**EDF4402 Biology Education**

**Assessment Task 1 – Developing a Teaching and Learning Resource**

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| *VCE year level 11 Unit 2; Organisms and their environment – adaptations of organisms* | **BIOLOGY IDEA: All organisms strive to reproduce** |
| **Reproductive adaptations – systems and strategies** |
| **What you intend the students to learn about this idea.** | * All living organisms have the capacity to reproduce * Reproduction involves some form of cell division * Reproduction can be **asexual** or **sexual** (reproductive systems) * Some species are capable of both asexual and sexual reproduction, depending on their environment * In order to ensure the reproduction and survival of subsequent offspring, organisms may adapt (reproductive strategies)   + Physically -anatomically/ physiologically   + Behaviourally   + In response to the environment   **Reproductive Systems**  **Asexual Reproduction**  Asexual reproduction occurs in both plants and animals  Simple organisms tend to reproduce asexually  There are different methods of asexual reproduction;  In plants through;   * stems * leaves * roots * plant propagation * **apomixis**     In animals through   * **budding** * **fragmentation** * **parthenogenesis**   The advantages of asexual reproduction   * Large numbers of offspring can be produced rapidly * There is no need to find a mate * The is no need to expend energy on mating rituals etc   The disadvantages of asexual reproduction   * There is no genetic variation * **Mutations** become **homozygous** * Environmental changes can have a severe impact because the organism cannot adapt   **Sexual Reproduction**  Sexual reproduction occurs in both plants and animals  More complex organisms tend to reproduce sexually  Sexual reproduction is the union of two **haploid gametes** to form a genetically unique(except for identical twins) **diploid zygote**  ***Sexual Reproductive Systems in Plants***   * **Nonvascular plants** – have **flagellated** sperm and require water * Seedless vascular plants – produce **spores** * Seed plants - where the seed contains the **embryo**, a food source and a protective coating   + **Gymnosperms** – have naked seeds   + **Angiosperms** – the seeds are contained in fruit   Most angiosperms are **bisexual** but have adapted to inhibit **self fertilisation**  There are some instances of self fertilisation  ***Sexual Reproductive Systems in Animals***   * Fertilisation   + External – occurs mainly in aquatic environments     - **Broadcast spawning**     - **Demersal spawning**   + Internal     - **Oviparity**     - **Viviparity**       * Egg-yolk       * **Placental** * Marsupial reproduction   **Reproductive Strategies**  Reproductive strategies are the techniques utilised by an organism in an attempt to reproduce.  These techniques may also be designed to attract the fittest mate and ensure the survival of their offspring.  There are populations of species with similar reproductive strategies, they are known as;   * **r-selected** or **opportunistic**   + many offspring - usually small   + offspring have a short generation time   + reach reproductive maturity early   + provide little or no care to offspring   + have a short life span   + reproduce rapidly in favourable conditions   + expend much of their energy on reproducing * **K – selected** or **equilibrium**   + have fewer offspring - usually large   + offspring have a long generation time   + offspring usually develop internally   + reach reproductive maturity later in life   + expend little of their energy on reproduction   + nurture their offspring for extended periods of time – often until adults   ***Animal strategies***  Mating systems   * **Monogamy**   + mate for life   + mate for one or more breeding season * **Polygamy**   + **polygyny**   + **polandry** * **Promiscuity**   Parental care – there are varying levels of parental care of both eggs and offspring  Frequency and timing of mating – can be dependent on environmental factors  ***Plant Strategies***  **Pollination** - refers to the transfer of pollen not fertilisation of the egg  **Pollination vectors**  Seed **dormancy**  Methods of seed dispersal  Annual plants  **Perennia**l plants |
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| **Why it is important for students to know this.** | To demonstrate another example of the reliance of species upon each other, in this instance it is for perpetuation of the species.  To demonstrate how the adaptations of species’ can produce symbiotic relationships.  To demonstrate how organisms adapt to avoid extinction  To demonstrate the importance of genetic variation |
| **What else you know about this idea (that you do not intend students to know yet).** | The molecular genetics of creating a new phenotype |
| **Knowledge about students’ thinking**  **/difficulties connected with teaching this idea.** | Students should have prior knowledge of the anatomy and physiology of plant and animal reproduction.  Students may be unaware of the time frames for evolutionary adaptations |
| **Teaching procedures**  **(and particular reasons for using these to engage with this idea).** | Activities  1. Working in groups of two or three, students are provided with a flower. They must then examine the flower (they may dissect it) making notes about the physical properties of the flower; aroma, petals, etc. From their observations they must form a hypothesis about some of the reproductive strategies of the flower especially in relation to pollination. Students will be asked to justify their hypothesis to the class. Then the students will be asked to resource relevant literature to determine if their hypothesis was correct and compare their hypothesis with the actual facts. *This task will give students a firsthand encounter with the types of structures associated with different pollination vectors.*  2. Investigating Reproductive Strategies Activity <http://teach.genetics.utah.edu/content/begin/traits/ReproductiveStrategies.pdf>– produced by the Genetic Science Learning Centre, this activity examines the more unusual reproductive strategies of some organism both sexual and asexual. *It gives a great description of the physical and behavioural attributes of the organisms but leaves the student to identify what the adaptations actually are.*  3. Students will be given a passage of text relating to some aspect of reproductive adaptation. They will be asked to develop a list of new vocabulary (like the words I have highlighted in my knowledge section), and then create a crossword for their fellow students to solve. They may do this manually or electronically using the following website; <http://www.eclipsecrossword.com/>  *This task has two aspects; the first being to familiarise students with the new and often complex words and their spelling; and secondly to familiarise them with the meanings of the words. This effect is also doubled when they solve each other’s crosswords. This task may also incorporate the use of ICT if the student chooses.*  4. Using an interactive whiteboard and software (where possible) create a concept map. This should be a whole class activity, although small groups could be given sections of the topic and then they could all be brought together. However, if whiteboard software is available then you could create a really interesting and interactive activity. My idea would be to have the students arrange the various headings (asexual, sexual, marsupial, polygamous etc) in consultation with each other and try and include an example of each adaptation and determine if it is r-selecting or K-selecting.  *I think this activity would serve to clarify the topic, since it covers a very broad range of possible adaptations, by allowing students to map it out and discuss it with their peers.* |
| **Specific ways of ascertaining students’ understanding or confusion around this idea**  **(include likely range of responses).** | *Students are asked to hypothesise using the knowledge they have gained, and then present their hypothesis this will show a clear understanding of the structure and functions of plant biology and if they grasp the concept of a vector. I would expect that those students who cannot grasp which structures relate to pollination may confer with other students and use their responses.*  *The reproductive strategies activity incorporates and reinforces the systems of asexual and sexual reproduction and should demonstrate those students who are not grasping these concepts, as well as those who cannot recognise or differentiate between adaptations.*  *I would expect that the crossword would be challenging to students and that many of them would have to refer to their notes or text for spelling or definitions. Some students will probably think they have never heard some of the words before.* |

**References**

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