**MODULE CONTENT**

***Module Title:*** **BIOLOGICAL SCIENCE**

***Authors:*** **AMANDA BERRY AND KATHY SMITH**

***Module Description:***

Teaching about ecological concepts in primary science has often focussed on descriptions and definitions. In this module, participants are introduced to a range of activities that could be used to explore children's ideas about ecological concepts, particularly the concept of survival. Through involving participants in various activities and discussion, implications for planning curriculum to cater for the range and development of children's ideas are explored.

***Summary of Activities:***

| | *Title* | *Min* |
|---|---|---|
| 1 | Unpacking an Outcome | 15 |
| 2 | Needs for Survival | 20 |
| 3 | Dingoes and Wallabies | 15 |
| 4 | Balance in a Rockpool | 20 |
| 5 | Mara - A Survival Story | 50 |
| 6 | Needs for Survival Revisited | 15 |
| 7 | Implications for Planning | 15 |
| | **Total** | 155 |

***Module Outcomes:***

- To be aware of the number of complex concepts embedded in one outcome statement.
- To recognise that both adults and children hold a range of meanings for words commonly associated with ecology (for example, survival).
- To monitor personal understanding of the concept of survival.
- To build an understanding of the feeding relationships involved in a food chain and food web.
- To recognise some of the complex interactions that can occur in a food web and the way in which any change has an effect on the populations of all the other organisms in the web.
- To reflect on ways in which the curriculum can be planned and modified in response to children's beliefs.

***Resources and Materials:***

- White board markers & textas.
- Overhead Projector.
- Butcher Paper.
- Packet of “Post it” Notes.
- Blu Tack.
- A3 paper (1 per person).
- OHT 1.1, 2.1, 2.5, 5.7, 6.3, 7.1
- Attachment 1.3, 1.4 (1 copy for Facilitator).
- Attachment 2.7, 7.3 (1 per participant).
- Seaweed Cards (Att 4.1 150 cards needed, photocopy this sheet x 19).
- Pencils, erasers.
- Paper or plastic bags.
- Attachment 5.1 (1 per group of 4).
- Attachments 3.1, 4.1 (1 per pair).

## *Activity 1: Unpacking an Outcome*

***Purpose:*** To demonstrate the complexity of the CSF outcomes and to identify some of the key understandings that could be developed in this module.

***Teaching Procedures:*** Relational Diagrams

***Time allocation:*** 15 minutes

***What to do:***

| FACILITATOR | PARTICIPANT |
|---|---|
| 1.1 Present CSF outcome Level 3.1, "Describe environmental factors that affect the survival of living things", and outcome 4.1. See OHT 1.1 for outcome statements. | |
| 1.2 Ask participants to identify key concepts in the outcome statement (eg. living, non-living, survival, ecosystem). | 1.1 Identify key concepts |
| 1.3 Introduce procedure of Relational Diagrams. Explain that the purpose of relational diagrams is to explore meanings that people have for words and the relationships they see between different words. Do an example together first. Guide participants through each step of the practice example. See Attachment 1.3 for practice task instructions and completed example. | |
| 1.4 Ask participants individually to draw a relational diagram that shows their understanding of the relationship between the words living, non-living, ecosystem. See Attachment 1.4 for task instructions and completed example. | 1.2 Draw diagram |

| | |
|---|---|
| 1.5 After the diagram is completed, ask participants to mark where the following words would fit:<br>Air, water, soil, plant, animal, fire.<br><br>1.6 Organise participants into groups of 4 to share and discuss diagrams, then each group should draw one diagram, using the same terms, that all group members agree upon. (Use butcher paper since some will be displayed.) Allow 10 mins.<br><br>1.7 Discuss responses to the task. Discussion should aim to bring out the complex nature of these concepts and the way in which the task allows sharing and clarification of ideas.<br><br>1.8 Explain that this module will focus on the idea of <u>survival</u> of organisms in ecosystems. | 1.3 Add words<br><br>1.4 One volunteer group to talk about the diagram they constructed and group processes involved. |

**Discuss /Consider**

- How might relational diagrams be used with primary students? Consider any modifications that you might make. (One suggestion is to use pictures of objects that might fit in the diagrams rather than using words).

