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CLIL LESSON PLAN

Imbalance in the Food Web: The Impact of Invasive Species

LESSON OVERVIEW

Subject(s)	Geography · Biology
Age Group	11–14 years old
Duration	60 minutes
CEFR Level	B1+ / B2

LEARNING OBJECTIVES

Content Objectives

- To analyse how the introduction of allochthonous species alters the energy flow and balance of the food web.
- To identify and categorise the different trophic levels affected by a biological invasion.
- To assess the socioeconomic and environmental impacts resulting from the loss of endemic biodiversity.
- To synthesise possible solutions or mitigation protocols to restore the ecosystem balance.

Language Objectives

- To accurately use technical terms such as photovoltaic cells, carbon sequestration, power grid, energy efficiency, intermittent energy and fossil fuel combustion. Support: bilingual visual glossary displayed throughout the lesson; choral pronunciation practice of high-risk terms before writing and speaking tasks.
- To write scientific hypotheses and conclusions using conditional sentences and passive voice.
- To synthesise information from academic texts using the note-taking technique and technical summaries.
- To discuss and argue positions on the ethics of human intervention in nature using contrast linkers and formal opinion.

COMMUNICATION SKILLS

Reading:

- Technical reading of a food web diagram and a short academic text on 'Niche Displacement.'
- Identification of academic keywords and logical linking words in a report about invasive species.

Listening:

- Understanding of an academic teaching explanation of 'Trophic Cascades.'
- Active listening to complete a technical outline (graphic organisers) on the cause-and-effect relationship of biological invasion.

Writing:

- Writing a scientific hypothesis using conditional structures (e.g., If X happens, then Y will occur).
- Use of nominalisation and the passive voice to describe biological processes objectively (e.g., The introduction of species A resulted in the depletion of...).

Speaking:

- Formal presentation of arguments based on scientific evidence during the group discussion.
- Use of precision language to explain how an invasive species alters specific trophic levels.

GRAMMAR, VOCABULARY & PRONUNCIATION

Language of Learning (CALP)

Before introducing the English terms, the teacher elicits prior knowledge: 'Do you know this concept in your language?' The teacher writes the English term alongside the L1 equivalent on the board. Students likely know many of these concepts conceptually — the challenge is the English academic form, not the underlying idea. Pronunciation of high-risk terms is modelled by the teacher and practised chorally. Students are not expected to self-correct independently; the teacher offers reformulation rather than explicit correction.

Technical terminology: Trophic cascade, niche displacement, biotic/abiotic factors, biodiversity loss, apex predator, secondary consumers.

Verbs of scientific rigour: Synthesise, hypothesise, disrupt, quantify, mitigate.

Classification concepts: Endemic species, allochthonous species, anthropogenic impact.

Language for Learning (BICS)

All BICS phrases are provided on a printed reference card (one per student) and displayed on a classroom poster visible to all students throughout the lesson.

Phrases to structure thought:

- 'The evidence suggests that...' • 'According to the graph, we can observe...' • 'Could you elaborate on why...?'

Language for technical collaboration:

- 'Let's categorise these species based on...' • 'If we change this variable, then...' • 'I agree with your hypothesis, however...'

Task instructions:

- 'Compare and contrast the two ecosystems.' • 'Write a summary using the passive voice.'

Language Through Learning (not planned)

- Language that arises when trying to explain complex concepts with one's own words before using the technical term.
- Vocabulary related to unforeseen ethical debates (e.g., 'Is it the invasive species' fault for being invasive?').
- Linguistic doubts about scientific prefixes and suffixes (e.g., Bio-, -diversity, Eco-).

COGNITION

LOTS — Remembering, Understanding, Applying

- To define key terms such as endemic species, allochthonous species and the ecological niche using a technical glossary.
- To identify the biotic and abiotic components of a specific ecosystem from a short text.
- To sort different organisms at their corresponding trophic levels (producers, primary consumers, etc.) in a given diagram.
- To illustrate a simple food web showing the relationship between native species before the arrival of an invader.

HOTS — Analysing, Evaluating, Creating

- To analyse a population graph to determine the exact point at which the invasive species caused an imbalance. (Analysing)
- To evaluate the effectiveness of different species control methods (chemical, mechanical, or biological) by comparing their scientific pros and cons. (Evaluating)
- To create an ecological restoration proposal that includes a hypothesis on how the trophic balance would be restored after an intervention. (Creating)

GUIDING QUESTIONS FOR TEACHERS

Pre-lesson and in-lesson self-reflection:

- Have I provided sufficient language support (sentence frames, word banks, graphic organisers) for students to complete the writing and speaking tasks independently?
- Are my students familiar with the key grammatical structures required in this lesson (passive voice, conditionals) before they are expected to produce them?
- Can my students read and interpret a food web diagram, or do I need to provide brief input before the main activities?

