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Lifting the cover: developing an analytical tool to unravel environmental education resources

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ABSTRACT

Evaluations of environmental education (EE) programmes and resources are becoming increasingly visible and important. While benefits accrue through evaluation, many programmes and resources have yet to realise these. Issues such as a lack of clear objectives, reliance on traditional, summative approaches and inattention to context have prevented rigorous evaluation occurring. This paper reports on the development of an analytical tool designed to unravel EE resources. Its theoretical basis is a socially acute questions (SAQ) approach and educational configurations teachers use when implementing this approach. Using these configurations, a series of interrogatory questions were developed to unravel a resource writer's education intent – what type(s) of knowledge are valued, the view of science presented and the view of learning. Two contrasting resources were analysed to test this tool. This analysis revealed that one resource viewed knowledge as universal, had a scientistic epistemic posture and a doctrinal/pragmatic didactic approach whereas the other viewed knowledge as contextualised, had a relativistic epistemic posture and a problematising/doctrinal didactic approach. Consequently, this tool showed that it was able to unravel a resource writer's intent, identify gaps so teachers could adapt a resource and build capacity for didactics of EE and its evaluation.

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Introduction

There are a plethora of electronic and hard copy resources available for teachers to access when planning to teach an environmental education programme. These resources are developed by a variety of organisations and people, for example governmental organisations such as New Zealand's Department of Conservation (http://www.doc.govt.nz/get-involved/conservation-education/), non-governmental organisations such as Zealandia (https://www.visitzealandia.com/education#resources), private organisations such as Project Janszoon (http://www.janszoon.org/education/), and educational organisations such as The Science Learning Hub (https://www.sciencelearn.org.nz/). Environmental education associations such as the North American Association for Environmental Education (NAAEE) have a multitude of resources available on their websites (https://naaee.org/our-work/programs/eepro-professional-development-site-ee).

But it is difficult for teachers to identify a resource writer's underlying learning beliefs and reasons for its development let alone ensure that it will support the development of students' environmental awareness, knowledge, attitudes and values. More importantly, from an environmental education viewpoint, the resource should have potential to empower students to take informed action.

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All of these issues are important for teachers, especially when they are selecting such a resource that develops knowledge and attitudes, and identifies pedagogical practices. We assert that teachers need to be informed of the underlying messages that are contained within the resource. We wondered if a tool could be developed so that teachers could become aware of the resource writers' educational intentions.

The aim of this paper is to locate the role of evaluation in environmental education, its benefits and challenges and examine existing evaluation tools. Furthermore, a space is identified and justified for an analysis tool that can be used to unravel an educational resource and disclose the writers' intentions as well as their underlying perspectives. A tool designed for this purpose is then introduced. Two resources will be considered to illustrate how the tool can be used. Finally the tool's efficacy and limitations will be discussed.

Evaluation in environmental education programmes

Even though evaluation has only recently become a noticeable element of environmental education (EE) programmes (Heimlich 2010), there is no doubt that evaluation of an EE programme is crucial for its success. Increasingly, funders of such programmes require evidence to demonstrate a programme's efficacy and impact and as such, effective evaluation has become critical to secure funding (Zint, Dowd, and Covitt 2011). With the increasing drive for educational accountability, evaluation can also help to justify the effort put into developing resources for EE programmes (Carleton-Hug and Hug 2010).

The benefits of evaluation for the long-term success of an EE programme are well established. Fundamentally, through evaluation EE educators can gather evidence that a programme is achieving its objectives along with the overall benefits of EE (Zint, Dowd, and Covitt 2011). But there are other aspects that evaluation can uncover. For example, Monroe (2010) argues that evaluation can help educators identify and then enact changes for programme improvement. She also comments that through enactment of evaluation, educators can gain evaluative skills and improve their programmes – resulting in more effective educators and consequently building capacity and advancing the EE field (Monroe 2010). Likewise, Carleton-Hug and Hug (2010) maintain that evaluation that results in improved design and delivery can also lead to enhanced programme effectiveness. Furthermore, through evaluation, EE educators can identify the assumptions that underpin a programme and in doing this, are able to relate these assumptions to the objectives and activities of their programme, resulting in a more coherent 'package' (Carleton-Hug and Hug 2010).

Despite these benefits, there seems to be few evaluation tools that could lead to such capacity building in EE. Researchers have provided a range of reasons for this situation. Carleton-Hug and Hug (2010) argue that there is a surprising scarcity of evaluation in the EE field because the majority of EE programmes do not routinely include methodical and high quality evaluations as part of their usual practice. If conducted, they are generally an assessment using immediate measures of post-test/experience relating to the overall goals of a programme, rather than assessment of the types of behavioural or affective outcomes that can take a long time to develop (Ardoin, Biedenweg, and O'Connor 2015). In addition, there is little consensus between EE researchers on what constitutes the elements of evaluation and what comprises an evaluative approach (Carleton-Hug and Hug 2010). Based on a review of articles published on evaluations in three prominent EE journals over four years, these researchers found 20 articles that reported programme evaluations. They noted that in these evaluations, there was no commonality in how evaluations were constructed or even any common components that could be identified as critical elements.

This lack of evaluation of EE programmes could be attributed to the field's short history (Carleton-Hug and Hug 2010). Another reason could be that systematic evaluation requires expertise that many EE organisations lack (Powell, Stern, and Ardoin 2006). Furthermore, it appears that EE educators seem to have an intuitive grasp of possible learning occurring (Monroe et al. 2005) and on occasions 'sense' that a programme is working (Ardoin, Biedenweg, and O'Connor 2015). This intuitive approach could be another reason for not seeing the need for evaluation. Nevertheless both Monroe et al. (2005) and Ardoin, Biedenweg, and O'Connor (2015) argue that both EE educators and researchers need to look into the 'black box' (Ardoin, Biedenweg, and O'Connor 2015, 44) so that the mechanisms of a programme,

that is the how and why something 'works', can be identified and evaluated. Monroe (2010) adds that articulation of the theory that drives a programme should be included.

While some evaluation of EE programmes is being carried out, there is room for improvement as issues exist with many of the evaluations that have been conducted. These include evaluators relying on traditional approaches that involve quantitative strategies and a quasi-experimental approach (Zint 2013), which results in primarily summative-type evaluations. This reliance on one approach is evident in the collection of *EE Outcomes Measurement Tools*, developed by participants in an online professional development course at Cornell University (Kudryavtsev and Krasny 2012). In this collection of 13 tools, nine adopt a pre-/post-learning evaluation approach and one a post-learning only. Tools have also been published from the 2014 course and while there was a greater variety of tools developed, e.g. drawings of waste at a school, a word cloud to illustrate ideas about a concept, use of photos and interviews, pre-/post-learning surveys still dominated (nine out of 21 tools) and six surveys that were developed for use at one point, e.g. pre-learning only (Kudryavtsev and Krasny 2014).