***Tips and Tricks:***

- Participants need to be aware of the potential difficulties in curriculum planning, given the complex nature of the concepts included in an outcome statement. It is important that teachers organise manageable activities related to these concepts.

## *Activity 2: Ideas about survival*

***Purpose:*** To look at the range of ideas that adults have about the concept of survival and to consider the survival needs of different types of organisms. To predict some of the possible responses that children may bring to the same task.

***Teaching Procedures:*** Brainstorm

***Time allocation:*** 20 mins

***What to do***

| FACILITATOR | PARTICIPANT |
|---|---|
| 2.1 Show OHT of remote area. See OHT 2.1. (Colour OHT of remote area) | |
| 2.2 Introduce the activity as a way of thinking about the concept of survival. Begin with consideration of human survival needs. | 2.1 Each person should make a list of what s/he would need to be able to survive in this environment. (Ideas include water, shelter, protection, food). |
| 2.3 Collate the list on the board. Ask whether any of these survival needs can be eliminated as non essential. | |
| 2.4 Look at OHT 2.1 picture again. This time, write a list of the survival needs of a plant in this environment. Collate the list on the board as before. Discuss how these survival needs might be met. Look for common survival needs shared by plants and humans. | |

| | |
|---|---|
| 2.5 Show OHT 2.5, (other colour OHT). Do the same activity as above, identifying survival needs of humans and plants.<br><br>2.6 Ask participants whether the general human survival needs are the same for other animals.<br><br>2.7 Ask participants to record ideas about survival needs of plants and animals on separate word wheels.<br>See Attachment 2.7 for Word Wheels handout.<br><br>2.8 Ask participants to keep word wheels. These will be revisited throughout the session. | 2.2 Participants to identify general survival needs for humans and plants (ie. not environment specific).<br><br>2.3 Complete word wheels |

**Discuss/Consider:**

- Discuss the effect/purpose of using a large visual to begin activity. What purpose did the second OHT serve?
- How do you anticipate that children would respond to the same task?
- Given the variation possible in children's ideas about survival, what are the implications for trying to plan a unit that focuses on the survival of organisms?
- What are some other ways of probing students' ideas prior to beginning a unit of work?
- How do you use the children's thinking in relation to planning a unit? (How might this affect the types of activities you select and their sequence?).

## *Activity 3: Dingoes and Wallabies*

***Purpose:*** This game introduces the idea of avoiding predators as a factor that contributes to the survival of organisms.

***Teaching Procedures:*** Games

***Time allocation:*** 15 minutes

***What to do***

| FACILITATOR | PARTICIPANT |
|---|---|
| 3.1 Introduce the Dingoes and Wallabies Game.<br>See Attachment 3.1 for game instructions, Playing Sheet, and Score Sheet | 3.1 Divide into pairs. Play game. |

**Discuss/Consider:**

- What do you think is the purpose of this game?
- Discuss whether the balance between predator and prey changed during the game. (This may involve a discussion of the meaning of the word balance). Discuss reasons why this was so.
- Why were there many more wallabies than dingoes at the start of the game?
- In real life what other factors might affect the survival of these animals in their environment?
- Discuss ways in which the game might be modified for more demanding maths skills (e.g. use of coordinates rather than numbered squares), and for simulating the game by creating a simple computer program (spreadsheet), allowing for many 'goes' in a short time.

***Tips and Tricks:***

- Facilitator should look for opportunities to ask participants about how this activity could be linked in with other key learning areas.

## *Activity 4: Balance in a Rockpool*

***Purpose:*** To introduce a more complex predator/prey simulation game, which introduces the concept of balance in a rockpool ecosystem.

***Teaching Procedures:*** Games

***Time allocation:*** 20 minutes

***What to do***

| FACILITATOR | PARTICIPANT |
|---|---|
| 4.1 Introduce the balance game as another example of a predator/prey simulation game. This time the focus is on different factors which can influence the survival of populations of organisms. See Attachment 4.1 for game instructions and seaweed cards. | 4.1 Organise into animal groups. Play game. |
| 4.2 Following the first round, ask participants:<br>• Does the rockpool have a good balance of organisms? (If the round has only lasted a short time and/or one type of animal has not survived then the balance was not good!)<br>• How can the rules of the game be changed so that the game lasts longer with some of each animal getting enough food to survive? (Suggestions include having a "safe" place, changing the amount of food available, start at different times, etc.) | 4.2 Suggest some alternatives about how balance can be maintained. Replay game using one suggestion at a time (Two or three replays is probably sufficient). |

