Digital Immersion for Sustainable Tourism Education: A roadmap to virtual fieldtrips

Dr Christian Schott

School of Management

P.O. Box 600

Victoria University of Wellington

Wellington, New Zealand

+64-4-4635719

christian.schott@vuw.ac.nz

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ABSTRACT

Fieldtrips have been an important component of a range of educational disciplines for many decades and the associated pedagogies of active and experiential learning have been promoted since the early 1900s. Active learning, which is an integral part of fieldtrips has been found to act as a valuable means of engaging students with the subject, enhancing student's subject knowledge and understanding, and developing lifelong learners. Fieldtrips additionally allow for a concept or topic to be examined in its social, cultural, environmental and political context, thus creating a space for situated learning, which is recognised to assist in crystallising learning outcomes for students. The merit of fieldtrips to learn about complex topics, such as sustainable tourism development is thus well established. However, today's teaching and learning budgets are constrained and students are less able to pay for fieldtrips in the face of steadily increasing tuition costs in most countries than they may have been in the past. As a consequence, the tradition of fieldtrips has become less common despite its recognised educational value. In response, this book chapter presents a learning tool which provides a trade-off between the benefits and drawbacks of the comparatively affordable 'one dimensional' text based case study and the rich, authentic, but increasingly less accessible multi-dimensional experience of a real fieldtrip – a digital immersion (virtual) fieldtrip.

Keywords: virtual fieldtrips, sustainable tourism development, digital immersion, active learning, Open Simulator, Fiji

INTRODUCTION

Fieldtrips have been an important component of a range of educational disciplines for many decades and the associated pedagogies of active and experiential learning have been promoted since the early 1900s by the educational philosopher John Dewey (1968). The active learning process which is an integral part of fieldtrips has been found to act as a valuable means of engaging students with the subject (Hanson & Moser, 2003; Schott & Sutherland, 2008), enhancing student's subject knowledge and understanding (Chickering & Gamson, 1987) and developing lifelong learners (Clegg, 2000, cited in Wolfe, 2006). While there is a lack of consensus over an exact definition (Prince, 2004), at its core active learning entails strong student ownership of the learning process and thinking about the things they are doing as part of that process (Bonwell & Eison, 1991), which differentiates it from passively focused "absorption learning". Fieldtrips additionally allow for a concept or topic to be examined in its social, cultural, environmental and political context, thus creating a space for situated learning, which is recognised to assist in crystallising learning outcomes for students (Jakubowski, 2003; Scarce, 1997). The merit of fieldtrips to learn about complex topics, such as sustainable tourism, particularly when situated in environments that are environmentally, socially, and culturally unfamiliar, is thus well established.

However, today's teaching and learning budgets are constrained, there are increasing workload pressures on staff (Dredge & Schott, 2013), and institutions are concerned about liability issues related to off-campus activities (Pearson & Beckham, 2005). Additionally, students are less able to pay for fieldtrips than they were in the past due to steadily increasing tuition fees, and there is growing recognition of the negative environmental impacts that are generated by air travel which can be part of fieldtrips (Schott, 2012). As a consequence, the tradition of fieldtrips has become less common despite its recognised educational value. The growing cohort of educators who don't have the option of incorporating a fieldtrip into their curriculum, but nevertheless wish to deepen students' learning by applying complex concepts to a meaningful context, have two alternatives:

(1) To revert to predominantly text-based case-studies which describe the case's context and complexities with the support of illustrations and in some cases videos; or
(2) To embrace 21st century technology and harness its educational capabilities by developing a tool for 'digital immersion' active learning using virtual reality software.

While text-based case studies have in recent years become less one dimensional and descriptive through the support of digital illustrations, the richness of both active and situated learning is largely absent in this learning tool. Equally, the ability for students to learn about the profound interrelationships that are central to complex topics, such as sustainable development, is compromised by text-based case-studies. The second option, which can best be described as a virtual fieldtrip, has the ability to 'bring alive' the information contained in a text-based case study in addition to replicating some of the complexities and contextual richness of real fieldtrips by providing a platform for (digitally immersed) situated and experiential learning. The need for greater use of non-text based learning tools, is further underscored by the diversity of learning styles present in our classrooms; our current generation of students is more diverse than ever, which inevitably leads to an increased prominence of a diverse range of learning styles (such as kinaesthetic, spatial-visual and audio), in addition to text-based learning styles. As such, the virtual fieldtrip can be conceptualised as a trade-off between the benefits and drawbacks of the comparatively affordable 'one dimensional' text based case study and the rich, authentic, but increasingly less accessible multi-dimensional experience of a real fieldtrip. Based on this strong pedagogic rationale and given that many students have experienced a digitalised childhood and youth, this chapter promotes the digitally immersed case study (referred to as the virtual fieldtrip), as an effective learning tool that aligns strongly with the digitalised everyday lives of students.

