer of knowledge, as students can see the relevance of what they are learning. Moreover,

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integrative syllabi promote cognitive flexibility, while learners are encouraged to draw connections between different types of knowledge and to approach problems from multiple perspectives. This is especially valuable in scientific contexts, where complex issues often require interdisciplinary solutions. By getting into contact with scientific content in English, students also develop the language needed to participate in global academic and professional communities.

For example, several integrative activities can be effectively implemented in the English classroom. One example is a project-based activity where students investigate a scientific phenomenon such as renewable energy. Students begin by reading simplified scientific texts and watching short documentaries in English, then they work in groups to design a model of a sustainable energy solution, such as a solar-powered device. Throughout the process, they must use English to discuss ideas, negotiate roles, and document their progress. The final stage involves presenting their project to the class, using visual aids and scientific terminology.

Another example is a data interpretation activity. Students are given charts or graphs related to topics like global temperature changes or population growth. They are asked to describe trends, compare data, and draw conclusions using appropriate language structures. This activity integrates language learning with statistical literacy and critical thinking.

A third integrative activity involves role-play in a scientific context. For instance, students simulate a conference where they take on the roles of researchers presenting their findings. Each student prepares a short presentation on a scientific topic, followed by a question-and-answer session. This not only practices formal speaking skills but also introduces students to the conventions of academic discourse.

6. Conclusion

This approach illustrates how integrative learning can effectively combine language education with scientific inquiry. By engaging in an experiment, students experience firsthand how Earth's systems function while developing their ability to communicate in English. The hands-on approach not only increases motivation but also deepens understanding, making learning both meaningful and memorable. Students expressed their desire to conduct further experiments and confessed that their accomplishment was solid and rewarding.

In conclusion, integrative learning represents a transformative approach to English language education. By filling the gap between language and content, it prepares learners for the demands of a globalized world where communication and knowledge are deeply intertwined. An integrative syllabus not only enhances linguistic proficiency but also equips students with the skills needed to navigate complex, interdisciplinary challenges.

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