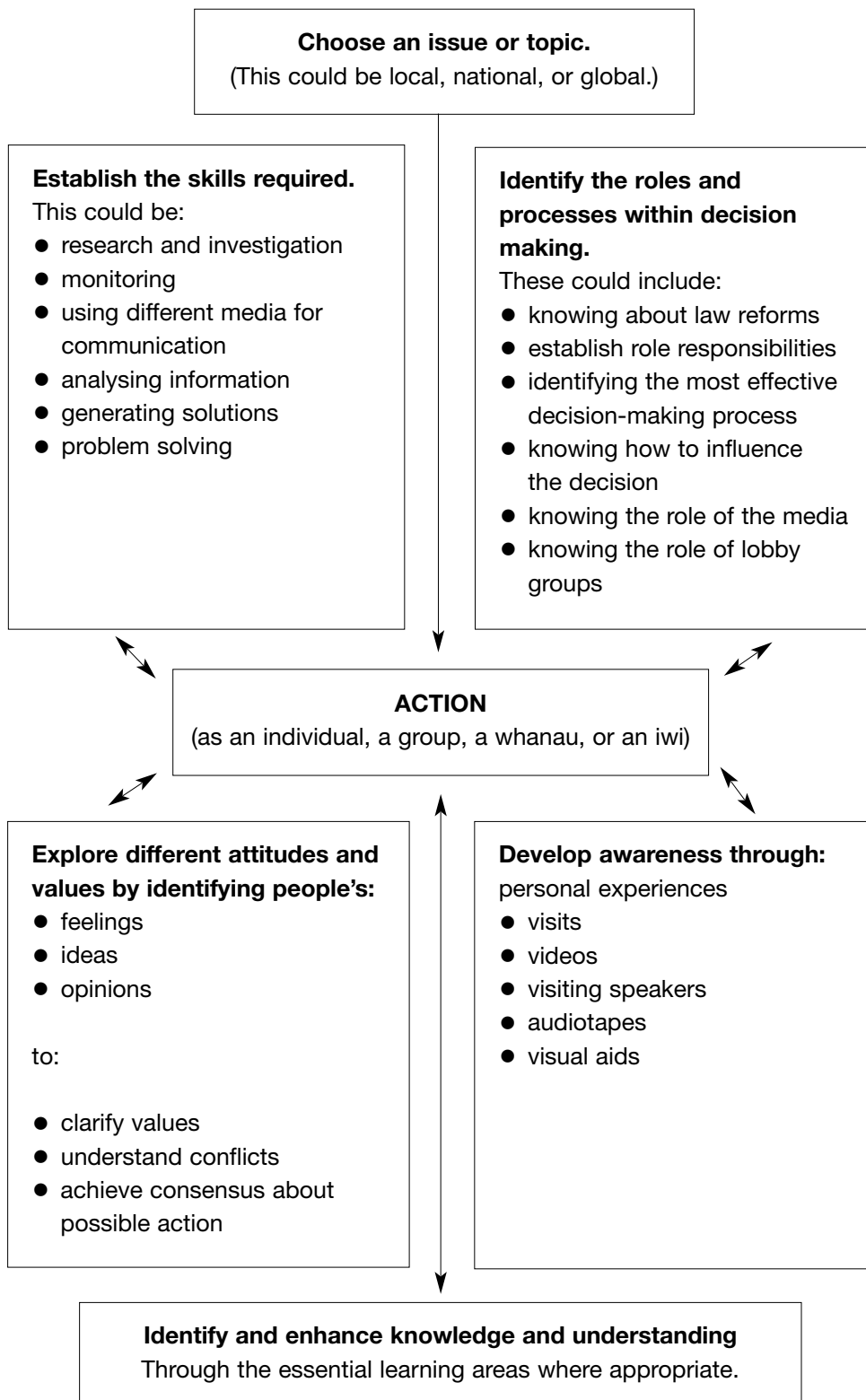