- Have I verified comprehension of task instructions before each activity, and do I have a contingency plan if a group finishes early or falls behind?
- Have I assigned roles within groups to ensure equitable participation and avoid one student dominating the analysis?
- After the lesson, what evidence do I have that students achieved both the content and language objectives?

CULTURE

How does this topic relate to everyday life or current events?

The introduction of invasive species is not exclusively a contemporary phenomenon. Many current biological invasions have historical roots: 19th-century trade routes, colonial-era species exchanges, and early shipping practices that transported organisms in ballast water. Understanding these historical causes helps students recognise that past human decisions continue to shape present ecosystems.

Current pathways — global trade, tourism and the pet trade — extend and accelerate patterns that began centuries ago. Real and nearby cases illustrate both timescales: the zebra mussel (introduced via 19th-century ballast water), the Asian hornet (arrived via commercial cargo in the early 2000s) and the water hyacinth (introduced deliberately as an ornamental plant in the 19th century and now one of the world's most damaging aquatic invasive species).

Are there intercultural, citizenship, or global perspectives included?

The lesson analyses how globalisation has erased natural biological boundaries, making biological invasion the second leading cause of biodiversity loss worldwide. It promotes individual responsibility (e.g., not abandoning exotic pets or cleaning fishing/hiking equipment so as not to transport seeds or larvae).

Are life skills (e.g., collaboration, decision-making) addressed?

Students must evaluate scientific data to decide the best course of action when faced with an invasive pest, balancing ethics and effectiveness. Work is carried out in pairs or small groups to synthesise complex solutions to real environmental problems.

21ST-CENTURY SKILLS

BICS-Related Skills

Communication: Exchanging ideas clearly during group work to organise the research and present the impact conclusion during the Expert Panel.

CALP-Related Skills

Critical Thinking: Evaluating the validity of data sources and analysing the root causes of biological imbalance when completing the food web analysis.

Collaboration: Equitable distribution of roles to analyse the different trophic levels of the ecosystem. Each group member is responsible for a specific aspect of the food web analysis.

Flexibility & Adaptability: Adjusting initial hypotheses upon receiving new data on the invasive species during the Mapping the Trophic Cascade activity.

Social & Cross-Cultural Skills: Respecting peers' opinions when discussing ethical dilemmas about environmental management during the Expert Panel and Gallery Walk.

Time Management: Organising tasks to complete the food web analysis within the 60-minute class period.

Initiative: Actively searching for local examples of invasive species to enrich the discussion during the warm-up and the Cultural Connection.

Problem-solving: Designing a technical mitigation strategy based on the collected scientific evidence in the Impact Report.

Creativity (Academic): Developing original visual models to represent complex trophic cascades in the food web diagram.

Information Literacy: Filtering and synthesising technical information extracted from simplified academic reports and species fact sheets.

Media & ICT Literacy: Using digital ecosystem simulators or AI tools to predict population growth and obtain data on reproduction rates.

Productivity & Accountability: Taking responsibility for the accuracy of the data presented in the restoration proposal and the Impact Report.

Leadership & Responsibility: Guiding the group towards conclusions based on scientific logic rather than emotion during the Expert Panel.

Entrepreneurship: Proposing innovative and sustainable ideas for community-level invasive species management in the ecological restoration proposal.

METHODOLOGY

Duration	Lesson Flow	Activities	Materials Needed	AI Tools Integration
10'	**Warm-up Activities**	**1. The Mystery Invader** The teacher projects an image of a local invasive species. Students observe silently for thirty seconds. **2. Initial Hypothesis — Think, Pair, Share** Students are presented with the guiding prompt: 'How do you think it got here, and what do you think it eats?' • Think (1–2 minutes): Students reflect individually and note	Projector. • Image of a local invasive species.	**Image Generator:** Use of DALL·E to create a hyperrealistic image of an invasive species (e.g., zebra mussel) colonising a native ecosystem.