Adding to these issues surrounding evaluation, Stern, Powell, and Hill's (2014) review of 66 peer-reviewed studies concluded that current EE evaluation practices often did not enable the identification of practices that lead to the most desired outcomes. Also, since many evaluations are of single programmes, it is difficult to take account of contextual effects (Carleton-Hug and Hug 2010).

Another issue is that on occasions, evaluations have been based on weak assumptions, such as the 'knowledge + attitudes = behaviour' model (Zint 2013, p;.307). Furthermore, Carleton-Hug and Hug (2010) found that many EE programmes lack clear objectives, making evaluation problematic.

Characteristics of quality evaluation and available tools

Ideally, evaluation should be carried out throughout a programme's development, design and enactment in order that evaluation becomes 'ongoing and institutionalised' (Powell, Stern, and Ardoin 2006, 232). Powell, Stern, and Ardoin (2006) proposed the *Sustainable Evaluation Framework* that contains four types of evaluation processes which are used in an iterative manner. These are *utilisation-focused evaluation* that concentrates on the organisation's needs and is conducted at the beginning of the process to identify the evaluation's goals, resource availability and stakeholder's needs. *Participatory evaluation* occurs throughout the development and implementation of the evaluation and involves stakeholders in decision-making. *Theory-driven evaluation* involves the use of research and theoretical structures, e.g. logic models, to develop tools and indicators with which to measure the programme's goals. *Consumer-based evaluation* involves the stakeholders throughout the evaluation and programme enactment in order to gather data for the refinement of the programme. In this way a range of data-gathering tools and theoretical structures are employed enabling triangulation to occur, resulting in an evaluation system that is 'unique and contextual' to a particular organisation (Powell, Stern, and Ardoin 2006, 236).

The *My Environmental Education Evaluation Resource Assistant* (MEERA) (Zint n.d.), another evaluation tool designed to support EE educators to evaluate their programmes (Zint 2010), also employs an iterative approach. This tool is similar to the *Sustainable Evaluation Framework* in that it encourages evaluators to use a logic model, to clarify the evaluation's goals and indicators of success, design and implement tools that will gather a range of data, analyse that data, and then develop conclusions and recommendations for a programme's refinement. The strength of this tool is that each step of the process is discussed in detail, enabling educators to develop their capacity to evaluate a programme.

When looking to review a resource, the NAAEE has provided a publication *Environmental Education Materials: Guidelines for Excellence* (NAAEE 2004) that makes recommendations for the development and selection of EE materials. It provides a list of six key characteristics of high quality EE materials together with guidelines that illustrate that characteristic. Indicators are provided to help gauge the degree to which the material being evaluated adheres to the guidelines. In this way the quality of the materials can be judged and if weaknesses are identified, an educator can compensate accordingly. The framework for these guidelines is identified as being the *Belgrade Charter* and *Tbilisi Declaration* (NAAEE 2004), documents developed at United Nations conferences where goals for EE were first articulated.

The characteristics include the materials being fair and accurate; having depth in that they foster awareness, knowledge, attitudes, values and perceptions about environmental issues; emphasising lifelong skills to address environmental issues; having an action orientation; being instructionally sound in order to enact effective learning; and being easy to use (NAAEE 2004). Similarly to MEERA, details are provided about the guidelines for each characteristic and its indicators, along with examples. As such, an educator could use this evaluation resource as a professional learning opportunity to build their evaluative capacity.

While these characteristics do correspond with the goals identified in the *Belgrade Charter* and *Tbilisi Declaration*, there does not appear to be a characteristic that relates to a theory driving the evaluation, an element that Monroe (2010) argues is necessary when undertaking EE evaluations. Furthermore, the NAAEE tool takes no account of the way in which a resource/programme is influenced by its writer's beliefs about a subject, such as EE, information provided by resource materials and types of pedagogical strategies employed.

In this way the evaluation process helps to drive refinement and change, as well as building capacity. Evaluation needs to be able to identify a programme/resource writer's underlying assumptions (Carleton-Hug and Hug 2010), and recognise its mechanisms (Ardoin, Biedenweg, and O'Connor 2015) and practices (Stern, Powell & Hill 2014). Given these requirements, we set out to design a tool that could analyse EE resources as follows. The tool developed is based on Simonneaux and Simonneaux's (2012) educational configurations that were the result of their analysis of teachers' use of a socially acute questions (SAQ) approach. We argue that the SAQ teaching approach, which is a progression of a socioscientific issues teaching approach (SSI), closely corresponds to education for sustainability (EfS). However, our analytical tool is not suitable for an entire programme evaluation, but rather to be used in the initial planning period prior to teaching.

Theoretical background of the tool

There is a wide range of resources available for teachers embarking on an EE programme. They can choose to direct their focus in a broad EE landscape which has a topography that ranges from narrow scientific valleys through to the broad plains of an activist/advocacy focus. It could be argued that pedagogical decisions are influenced by the resource chosen. A surface reading of a resource could indicate how students could be involved. Their engagement could be limited to scientific data collection about the quality of water in a waterway (Lord 1999) or encompass all the aspects of the socioscientific issue[1] (Sadler 2011) of the spread of didymo (*Didymosphenia geminata*) through recreation activities like kayaking and fishing. Furthermore, when one considers the SAQ (Legardez and Simonneaux 2006) of the control of the common brush-tailed possum (*Trichosurus vulpecula*), then there are not only the ecological and tourism-related issues of the decimation of the New Zealand native forests, bird and invertebrate populations but also the economic issue of the possum being the host and not vector which spreads bovine tuberculosis to cattle and deer. Each of these philosophical approaches signal a degree of domain focus, complexity of the issue and level of student autonomy over learning and action.

In fact, the narrowness of the role of science in environmental education has been questioned (Skamp 2009; Tsevreni 2011), it is argued that an SAQ approach is relevant to EE because this approach reflects the breadth, complexity and acuteness of environmental issues where not only scientific knowledge is considered, but social interactions such as patterns of political and economic government, risk and the notion of taking action are central (Simonneaux, Panissal, and Brossais 2013).