**Discuss/Consider:**

- What rules were necessary in the game so that some of each kind of animal could survive? (The most important rule is changing the starting numbers of the animals, so that there are many plants, many crabs, fewer fish and only one or two seagulls).
- What would happen in a real system if one kind of animal disappeared? How might a pond be managed so that different groups of organisms are able to survive?
- In this game, the most likely survivors are the top-level predators (ie. seagulls). Does this represent real life? What factors affect the survival of these top-level predators?
- How do plants ensure their survival? What would happen if all the plants disappeared? (The whole system would collapse because eventually the animals would have nothing to eat.)
- How might this game be modified to show the effect of introduced species, or environmental poisoning?
- In real life, what factors ensure the survival of a species? (Include being able to find a mate, reproduce successfully, compete for resources successfully, and finding sufficient resources).

***Tips and Tricks:***

- Following this activity, participants should return to their word wheels to add any ideas about animal/plant survival that they have learned from their experiences of the last two games.
- Facilitator should look for opportunities to ask participants about how this activity could be linked in with other key learning areas.

## *Activity 5: Mara - a survival story*

***Purpose:*** In this structured enquiry exercise, participants will look at different factors that contribute to balance in an ecosystem and consider ways in which that balance can be maintained or disturbed.

***Teaching Procedures:*** Structured Enquiry

***Time allocation:*** 20 minutes

***What to do***

| FACILITATOR | PARTICIPANT |
|---|---|
| 5.1 Explain that a story will be distributed in parts. Participants will be working in small groups on activities related to the story. Introduce Part 1 of the Mara story. See Attachment 5.1 Part1 | 5.1 Organise into small groups |
| 5.2 In small groups, read this part of the story. Ask each group to draw a food chain for the island of Mara. (A food chain shows the feeding relationships between different organisms. How the food chain is drawn doesn't matter as long as the feeding relationships are shown). | 5.2 Each group should underline the parts of the story that describe the ecosystem of Mara. Discuss ideas as a whole group. Try to reach consensus about what is an ecosystem. Decide within each group whether the ecosystem on Mara is balanced. Give reasons. |
| 5.3 Compile group responses on the white board about whether the ecosystem on Mara is balanced or not. Ask each group to explain their reasons. | |
| 5.4 Distribute part 2 of Mara. See Attachment 5.1 Part 2. Ask groups to modify their food chain diagram to include the rats and their food sources. | 5.3 Each group should decide, with reasons, whether or not the ecosystem is balanced. |
| 5.5 Record group decisions on the board. Groups to explain reasons for their decision. | |

| | |
|---|---|
| 5.6 Distribute part 3 of Mara-Attachment 5.1 Part 3. Collate group responses on the board. Groups to explain reasons for their decision.<br><br>5.7 Distribute part 4 of Mara. See Attachment 5.1 Part 4. Also introduce survival questions using OHT 5.7<br><br>5.8 Ask small groups to share their ideas concerning the survival of the Glimpies from the questions above. | 5.4 Continue food chain and modify to include the humans. Decide whether or not the ecosystem is balanced.<br><br>5.5 Participants decide within their small groups:<br>• Do you think that the Glimpies will survive?<br>• Will the island be beautiful again?<br>• Will the ideas about relocating the Glimpies to another island and breeding them in captivity be successful?<br>• Can anything else be done?<br>See OHT 5.7 for copy of Questions |

**Discuss/Consider:**

- What do you see as the purpose for this activity?
- What was the effect of revealing one piece of information at a time?
- Can you think of any real life examples of the Mara story? (One example is the koalas on Kangaroo Island).
- How has this activity influenced your thinking about the concept of survival? (Some possibilities are that survival can refer to whole groups as well as individuals, an unbalanced ecosystem affects the survival of groups of organisms, balance can be disturbed by introduced species and/or human activity).
- How would you use this activity with a group of children?

***Tips and Tricks:***

- Participants can draw a food chain in any way that they choose. The most important aspect of a food chain is that the diagram shows the feeding relationships between different organisms. This may lead to discussion of a food web, which is a series of linked food chains.