Conceptualising 'virtual fieldtrips'

Over the last 15 years educators spanning many disciplines have been inspired to recreate aspects of the 'field' in visual and audio format with the aim of adding meaning and context to the topic being discussed. Some refer to these learning tools as 'virtual fieldtrips'; however, the term is used for a wide variety of teaching and learning tools. Examples include videos of a teacher's real fieldtrip, pictures of a particular location supported by interpretative text, use of Google Earth coupled with YouTube videos and 360 images to provide a visualisation of a place and its features, and the most recent projects which present virtual reality 3D renderings of buildings or specific reality-inspired objects. All of these approaches to enrich the teaching and learning experience are valuable as they appeal to a variety of learning styles and seek to present an authentic account of a case. However, current technology allows a much greater penetration into the foundations of experiential and situated learning by immersing learners in a complex, three-dimensional learning space. What sets this project apart from the various

'virtual fieldtrip' formats outlined above are: the experimental recreation of crucial 'human and cultural facets' of the real world; the large scale of the case which incorporates two villages; the nature of the assessments (fieldwork) requiring groups to learn by conducting research in the field, and finally the ability of the students' group discussions to take place 'in the field' (between avatars while in the virtual environment). For this project, a virtual fieldtrip was thus conceptualised in the following way:

> *A virtual fieldtrip recreates a wide range of aspects and complexities of the real world in digital format using both audio and visuals (3D objects, videos, still images, and documents). It allows student researchers to digitally immerse themselves and collaborate in the environment (physical and social/cultural) with the aim of completing fieldwork tasks similar in nature to those set during real fieldtrips.*

The project was designed for second year Tourism Management students at Victoria University of Wellington (New Zealand) with funding from the VUW Teaching and Learning Development Fund. It was specifically targeted at a compulsory second year course on Sustainable Tourism Development (STD) because of the myriad of complexities that are inherent to STD but difficult for students to truly appreciate while sitting in a lecture theatre. In response, the virtual fieldtrip was created to deepen students' learning by applying the theory from lectures and readings to a remote Fijian island and its two communities, which are exposed to a variety of local and global challenges that most students in New Zealand struggle to relate to; but which are not uncommon in developing countries. Additionally, Fiji is important from a tourism perspective as it is the third most visited country by New Zealanders (Ministry of Business, Innovation and Employment, 2013) and as such a place of great relevance to New Zealand undergraduate Tourism Management students – as future managers and as tourists. While providing an authentic case for students to apply the concept of STD to the realities of a community, learning about these realities also serves to reinforce the acute need for STD which in turn illustrates the relevance of the topic and the rationale for learning about it. Three specific pedagogical drivers underpinned the project:

- A desire to enhance authenticity of the learning context;
- Fostering an acute sense of the interconnectedness and complexities of social, cultural, environmental and economic factors impacting communities (particularly in developing countries); and

- Increasing access to, and passion for, learning

The Fieldwork Task

The student task was designed as a role play where the second year students worked for a New Zealand-based Tourism Consultancy which specialises in STD. Students worked in project groups of three or four and were dispatched to conduct fieldwork on the (virtually recreated) Fijian island in response to this fictional initiative:

A collaborative initiative between the Government of Fiji and NZ Aid has been set up to determine whether strategic STD of a remote Fijian island would result in the positive impacts outweighing the negative ones – the three dimensions of sustainable development need to be considered as do the direct, indirect and induced, and the short as well as long term impacts.

As students needed to determine whether the benefits of STD would outweigh the associated costs, they had to incorporate compromises and trade-offs in their decision-making; much like in the 'real world'. Based on this process, groups could either (a) devise a STD plan for an area of their choice, or (b) present an argument against any development initiatives. To combine deep learning with the development of diverse communication skills, a group presentation of the proposal was followed by the submission of a detailed group report in the form a wiki (collaborative, media enhanced online document).

