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**Student Name:** Anna Koetz

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<thead>
<tr>
<th>Criteria</th>
<th>Mark / 40</th>
<th>Outstanding (10-9)</th>
<th>Highly proficient (8-7)</th>
<th>Satisfactory (6-5)</th>
<th>Unsatisfactory (4-0)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Part A: Clearly identifies a pedagogical framework and is able to relate this to planning to teach.</td>
<td>/10</td>
<td>Provides clear description of the chosen pedagogical framework and demonstrates deep understanding for how it supports the teaching process in terms of sequencing lessons and aligning the ‘how’ of teaching to what is to be taught for the specific subject chosen.</td>
<td>Describes the chosen pedagogical framework and demonstrates how it supports the teaching process in terms of sequencing lessons and the ‘how’ of teaching for the specific subject chosen.</td>
<td>Describes a pedagogical framework and discusses some aspects of how it supports the teaching process.</td>
<td>Does not clearly develop a description of a specific pedagogical framework or how it relates to teaching the specific subject.</td>
</tr>
<tr>
<td>Part B: Planning (using the template)</td>
<td>/10</td>
<td>Develops a cohesive unit plan with exemplary and nuanced understanding and engagement with the syllabus document and incorporating all elements including the context, objectives (constructing/transforming), pedagogy, resources, CCEs and assessment with relevant CCEs (3 only) as teaching strategies.</td>
<td>Develops a quality unit plan incorporating all elements including the context, objectives (constructing/transforming), pedagogy, resources, CCEs and assessment. CCEs (3 only) underpinning explicit teaching of the subject.</td>
<td>Develops a unit plan incorporating all elements including the context, objectives (constructing/transforming), pedagogy, resources, CCEs and assessment.</td>
<td>Developed unit plan does not include all elements and / or the elements are not correctly aligned or taken from the syllabus.</td>
</tr>
<tr>
<td>Part C: Lesson Plan and justification</td>
<td>/10</td>
<td>Presents a highly developed critical lesson plan, clearly linked to the unit plan and is able to justify the use of ONE CCE underpinning the lesson plan with theory.</td>
<td>Clearly demonstrates comprehensive links to the unit through the lesson plan and is able to provide justification of the use of ONE CCE underpinning the strategies with theory.</td>
<td>Some evidence of planning for use of ONE CCE, some theory noted, and beginning to justify planning decisions.</td>
<td>Demonstrates little knowledge of the CCEs or uses more than ONE CCE. Doesn’t understand their link as a teaching strategy to support the curriculum delivery. Fails to justify beyond the surface level.</td>
</tr>
<tr>
<td>Part D: Communication with parents and students</td>
<td>/10</td>
<td>Strong evidence of connection and engagement with parents and students and ability to create clear understanding for their subject’s benefit to students in the future and across the learning spectrum.</td>
<td>Clear evidence of engagement with parents and students and ability to describe their subject’s benefit to students in the future and for further learning.</td>
<td>Evidence of engagement with parents and students and ability to describe most aspects of their subject’s benefit to students.</td>
<td>Little evidence of engagement with parents and/or students. Does not clearly describe their subject’s benefit in a manner that builds parental understanding. Future focus is unclear.</td>
</tr>
<tr>
<td>Professional literacy and communication: (Note no marks are attributed to this section however students must be satisfactory to pass the assessment item).</td>
<td></td>
<td>Demonstrates a very high level of skill in written communication and referencing at all times.</td>
<td>Effective written and communication skills throughout, including referencing.</td>
<td>Mostly effective communication and referencing</td>
<td>Written communication and/or referencing at an unacceptable level.</td>
</tr>
</tbody>
</table>

**Comments**
Part A Using a Pedagogical Framework to Sequence Learning

Inquiry-based learning is broadly defined as ‘active learning that that emphasizes questioning, data analysis, and critical thinking’ (Bell, Smetana & Binns, 2005, p. 31). Thus, similar to other inquiry-based pedagogical models, the Alberta Learning Focus on Inquiry model (AIM) encourages students to be actively involved in their learning, formulate questions, investigate widely, and then build new understandings, meanings and knowledge (Alberta Learning, 2004, p. 1).

AIM has six distinct phases: planning, retrieving, processing, creating, sharing and evaluating (pp. 11-13). Reflection is embedded within all levels (p. 11). Although the steps of many inquiry models are similar (Gordon, 2000), AIM explicitly incorporates metacognition throughout the inquiry, including reflection on both thought processes (cognitive domain) and feelings (affective domain) (p. 11). Specifically, reflection is embedded at every step. Although meant to be implemented in a sequential process, the recursive nature of AIM represents the non-linear nature of both construction of meaning and ‘real’ scientific inquiry, that is, an inquiry process typically involves revisiting previous steps to refine questions or methods, or gather further data (Nayler, 2000; Alberta Learning, 2004).

Sequencing the learning

AIM is a process-based model that provides a clear sequence to be followed and advice on how to plan a unit as well as a specific inquiry (Alberta Learning, 2004, pp. 23-31). Although the visual representation of AIM (p. 10) does not indicate where the inquiry process begins and ends, the textual description of the model clarifies that it begins with planning, followed by retrieving, processing, creating, sharing and evaluating.

AIM provides guiding principles and suggestions for activities at each of the inquiry steps (Teaching Delivery level) (Alberta Learning, 2004, e.g. pp. 49-50), which are incorporated in the unit in Part B as follows:

- A powerful hook in the beginning of the unit and its sub-sections, authenticity of the problem, as well as place-based learning will help incite curiosity and make the inquiry personally important to the students. The unit demonstrates this by incorporating videos and pictures as hooks for beginning new Learning Experiences
(e.g. the video “Home” in Learning Experience 1), and by choosing a real, current, controversial topic for inquiry (e.g. Assessment 2).

- Reflection is at the core of AIM, so the unit incorporates learning about and keeping learning logs and field note books, and made reflection an integral part of both formative and summative assessments.
- Teaching strategies in Learning Experience 2 of the unit follow closely the steps and guides of the inquiry model.

Through inquiry-based models, students experience the ‘real-life’ processes of science and scientific inquiry, i.e. generating hypotheses, developing a plan for gathering data, gathering and evaluating data and information (developing information literacy) (p. 12) and constructing evidence based on data/information (Bell, Smetana & Binns, 2005; Julien & Barker, 2009). Therefore, an inquiry-based model fits perfectly with the Authority Subject Biology (QCAA, 2014a), for which the unit in Part B has been written. In addition, inquiry-based learning fosters the exact attitudes and skills that are at the core of scientific inquiry, and at the core of the Biology syllabus, for example curiosity, critical thinking, problem-solving and learning to learn (pp. 1-2). The affective domain of AIM also directly links with the fourth General Objective of the syllabus: Attitudes and Values (p. 5). Finally, the process of inquiry is transferrable, not only between different scientific projects but also across the curriculum and to everyday life situations.
**Part B Unit Plan**

**Unit Topic: Biology - Human impact on ecosystems**

**Length of Unit: 10 weeks**

**Year Level: 12**

**CONTEXT**

**School:** ABC School in regional far North Queensland is a public co-educational K-12 school of 1800 boys and girls. The school lies within a suburb of high socio-economic status with the majority of students coming from professional and small business backgrounds. The student population includes a small number of Indigenous students (6%), students from a non-English-speaking background (2%) and students with a disability (6%). Two of the actions resulting from the 2013 Learning and Teaching Audit included ensuring ‘that the Extension classes are engaged in “real” higher level work’ as well as to ‘[p]romote strategies to ensure that all students are engaged in challenging, meaningful learning’ (XXX School Teaching and Learning Audit Action Plan for 2014, p. 1). This unit aims to fulfil these two actions. The school also participates in the National Secondary School’s Computer Fund (NSSCF) initiative, which means that all students in Years 10-12 have access to their own laptop.