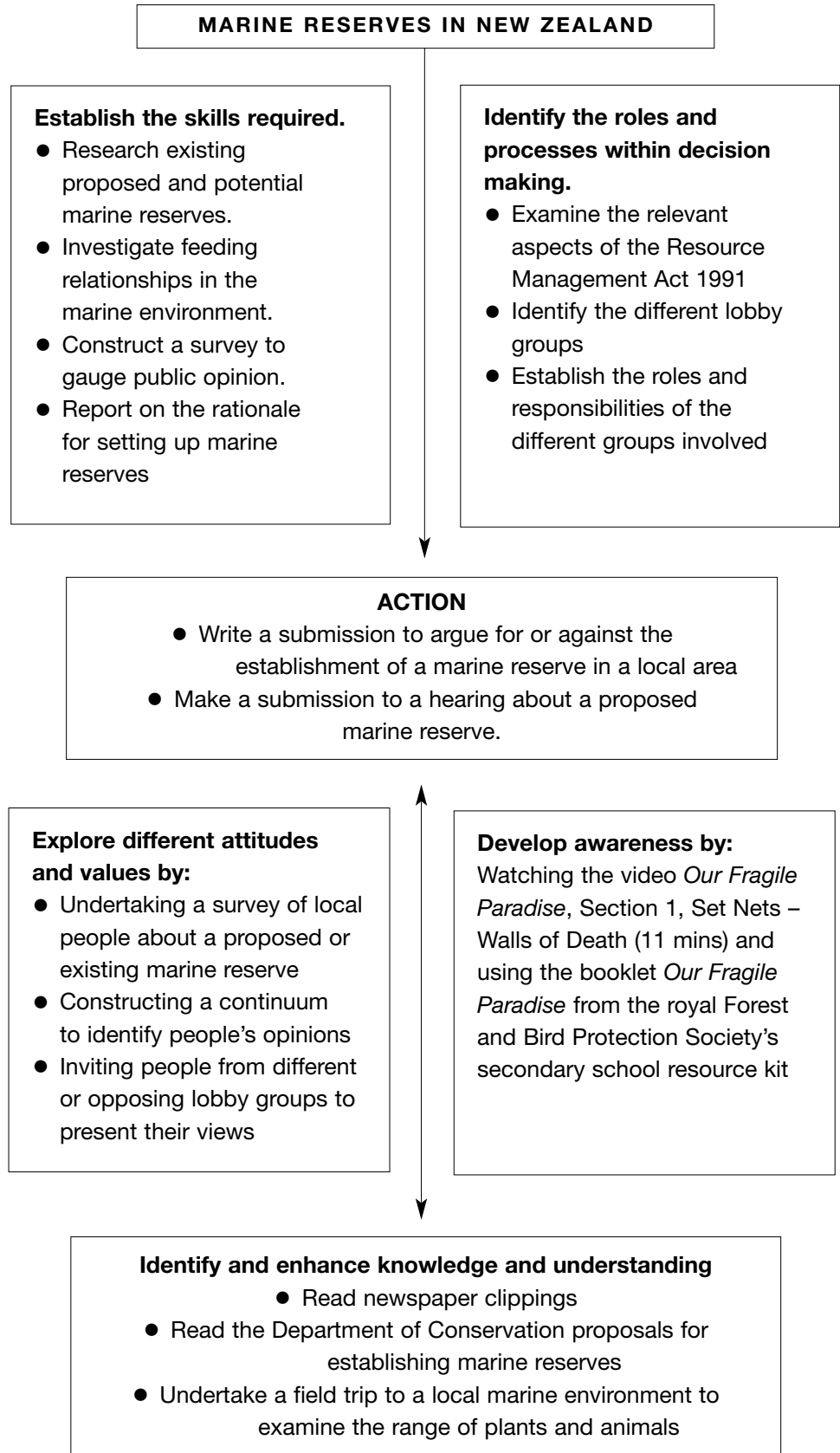