To render the fieldwork experience as authentic as possible students were advised to start their visit at the same point where the researchers who developed the virtual fieldtrip arrived on the real island. Fijian cultural protocol dictates that on arrival visitors must meet the village elders and present gifts (kava) as part of the 'I sevusevu' ceremony, which serves to explain the visitors' intentions and to seek welcome onto the vanua's (community) land. Students need to watch the video of the researcher's 'I sevu sevu' ceremony to understand this important Fijian custom, which is the first of a number of cultural insights which emphasise both the significance and nature of the vanua's cultural protocols. Afterwards, the students freely explored to learn about the island: the geography, topography, flora and fauna, the two villages and their layout, the communities' customs, community members' opinions and aspirations, any potential touristic resources, the current sourcing of fresh water, how the communities meet their energy needs, schooling, and health facilities amongst other important considerations.

Based on this fieldwork each project team had to initially discuss and decide whether they felt that the positive impacts of any STD would likely outweigh the associated negative impacts. There are no 'right' or 'wrong' answers to this, rather the task is about presenting an informed argument. The teams that worked on a proposal incorporating a sustainable tourism development plan had to address five key criteria: products & facilities, target market, community participation/consultation, maximisation of benefits for community, and natural resources & the environment. The teams that were opposed to any development were asked to discuss the rationale behind their decision by addressing the economic, environmental, and socio-cultural reasons. Following a group presentation of the pro or contra proposal to the fictional funding bodies a more detailed proposal was submitted by each group using a wiki, thus allowing for easy collaboration and extensive media enhancement of the proposals.

DEVELOPING A VIRTUAL FIELDTRIP: A DEVELOPMENT ROADMAP BASED ON THE FIJIAN VIRTUAL FIELDTRIP PROJECT

To illustrate the process of developing the virtual fieldtrip, as briefly described above, key steps will now be outlined for those who are interested in replicating the concept, which can be applied to a variety of settings and topics; but is a particularly powerful learning tool for sustainable tourism because of its complex and applied nature. The selection process for suitable technology and software was conducted in mid 2011. As such, the software selection process for a replication project should be conducted using the options available at that time rather than relying on the options identified for this project in 2011.

Software Selection Process

All potentially suitable software was identified and evaluated against a set of criteria including: user friendliness, adaptability, versatility, interactivity, and a number of other specific points. For each of the criteria it was considered important to distinguish between three different project dimensions: the initial building phase, the ongoing maintenance, and the daily use by learners (see Appendix 1 for more detail about the criteria and the scoring matrix). This resulted in a short list of three possible programmes that were further evaluated.

The software program ultimately selected for the project was the Open Simulator (OpenSim) because of the following key benefits: in step with progress in virtual world software and appeal

to users, does not incur development or usage charges, no infrastructure costs because of ability to join a New Zealand-based OpenSim digital learning initiative called the New Zealand Virtual World Grid (primarily used for role play and architectural design), software and hardware requirements were met by VUW student computers, ease and speed of development functions, ability to update the virtual world.

OpenSim is the software that runs the virtual world, but it requires a 'viewer' to access it. We found Imprudence Viewer to be most effective for our purposes. Because OpenSim requires Internet access to constantly download the virtual world's content it is worth noting that data usage varies between roughly 40MB of data per hour for low resolution settings, and roughly 200MB per hour for the highest resolution settings.

Scale of the Virtual Island

The creation of the project began with a detailed assessment of the Fijian island's size relative to server capacity and practicality considerations in order to determine how many 'regions' would be appropriate to develop the virtual island. At the same time, consideration was given to the scale at which the island and its detail would be created as the relative size of objects and distances between villages and facilities are important features of a virtual fieldtrip. After discussion with the server manager, the decision was taken to develop the virtual island at a scale of roughly 1:3. At this scale the virtual island was spread over eight regions with the most notable exception to the 1:3 scale being applicable to the two regions connecting the two villages where only an approximately 1:6 scale could be achieved (see Figure 1); while the change in scale is not accurately reflective of the island, the key messages about significant distances (such as the time required for children to walk to school) were still clear through the use of signs. The benefits of developing the virtual island at this scale and in this manner are: i) that while all the significant detail and information was still placed in its appropriate context it was believed that students are less likely to lose interest in exploring the island than if it took three times as long to walk from point A to point B, and ii) that lesser demands are placed on the server than if more regions were utilised for the virtual island.