**Students:** This Y12 class consists of 16 students (9 girls, 7 boys). One student has Indigenous background. One student is mildly autistic and prefers to work alone, with extension activities provided to enable his highly developed, fast cognitive skills.

**Special Events:** During this unit, a public lecture will be held at the local university with the topic: “Trade-offs between mining and conservation in Cape York”. Permissions will be sought from parents to attend this lecture.

**Staff:** Dr. Ecologia – teacher; strong background in ecological research prior to teaching; also available for planning and feedback: Mr. Hod, Head of Department (Science) and Mrs. Biologia, secondary science teacher; Mrs. Aide, teacher aide, available on request and for field trips.

**Stage 1 – Desired results**

**Overview of the Unit:** At the beginning of the unit students learn about ecosystem dynamics, including interactions within and between species (including humans), interactions between abiotic and biotic components of ecosystems, and how populations and communities continuously change in space and time through various factors and influences. They also learn about the steps of a scientific inquiry. Students then learn how and why to measure abiotic factors, population numbers and species diversity in the field and how to analyse this data, in order to compare between ecosystems and assess the impact humans have on ecosystems (including how they can be reduced or mitigated). By the end of the unit, students should be able to apply their knowledge about ecosystems and their data gathering, analysing and interpreting skills by generating an environmental impact assessment for a real-world problem, and more deeply exploring how humans impact on the chosen ecosystem.
### Students will know (Constructing Knowledge objectives from the syllabus)

**Understanding Biology (UB)**
- recall ideas, concepts and theories of biology
- describe biological ideas, concepts and theories applied to a range of situations

### Students will be able to do (Transforming objectives from the syllabus)

**Investigating Biology (IB)**
- design, manage and carry out non-experimental investigations
- develop skills and processes required to collect, organise, interpret, model and present primary and secondary data

**Evaluating biological issues (EBI)**
- evaluate and assess the reliability, authenticity, relevance, accuracy and bias of the sources and methods of the collection of information
- justify decisions and develop future scenarios based on the interpretation and analysis of current information.

### Stage 2 – Assessment evidence

<table>
<thead>
<tr>
<th>Assessment Tasks</th>
<th>Criteria (from the syllabus):</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Formative:</strong></td>
<td></td>
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<tr>
<td>1. Exit ticket questions and reflections in the form of 321RIQ to be completed at the end of each Learning Experience</td>
<td>1. Criterion 1: Understanding biology</td>
</tr>
<tr>
<td>2. Field trip plan (to be handed in and returned with feedback prior to field trip)</td>
<td>2. Criterion 2: Investigating biology</td>
</tr>
</tbody>
</table>
| 3. Field note book (notes, ecosystem diagrams, data collection, data analysis & graphs); the second schoolyard ecosystem description and analysis is completed independently | 3. Criterion 1: Understanding biology  
Criterion 2: Investigating biology |
| 5. Presentation of environmental impact assessment research findings (feedback from peers and teacher) | 5. Criterion 3: Evaluating biological issues |
## Summative:

1. **Summative Assessment 1: Assignment**
   - Students create a multimodal text (Wiki, brochure, presentation or video) that informs young people about what ecology is, what makes up ecosystems, why ecosystems and their connectedness are important for life on earth, and some impact humans can have. It includes a reflection on learning and on the inquiry steps.

2. **Summative Assessment 2: Extended response task**
   - Students conduct an environmental impact assessment to decide where a new development should be built; to do so, they need to investigate and compare at least two different ecosystems in terms of their structure, complexity, diversity, ecosystem value, and the impacts that removing/altering this ecosystem might have on surrounding ecosystems. They need to present a justification as to where to place the development, or propose an alternative location. This will be presented as EIA report. A research log book outlining all steps of the Alberta Inquiry Model with reflection at every step will form part of the assessment.

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### Stage 3 – Learning plan:

<table>
<thead>
<tr>
<th>Learning Experience 1</th>
<th>Length: 0.5 weeks</th>
<th>Topic and alignment to objectives: Planning for and reflecting on ecology and an inquiry model</th>
<th>Underpinning pedagogical strategies aligned to activities: To be written in terms of what teachers will do</th>
<th>Resources</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ACTIVITY (S):</strong> What will the students do?</td>
<td><strong>TEACHING STRATEGIES aligned to activities:</strong> What will the teachers do?</td>
<td>CCEs</td>
<td>ICT</td>
<td>Optional Other</td>
</tr>
<tr>
<td>(2 lessons) Students will explore their prior knowledge about ecology and human impacts. Students will learn about this unit and its assessment.</td>
<td>As a hook and introduction to the unit, the teacher will show a video about the interconnectedness of all life on earth and the human impact. Then, the teacher will use Think-Puzzle-Explore (a Visible Thinking routine) for the questions “What is ecology and why do we care?” to encourage students to explore</td>
<td>Teacher-created PowerPoint with embedded YouTube video(s). Use of website creator (e.g. Wiki) Use of online databases and search engines</td>
<td>Literacy: teacher will embed the Four Resources Model within this unit in order to promote effective literacy learning, both general literacy and science literacy. A range of multimodal texts will be used throughout. Code breaking: Teacher uses ecological</td>
<td>Home. by Besson &amp; Carol (2009) [<a href="http://youtu.be/gpENMKaoCU">http://youtu.be/gpENMKaoCU</a>]; very long, choose appropriate short section; shorter version (trailer): [<a href="http://youtu.be/KDlcANyFHhA">http://youtu.be/KDlcANyFHhA</a>] What is ecology? by Life Happens [<a href="http://youtu.be/U8PFgRk-x2U">http://youtu.be/U8PFgRk-x2U</a>]</td>
</tr>
</tbody>
</table>
their prior knowledge about ecology. To do so, the teacher will first explain and model how Think-Puzzle-Explore works, then ask the students to form pairs and answer the question, asking them to write their ideas/thoughts down. Teacher the shows video “What is ecology”. When finished, groups will revise their answers, then share with the class, with teacher listing ideas on the board, to be copied and kept for reflection later on in the unit.

Teacher will then move on to explain the unit and its assessment, making clear links to the importance and authenticity of the Learning Experiences, activities and assessments. Teacher will also explain that an inquiry model will be used for the two parts of the unit.

321 RIQ exit ticket

(2 lessons) Students learn about the general steps of an inquiry as well as the about the Alberta Inquiry Model, how to find reputable resources, how to take notes and summarise information.

