Year 9 AEP Biological Sciences Research

Formative Assessment

**Maker Model of Curriculum Differentiation Teacher planning**

Adaptations

**Content Modifications**

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| **Abstraction**  The focus of discussions, presentations and reading materials should be on abstract concepts, themes and theories.  Example; Baudin’s Black Cockatoo  <http://nokomis.com.au/cockatooplates.html>  Screen shot 2013-05-11 at 3.10.36 PM.png | **Going beyond the facts**  **Adaptations:**  Traits that function to increase survival or reproduction and are due to genes (i.e., are heritable) are called **adaptations**. Organism form and function are the product of many generations of evolution. Stories explain how adaptations work; how their function is better than some alternative.  **Three Types of Animal and Plant Adaptation:**  **Structural Adaptation**  Structural adaptation refers to physical features of an organism (shape, body covering, armament and also the internal organisation).  Example; Baudin’s Black Cockatoo, like all birds, have many bones that are hollow. This makes them very light-weight, which helps them fly.  **Functional Adaptation**  Functional adaptation, otherwise known as physiologicaladaptation, permits the organism to perform special functions (for instance; making venom, secreting slime, and phototropism) but to also perform more general functions such as growth and development, temperature regulation, ionic balance and other aspects of homeostasis.  Example; Baudin’s Black Cockatoo, like all birds, excrete nitrogenous wastes in the form of uric acid  **Behavioural adaptation**  Behavioural adaptation composes of inherited behaviour chains and/or the ability to learn. Some examples are searching for food, mating and vocalisations. Behaviours may be inherited in detail (instincts).  Example; What does Baudin’s Black Cockatoo do when threatened? |
| **Complexity**  Determined by examining the number and difficulty of concepts and disciplines that must be understood or integrated. | **Dealing with greater breadth and depth**  Interdependence of body organs and systems and the environment.  Adaptations and selection over time leads to conservation of favourable genotypes. |
| **Variety**  Students can work on different aspects of a broad theme and in their areas of interest. | **Being exposed to new ideas or content**  Individual students choose an example from the animal or plant kingdom.  Each student chooses one body system of their organism and explores the adaptations of this system to the environment of the organism.  Write a script for a story to explain how adaptations work; how their function is better than some alternative. Gather visual evidence and build an iMovie. |
| **Organisation**  Content is organised around key concepts or abstract ideas. | **Selecting new arrangements of content**  For the chosen body system;  Describe the body system and its parts.  Explain how the system functions in this organism.  Explain how this is an adaptation to the environment. You can do this by comparing the system of your organism to the human systems that you are learning about. |

**Process modifications**

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| **Higher-order thinking skills**  Instructional methods should stress the use rather than the acquisition of information. | Using questions from the analysis, synthesis and evaluation area of Bloom’s taxonomy.  Demonstrate how the features of your chosen system help your animal survive in its environment |
| **Open–ended processing**  Questions are provocative in that they stimulate further thinking and  research into a topic | Encouraging divergent thinking  Are the speed and amount of modern climate change unprecedented?  Is dangerous warming of the earth occurring?  Is the temperature range observed in the 20th century outside the range of normal variability? |
| **Discovery**  Activities stimulate inductive  reasoning to find patterns and underlying principles. | Adopting an inquiry approach to determine own conclusions  Within each story;  Describe the form of the adaptation.  Explain how the adaptation functions.  Explain how the adaptation helps the organism survive in its environment.  Describe the evidence for this. |
| Proof and reasoning  Students are required to explain the reasoning that led to their conclusions.  Students learn about other students’ approaches and learn to evaluate reasoning processes. | Being required to give reasons, substantiate conclusions.  Pairs of students present their story on their organism and its body system and how this helps it to survive its environment.  Class takes notes on each. |
| **Freedom of choice**  Choice of activities can be motivating and independent learning can meet the gifted student’s preference for self-regulation. Some students need support to become independent learners. | Choose one organism and one adaptation only. The following are some ideas. You are free to choose a topic of your own.   * How does the ***digestive system*** of a kangaroo, rabbit, cow, chicken, cockatoo or polar bear help it survive in its environment? * How does the use of ***metabolic water*** in desert mammals eg Spinfex Hopping Mouse *Notomys alexis* * How does ***temperature control*** in a lizard, kangaroo, horse, dog or fish help it survive in its environment? * How does the ***excretion of nitrogenous waste*** in a fish, bird, frog or turtle help it survive in its environment? * How does the ***respiratory system*** of lizard, kangaroo, horse, dog, cockatoo or crocodile help it survive in its environment? * How does the ***circulatory system*** of fish, amphibians, reptiles, birds other mammals help survival in its environment? * How do **plant adaptations** for water loss, low soil nutrients (eg Banksia), high salt concentration in soil help survival in the environment? |
| **Group interactions of like-ability peers**  Structured and unstructured activities should be provided to enable both intellectual and socio-affective goals. | Enabling group problem-solving  Individual students research and present an iMovie.  Cooperative discussion of the presentations  Individual written evaluation answering the provocative questions. The written evaluation will be conducted in class and will involve comparing the human systems learned and the adaptation chosen to research. |

