

Building Ecosystems

Secondary: (ages 11 – 14)

Science

Students will identify, appreciate, and create original models of different types of ecosystems. They will discuss and appraise their models and the models of others, coming to understand the strengths and limitations of different models according to different criteria and for different purposes

Time allocation About 6 lesson periods

Subject content Identify, understand, and represent different types of ecosystems
Develop awareness of the variety of mediums used to present data

Creative and critical thinking This unit has a **creativity** and **critical thinking** focus:

- Consider several perspectives on a scientific problem
- Envision and produce an original model of an ecosystem
- Explain both the strengths and limitations of model according to different criteria
- Reflect on steps taken and choices relative to alternatives

Other skills Communication; Collaboration

Key words Inter-dependence, food webs, habitat, environment

Products and processes to assess

Students work collaboratively to create a representation of an ecosystem. They move through several stages of self-assessment to help them refine and improve their product. At the highest levels of achievement, their product is imaginative and shows a high level of personal features in its formulation, techniques, composition or content. Their work process demonstrates that they are willing to explore a variety of ideas, consider different perspectives, challenge and refine their initial ways of envisioning their model and shows a clear understanding of the strengths and limitations of different models for different purposes.

Teaching and Learning plan

This plan suggests potential steps for implementing the activity. Teachers can introduce as many modifications as they see fit to adapt the activity to their teaching context.

Step	Duration	Teacher and student roles	Subject content	Creativity and critical thinking
1	Prior to lesson period 1	Teacher should work on the theory of ecosystems (habitat, food chain...). The teacher should collect a set of art materials and recycling material to make available for the students to work with.	Theory of ecosystems (habitat, food chain, etc.)	
2	Lesson periods 1 and 2	<p>Texts, videos, and images of ecosystems are shown and discussed. One possible pathway is that for each representation of an ecosystem, the class discusses questions such as "What does this show us about ecosystems? What is missing? What don't we know as a result of looking at this way of showing an ecosystem? What are the strengths and limitations of this representation of an ecosystem?" The different representations of ecosystems can then be ranked by each group according to a number of different criteria. Which is the most scientific? Why? Which is the most creative? Why? There can then be a comparison of how each group has ranked the ecosystems.</p> <p>The students are divided into pairs and challenged to build on these discussions to come up with a creative product that represents different types of ecosystems. The rubric should be presented to make students aware of what should be reflected throughout the process. Students then begin to plan and make their models/representations.</p>	<p>Discussing ways to model and represent different kinds of ecosystems</p> <p>Producing a representation of an ecosystem</p>	<p>Analysing gaps in knowledge</p> <p>Appraising representations on the basis of differing criteria</p> <p>Considering and comparing perspectives on the problem</p> <p>Generating and playing with unusual ideas to represent ecosystems</p>
3	Lesson periods 3 and 4	<p>Students continue to make their ecosystems. After a short period of becoming re-acquainted with the task, students are asked to present the beginning of their work on ecosystems based on the content that was presented to them.</p> <p>The students will have the first moment out of three moments of oral self-assessment. In addition, they are asked to respond to five written questions:</p> <ol style="list-style-type: none"> 1. Do you consider your product creative? Why? 2. Which level do you evaluate yourself on at this moment? 3. After seeing your colleague's product, did you change your work? 4. Can you propose things that can be improved? 5. How did the rubric help you in the process? <p>Students then return to refining and making their models.</p>	<p>Presenting their work on ecosystems</p> <p>Refining their work on ecosystems</p>	<p>Envisioning and producing a model of an ecosystem</p> <p>Appraising their own work and considering alternative perspectives</p> <p>Reflecting on steps taken, degree of creativity/novelty, and chosen approach relative to alternatives</p> <p>Reviewing and revising models</p>
4	Lesson period 5	The students will present their product for the second time and they will have the second moment out of three moments of oral self-assessment. In addition, they are asked to respond to the same five questions again in writing. As appropriate, the teacher may decide to challenge students here to remind them that as this is the second round, their	Presenting round 2 of their work on ecosystems	As in step 3 but students are asked to deepen their reflections as this is the second round of review

answers should be more in-depth

1. Do you consider your product creative? Why?
2. Which level do you evaluate yourself on at this moment?
3. After seeing your colleague's product, did you change your work?
4. Can you propose things that can be improved?
5. How did the rubric help you in the process?

Refining work on ecosystems

Students then return to working on their products, responding to their own feedback to help them improve it. If there is time, this process will be repeated one more time.

5	Lesson period 6	After having completed the work, it is hung in a gallery around the room. The students turn to the rubric and assess themselves orally. When they are finished they should visit the works of others and ask questions, make suggestions for improvement and discuss what they have learned about ecosystems.	Discussing what they have learned about ecosystems	Reflecting on steps taken and chosen approach relative to possible alternatives
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Resources and examples for inspiration

Web and print

- Texts, videos, and images of ecosystems to show and discuss

Other

- Paper, pencils and rulers
- Brushes, paint
- Any other material the students may need to use in their products.

Opportunities to adapt, extend, and enrich

- Further links could be made to art, biology, and history

Creativity and critical thinking rubric for science

- Mapping of the different steps of the lesson plan against the OECD rubric to identify the creative and/or critical thinking skills the different parts of the lesson aim to develop

	CREATIVITY Coming up with new ideas and solutions	Steps	CRITICAL THINKING Questioning and evaluating ideas and solutions	Steps
INQUIRING	Make connections to other scientific concepts or conceptual ideas in other disciplines		Identify and question assumptions and generally accepted ideas of a scientific explanation or approach to a problem	2
IMAGINING	Generate and play with unusual and radical ideas when approaching or solving a scientific problem	2	Consider several perspectives on a scientific problem	2,3,4
DOING	Pose and propose how to solve a scientific problem in a personally novel way	3,4	Explain both strengths and limitations of a scientific solution based on logical and possibly other criteria (practical, ethical, etc.)	2,3,4
REFLECTING	Reflect on steps taken to pose and solve a scientific problem	3,4,5	Reflect on the chosen scientific approach or solution relative to possible alternatives	3,4,5