Teacher will ask students to reflect on how they would solve a hypothetical problem by putting a scenario/picture of an everyday problem on the IWB (e.g. mobile phone is broken) and using Think-Write-Pair-Share. Ideas and steps of problem-solving/inquiry will be written on IWB. Teacher will then also list on the board the steps of the Alberta Inquiry Model and ask students to compare the similarities/differences between the steps they came up with and the Alberta Inquiry Model. Students to copy or glue Alberta Inquiry Model steps in their workbooks. Teacher will then show some real-life science inquiry in action (video). Following on from this, the following seven activities (1-2 lessons each) will then be used to teach and practice each of the six inquiry steps plus reflection to create a multimodal text (assessment 1).

Recording/noting data

The teacher will point out the importance of note taking and provide a first opportunity for students to practice by simply copying down the notes from the board.

Code breaking: Teacher uses ecological terms and provides verbal definitions.

Meaning-making (text participation):

Teacher will encourage students to connect to prior knowledge about problem-solving steps by using Think-Write-Pair-Share activity.

Text using & analysing: Teacher will encourage students to think more deeply about inquiry/problem solving steps by getting students to create their own steps and then compare own and Alberta steps.

Picture of broken mobile phone to put up on IWB e.g. http://www.clove.co.uk/product_images/fullsize/cat-b100-puddle-cat-b100tp-p13.jpg

Poster with Alberta Inquiry Model Steps hung in a prominent place in the classroom.
<table>
<thead>
<tr>
<th>Learning Experience 2</th>
<th>Length: 2.5 weeks</th>
<th>Topic and alignment to objectives: Learning about ecology through a guided mini-inquiry</th>
<th>Resources</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ACTIVITY (S):</strong> What will the students do?</td>
<td><strong>TEACHING STRATEGIES aligned to activities:</strong> What will the teachers do?</td>
<td><strong>Underpinning pedagogical strategies aligned to activities:</strong> To be written in terms of what teachers will do</td>
<td><strong>Code breaking:</strong> Teacher uses ecological terms and provides verbal definitions. The teacher will ask to see student journals to check that they are increasing their use of appropriate terminology. Differentiation: assessment 1 can be done using the computer (website/Glogster/video) or using non-electronic media (hand-written text or poster); groups will be allocated into mixed-ability where appropriate. The autistic student will work alone as to his preferences.</td>
</tr>
<tr>
<td>[12 lessons] Students explore what ecology is, what makes up ecosystems, why ecosystems and their interconnectedness are important, and what impacts humans can have. Students learn about and practice the Alberta Inquiry Model. Students produce and hand in assessment 1 including a reflection on their learning.</td>
<td>In each of the seven learning activities the teacher will recap the steps of the inquiry method and focus on one of these. The teacher will commence with a PowerPoint presentation about the step/skills needed in each step, using think-pair-share strategies to connect with students’ prior knowledge; the teacher then models how to do the particular step, followed by guided student practice (lesson 1); this is then followed by further independent student practice of the specific skills (practicing on the ecological questions for assessment 1), with appropriate scaffolding depending on students’ pace of learning (lesson 2). In each lesson, as students practice, the teacher circulates and guides/models according to groups’ students’ abilities. When appropriate and several students/groups require help with the same core skills (e.g. finding and/or judging scientific information, note-taking, text components) teacher will gain whole-class attention and use direct teaching and modelling of these core skills. Students then continue working independently or in pairs/groups. Reflecting (1 lesson): teacher asks class to think about what ‘reflection’ means and how note taking changes depending on the topic/purpose. For each of the inquiry steps explored in this Learning Experience, the teacher will explain and model different types of note taking (e.g. notes on information searches, reflection on feelings and learning, planning, data collection and analysis) and provide opportunities for students to practice. Special emphasis is placed on the importance of keeping a meticulous research diary/field note book.</td>
<td><strong>Use of digital media/software for keeping a reflection/learning log</strong></td>
<td></td>
</tr>
<tr>
<td>Recording/noting data: The teacher will model note taking and how note taking changes depending on the topic/purpose. For each of the inquiry steps explored in this Learning Experience, the teacher will explain and model different types of note taking (e.g. notes on information searches, reflection on feelings and learning, planning, data collection and analysis) and provide opportunities for students to practice. Special emphasis is placed on the importance of keeping a meticulous research diary/field note book.</td>
<td><strong>Text using &amp; analysing:</strong> Exploring different types of reflection texts.</td>
<td><strong>PowerPoint presentation about Alberta Inquiry Model steps</strong></td>
<td></td>
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<tr>
<td>Judging/evaluating: The teacher will model how to judge the reliability and validity of information using an information criteria sheet. The teacher will provide many different types of resources and encourage the students to be critical and discuss whether or not sources are reliable throughout the unit. The teacher will also explain and model, and students will practice, how to evaluate a presentation based on criteria.</td>
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<tr>
<td>Synthesising: The teacher will model how to synthesise information, including how to synthesise information gathered from literature searches as well as synthesising information into a final product (formative and summative assessments). The teacher will provide many opportunities for students to practice synthesising in order to produce assessments 1 &amp; 2.</td>
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<tr>
<td>Planning (2 lessons): Teacher gives scenario/event (e.g. hiking trip to remote</td>
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<td></td>
</tr>
<tr>
<td><strong>Resources</strong></td>
<td><strong>Code breaking:</strong> Teacher uses ecological terms and provides verbal definitions. The teacher will ask to see student journals to check that they are increasing their use of appropriate terminology. Differentiation: assessment 1 can be done using the computer (website/Glogster/video) or using non-electronic media (hand-written text or poster); groups will be allocated into mixed-ability where appropriate. The autistic student will work alone as to his preferences.</td>
<td><strong>PowerPoint presentation about Alberta Inquiry Model steps</strong></td>
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<td><strong>PowerPoint presentation about Alberta Inquiry Model steps</strong></td>
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</table>
field site) and asks students to think-pair-share how they would plan for the scenario/event; teacher guides class discussion about planning, importance of a plan, steps of a plan by asking questions and encouraging discussion; particular emphasis on questions such as: What exactly is the task/question? Who is the audience? What does success look like? Teacher guides how to create a mind map/organiser to visualise the plan and what information is needed. Students then practice for their mini-inquiry questions.

**Retrieving** (2 lessons): Teacher asks what students know about Kangaroo culling and writes ideas on the board; then explains and models google & database search strategies. Think-Pair-Share credibility of 3 information sources. Open class discussion to generate list of criteria to judge reliability by. Modelling evaluation sheet for resource reliability to practice.

**Processing** (2 lessons): Using some of the resources from previous lesson, teacher explains and models skimming and scanning skills; recording and organizing bibliographic information; note-taking skills; synthesising; re-focusing inquiry. Teacher introduces Reporter’s Notebook (Visible Thinking Routines) to clarify facts from feelings/opinions or Claim- Support- Question to clarify truth claims

**Creating** (2 lessons): Teacher shows videos of different modes of presenting information (formal & informal presentation, student-created documentary/video) followed by think-pair-share about good/bad points, how they could be improved; learning about giving, receiving, incorporating feedback; in groups students analyse different multimodal texts (brochure, Wiki, video) for their structure, language and audience; for remainder of double lesson students prepare their text for assessment 1 (to be finished at home).

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Use of software to create digital mind map

Use of internet databases (Google, Google Scholar, Web of Science, Science Direct, High Wire etc.) for keyword search in order to find credible and relevant information.