All of these approaches can be subsumed within the EfS movement, also known as education for sustainable development (ESD) that dominates the French education system (Simonneaux and Simonneaux 2012). Birdsall's (2013) didactic (pedagogical) framework for an EfS curriculum provides a way for learners and teachers to develop an understanding of an environmental issue and justify their actions. Consequently, the didactic focus for EfS is for learners to be able to make pro-environmental decisions in order to take action on or advocate for environmental issues (Tilbury 1995). We support this overview of EfS because interdisciplinary learning from an inquiry-based focus occurs within this

didactic focus. Here it is anticipated that learners will be able to examine their own value positions and develop an environmental ethic. A key didactic principle is to develop a level of criticality where learners can start to understand the underlying causes of un-sustainability in society as well as their political literacy (Tilbury 1995). It is hoped that experiencing an EfS curriculum would provide learners with the capacity to consider probable and possible futures from a sustainable perspective, which in turn would influence their vision for the future and the type of action that they would take.

A SAQ approach and its educational configurations

A SAQ approach (*Questions Socialement Vives* in French) has its origins in a particular view of science – that of Post Normal Science (Funtowicz and Ravetz 1993). This view of science moves decision-making out of a laboratory and sees science as practised in the public domain where its direction is determined by a wider range of stakeholders than scientists alone. Post Normal Science has a more humanist rather than reductionist approach. Furthermore, it acknowledges that science involves uncertainties and disputed values when high-stakes, pressing decisions need to be reached about the application of scientific knowledge. Perceptions about risk and an understanding of the risk analysis process are also essential components.

A SAQ approach can be described as presenting open-ended questions about issues that involve 'messy' problems that are controversial and have social implications by challenging social practices and value systems that are considered important in society (Legardez and Simonneaux 2006). Because a SAQ approach has its roots in Post Normal Science which views science as practised in the public domain and being influenced by a variety of stakeholders, it is interdisciplinary in nature. This interdisciplinarity recognises that different knowledges are required when studying an open-ended, controversial issue. Also, it acknowledges that issues are complex and science alone cannot cope with their 'messiness' (Simonneaux and Simonneaux 2012). Due to their complexity, these issues raise uncertainties, which leads to the need for an understanding of risk analysis.

Another unique feature of a SAQ approach is its degree of 'acuteness' (Simonneaux and Simonneaux 2012). This term refers to an issue's potential for controversy, not only at a societal level, but also when an issue is discussed in the classroom. Simonneaux, Panissal and Brossais (2011) suggest how a SAQ approach could be pedagogically managed in a classroom. They developed a continuum where such management could range from 'cool' where the issue is considered theoretically, to a high degree of acuteness that is referred to as 'hot' where a pedagogy is employed so that students can debate and justify their views in terms of risk, using a range of knowledges in order to consider action.

Based on their SAQ approach, Simonneaux and Simonneaux (2012) have provided a typology of educational configurations identified from their research with teachers that could provide information about how teachers taught SAQs about sustainability. These authors argue that a teacher's pedagogy is influenced by the types of information which a teacher uses, alongside a teacher's view of science and the didactics they employ. From their data these authors developed three educational configurations consisting of attributes of knowledge, epistemic posture and didactic strategies. These configurations enabled a map to be constructed that illustrates the complex mixture of decisions teachers make when teaching.

However, there are subtle signals in the resources that teachers choose when planning for teaching an EE programme. We have transformed these educational configurations into a series of questions that provide an analytical tool to interrogate the subtle signals found in EE resources. Simonneaux and Simonneaux's (2012) attributes of knowledge can be interpreted as the resource writer's stance on what knowledge is important/valued, trustworthy and valid. Epistemic posture has been translated into the way that a writer has presented the material, that is how they view science within the resource. Finally, Simonneaux and Simonneaux's (2012) categorisation of their teachers' didactic strategies can be related to the resource writer's choice of didactics that reflects their views of learning.

Because Simonneaux and Simonneaux's (2013) configurations do not mention components such as values exploration, envisaging possible futures or developing political literacy which are essential components of an EfS focused curriculum (Tilbury 1995), Birdsall's (2013) components (459) were also incorporated into the interrogatory questions.

These educational configurations and components have been transformed into a series of questions listed in Table 1 with links to the relevant configuration and component. The educational configurations will now be discussed in turn.

Attributes of knowledge acknowledge that solutions to controversial issues require interdisciplinary knowledge, that is 'hard' science and social sciences. Consequently, it is significant to note who has published the material, for example a university, a scientific community, as well as its disciplinary link(s) (Questions 1 and 3 in Table 1). Simonneaux and Simonneaux (2012) provide four attributes of knowledge, or conceptions of knowledge construction (Questions 17–19): universal knowledge; plural

Table 1. Interrogatory questions for analysis.

Grouping of questions	Question and link to SAQ component
Contextualising questions	1. What are the name, publisher and date of the resource? (linked to *Attributes of knowledge* configuration) 2. Are the goals/aims of the resource identified and what are they? (linked to *Didactic strategies* configuration) 3. Identify the references sourced to develop the resource? (linked to *Attributes of knowledge* configuration) 4. What references are provided to extend learning? (linked to *Didactic strategies* configuration) 5. Describe the method of presentation – printed material, visual material, audio-visual resources, etc.
Pedagogical framework (based on Birdsall's (2013, 459) components for teaching EfS)	6. At which level is this resource pitched? 7. Where does this resource fit into *The New Zealand Curriculum*? Give examples of overt and implicit links 8. What potential has the resource for teaching sustainability? (environmental, socio-cultural and economic)? (linked to *Didactic strategies* configuration) 9. What science concepts are apparent? Which ones are the most important and why? (linked to *Didactic strategies* configuration) 10. What opportunities are available to develop understanding about NoS? (linked to *Didactic strategies* configuration) 11. What opportunities are available to develop scientific inquiry skills? (linked to *Didactic strategies* configuration) 12. Does the resource provide an opportunity for students to present their own points of view? If so, what are these opportunities? (linked to *Didactic strategies* configuration) 13. What values do the authors identify in the resource? (linked to *Didactic strategies* configuration) 14. Is there any evidence of a future scenario/implications for the future in the resource? (linked to *Didactic strategies* configuration) 15. Are there spaces for students to develop their political advocacy skills? (linked to *Didactic strategies* configuration) 16. Are their spaces for students to develop personal action-taking skills? (linked to *Didactic strategies* configuration)
Knowledge development (all linked to Attributes of knowledge configuration, that is universal/plural/engaged/contextualised)	17. Who provides the scientific knowledge in this resource? 18. What scientific claims have been made and how are they authenticated? 19. What evidence is provided to justify the stance/position of this resource?
The role of science (all linked to Epistemic postures configuration, that is scientistic/utilitarian/scepticism/relativism)	20. How is scientific knowledge used in the resource? 21. What evidence is there that people other than scientists have been consulted in the development of the resource? 22. What non-scientific views are apparent?
Achieving learning goals (all linked to Didactic strategies configuration, that is doctrinal/problematizing/critical/pragmatic)	23. Is an underpinning pedagogy apparent in the resource? If so, what is it? 24. Identify the presence of the following strategies: • opportunities for critical thinking • space for critique of scientific evidence • identification of risk factors

