

Progression in understanding systems concepts

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In this progression, we have illustrated the stages identified by Assaraf and Orion with reference to ecosystems:

1. Naming parts and processes

Children can name both living (e.g., specific plants and animals) and non-living (e.g., rocks, water) parts of an ecosystem. They may also name some processes such as feeding, weather activity and so on.

2. Identifying processes that create relationships between parts

Feeding relationships are probably the simplest beginning point – e.g., "caterpillars eat cabbage leaves" in a garden ecosystem.

3. Building up a framework of relationships

Food chains and webs are one type of framework. Nutrient cycles and weather cycles are others.

4. Making generalisations about relationships

Saying that all food chains must start with a plant is an example of a generalisation.

5. Understanding that some relationships can impact on other relationships

Humans can be involved in relationships directly and indirectly – e.g., when they kill caterpillars there is less food for blackbirds in the garden.

6. Knowing there can be hidden dimensions that affect the system

In a garden ecosystem the decomposers are mostly tiny soil animals or invisible bacteria and fungi. They are hidden but without them soil would lose its fertility.

7. Understanding that many systems go in cycles

Decomposers are nature's recyclers! Nutrient cycles such as the carbon cycle would stop if dead bodies could not be broken down.

8. Recognising that systems can change over time, sometimes slowly and sometimes quite quickly

Students who understand this may be able to predict changes and give reasons for their predictions.

References

Assaraf, O., & Orion, N. (2005). Development of system thinking skills in the context of Earth system education. *Journal of Research in Science Teaching*, 42(5), 518-560.

Resource List

- A flax bush ecosystem
- A native bush ecosystem