Meaning making, text use & analysis:

Students critically analyse and evaluate different types of texts sources from the internet for relevance, credibility and bias. Students analyse internal structure and language of different texts.

**Code-breaking, meaning making, text using**

Students learn about and practice note-taking, skimming/scanning texts, bibliographic information of texts

You Tube videos; analysing Wikis and videos

Meaning making, text using: different modes of presentation (video, formal and informal oral presentations); students analyse different multimodal texts for their structure, language and audience.

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Feedback examples
**Sharing (2 lessons):** Students share their work, i.e., presentation, video, Wiki etc. (assessment 1). Teacher and students provide feedback. Teacher explains what students can/should do with their feedback.

**Evaluating (1 lesson):** Was the inquiry successful? Reflect on learning, inquiry process, successes/challenges: revisit Think-Puzzle-Explore to reflect on learning; use ‘I used to think… but now I know’ to enable students to see how their learning, thoughts and attitudes have or have not changed.

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<table>
<thead>
<tr>
<th>Learning Experience 3</th>
<th>Length: 2 weeks</th>
<th>Topic and alignment to objectives: Planning, retrieving and processing ecological field data</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ACTIVITY ($)</strong></td>
<td><strong>TEACHING STRATEGIES aligned to activities:</strong></td>
<td><strong>Underpinning pedagogical strategies aligned to activities:</strong> To be written in terms of what teachers will do</td>
</tr>
<tr>
<td>What will the students do?</td>
<td>What will the teachers do?</td>
<td></td>
</tr>
<tr>
<td>(3 lessons) Students will learn about and predict the components, structure, diversity and potential vulnerability/value of different ecosystems. Students learn how to record notes in field notebook.</td>
<td>Teacher will take students into the schoolyard and lead a group discussion on how they would classify the components, structure, diversity and potential vulnerability/value of the ‘schoolyard’ ecosystem. Students to fill in ecosystem components retrieval chart and draw ecosystem diagram in their field notebook. Teacher will show real field note books and explain and model what information should go into a research diary/field note book. Ecosystem classification and note taking is repeated for a different part of schoolyard, e.g. oval. Back in class teacher models how to draw conclusions from their field notes in order to synthesise their notes and draw conclusions about one schoolyard ecosystem. Students in pairs to synthesise and draw conclusions about second ecosystem. Teacher then shows short videos (using RAS Alert) of several ecosystems. Students again fill in retrieval chart (components, structure, diversity and potential vulnerability/value). Think-Pair-Share after recording/noting data.</td>
<td>Recording/noting data: The teacher will explain and model how and why to keep a meticulous research diary and/or field note book. Students will take notes throughout the unit, including information searches, reflection on feelings and learning, planning, data collection and analysis. Synthesising: The teacher will model how to synthesise information, including how to synthesise information gathered from literature searches as well as synthesising information into a final product (formative and summative assessments). The teacher will provide many opportunities for students to practice synthesising in order to produce assessments 1 &amp; 2).</td>
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<tr>
<td><strong>CCEs</strong></td>
<td><strong>ICT</strong></td>
<td><strong>Optional Other</strong></td>
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<tr>
<td>Code breaking: Teacher uses ecological terms specific to describing and comparing ecosystems.</td>
<td>Use of ICT to present students’ findings (assessment 1)</td>
<td>Use of digital reflection/learning log</td>
</tr>
<tr>
<td>Meaning making, text using: Structure &amp; purpose of field note books</td>
<td>Use of IWB and YouTube videos</td>
<td></td>
</tr>
<tr>
<td>Ecosystem components retrieval charts</td>
<td>Videos of two different ecosystems, e.g. rainforest layers (<a href="https://youtu.be/Ax6zlSzyNM">https://youtu.be/Ax6zlSzyNM</a>)</td>
<td>RAS Alerts chart – teacher modified from</td>
</tr>
<tr>
<td>(2 lessons) Students will explore different ways to collect data in order to describe, classify and compare different ecosystems. They will also explore how to qualitatively describe and draw an ecosystem. Teacher will hand out scientific research papers and ask students to identify the different parts of scientific publications and reports and compare sections of different types of publications. Teacher will then focus on the methods sections that outline different ways to measure and describe ecosystems. Jigsaw (expert groups): teacher explains how Jigsaw works then groups read through one methods section each, identify the method used and why, what steps are involved, and present method to whole class. Whole class to take notes on different methods and their steps. All methods consolidated on IWB, including under what circumstances/in what ecosystems different methods are used. Recording/noting data The teacher will model note taking and provide many opportunities for students to practice note taking and give feedback. Students will take notes throughout the unit, including information searches, reflection on feelings and learning, planning, data collection and analysis. Special emphasis is placed on the importance of keeping a meticulous research diary/field note book. Judging/evaluating The teacher will model how to judge the reliability and validity of information using an information criteria sheet. The teacher will provide many different types of resources and encourage the students to be critical and discuss whether or not sources are reliable throughout the unit. Students can use computer to create a field trip plan. Code breaking, meaning making: Language and components of a research versus inquiry plan, and of risk assessments. PowerPoint presentation for review of different methods for measuring ecosystem components, structure, diversity and potential vulnerability/value; review of research planning. Blank risk assessment templates. Risk assessment examples.</td>
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<td>(2 lesson) Students will prepare for the field trips, including planning how and what to measure, what equipment to take, preparing data sheets, and writing risk assessments. Teacher will use PowerPoint to review different methods for determining and measuring ecosystem components, structure, diversity and potential vulnerability/value. Teacher will also review why and what a good research or field trip plan needs to incorporate. Students to discuss in pairs how an overall inquiry plan might be different from a field trip plan. Then, teacher will model how to do a risk assessment using an example. In their groups, students will then create a plan for the field trips. Groups to hand in proposed plan, including equipment list, a detailed explanation of four survey methods, justification of two methods to be used in the field, risk assessment, data sheets and field trip check list. Recording/noting data Teacher shows different types of data sheets and models how to accurately note down scientific data. Students can use computer to create a field trip plan. Code breaking, meaning making: Language and components of a research versus inquiry plan, and of risk assessments. PowerPoint presentation for review of different methods for measuring ecosystem components, structure, diversity and potential vulnerability/value; review of research planning. Blank risk assessment templates. Risk assessment examples.</td>
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</tr>
<tr>
<td>(1 day) Field trip to two different ecosystems Students measure, collect, collate and enter ecosystem data. Teacher (or visiting expert if possible) will model, in the field, how to use equipment correctly and how to measure and describe ecosystems by using survey techniques. Teacher will guide groups and students during the field trip according to their proposed plan, including equipment list, a detailed explanation of four survey methods, justification of two methods to be used in the field, risk assessment, data sheets and field trip check list. Recording/noting data Teacher models how to accurately note down scientific data, both on paper and electronically. Teacher shows how small errors can result in large mistakes and wrong conclusions. Use of Excel and available Apps for data collection and analysis. Code breaking: Teacher uses ecological terms specific to describing, comparing and measuring ecosystems. Field equipment to measure ecosystem structure. First aid equipment. Water and food.</td>
<td></td>
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</tbody>
</table>
Students describe ecosystems quantitatively and qualitatively and draw ecosystem diagrams.