**Product modifications**

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| **Real–world problems**  Products should address problems that are meaningful to the students | Investigating real-life problems  Adaptations of species to environment change over geological time. |
| **Real audiences**  Gifted students are not developing products that are evaluated only by the teacher. | Using products for evaluation by teachers, peers, community, and particular readership.  iMovie/podcast to Teacher and peers  Lectures to Year 8 AEP students |
| **Evaluations**  Gifted students’ products should be evaluated by appropriate audiences, their peers and themselves | Undertaking teacher assessment and student evaluation using pre-established criteria.  Individuals research and present.  Cooperative discussion of the presentations.  Peer evaluation of the adaptation story within the movie.  Individual written evaluation answering the provocative questions. |

•**Remember to include your name, date and references.**

Vocabulary

* adaptation
* genotype
* form and function
* acclimation
* trade-off
* diffusion
* heart chambers
* metabolic water
* surface area to volume ratio
* efficiency

Prepared by CJMorritt

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| Screen shot 2013-05-11 at 3.10.36 PM.png  Baudin’s Black Cockatoo  <http://nokomis.com.au/cockatooplates.html> | **Year 9 AEP Biological Sciences Research**  **Formative Assessment**  **Adaptations**  **Build an iMovie Project**  **Adaptations of a species to their environment** |

**Adaptations:**

Traits that function to increase survival or reproduction and are due to genes (i.e., are heritable) are called **adaptations**. Organism form and function are the product of many generations of evolution. Stories explain how adaptations work; how their function is better than some alternative.

**Three Types of Animal and Plant Adaptation:**

**Structural Adaptation**

Structural adaptation refers to physical features of an organism (shape, body covering, and the internal organisation).

**Example**

Baudin’s Black Cockatoo, like all birds, have many bones that are hollow. This makes them very light-weight, which helps them fly.

**Functional Adaptation**

Functional adaptation, otherwise known as physiologicaladaptation, permits the organism to perform special functions (for instance; making venom, secreting slime, and phototropism) but to also perform more general functions such as growth and development, temperature regulation, ionic balance and other aspects of homeostasis.

**Example**

Baudin’s Black Cockatoo, like all birds, excrete nitrogenous wastes in the form of uric acid

**Behavioural adaptation**

Behavioural adaptation composes of inherited behaviour chains and/or the ability to learn. Some examples are searching for food, mating and vocalisations. Behaviours may be inherited in detail (instincts).

**Example**

What does Baudin’s Black Cockatoo do when threatened?

The interaction of an organism’s adaptations and environmental selection over time leads to conservation of favourable genotypes.