knowledge; engaged knowledge and contextualised knowledge. *Universal* knowledge is set within the traditional model of science knowledge development that provides 'truth' about the world that is generalizable and is obtained from empirical data. Such knowledge would be gleaned from scientific papers or data collected about an issue. The construction of *plural* knowledge acknowledges that different paradigms may be used as evidence to substantiate the best resolution for an issue and it is less concerned with a scientific view of 'truth'. *Engaged* knowledge is a response to controversies and signals an awareness of the complexity of knowledge sources that are employed when responding to a SAQ. Uncertainties, possible risks and stakeholders' values are clarified. *Contextualised* knowledge relates to knowledge constructed in a specific situation that is interdisciplinary and can integrate local knowledge that could be produced by stakeholders.

The epistemic posture of a resource writer can be related to their viewpoint of science. These four categories are based on Simonneaux and Simonneaux's (2012) research into the epistemology and sociology of science and are the scientistic posture; utilitarianism; scepticism and relativism (Questions 20–22). The *scientistic* posture acknowledges that science is essential to progress, and therefore superior, sacralising science and the scientist. This dominance is reflected in a hierarchy where science knowledge is directly attributed to scientists. The posture of *utilitarianism* capitalises on the reductionist nature of science by using specific knowledge as a resource when decisions are made and/or actions taken. Consequently knowledge use is foregrounded with examples of how this happens. *Scepticism* is a posture that recognises the risks involved with science breakthroughs. The resource would then include media reports about controversies and material that develops awareness that science is influenced by political and economic interests. Consequently critical thinking skills are foregrounded. As a posture, *relativism* posits that science is not superior and there are different knowledges that are equal, such as cultural and religious beliefs. This posture is based on the work of Feyerabend (1979) who argues that science cannot be considered dominant because no universal knowledge validation can be ascribed to science. A resource would include different knowledge sources.

Didactic strategies are characterised by the educational aims and the ways in which these are achieved. The didactic strategies implicit in the resource would include the following educational aims (Questions 2, 8–16, 23–24): doctrinal; problematic; critical; and pragmatic (Simonneaux and Simonneaux 2012). A *doctrinal* strategy is employs a transmissive approach where the expert chooses and delivers the information to learners with little opportunity for interaction. Learning is determined by clearly defined objectives. The *problematic* strategy focuses learners' attention on a particular issue where the teacher is a facilitator so that learners can develop their own understanding and reasoning about an issue. Learning is contextualised and interdisciplinary. A *critical* strategy is focused on developing learners' critical thinking skills by teaching argumentation and assessing experts' information. Learners become aware of uncertainties and risks involved in environmental issues. A *pragmatic* strategy involves learning about taking action when involved real-life issues. The emphasis is on issues relevant to the learners' lives and action taken is not necessarily based on scientific data.

Research design

A series of questions have been identified (see Table 1) that could enable educators to interrogate an EE resource. These interrogative questions have been adapted from Simonneaux and Simonneaux's (2012) attributes of knowledge, epistemic postures and didactic strategies alongside Birdsall's (2013) components for teaching EfS. It was hoped that answers to these questions would enable a teacher to locate a resource in the landscape of EE, that is environmental science, SSIs, SAQs and EfS. Once a teacher had decided where to situate the resource, they could decide if this resource fitted their educational focus and make adjustments according to their learners' needs.

The following research question was posed to determine if such an analysis tool was effective for this interrogation:

What educational configurations of an EfS resource can be identified when planning for EfS teaching and learning?

Testing the tool

Following the development of the interrogatory questions (Table 1), the tool was trialled using three EE resources. One was set in the context of New Zealand estuaries and was written for secondary biology students aged 15–18 years of age. The other related to the issue of invasive plants and the final one explored the issue of a critically endangered dolphin. The latter resources were written for primary students (5–12 years of age). Results of this analysis showed that our tool was able to reveal the educational configurations of these resources (France and Birdsall 2014).

For this paper, two other resources were selected, one national and one international. Because an SAQ approach has a science foundation, we wanted to explore if our tool could be used to analyse resources that did not have a science focus. Thus one of the resources selected had a social sciences focus.

We analysed each resource separately using the interrogatory questions and recording comments related to each of the questions. The whole of each resource was analysed. Next we met and discussed their analysis. When differences were encountered, these were resolved through discussion. These raw data in the form of comments are displayed in a table in Appendix 1.

Next we analysed our responses in terms of the educational configurations, looking for signals of the different configurations in the comments and making a holistic judgment. For example, when analysing the Attributes of knowledge in one resource, it was noted that it was developed by scientists and published by a government department. Scientific evidence supported knowledge claims and scientific concepts were used throughout the resource. These comments suggested that this resouce illustrated a traditional model of science knowledge development, so it was deemed to be having attributes of *universal* knowledge. This second stage of data analysis is illustrated in Tables 2 and 3.

Description of the resources

Habitat Heroes: explore your local green spaces – Tūhura koutou wāhi matomato rohe

This is a primary school teacher resource for students aged 5–12 years of age that was produced by New Zealand's Department of Conservation by accessing writers from the education and scientific communities – however no overt authorship is claimed. This New Zealand-focused online resource contains information about New Zealand's green spaces and contains activities that are strongly linked to the scientific collection of data (http://www.doc.govt.nz/get-involved/conservation-education/resources/habitat-heroes-green-spaces/). The structured activities have a socio-constructivist learning focus with activities for learners to access their prior knowledge and then collect scientific evidence to support their view of the level of biodiversity in their local green space. The activities allow learners to discuss their results with teacher direction and there is a focused opportunity for action-taking that is practical, rather than political or economic. This online resource provides direct links to New Zealand curriculum requirements and is 17 pages long.

Keep wild animals wild

This online resource designed for three different age groups, provides a persuasive socially-focused argument against the use of wild animals as pets and their body parts as products. This analysis was done on the 8–10 year old resource (24 pages long), however the material for the 12–14 year old group (22 pages long) was examined to see if there was a change in tone. But no tone change was apparent. The resource provided many opportunities for learners to locate themselves in a values continuum for keeping a wild animal as a pet and/or buying products made from wild animal parts (http://www.ifaw.org/united-states/our-work/education/keep-wild-animals-wild). The case was made for wild animals with an internationally-focused selection of endangered animals. This international focus was continued with many children of different ethnicities commenting on the issue in their own languages. The activities allowed learners to reflect on their changing views and solicit their peers' opinions. The video had an underlying bias in that all of the children featured at the conclusion were in support of banning the

use of wild animals as pets or products. Educationally, this resource is underpinned by a socio-cultural learning theory with the video and magazine taking the advocacy role.