Teacher shows collated group and class data on the IWB. Teacher asks whole class how this data might be presented graphically, and how to analyse the data. After several ideas, teacher asks what the question(s) was/were to be answered. Once these specific questions have been identified and put on IWB, Think-Pair-Share how to answer these questions using graphs and descriptive statistics. Teacher explains different types of graphs and most common descriptive statistics (average, variation, max/min etc.). Teacher models preliminary data analysis using class ecosystem data with focus on how to create graphs to compare & contrast ecosystems.

In groups, students analyse their data and create graphs in order to compare the two ecosystems. Graphs/data results will be added to students’ field note book with individual description and explanation of results.

Students hand in field note books for formative feedback.

Recording/noting data
Teacher models how to accurately note down scientific data, both on paper and electronically. Teacher shows how small errors can result in large mistakes and wrong conclusions.

Judging/evaluating
Use of different software programs for data collection and analysis.

Code breaking: Understanding components and their meaning, of different visual data representations (graphs, tables).

Numeracy: Data analysis, generating tables and graphs to represent data, interpreting graphs

(2 lessons) Students learn how to qualitatively and quantitatively analyse and visually present their field data in order to compare two ecosystems.

Learning Experience 4
Length: 1 week
Topic and alignment to objectives: Human impact and environmental impact assessments

<table>
<thead>
<tr>
<th>ACTIVITY (S): What will the students do?</th>
<th>TEACHING STRATEGIES aligned to activities: What will the teachers do?</th>
<th>Underpinning pedagogical strategies aligned to activities</th>
<th>Resources</th>
</tr>
</thead>
<tbody>
<tr>
<td>(4 lessons) Students explore human impacts on ecosystems and learn about environmental impacts assessments (purpose, legalities, components)</td>
<td>Visiting experts (if possible one expert from a mine or similar, and one from a conservation agency to represent different interests/bias) to talk about process of EIA. Teacher models how to write an EIA, followed by situated practice.</td>
<td>Judging/evaluating Recording/noting data Interrelating ideas/themes/issues</td>
<td>PowerPoint presentation by visiting experts Critical literacy/text analysis: viewpoint and bias of visiting experts; components and audience of Environmental Impact Assessments; possible bias in Environmental Impact Assessments depending on authors and audience</td>
</tr>
<tr>
<td>(4 lessons)</td>
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</tbody>
</table>

Students enter their data into Excel spreadsheets.

Students learn how to qualitatively and quantitatively analyse and visually present their field data in order to compare two ecosystems.
Teacher revisits steps of an inquiry and expectations for assessment 2. Concepts/ecosystems/cycles to form an appreciation of the interconnectedness of all ecosystems.

Learning Experience 5  
**Length:** 4 weeks  
**Topic and alignment to objectives:** Extended response task – Environmental Impact Assessment

<table>
<thead>
<tr>
<th>ACTIVITY (S): What will the students do?</th>
<th>TEACHING STRATEGIES aligned to activities: What will the teachers do?</th>
<th>Underpinning pedagogical strategies aligned to activities</th>
<th>Resources</th>
</tr>
</thead>
</table>
| Students will apply their knowledge of ecology, ecosystems and human impacts to a real-world problem/scenario that requires an EIA, using the steps of the Alberta Inquiry Model. | Teacher will revisit and explain steps of an inquiry and expectations for second assessment task. Think-Pair-Share about the inquiry steps and how they relate specifically to assessment 2. Students to note down a preliminary plan how to start the assignment, specifically how to define the general task clearly in their own words and where to go next from the task definition. They share this on the WB, followed by whole class discussion and refining of the task definition. Teacher will ask students to choose a scenario from the assessment 2 task sheet and form pairs with another student who chose the same scenario. Students can also work alone. | Recording/noting data  
The teacher will continue to guide note taking and give feedback. Students continue with the research diary/field note book for this assignment.  
Judging/evaluating  
The teacher will continue to guide students in how to judge the reliability and validity of specific sources students find for their assessment. Students are encouraged to use the information criteria sheet and be critical of the sources they find. Students will also evaluate their peers' presentations.  
Synthesising  
The teacher will continue to guide students in how to synthesise information. | Code breaking: Students are now expected to use the appropriate terms and language to describe, analyse and compare ecosystems.  
Meaning making & text use: Students are expected to apply their skills in breaking down and analysis different types of scientific texts, and in understanding the broader purpose (and audience) of different texts.  
Text analysis: Students are expected to practice and apply their skills in critical text analysis by evaluating relevance, credibility and possible bias of texts.  
Differentiation: Students can work alone, in pairs or in groups as they prefer |

Use of  
- internet search engines  
- mind maps for planning assignment  
- Excel for further data analysis/ graphing  
- Word for writing report  
- PowerPoint, Glogster (http://edu.glogster.com/glogpedia), storyboard/video and similar software for presentation |

Assessment 2 task sheet and rubric  
Any ICT required by students
ABC State High School

Task Sheet
SEMESTER 3, 2014

Biology Summative Assessment Item 2:
Environmental Impact Assessment (EIA) report

STUDENT NAME: ___________________________________________________

TEACHER: _________________________________________________________

<table>
<thead>
<tr>
<th>Timelines</th>
<th>Dates</th>
</tr>
</thead>
<tbody>
<tr>
<td>DATE HANDED OUT</td>
<td>Beginning of unit</td>
</tr>
<tr>
<td>MONITORING DATE</td>
<td>Week 9 of this unit</td>
</tr>
<tr>
<td>DUE DATE</td>
<td>Week 11 of this unit</td>
</tr>
<tr>
<td>RESULT</td>
<td>(OVERALL MARK)</td>
</tr>
<tr>
<td>TIME ALLOWED</td>
<td>4 weeks in-class plus 1 week at home</td>
</tr>
</tbody>
</table>
**Format:** Environmental Impact Assessment report

**Audience:** ABC City Council

**Time allowed:** 5 weeks including 4 weeks of class time

**Length:** 1500 words

**Task Description:**

Conduct an Environmental Impact Assessment (EIA) for a human development of your choice (see choices in ‘Background’ below) and present your findings (a) in a 1500-word EIA report, and (b) in a group presentation (see details below).

Through your investigation into the ecosystems that may be affected by the development, and how impacts may be mitigated, this task will show your knowledge and skills in Understanding Biology, Investigating biology, Evaluating biological issues as well as your developing Attitudes and Values. Specifically, the task allows you to show your skills in:

(Investigating Biology)

- designing, managing and carrying out a non-experimental investigation, and
- collecting, organising, interpreting, modelling and presenting primary or secondary data

(Evaluating biological issues)

- evaluating and assessing the reliability, authenticity, relevance, accuracy and bias of the sources and methods of the collection of information, and
- justifying decisions and developing future scenarios based on the interpretation and analysis of current information.

**Background:**

The city of ABC, Queensland, is growing. A mega-hotel complex is proposed to be built, which will bring an additional 1 million visitors to ABC city annually. Consequently, the airport will need to be extended. Both projects, building the hotel-complex and extending/relocating the airport, require extensive planning as well as assessment of their environmental impact, in order to find a suitable location that will minimize these impacts of the developments on the environment.