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		down their ideas in any language. • Pair (2–3 minutes): Students discuss their ideas with a partner. Use of the first language is explicitly permitted at this stage. • Share (2–3 minutes): Pairs share their hypothesis with the class. The teacher collects ideas on the board, introduces or confirms the English scientific terms where needed. Note: the Think-Pair-Share structure reduces anxiety, increases participation and gives all students — including those less confident in the target language — a rehearsal opportunity before public sharing.		
30'	**Main Activities**	**1. Mapping the Trophic Cascade** Each group receives a different food web diagram (freshwater lake, Mediterranean scrubland, or coastal estuary) with a different assigned invasive species, preventing copying between groups. Before beginning, the teacher pre-teaches key vocabulary using a bilingual visual glossary. Each group receives a written procedure card with step-by-step guiding questions: • Which species does the invasive species compete with or prey on directly? • What happens to the consumers that depended on the species that disappeared? • Which trophic level is affected first? Which is affected last? • How long might it take for the imbalance to affect the entire food web? • What abiotic factors (water, light, space) does the invasive species alter? Students record their findings on a cause-and-effect graphic organiser, introduced by the teacher using a modelled example before groups work independently. **2. Impact Report**	Three or more different food web diagrams (one per group). • Species fact sheets with bilingual visual glossary attached. • Cause-and-effect graphic organisers (one per group). • Written procedure cards with guiding questions (one per group). • Model paragraph displayed on the board. • Writing frames with sentence starters (one per student). • Grammar reference poster: passive voice and conditionals.	**Gemini (Grounded Search):** Groups consult AI to obtain specific data on the reproduction rate of their assigned invasive species to justify their analysis.

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		Before writing, the teacher displays a model paragraph on the board. Each student receives a writing frame with sentence starters: • Sentence 1 (context — passive voice): 'The region of [X] is characterised by…' / 'The energy mix for this region has been designed to…' • Sentence 2 (cause-effect — connector): 'Due to [factor], [species] was affected because…' • Sentence 3 (trophic consequence — conditional): 'If [invasive species] continues to spread, [native species] will…' • Sentence 4 (conclusion — modal): 'In order to restore balance, [intervention] could be…' A grammar reference poster displaying passive voice and conditional structures remains visible throughout the writing task.		
10'	**Wrap-Up & Sharing**	**1. Expert Panel** Each group delivers a one-minute spoken summary of their impact conclusion. Each spokesperson receives a speaking frame: • 'The ecosystem we analysed was affected by…' • 'As a result of the invasion, the following trophic levels were disrupted:…' • 'Our evidence suggests that if no action is taken,…' • 'We propose that the most effective mitigation measure would be…' Groups have 2–3 minutes preparation time. The teacher checks pronunciation of high-risk terms (niche, species, invasive, trophic, biodiversity) during preparation. Grammar errors are addressed collectively after all groups have presented, using reformulation. **2. Gallery Walk — Peer Response** Food web diagrams and Impact Reports are displayed on the walls	Post-its or Padlet. • Whiteboard or digital wall. • CALP response phrases displayed on the board.	**Abstract Generator:** The AI synthesises all class conclusions into a 'Biodiversity Decalogue', which is projected at the end. Students copy it as a model of academic synthesis writing.

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		or on Padlet. Students circulate and leave one written comment per group using the CALP response phrases on the board: • 'This evidence supports the conclusion that...' • 'One aspect that could be developed further is...' • 'I would challenge this hypothesis because...' • 'This proposal is effective because...' AI Tool: The teacher inputs key points from all group presentations into an AI tool to generate a Class Sustainability Statement — a single paragraph synthesising the main conclusions — projected and read aloud as a closing activity. Students copy it into their notebooks as a model of academic synthesis writing.		
10'	**Evaluation & Feedback**	**1. Teacher Assessment** • Correct identification and labelling of the trophic levels affected by the invasive species in the food web diagram. • Accurate use of cause-and-effect linking words (consequently, as a result, due to) in the Impact Report. • Accurate use of passive voice and conditional structures in the Impact Report. • Quality of scientific argument during the one-minute presentation: evidence-based reasoning, use of CALP vocabulary, logical structure. • Active participation during peer listening: did the student note one strength and one question for the presenting group? **2. Peer Assessment** Groups exchange Impact Reports and evaluate using a simplified rubric with three criteria: • Use of CALP terminology: not present / present but inaccurate / used accurately.	Simplified peer assessment rubric. • Self-assessment sheets.	**Interactive Quiz (AI):** A short 3-question quiz (AI-generated Kahoot type) on the key concepts (niche, trophic cascade) for immediate feedback.

Duration	Lesson Flow	Activities	Materials Needed	AI Tools Integration
		• Use of cause-and-effect linking words: not present / present but inaccurate / used accurately. • Clarity of the proposed mitigation measure: unclear / partially clear / clear and evidence-based. **3. Student Self-Assessment** Students complete the form (achieved / in process / need support) with a verification check for each item: • I can explain the concept of 'Trophic Cascade' and how it is initiated by an invasive species. (Check: Can I describe it in my own words without reading my report?) • I can predict consequences in the food web based on evidence. (Check: Did I use at least one conditional sentence in my report?) • I have used cause-and-effect linking words (consequently, as a result, due to) in my report. (Check: Underline them in your report now.) • I have used the passive voice to describe scientific processes. (Check: Find one passive structure in your report and mark it.) • I contributed scientific arguments during the group discussion. (Check: Can I recall one specific point I made during the Expert Panel or write it down now in one sentence?)		

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