Data reveals the signals and configurations

Our examination of these two resources will now be discussed in turn to illustrate the potential of this tool to provide an analysis of the focus of the educational configuration of each resource.

Habitat Heroes: explore your local green spaces – Tūhura koutou wāhi matomato rohe

At first glance, this resource appears to have all of the attributes for EfS in that there are pictures of children taking part in environmental activities such as observing birds and gathering data and accompanied by helpful conservationists. The layout of short, explanatory notes that are interspersed with beautiful pictures of New Zealand flora and fauna and the close links to *The New Zealand Curriculum* (Ministry of Education 2007) that are found in the educational section, could inspire an EfS teacher to embrace this resource wholeheartedly and embark on an EfS programme.

However, an examination of the education configuration of this resource reveals quite a different story as illustrated in Table 2. This table shows that this resource has an education configuration where its attributes of knowledge are universal, it has an epistemic posture that is scientistic and the didactic strategies employed are doctrinal and pragmatic.

Table 2. Educational configuration of Habitat Heroes – Green Spaces resource.

Components of configuration	Characteristics of component identified	Analysed data
Attributes of knowledge	Publisher	Published by government department
Universal	Science knowledge provides 'truth' and is generalizable	Knowledge from Department of Conservation scientists and scientific book
	Knowledge based on empirical data	Scientific evidence supports claims
		Dominant concept biodiversity and other scientific concepts included
Epistemic posture	Science is essential for progress, therefore science is superior, sacralising science and scientists	Evidence-based knowledge approach employed
Scientistic		Modelling of data collection as evidence
		Value of science as being able to provide answers
	Science knowledge directly attributed to scientists	Trust in scientists as being able to provide information for conservationists
		No non-scientific views apparent. Ministry of Education website only non-scientific contribution
Didactic strategy	*Doctrinal* – transmissive approach, expert chooses and delivers information, little interaction	*Doctrinal* – models how scientists collect evidence
Doctrinal/pragmatic		Knowledge about scientific experimental skills developed
	Learning determined by set objectives	Development of understanding of scientific concepts through discussion and use of scientific vocabulary (introduced by teacher)
	Pragmatic – learning about taking action when involved in real life issues. Emphasis on relevant issues	Nature of science understandings developed through scientific investigations
		Opportunities for discussing evidence gathered but assumption that evidence is only scientific
		Ecological values implicitly presented
		Pragmatic – learners encouraged to take action, action-taking template provided
		Envisioning of a possible future
		But action encouraged is of direct, 'safe' type, not political

The first set of questions provide information about the knowledge sources of this resource which come from information published by government departments which has been accessed from scientists. Without doubt, professional competence is stamped all over this document with the goal of obtaining scientific evidence as the dominant theme. Scientists are not quoted but their underlying philosophy is expressed throughout the resource in that evidence is the foundation of all scientific endeavours. We would identify that the 'Attributes of knowledge' exemplified is *universal*, which means that this government-published resource is providing universal scientific knowledge that can be applied to solve the problem of an ecosystem that could show a paucity of flora and fauna diversity. The focus of this government publication is single-mindedly showing learners how to gather evidence using a hypothetical-deductive model. The writers presume that once learners have developed the scientific skills for collecting evidence, these outcomes could be used in any ecosystem, giving further evidence of a *universality* attribute. There is no capacity to acknowledge other forms of evidence. In fact the only acknowledgement of the bi-cultural nature of New Zealand is in this resource's title.

We would classify this epistemic posture as *scientistic* where science provides the discipline and framework. Within this resource, scientific data is required to support decisions and scientific data gathering strategies are provided so that the learners can mimic a scientific method where data is gathered systematically. This sacralisation of scientific knowledge enables the learners to make decisions with the assurance that there is only one way of looking at the world and there is no room for alternative views. However, this scientific view is rather simplified in that it does not give an appreciation of modern science in that there is no opportunity to acknowledge issues of risk and probability and that there could be other influences outside science that may affect their green space ecosystem. There is an encouragement for students to actively engage in improving their environment but all of the activities stem from the collected scientific data. There is a belief that an improvement in the biodiversity of the learners' green space would occur if they employed a rational, science, evidence-based data when working to improve the biodiversity.

Because of the sacralisation of science, it is inevitable that the didactic focus of this resource is *doctrinal* where there is an assumption that a hierarchical model of teaching will provide skills for learners to produce scientific evidence. Worksheets and defined experimental procedures are supplied to promote neutrality in both data collection and analysis. This neutrality is apparent when learners are asked to collate the data so that they have a larger data-set to support their judgment about the health of their green space. Although discussion is promoted, there is no space to express a diversity of views because the questions are focused only on the data that have been collected.

This analysis shows that in addition to the scientific data collecting skills, e.g. identifying pest footprints, mini-beast hunt, a scientific vocabulary forms a dominant didactic strategy, for example biodiversity, mammals, exothermic, pollinator, invertebrate and concept development of biodiversity. This scientific vocabulary development is supported by the development of scientific skill concepts such as hypothesis, sample, sample area, and data. It is interesting to note that although this resource has a strong scientism focus, most of the fauna has the Māori name as its 'common' name, rather than the Genus and species name. This could be because most New Zealand children are aware of Māori names for animals in the bush, for example tui, kererū, weka, and pūkeko.

This emphasis on disciplinary knowledge from 'hard' science is supported by the educational links identified through the curriculum links (2, 3 in the resource) where Social Sciences and Health & Physical Education are given brief attention with the curriculum links that could be utilised but no identified activities that could develop this type of knowledge.

We are not criticising this resource when we have identified the characteristics of its doctrinal focus. This implicit neutrality, emphasis on disciplinary knowledge, provision of a series of structured lessons and workshops, supporting biological science and ecology would provide a strong didactic framework for a teacher who wishes to carry out a science-ecology sequence of lessons that have an end point where learners can take direct action. This is signalled in the diagram 'Planning for action' (12) and gives a nod to the *pragmatic* didactic strategy. However the actions are 'safe' and do not involve

controversial, political activities. Teachers control the action and actions are 'eco-gestures' (Simonneaux and Simonneaux 2012, 83), rather than the autonomy that learners are encouraged to assume when carrying out an EfS programme. In *Habitat Heroes* learners' involvement is restricted to being encouraged to build a pollinator palace or a weta (a group of insect species in the *Anostostomatidae* and *Rhaphidophoridae* families) hotel, and plant tree species to attract bird life rather than tackle the economic issues that lead to declining biodiversity, for example agri-industry, urban sprawl and allocation of water volume.