In terms of the hotel development, it is proposed to be built in an area that was used for sugar cane growing. However, it is a large development covering 340.6 Ha, and would also encroach on mangrove, beach and estuarine ecosystems (see map).
In terms of the airport development, there are two options: extend the current airport or find an alternative location. If the airport is to be extended, it would encroach further into mangrove ecosystem as well as encroach onto ABC River and ABC River Mouth (see map).

**What to do:**

**Individually:**

- Choose one of the projects (hotel development or airport development).
- Set up a research log book that you will use for planning, note-taking and reflection.

**In groups of 2-4:**

- Research where the development will be placed and what ecosystems are currently present.
- Using the field trip data, or information/data from appropriate sources, investigate and describe the ecosystem(s) in terms of ecosystem components, structure, diversity and potential vulnerability/value.
- Research why and how the ecosystem(s) might be affected, and how their degradation may impact surrounding ecosystems.
- Research any other ecological issues tied to the development in its currently proposed location.
- Identify and justify a location for the development, indicating the adverse environmental effects and how they can be mitigated.
- Prepare and give a presentation about your preliminary findings. These can be in your choice of mode, e.g. scientific poster, presentation, video, storyboard, Glogster or similar.
  - The presentation is due in week 10 of this unit.

**Individually**

- Write an Environmental Impact Assessment, clearly focusing on the intended audience, using the appropriate sections used for an EIA: Title, Summary, Description of Project, Existing Environment, Potential Environmental Impacts, Impact Mitigation Strategies, Recommendations and Justification, Conclusion.
  - A draft EIA is due in week 9 of this unit. The draft should contain all the necessary sections with dot points indicating your findings so far.
  - The full EIA report, together with the research log book, is due in week 11 of this unit. These two items form the summative assessment 2 for this unit.

You are welcome to add any additional, non-ecological issues (e.g. cultural or social issues) of the development and suggest solutions.
<table>
<thead>
<tr>
<th>Criteria</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
</tr>
</thead>
<tbody>
<tr>
<td>Investigating biology</td>
<td>The student communicates investigative processes by:</td>
<td>The student communicates investigative processes by:</td>
<td>The student communicates investigative processes by:</td>
<td>The student communicates investigative processes by:</td>
<td>The student communicates investigative processes by:</td>
</tr>
<tr>
<td></td>
<td>• planning, modifying and implementing their inquiry using the steps of the Alberta Inquiry Model, including reflection at every step.</td>
<td>• selecting, modifying and implementing their inquiry using the steps of the Alberta Inquiry Model, including some reflection.</td>
<td>• selecting and implementing their inquiry using some steps of the Alberta Inquiry Model</td>
<td>• following instructions to collect and organise information/data about ecosystems.</td>
<td>• following instructions to collect and organise information/data.</td>
</tr>
<tr>
<td></td>
<td>• collecting and organising information/data to identify trends and interrelationships within and between ecosystems.</td>
<td>• collecting and organising information/data to identify trends between ecosystems.</td>
<td>• collecting and organising information/data about ecosystems.</td>
<td>• collecting and organising information/data about ecosystems.</td>
<td>• collecting and organising information/data about ecosystems.</td>
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<tr>
<td></td>
<td>• evaluating the design of the inquiry and reflecting on the adequacy of the information/data collected.</td>
<td>• evaluating the design of the inquiry and the adequacy of the information/data collected.</td>
<td>• evaluating the design of the inquiry and the adequacy of the information/data collected.</td>
<td>• evaluating the design of the inquiry and the adequacy of the information/data collected.</td>
<td>• evaluating the design of the inquiry and the adequacy of the information/data collected.</td>
</tr>
<tr>
<td>Evaluating biological issues</td>
<td>The student communicates by:</td>
<td>The student communicates by:</td>
<td>The student communicates by:</td>
<td>The student communicates by:</td>
<td>The student communicates by:</td>
</tr>
<tr>
<td></td>
<td>• gathering, critically analysing and evaluating information and data about at least two affected ecosystems (including a quantitative and qualitative analysis of the affected ecosystems) from a variety of valid and reliable sources</td>
<td>• gathering, analysing and evaluating information and data about at least two affected ecosystems (including a qualitative analysis of the affected ecosystems) from a variety of valid and reliable sources</td>
<td>• gathering information and data about one affected ecosystem from a variety of sources</td>
<td>• gathering and using biological information to make statements about one affected ecosystem</td>
<td>• gathering and using supplied information to make statements human impacts on ecosystems.</td>
</tr>
<tr>
<td></td>
<td>• integrating the information and data to make a justified and responsible decision about whether and where to place the development to minimise impacts, and about how impacts may be mitigated.</td>
<td>• integrating the information and data to make a supported decision about where to place the development to minimise impacts, and about how impacts may be mitigated.</td>
<td>• selecting relevant information and data to make plausible decisions and predictions about where to place the development to minimise impacts.</td>
<td>• recognising that humans have an impact on ecosystems.</td>
<td>• recognising that humans have an impact on ecosystems.</td>
</tr>
<tr>
<td></td>
<td>• considering alternatives and predictions about the human impact on the affected as well as surrounding ecosystems, and how impacts (including environmental and other impacts) can be mitigated.</td>
<td>• recognising predictions about the human impact on the affected as well as surrounding ecosystems, and how environmental impacts can be mitigated.</td>
<td>• recognising concepts about the human impact on the affected ecosystems.</td>
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</tbody>
</table>
### Lesson Planning Template

**Year Level/s:** 12  
**Date:** February 2015  
**Learning area (subject):** Biology  
**Duration:** 90-minute lesson (double)

### What is the learning experience / broad issue / concept / focus of the learning from the unit that this lesson relates to?

This lesson fits within the unit “Ecology & human impact” and specifically within Learning Experience 1: “Learning about ecology through a guided mini-inquiry”. The two aims of this Learning Experience are for students to (1) connect with and extend prior knowledge of ecology, ecosystems and the interrelatedness of ecosystems; and (2) learn about and use the steps of an inquiry model (specifically the Alberta Inquiry Model).

### Lesson Objective: What specific part of Learning Experience does this lesson aim to develop? A good objective must indicate “Given what, Do what, How well?”

This lesson aims to develop students’ understanding of, and skills required for, the second step of the Alberta Inquiry Model: Retrieving – searching for and evaluating information. Using these retrieving skills students will search for and retrieve information on the broad ecological questions that will be explored throughout Learning Experience 1: What is ecology? What makes up ecosystems (incl. biotic/abiotic components and their connections)? Why are ecosystems and their interconnectedness important? What impacts can humans have on ecosystems?

At the end of this lesson, students should be able to:

- Correctly explain the purpose of the second step of the Alberta Inquiry Model: Retrieving, and how this step fits within the sequence of steps within the Alberta Inquiry Model.
- Conduct an effective and efficient search, using appropriate keywords, and using both Google and at least one electronic database, to find at least three different sources of information to answer the above ecological questions.
- List at least five pieces of information (criteria) about a source to evaluate its reliability, authenticity, relevance, accuracy and bias.
- Evaluate the reliability, authenticity, relevance, accuracy and bias of the five different sources of scientific information using the criteria above.

These objectives specifically fit within the Senior Biology Syllabus criteria of Evaluating biological issues (EBI): evaluate and assess the reliability, authenticity, relevance, accuracy and bias of the sources and methods of the collection of information.
## Know and Do: By the end of the lesson what knowledge (content and understandings) and skills (processes) do students need to develop?