Environmental education – an action-orientated approach

The following diagram describes an action-oriented approach to environmental education. The models are taken from the Ministry of Education's Guidelines for Environmental Education.



Using an action-oriented approach, the level 5 topic **Marine Reserves** could be developed as illustrated below.



Environmental education – teaching activities

In the Ministry of Education's *Guidelines for Environmental Education* in New Zealand Schools, page 75, the topic of marine reserves is developed as an example of how to apply an action-oriented approach. The following is a list of useful teaching activities about shellfish that can be developed in a similar way.

Shellfish

- A** Investigate shellfish life through:
 - books
 - live study in natural habitats
 - local food suppliers – fish shops

- B** Identify good places to go to find particular shellfish (habitat preferences)

- C** How do different shellfish:
 - move
 - feed
 - shelter/hide/protect themselves
 - mate and breed
 - other

- D** How are the shells of shellfish useful to them:
 - skeletons for muscle attachment
 - To give protection from predation
 - wear
 - crushing
 - drying out

- E** Identify scars on the inside of bivalve shells to attach muscles and the hinge ligament or accommodate the siphons and identify the interlocking hinge teeth. Relate these to how the shells work – open and close, are shaped for burrowing etc

- F** What do shellfish eat and how do they eat it. Describe methods and feeding problems for:
 - herbivores (grazers and browsers)
 - filter feeders
 - predators
 - scavengers
 - deposit feeders

G Kaimoana.

What shellfish do we eat? Kaimoana conservation

H What are the dangers of eating shellfish?**I Epizoites and parasites**

Creatures that live on or in living shellfish

J Life histories of different shellfish (wall charts)**K Different habitats** of particular, common shellfish:

Rocky shore

- oysters
- mussels
- grazing snails (including limpets)
- predatory whelks
- scavenging whelks

Sandy shore

- tuatua
- toheroa
- wheel shell
- spotted whelk

Mudflat

- mudsnail
- hornshell
- cockle
- wedge shell
- nutshell

L Interrelationships between shellfish**M Hazards to shellfish:**

Physical

- crushing natural – waves and wave tossed rocks
- crushing unnatural – cars, trail-bikes, boat trailers, foot and horse traffic, silting (deep burial and gill clogging)
- erosion and abrasion by sand-blasting (wave carried sand)
- desiccation (wind and sun)
- burning (ultra violet rays)

Biological

- predation (by other marine life and by people over harvesting)
- disease
- pollution: silt, oil and vehicle residues, toxic chemicals of horticulture, farming or industry, sewerage and excessive freshwater (stormwater)

- N Human uses for shells:**
- eating utensils (scallop, paua)
 - musical instruments (conch, trumpet shell, rattles and other percussion)
 - fish hooks (from paua shell edge and whelk columella)
 - ornament (paua eyes in Maori carvings, whelk and pearl necklaces and earrings.
 - scrapers (for food preparation and for fibre (flax) preparation.
 - garden lime crushed and burnt – reduces acidity and makes soil more friable)
 - grit for chickens (crushed to provide chalk for strong eggshells).
- O Myths and legends**
- P Preferred tidal position**
Matching densest abundance of each species to tide height
- Q Movement**
Different methods:
- snails and slugs: crawling. Fast and slow
 - bivalves: crawling and burrowing
 - scallops and file shells: swimming
- R Homing snails** (limpets and chitons)
- S Naming the parts of a mussel and describing the function of each part**
- T Shape and thickness for function**
How particular shells are suited to lifestyles:
- grazers (thick, helmet shaped) and predators (pointed spindles)
 - cockles (thick, rounded shallow burrowers), tuatua (sharp deeper burrowers)
 - wedge shell, (thin, very sharp, flat, deep burrowers)
 - scallops (thin, lightweight, streamlined, jet propelled swimmers)
- U Identifying common species** (English, Maori and scientific names)
- V Collecting, transporting and keeping alive** one common shellfish
- W Cooking shellfish:** traditional and modern
- X Sickness and diseases** from eating uncooked shell fish – from upset stomach and diarrhoea to nervous disorders (*Gymnodinium* neurotoxins) to serious sewerage borne diseases such as typhoid