Keep wild animals wild

This internationally produced online resource is so 'sexy' and will appeal to the idealism of the young who are in love with animals, particularly the furry ones. The website provides a magazine containing articles that illustrate the plight of many endangered wild animals; a video that shows a range of attractive young people from all over the world who express their love of animals and then at the conclusion, show how their views have been changed and that they never want to exploit wild animals; and a teacher resource that provides in-depth expertise through highly structured activities that are closely linked to the magazine and video (http://www.ifaw.org/united-states/our-work/education/keep-wild-animals-wild). This resource is glossy, accessible to both teachers and learners and in fact, is a sophisticated, persuasive resource.

Table 3. Educational configuration of keep wild animals wild resource.

Components of configuration	Characteristics of component identified	Analysed data
Attributes of knowledge *Contextualised*	Publisher Knowledge constructed in specific situation – interdisciplinary, can integrate local knowledge	Written by veterinarians and education resource writers. Published by IFAW Unsubstantiated scientific claims made All resource material supplied by IFAW (website, magazine, video) Experts in video not identified as scientists
Epistemic posture *Relativism*	Science not superior, different knowledges and all equal	Strong political and social advocacy focus Scientists not overtly involved – experts are veterinarians, animal welfare/rescue or wildlife campaigners Social sciences knowledge sources utilised Strong non-scientific views of animal welfare advocacy presented with international flavour – CITES
Didactic strategy *Problematising/doctrinal*	*Problematising* – focuses learners' attention on an issue, teacher facilitator, learners develop own understanding and reasoning related to issue	*Problematising* – aims for learners to explore issue of why people trade in wildlife and how do our choices as consumers affect animals Opportunity to present own viewpoint and that of an animal Value of animals belonging their habitat promoted along with risks to both people and wild animals when they come into contact Opportunities for reflection on ideas and learning but not in a critical manner *Doctrinal* – Opportunities for learners to put themselves in role of animal and thinking about how animals would feel Emotional focus on wild animal trade and 'rightness' of position put forward in this resource
	Doctrinal – transmissive approach, expert chooses and delivers information, little interaction Learning determined by set objectives	

This analysis of *Keep wild animals* wild could provide a teacher with a critical lens so that they can see past this very effective propaganda vehicle. Although we agree that wild animals should not be exploited either as pets or their body parts used as products, we question the unstinting use of emotion when delivering this message.

It is proposed that a measured examination using our analysis tool should provide some substance to our unease about this worthy package as shown in Table 3. This table illustrates an educational configuration as the attributes of knowledge being contextualised, the epistemic posture being relativist and the didactic strategies being problematizing and doctrinal.

First an evaluation of its attributes of knowledge. After an intensive search, we found that all hyperlinks in the resource led to the organisation who authored this resource. All evidence was anecdotal and delivered by experts in the video who did not substantiate their claims with scientific data. However they spoke authoritatively and the video was used to illustrate the points made. These experts were seen to be democratic in that they were representing associations engaged in and advocating for this cause (Brunet 2006). This symmetrical and democratic view of experts seen in the video shows that science is not preferred above any other disciplinary knowledge. To provide a scientific link, scientific vocabulary is used to substantiate the claim that the ecosystem is upset when wild animals are removed. Such words as 'keystone species', 'predator-prey relationships', animal 'adaption' and the concept of 'vulnerability' of an animal outside its 'habitat' are used. Therefore that the attributes of knowledge in this resource can be identified as *contextualised*. This categorisation is justified because there are equal contributions from scientists, experts and local people who are basing their evidence and justification for their actions on their observations and participation. Everybody seems to agree upon both the analysis of the issue and its resolution, which is indicative of an integrated expression of their values. Likewise, the resource is so integrated that one cannot identify a single discipline. This construction justifies calling it a-disciplinary which Simonneaux and Simonneaux (2012) refer to as the study of a functioning 'eco-socio system' (80). However it should be noted that an eco-socio system is not as simplistic as portrayed in this resource, since it refers to regions where the ecosystem and society have developed in parallel, for example the Pyrennean pastureland ecosystem found in the border between France and Spain.

The epistemic posture evident in this resource is that of *relativism* which has at its core the work of Feyerabend (1979) where science is not considered a superior form of knowledge and that all knowledges are considered equal. However, this resource does not signal that it is at the more radical end of relativism but it does acknowledge with its diversity and portrayal of an equality of experts, that an understanding of the world can involve a variety of knowledge sources, for example veterinarians, animal welfare/rescue and wildlife campaigners. Consequently there is a strong political and social advocacy focus and when scientists are involved, they are contributing to the cause by being veterinarians alongside those who are active welfare or rescue wildlife campaigners. Political advocacy is promoted with shots of delegates being present at a Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) conference. The nod to scientific understanding is provided with the use of scientific concepts such as habitat, ecosystem, adaptation and extinct and keystone species. These concepts are used beside the social concepts of consumer, commercial, product development and poaching. All of these features suggest that the epistemic posture is that all knowledge is used to explain and promote the cause of wild animal exploitation.

As we argued in the description of this resource, the implicit assumption of the 'rightness' of this cause and the supposition that behavioural change would solve the issue, could provide evidence that this resource could be described as propaganda, albeit beautifully packaged. The didactic strategies employed in this resource suggest that it has a strongly *problematising* focus but underpinned by a *doctrinal* approach. Its problematising characteristics are apparent in that learners are encouraged to construct the issue of keeping wild animals wild by carrying out a series of role plays where they act as a 'wild' animal or actors in a pet store skit that enables learners to consider different points of view (21). Interdisciplinary knowledge is apparent in that the learners are encouraged to think about the economic and social aspects of finding out why people trade in wild animals. It is also evident in the way in which the learners find out how to identify luxury products that have been sources from these

unfortunate animals. Conceptual understandings of scientific terms are developed through modelling of the concept of interdependence and the effect of removal of a keystone species (13).

There is an assumption that everyone using this resource will share the same values about the exploitation of wild animals. Consequently, didactic activities are used to firstly allow learners to put themselves in the role of the animal and think of their viewpoint (21) as well as using a practical exercise where they compare themselves to a sniffer dog who detects the presence of animals or products (8). The implicit shared value is to ensure the survival of wild animals by stopping the wild animal trade.