**Your Task**

1. Individual students choose one organism from the animal or plant kingdom.
2. Choose one body system of the organism and explore the adaptations of this system to the environment of the organism.
3. Write a script for a story to explain how this adaptation works; how its function is better than some alternative.
4. Your iMovie should be about 5 minutes in length and include a spoken story explaining how the adaptation suits the environment and how it is better than some alternative. Include visual evidence such images, videos and animation. Original visuals are preferred.
5. Include your name, Title, date and references.
6. Your iMovie will be submitted to Mrs Morritt and will be assessed by both peers and teacher.

**Your Topic**

Choose one organism and one adaptation only. The following are some ideas. You are free to choose a topic of your own.

* How does the ***digestive system*** of a kangaroo, rabbit, cow, chicken, cockatoo or polar bear help it survive in its environment?
* How does the use of ***metabolic water*** in desert mammals eg Spinfex Hopping Mouse *Notomys alexis*
* How does ***temperature control*** in a lizard, kangaroo, horse, dog or fish help it survive in its environment?
* How does the ***excretion of nitrogenous waste*** in a fish, bird, frog or turtle help it survive in its environment?
* How does the ***respiratory system*** of lizard, kangaroo, horse, dog, cockatoo or crocodile help it survive in its environment?
* How does the ***circulatory system*** of fish, amphibians, reptiles, birds other mammals help survival in its environment?
* How do **plant adaptations** for water loss, low soil nutrients (eg Banksia), high salt concentration in soil, help survival in the environment?

**Evaluation**

There are two types of evaluation associated with your research.

**Formative evaluation**

Peer and teacher evaluation of the adaptation story within the iMovie.

**Summative evaluation**

In class, on a date to be advised each student will write an extended response comparing the human systems with the adaptation of a chosen animal or plant.

**Vocabulary**

adaptation caecum

genotype respiration

form and function photosynthesis

acclimation nitrogenous waste

trade-off carbohydrate

diffusion lipid

heart chambers protein

metabolic water efficiency

surface area to volume ratio

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| **jc logo** | **Formative Assessment**  **iMovie Rubric: Adaptation Student Name:** |

**Title:**

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| **Criteria** | **Below expected level**  **2 points** | **At expected level**  **3 points** | **Above expected level**  **5 points** |
| **Introduction of topic** | Topic introduced. | Topic introduced clearly, and purpose of iMovie was made clear. | Topic introduced clearly and in an interesting way. Purpose of iMovie was made clear. Outline of points was given. |
| **Development of topic** | Some understanding of topic shown. Some links and connections made between ideas. Points are usually developed with minimum detail. Information is usually relevant. | Good understanding of topic shown. Links and connections between ideas made clear. Information was relevant and expressed in own words. Points were developed with sufficient and appropriate details. | A very good understanding of the topic shown. Links and connections between ideas made clear. Information was relevant and well expressed in own words. Points were well-organised and developed with sufficient and appropriate details. |
| **Ability to engage and involve audience** | Techniques used to engage audience were minimal, or mainly ineffective. | An interesting approach taken to topic. IMovie used techniques such as visual aids, animation, images, videos, surprising facts. | An interesting or original approach taken to the topic. IMovie used techniques such as visual aids, original animation, original images, original videos, surprising facts, humour. |
| **Suitability of iMovie for purpose and audience** | Attempts were made to tailor the iMovie content to the intended purpose of informing, interesting or persuading. | The iMovie content and structure was tailored to the audience and to the intended purpose of informing, interesting or persuading. | The iMovie content, structure and delivery were closely tailored to the audience and to the intended purpose of informing, interesting or persuading. |
| **Vocabulary, sentence structure, grammar** | The science vocabulary of the iMovie was mainly appropriate for the topic. The iMovie content was occasionally grammatically correct. | The science vocabulary of the iMovie was appropriate for the topic. Sentence structures were usually correct. The iMovie content was usually grammatically correct. | The science vocabulary of the iMovie was appropriate for the topic. A variety of phrases and sentence structures were used. TheiMovie content was grammatically correct. |
| **Conclusion of topic** | An attempt was made to conclude the iMovie. | The iMovie was summed up clearly. | The iMovie was summed up clearly and effectively, with key points emphasised. |

**Further Comments;**