<table>
<thead>
<tr>
<th>Students need to <strong>know</strong> ...</th>
<th>Students need to <strong>be able to</strong> ...</th>
</tr>
</thead>
<tbody>
<tr>
<td>• the purpose of the second step of the Alberta Inquiry Model: Retrieving, and how and why this step fits within the sequence of steps within the Alberta Inquiry Model</td>
<td>• conduct an effective and efficient search, using keywords, to find information to answer the ecological questions posed in this learning experience (see above)</td>
</tr>
<tr>
<td>• the differences between scholarly, news/general interest, popular and sensational sources of information</td>
<td>• evaluate the reliability, authenticity, relevance, accuracy and bias of different sources of scientific information</td>
</tr>
<tr>
<td>• several print and electronic sources relevant for scientific research in general and for ecological concepts and definitions in particular</td>
<td>• keep clear records of bibliographic information</td>
</tr>
<tr>
<td>• where to find information to answer the ecological questions posed in above</td>
<td></td>
</tr>
<tr>
<td>• the meaning of the terms: reliability, authenticity, relevance, accuracy and bias</td>
<td></td>
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<tr>
<td>• criteria that can be used to judge the credibility and authenticity of a source (print and web)</td>
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</table>

## Evaluation/Monitoring and Assessment:

### Prior Knowledge: *(How will I find out what the students know and/or remember?)*

Verbally revisiting learning objectives from previous lessons, particularly previous steps of the Alberta Inquiry Model, using whole class questions/discussion. K & W of KWL of searching for and evaluating sources of information.

### Formative Assessment: *(How will I monitor student understanding along the way?)*

Teacher will revisit the L of KWL at the end of the lesson using a 3:2:1 RIQ which will be handed in/emailed. Students/pairs will hand in:

- a summary (with hyperlinks) of 3 sources of information suitable for answering the ecological questions
- a criteria sheet for each of 3 ecological sources of information that clearly explains and justifies (in dot points) how students evaluated reliability, authenticity, relevance, accuracy and bias of the different sources

Teacher will observe body language and facial expressions of students during content delivery, videos and questions to determine whether students are following the presentation, are confused, dis-engaged.

### Summative Assessment: *(How will I provide concrete evidence of student learning?)*

There will be no summative assessment in this lesson. However, the lesson prepares students for the summative assessment 1 at the end of Learning Experience 1 (see unit plan).
**Resources needed:**
- Fake tree octopus website ([http://zapatopi.net/treeoctopus/](http://zapatopi.net/treeoctopus/))
- Kangaroo cull research article, newspaper article and blog
- Access to Google and several electronic, scientific databases (e.g. Web of Science if available, Science Direct, High Wire, NCBI)
- Source credibility evaluation sheet (e.g. [http://www.schrockguide.net/uploads/3/9/2/2/392267/evalhigh.pdf](http://www.schrockguide.net/uploads/3/9/2/2/392267/evalhigh.pdf))
- Other good resources: [http://www.lib.berkeley.edu/TeachingLib/Guides/Internet/Evaluate.html](http://www.lib.berkeley.edu/TeachingLib/Guides/Internet/Evaluate.html)

### Teaching Strategies and Learning Steps

<table>
<thead>
<tr>
<th>Introduction: Key learnings and how they will be achieved</th>
<th>What to say</th>
<th>Organisation/Resources</th>
<th>Individualising learning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time Allocation: 10 mins</td>
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<tr>
<td>Teachers will:</td>
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<tr>
<td>Students will:</td>
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<tr>
<td>Look at cartoon “On the internet, nobody knows you’re a dog.” and discuss what it might mean. Look at a fake ‘scientific’ website and puzzle over what might be unusual about it. Do KW of KWL answering the question: What do you know and want to know about finding information and judging its reliability/credibility?</td>
<td>What key messages will I convey? What strategies will I use to do this? Teacher will show cartoon (see resources) and ask open questions as to what the cartoon might mean, in order to get students thinking about the anonymity of the internet and how relatively easy, cheap/free, and mostly unmonitored it is. Teacher will then show fake tree octopus website on IWB and ask students whether they notice anything unusual in order for students to become more critical or even suspicious about what they see on the internet and begin asking critical questions. Teacher will ask open questions about credibility, authenticity etc. then give a brief overview of lesson topic (overall inquiry step: retrieving, specific lesson focus: evaluating credibility of information sources), then lead into KWL</td>
<td>What resources do I need? “On the internet, nobody knows you’re a dog.” cartoon Tree octopus website (see resources) up on the board</td>
<td>How can I make adjustments to meet individual student needs? Any explanations by the teacher will be given in writing to allow students to re-visit the instructions/explanations later. KWL can be done verbally and written down later. Individualised scaffolding will be particularly pertinent during independent student practice.</td>
</tr>
</tbody>
</table>

### Lesson Body: - step by step outline of learning experience sequence

<table>
<thead>
<tr>
<th>Lesson Body: - step by step outline of learning experience sequence</th>
<th>Time Allocation: 75 mins</th>
<th>What to say</th>
<th>Organisation/Resources</th>
<th>Individualising learning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time Allocation: 75 mins</td>
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<tr>
<td>Teachers will:</td>
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<tr>
<td>Students will:</td>
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</tbody>
</table>
|  - Share ideas/understanding of overcrowding and Kangaroo culling (or similar controversial topic)  
  - Practice searching the internet to find out about overcrowding and Kangaroo culling, guided by teacher modelling searching  
  - Students will read 3 different resources on overcrowding and Kangaroo culling (research paper, newspaper article, blog), then think-pair-share about structure/format, language and audience; class discussion on differences of sources  
  - In same pairs, students will define the terms reliability, authenticity, accuracy and bias, then rank the 3 resources according to their reliability, authenticity, accuracy and bias; class discussion of how groups ordered them and why, and what the terms actually mean | What strategies will I use to facilitate, guide and enable students to achieve the learning? Teacher will ask “What do you know about and Kangaroo culling?” and encourage all students to contribute by writing ideas on WB. Teacher makes clear that, since this is modelling an inquiry, it is ok to not know anything and out-there ideas are also ok. Using terms from brainstorm above, teacher will model how to effectively search, using keywords, Google and a scientific database (such as Web of | What resources do I need? WB Google, Google Scholar Database such as Web of Science if available at the school, Science Direct, High Wire, NCBI 3 resources on Kangaroo culling (research paper, newspaper article, blog) Evaluation sheet | How will I know if students are achieving the learning objective/s? Participation and quality of answers during class discussions and think-pair-shares. Teacher needs to ensure that all students share and participate. Checking accuracy of written work, e.g. definitions of terms, note taking. Checking progress during practice in |
• List possible criteria on WB
• Students use own or teacher provided source evaluation sheet to evaluate reliability, authenticity, relevance, accuracy and bias of the resources (guided)
• For the remainder of the double lesson, students will practice searching and evaluating skills while trying to answer ecological questions for assessment 1. They will choose 4 sources for which they will fill in the evaluation sheet including justification of final judgement (can be handed in by next lesson).