However, there is a strong doctrinal undercurrent present because learners are emotionally manipulated to firstly put themselves in the place of a wild animal – this could be considered a values clarification activity – but we consider its presentation is emotional. The statement in the magazine resource 'Imagine a world without wild animals' and a cartoon about a future without turtles not only signals a futures scenario but also re-emphasises this emotional focus. But there are many didactic strategies that allow learners to reflect on this issue and express their horror about this trade, i.e. through writing poetry, developing videos and murals to espouse their cause.

Action-taking is encouraged where learners develop warning labels for products and develop persuasive pamphlets. There appears to be little opportunity for critical reflection, for example in the 8–10 year old video there are no reasons given why poaching might occur while in the 12–14 year old resource's video, there is brief mention that poachers do need to make a living. We assert that the doctrinal underpinning message is declared even though there is an attempt to keep the explanation reasoned. It is left to the learners of all ages to emotionally promote their changed views at the conclusion of the video.

Opening the pedagogical gates for teachers

This analysis of two resources that appear to be differently positioned in the EE landscape could provide an opportunity for teachers to position the resource before deciding how they might approach teaching it. It is acknowledged that science education researchers have been attempting to make the discipline more relevant (Hodson 2011) and we assert that many successes are found in the EE field. These days, there is a push towards examining science-based issues using an SAQ approach, however there are many teachers who would find such a radical approach daunting (Hodson 2011).

Simonneaux, Panissal, and Brossais (2013) have constructed a continuum that allows teachers to locate their teaching programmes at an end where the science is used to solve problems to an opposing end where activism by learners is encouraged. These authors call one end of the continuum 'cold' and the other end 'hot'. The cold end allows teachers to design programmes where the focus is on learning science in 'interesting' contexts that could raise issues for learners. At the hot end Simonneaux, Panissal, and Brossais (2013) advocate teaching using an SAQ approach where all disciplines are employed when learners explore and justify their committed activism. The degree of warmth of these issues is underpinned by higher order thinking that involves attention to risk evaluation, values identification and socioscientific reasoning.

We assert that an analysis of a resource would be the first stage in identifying where the resource and perhaps where the teacher, would position the context in which they will use the resource to support teaching the issue. For example, *Habitat Heroes* could be considered at the cold end of the continuum because there is a strong science focus and an assumption of the universality of knowledge alongside sacralisation of science. We suggest that some teachers may decide to inject some criticality into their programme by asking different communities to comment on the reasons for degradation of a local green space – iwi (indigenous people), farmers, market gardeners and those people who have a strong belief in biodynamics. With such input, risk evaluation would then be explored and learners would need to critically examine their stance according to their values. In this way the issue is 'heated up'.

In contrast, *Keep wild animals wild*, could be a 'hot' topic but we assert that at this point, the hotness is superficial as it is based on emotion. Teachers might want to make this topic hotter but locating the issue in the learners' world. For example, in New Zealand is it appropriate to run a school fund-raising event where common brush-tailed possums (*Trichosurus vulpecula*) are hunted and their fur sold (see

http://www2.nzherald.co.nz/the-country/news/article.cfm?c_id=16&objectid=11883083)? When these events occur, learners and their parents have to examine their own values before identifying their stance. Alternatively, the teacher might wish to cool the issue by reducing the propaganda by collecting statistical information that is peer reviewed and providing activities that explore reasons why poaching occurs for the wild animal trade – using economic, political and social perspectives. Rather than using this resource to incite young learners to protest about an issue that could be far removed from their lives, it could be used as a catalyst for examining the issue of wild animals in their natural habitats closer to their lives that are exploited, for example the smuggling of native geckoes out of New Zealand.

Summary

We assert that this analysis tool has the potential to allow teachers to look in-depth at their didactics and the resources they assemble when developing an EE programme. Our explanation of the stances allow teachers to access the underpinning theoretical framing of resources and also understand and recognise the underlying messages as advocated by Monroe (2010), Ardoin, Biedenweg, and O'Connor (2015) and Carleton-Hug and Hug (2010). This tool provides teachers with a vehicle to critically analyse not only the resource but how they might position it in the EE landscape and employ didactic strategies that will situate them on the hot/cold continuum as identified by Simonneaux, Panissal, and Brossais (2013), thus improving a resource's efficacy (Carleton-Hug and Hug 2010).

However, this analysis tool does more than identify a resource's suitability for a particular group of learners or whether the resulting learning is effective. Instead it liberates a teacher by allowing them to assess a resource dispassionately while deciding the didactics they will employ to fully enhance the potential of a resource. This tool has potential to enable teachers to recognise how a resource can be adapted to suit their particular learners' context, rather than dismissing it as irrelevant and too far removed from them. In this way, a teacher's capacity for evaluation and programme improvement can be built (Zint, Dowd, and Covitt 2011). However, this tool does not contain the detail given by MEERA and an understanding of the epistemology of science is needed. Consequently, it could be that teachers might require professional development to assist with their capacity building.

A further limitation is that this tool cannot evaluate an entire programme but could, instead, be part of a suite of evaluation resources. Additionally, this tool has a science-based theoretical underpinning and it would be interesting to explore how effective it would be in evaluating a resource that has a strong social sciences focus.

Finally, there are many resources that are positioned within a discipline, for example social sciences, that are easily dismissed by those wanting to teach with a science focus and conversely those with a science focus often need to be heated up so that learners become more involved. We believe that this tool has such potential, enabling teachers to build their capacity to teach EE that fulfils the need to re-orient education towards sustainability.

Note

1. A socioscientific issue is science-based issue that has societal implications with no clear-cut answers. Such issues are relevant to learners and involve ethical reasoning. Consequently, when making decisions, both knowledge and values are needed and learners can come to different decisions even when considering the same knowledge base (Zeidler et al. 2005).

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Appendix 1. Data in form of responses to interrogatory questions.