## *Activity 6* *Needs for Survival (Revisited)*

***Purpose:*** To reflect on ideas about survival now that participants have experienced the different activities.

***Teaching Procedures:*** Concept map
Print Walk

***Time allocation:*** 20 minutes

***What to do***

| FACILITATOR | PARTICIPANT |
|---|---|
| 6.1 Ask participants to return to word wheels. Add/modify ideas to include the factors which participants now think affect the survival of organisms. | |
| 6.2 Ask participants to choose from their word wheels the 6 factors that they believe are the most important in affecting the survival of animals and plants. This task should be done individually. (Facilitator can suggest/ask about terms that may not be included eg. water, air). | 6.1 Share list with a partner and discuss reasons for factor choices. Each pair should compile a new list of 6 survival factors that both members of the pair agree upon. |
| 6.3 Ask pairs to create a concept map that links the different survival factors they have chosen. Give each pair an A3 sheet of paper. At the top of the paper, ask each pair to write the word "survival". Explain that a concept map is a teaching procedure that is used to explore the relationship that a person sees between different words. See OHT 6.3 for concept map instructions. | |
| 6.4 Display concept maps around the room. Ask participants to go on a print walk to look at the maps and consider similarities and differences between maps produced. Invite comment. | |

**Discuss/Consider:**

- How do your earlier and current ideas about survival compare? What, if anything, has changed or modified them?
- How might you use concept maps or print walks with primary children? Consider any modifications that might be made for suitability at different primary levels.

***Tips and Tricks:***

- It is a good idea for the facilitator to work through the concept map instructions with the participants. The most crucial step in the map making is writing the nature of the link onto the linking line. Describing the nature of the link is the main difference between a concept map and a mind map.

## *Activity 7* *Implications for Planning*

***Purpose:*** To reflect on ways in which these and other activities might be used to create a teaching sequence based on survival that is responsive to the beliefs and interests of children.

***Teaching Procedures:*** Interpretive Discussion
Diagrams as Summary Tools

***Time allocation:*** 20 minutes

***What to do***

| FACILITATOR | PARTICIPANT |
|---|---|
| 7.1 Ask participants to reflect on all of the activities presented in this module. See OHT 7.1 for list of activities.<br><br>7.2 Explain that an important purpose of this module has been to present a range of activities that would be useful in understanding the survival of organisms.<br><br>• In what ways do these activities provide opportunities for children to express a range of ideas?<br><br>• How can these activities be used so that children's ideas about survival may be monitored and developed?<br><br>7.3 Distribute Survival Unit Planner. See Attachment 7.3 for Unit Planner.<br><br>• If you want to develop a unit based on children's understandings, what steps would you need to take? | 7.1 Participants to fill in spaces on unit planner with activities that would support the development of an integrated unit about survival. |

**Discuss/Consider:**
- How is it possible to modify your unit planning when you want to further develop an area of children's understanding that you feel requires extra attention?

## Module Review

**Between Session Tasks:** Do Activity 2 with the children in your class to compare and consider the range of ideas that they have for the term survival.

**Support Materials:**

**Text:**

*Environment.* Australian Science Teachers' Association. Science and Technology in Society Series. Cambridge University Press, Melbourne.1998. (Mara Story Pp 39 - 45)

*Integrating Naturally. Units of Work for Environmental Education,* Kath Murdoch, Dellasta Pty Ltd.,1992

*Feral Animals* Gould League of Victoria, Moorabbin

*Feral Peril: Activities to Help Form Values about Wildlife Conservation* Gould League of Victoria, 1990

*New Horizons:Science 5-16 Book 1* Cambridge University Press (1993) (Dingoes and Wallabies adapted from Lions and Antelopes Pp90- 92)

*Outdoor Environmental Games* Gould League of Victoria

*Primary Investigations. Teacher Resource Book 6. Energy and Investigation.* Australian Academy of Science. Canberra, ACT. 1994.

(Dingoes and Wallabies, and Balance in a Rockpool were first published in Victoria by the Gould League)

**Web sites:**

Hands on for Habitat! Environmental Education Program
http://www.environment.gov.au/habitatia
Threatened Australian Plants Index
http://www.biodiversity.environment.gov.au/
Elanora Heights Primary School (Environmental Activities published by students)
http://www.zip.com.au/~elanora/
Gould League of Victoria
http://www.gould.edu.au