Science if available at the school, Science Direct, High Wire, NCBI). Teacher will explain about different databases (subscription based and free). Teacher will then hand out 3 resources on Kangaroo culling (research paper, newspaper article, blog) and explain that we will first look structure/format, language, audience of resources. Teacher will then put the following words on the board: reliability, authenticity, accuracy, bias; and ask students, in their pairs, to define the meaning of the terms, then rank the 3 resources according to these. Teacher will guide a class discussion about how to evaluate resources, what criteria can be used (listing these on WB), then hands out evaluation sheet and models filling it in for one of the resources.

Teacher asks students to practice the searching and evaluating skills for their ecological questions. Teacher will circulate and check progress and understanding of each student.

Conclusion: Reviewing learning/Summarising/Articulating where to next (Strategies to capture learning that occurred and move thinking forward.)

Time Allocation: 5 mins

Teachers will:

How will I help students to synthesise learnings?
Teacher will gain class attention and give brief summary of the lesson and revisit fake tree octopus website.
Teacher then puts up dog cartoon and asks students to rethink what it means, and to use it for their KWL.
Teacher reminds students to do and hand in their RIQ 321 KWLs plus 3 criteria sheets, one for each of 3 ecological sources.

What plans are in place for those who finish early?
Early finishers can continue searching for information that will answer the ecological questions for assessment 1. They can also create their own evaluation sheet and start evaluating and summarising each resource.

What about those who need more time?
Late finishers can hand in their 3 ecological sources and evaluation sheets by the next lesson.

Students will:
Look again at cartoon “On the internet, nobody knows you’re a dog”, rethink what it might mean and then revisit L of KWL by listing 3 things they learnt, 2 interesting ideas and 1 question.
Explanation and justification

The Common Curriculum Elements (CCEs) (Queensland Curriculum and Assessment Authority [QCAA], 2014b) are a set of 49 generic skills that QCAA deems highly important and relevant for all Queensland senior students to develop, particularly those students wishing to obtain an OP in order to go onto to higher education (QCAA, 2014c). The annual Queensland Core Skills (QCS) Test assesses how well students can perform these skills rather than subject knowledge. Forty-five of the 49 CCEs are developed in the senior authority subject of Biology (QCAA, 2014d), indicating that Biology students gain a broad range of skills that are also relevant in many other subjects.

The retrieving and evaluating of scientific information lesson is part of Learning Experience 1 of the unit ”Human impacts on Ecosystems” in Part B of this assignment and incorporates CCE number 45: Judging/Evaluating (QCAA, 2014b). This CCE supports students to use both procedural and deliberative operations in making judgments and through evaluating learn to assign merit according to criteria (p. 3). Judging and evaluating activities are particularly appropriate at this time in the unit, which was designed and sequenced according to the Alberta Inquiry Model (AIM) (Alberta Learning, 2004). One of the integral steps of AIM is retrieving information, and within this step one of the key skills is evaluating information (Alberta Learning, 2004, p. 53), which is also the focus of this lesson and necessary in order to move on to further steps of AIM.

In addition, evaluating is a higher order thinking skill defined as ‘making judgments based on criteria’ (Krathwohl, 2002, p. 215), and which can be subdivided into the cognitive processes of checking and critiquing (Krathwohl, 2002; Mayer, 2002) that align with QCAA’s (2014b) explanations of ‘judging’ and ‘evaluating’.

In this lesson, students learn to specifically evaluate resources found on the internet. Within this unit, judging/evaluating are skills needed in assessment 1, where students need to evaluate their resources and information for credibility, authenticity as well as relevance for their assessment item. They also support students to produce evidence in assessment 2 where students will evaluate their resources for credibility and relevance, judge whether and how the information will be incorporated into their presentation and report, and make a
judgment on whether and how an ecosystem is impacted by human development. In addition, students also evaluate their peers’ presentations (Learning Experiences 1 and 4).

Specific strategies in this lesson that develop the skills of judging/evaluating include:

- Teacher’s use of higher level, judging questioning that encourages students to think more deeply, drawing on their knowledge and attitudes, e.g. “How would you judge...”, “Is XYZ good/bad/useful? Why?”, “Are there other ways of doing/writing/judging/ ...?”

- Teaching students a process for determining the possible audience of a resource, which encourages students to think about different points of view (different spectacles) and possible bias.

- Teaching students how to sort different resources according to their credibility.

- Teaching students how to create their own criteria for evaluating websites/resources.

- Using a pre-prepared evaluation sheet enables students to compare their own criteria with pre-determined criteria, which also encourages higher order thinking, judging and evaluating their own and other criteria, as well as integrating own and other criteria.
**Part D Communication**

Welcome and thank you for coming to the Year 11 subject selection evening. I am Dr. Koetz, one of the Science teachers who will be accompanying the students on this final stretch of senior schooling! I am sure you are all very excited, and perhaps a little apprehensive about the choices and decisions that will affect your future and where you may go once you finish high school.

I am here tonight to tell you about the subject Biology (QCAA, 2014a). I will firstly tell you about what Biology students may learn in this subject. Then I will tell you how the subject supports students in the Queensland Core Skills (QCS) Test (QCAA, 2015a) and the Common Curriculum Elements (CCEs), and finally, where the subject might take you once you finish school.

First, Biology is an Authority Subject, which means that it counts towards your university-entrance scores (QCAA, 2015a). Biology is the study of living systems, including their origin, development, diversity, functioning and evolution. In Biology, students will have opportunities to discover and try out how scientists investigate problems, how the process of science works, and how new knowledge is discovered (QCAA, 2014a).

In addition, students may develop many transferrable skills, such as understanding, analysing and interpreting data and scientific information, reasoning, judging and evaluating, to name a few. These are some of the CCEs students may develop in Biology, but also in other senior science subjects.

These are the CCEs, and there are 49, ranging from using appropriate scientific terminology, to analyzing and synthesizing, to name a few. You can see all 49 CCEs in your handouts (QCAA, 2014b; QCAA, 2014d; QCAA, 2015b).

Of these 49 skills, Biology covers 45 (QCAA, 2014d). So you can see how Biology develops a very broad range of skills in students, and all of these skills are assessed through the QCS Test (QCAA, 2015b). It might sound daunting having to be able to perform 49 skills! However, the QCST does not test subject knowledge, only the actual CCE skills, and all of these CCE skills are being taught and developed in all senior subjects throughout the senior years, in every lesson (QCAA, 2015b).
For example, let’s look at *hypothesizing* (CCE 41). Biology students will be given many opportunities to learn how and why to hypothesize through a number of scientific investigations that they design and conduct over the two years (QCAA, 2014a). The skill of *hypothesizing* is not only developed in Biology but also in other Science subjects, English, Geography and several other subjects (QCAA, 2014d). By the time the QCST comes around, students would have framed many hypotheses, in many contexts and subjects, so that when asked for a hypothesis in the test, they should be able to do it.

So, what can you do with Biology when you finish school? Biological concepts and scientific skills are relevant to a range of careers, including medical, veterinary, food and marine sciences, agriculture, biotechnology, environmental rehabilitation, biosecurity, conservation and eco-tourism (QCAA, 2014a). However, the skills you learn in Biology, for example problem solving, evaluating, explaining to others, will also be useful in other careers, further study and everyday life.

Thank you very much for your time and patience! I am more than happy to now answer any questions you may have.
References