Educational configuration	Questions	Habitat Heroes – green spaces	IFAW – Keep wild animals wild
Attributes of knowledge	Who provides the scientific knowledge in this resource? (Link to Questions 1, 3 and 17)	Department of Conservation scientists and published by a government departments, e.g. Landcare Research. Information from a scientific book (Andrew Crowe)	Not apparent in teacher resource but student resource, i.e. magazine, authors are identified for each article. A programme director has written an editorial letter. Written by education writers and veterinarians. See http://www.ifaw.org/united-states/about-ifaw/experts
	What scientific claims have been made and how are they authenticated? (Link to Question 18)	Scientific evidence supports claims and this is modelled throughout the resource	Unsubstantiated scientific claims have been made, e.g. animals are endangered due to wildlife trade (pets and products), elephant as a keystone species, predator-prey relationships, animal adaptation vulnerability of an animal outside its habitat
	What evidence is provided to justify the stance/position of this resource? (Link to Question 19)	Evidence that scientific concepts are used and dominant concept is biodiversity – adaptation used to explain this concept	All resource material is provided by IFAW in terms a website, magazine and a video and no links provided to anything else. Video provides anecdotal evidence provided by veterinarians, animal welfare and wildlife rescue campaigners. Experts in the video are not identified as scientists. Map provided shows international routes used to traffic wildlife products
Epistemic posture	How is scientific knowledge used in this resource? (Link to Questions 9 and 20)	Evidence-based knowledge approach Scientific knowledge is modelled as evidence, e.g. data collected is evidence – scientific observation produces data, i.e. chart about healthy vs. unhealthy green space indicators	Strong political and social advocacy focus. Where scientists are involved, they are veterinarians, animal welfare/rescue or wildlife campaigners. The scientific terms used are habitat, ecosystem, exotic, adaptation, salmonella, extinct and keystone species
	What evidence is there that people other than scientists have been consulted in the development of this resource? (Link to Question 21)	No consultation evident Only reference to Māori is title of resource – Tūhura koutou wāhi matomato rohe Only reference to Ministry of Education is providing URL for curriculum links	No consultation evident. But social terms have been used such as consumer, commercial, products, poaching In video there is a section where reference is made to a CITES (Convention on International Trade in Endangered Species of Wild Flora and Fauna) Conference
	What non-scientific views are apparent? (Link to Question 22)	None	Very strongly non-scientific views of animal welfare advocacy. Political advocacy of IFAW at CITES Conference Experts not identified as scientists. (Because this was the 8–10 year old resource, there was no mention of scientific activity. However, the 12–14 year old resource did mention DNA fingerprinting for tracing elephant ivory by scientists)
Didactic strategies	What educational aim(s) is implicit in the resource? (Link to Question 2)	Provide awareness of biodiversity and model how scientists collect evidence to support small-scale, direct action-taking to improve the environment	Finding out why people trade in wildlife and how do our choices as consumers affect animals. The resource provides a way of answering second question but not first. Economic and social aspects taken into account in 12–14 year old resource, i.e. need for poachers to provide for their families

(*Continued*)

Appendix 1. (*Continued*)

Educational configuration	Questions	Habitat Heroes – green spaces	IFAW – Keep wild animals wild
	What disciplines are utilised in the resource? (Link to Question 4)	Science but minimal links to Social Sciences, Maths and English with no activities but instead linked to curriculum outcomes	Social Sciences, English and minimal Science
	What knowledge sources are accessible for learners? (Link to Questions 4, 10 and 11)	Scientific experimental skills knowledge developed by scientists, e.g. 5 min bird count activity	Social sciences knowledge sources used – magazine and video provided, however both sources presented one viewpoint and composition close to propaganda
		Sourced scientific methodology used by scientists and translated them for classroom use, e.g. footprint activity has been referenced to a scientific paper, 5 min bird count activity justified by previous conservation data gathering exercises	Anecdotal evidence was provided. But 12–14 year old video had clips of poaching activity and control
	What types of learning experiences/activities are proposed? (Link to Questions 9 and 23)	Prior knowledge identification through activities such as identifying and grading biodiversity of learners' green space	Prior knowledge identification through questioning Personal values positioning and with some justification opportunities
		Discussions	
		Development of scientific concepts through discussion and use of scientific vocabulary (introduced by teacher)	Interpreting and writing own poetry Role play, e.g. being a wild animal
		Modelling nature of science activities through investigations – e.g. plant identification, mini-beast hunt, tracking pests, 5 min bird count	Modelling how a dog sniffs out illegal wildlife objects. Modelling role of a keystone species Modelling the concept of interdependence indirectly
		Reflection on data collections, drawing conclusions	Pet shop skit Comparisons between a wild animal and a domesticated animal, e.g. a worksheet
		Taking action based on data and conclusions drawn	
	Does the resource provide an opportunity for learners to present their own point of view/a diversity of viewpoints? (Link to Question 24)	Opportunities for discussing evidence gathered but assumed that this evidence must be scientific – only in terms of scientific evidence	Opportunity to present own viewpoint, e.g. values clarification activity Opportunity to put self in role of animal and think of their viewpoint
	What values are implicit in the resource? (Link to Question 13)	Implicitly presented – strong ecological values – significantly encouraging learners to value biodiversity and take action, e.g. 'How can you make it better?'	Ensuring the survival of wild animals Stopping the wild animal trade in terms of pets and products Animal welfare ethic of animals belonging in their habitat
		Value of science as being able to provide answers	
		Justification of action taken through scientific data	
		Trust in scientists being able to provide information for conservationists and their projects	

How are risk factors considered? (Link to Question 24)	None	Risk factor of wild animals scratching or biting their owner, their carrying of disease and the wild animal catching a disease from their new environment Risk to wild animals of being poached and trafficked or killed for their product
Is there evidence of learners considering a future scenario or examining implications for the future? (Link to Question 14)	Yes – part of action-taking cycle – Step 2 is envisaging a future but limited to the green space studied	Yes – 'imagine a world without wild animals …' and in magazine a cartoon about a future without turtles
What opportunities for critical thinking are offered? (Link to Question 24)	None – only reflection on data collected	Opportunities for reflection on ideas and learning but not in a critical manner In 12–14 year old video there was identification of poachers needing to make a living but overall there was an unquestioned message against wild animal trafficking as pets and products that was based on animal cruelty as no mention of plants being trafficked
Are there spaces for learners to develop political advocacy skills? (Link to Question 15)	None	Opportunities for learners to present their ideas to peers, community and enter competitions Opportunity to develop persuasive pamphlets about keeping wildlife wild
Are there spaces for learners to develop personal/group action-taking skills? (Link to Question 16)	Learners encouraged to take action and action-taking cycle provided but direct action is encouraged rather than indirect (political) actions, e.g. build a pollinator place, wētā hotel, plant tree species to attract birdlife	Learners to develop warning labels for products that contain wildlife products by identifying the exotic animal's journey from its natural habitat Creating murals promoting keeping wildlife wild Creating videos
Is there potential for teaching about sustainability (environmental, societal, economic)? (Link to Question 8)	Sustainability not overtly mentioned. Environmental component of sustainability is implicit and could be developed by a teacher	Sustainability not overtly mentioned. Potential for teaching about social and economic components of sustainability could be developed
Are there opportunities to learn about NOS/scientific inquiry skills? (Link to Questions 10 and 11)	Modelling nature of science activities through carrying out scientific investigations – e.g. plant identification, mini-beast hunt, tracking pests, 5 min bird count Reflection on data collections, drawing conclusions	None