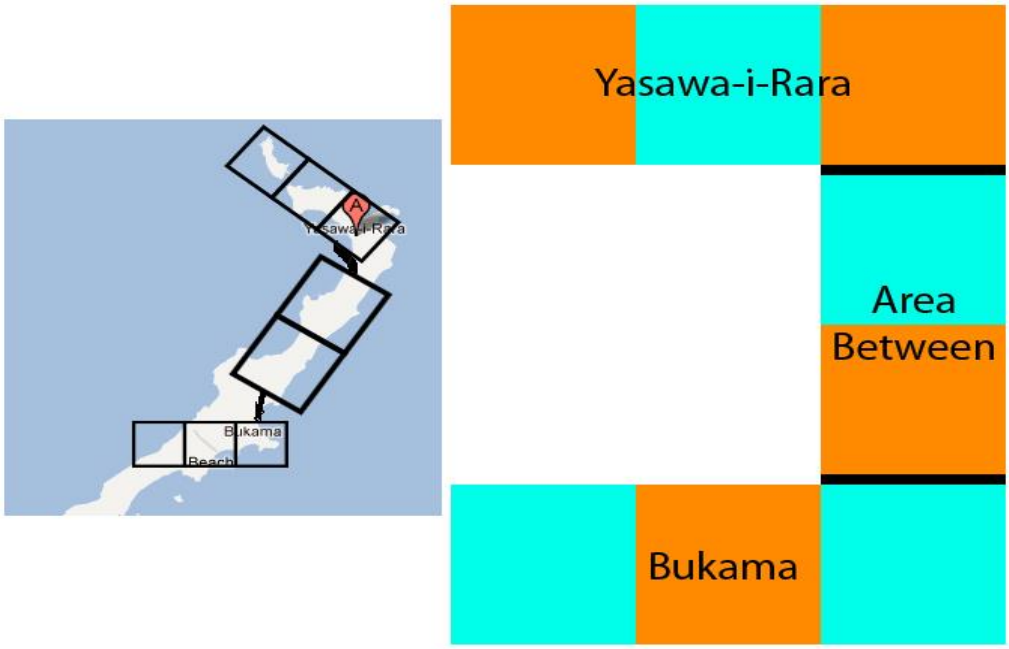

Figure 1 – Map of Bukama/Yasawa-i-rara and general layout of the server regions

In-Situ Fieldwork to collect required Information

The author, and a cultural and linguistic adviser from VUW's Professional and Executive Development Program, Maciu Raivoka, travelled to the Fijian island in June 2011 to gather all the required information for the project. In order to develop the virtual island as an effective learning tool the project enlisted a method commonly used to develop text-based case studies. The method was devised by Tyson (2008) who is the principal case writer for the Australia and New Zealand School of Government Case Program, which has a database of more than one hundred case studies. The method (see Table 1) was adapted for the project by focusing on a digital-immersion presentation of the case, rather than a structured textual account, and by focusing on the points relevant to a decision-forcing case, rather than a concept-application or illustrative one. This roadmap focuses on the key decision-making steps and 'technical' process of developing a virtual fieldtrip to Fiji because the important cultural dimension and related challenges can unfortunately not be covered in appropriate depth in this short case-study chapter.

Background – macro • Information about geographical location and features • Information about tourism and other development on the island • Relativities: e.g. populations size, economic dynamics, health care, education, role of church, etc • Political and cultural aspects to be considered
Background – more specific • Recent initiatives and/or projects relevant to Sustainable Tourism Management • Variety of stakeholders' views and opinions on tourism development and development more broadly • Comments and Insights from influential stakeholders as well as from members of the community who do not hold influential positions • Information about key events: e.g. new legislation, natural disasters
Dilemma or decision • Any dilemmas need to be identified and related material needs to be collected • Develop the range of key decision avenues: examining the factual aspects from a disciplinary perspective and by listening to the voices of a wide range of stakeholders • Identify and collect information which is authentic and provides support for the identified decisions avenues

Table 1 – The Case Planning Pyramid (adapted from Tyson, 2008)

Different media were employed to document the above; some information was collected to be used directly in the virtual world, while other information served to guide the digital design of the environment and objects on the virtual island. The following media were used to gather and document information about the island and its communities:

- Videos with audio
- Digital Photographs
- Digital Excel data spread sheets (e.g. tourism statistics)

- Digital Word documents/PDF documents
- Hard copies of important documents (e.g. evacuation plans)
- Digital map files

Designing the Virtual Island

Using a map of the real island as a guide, each of the eight regions was shaped to reflect the basic geography and topography of the real island; see example in Figure 2.

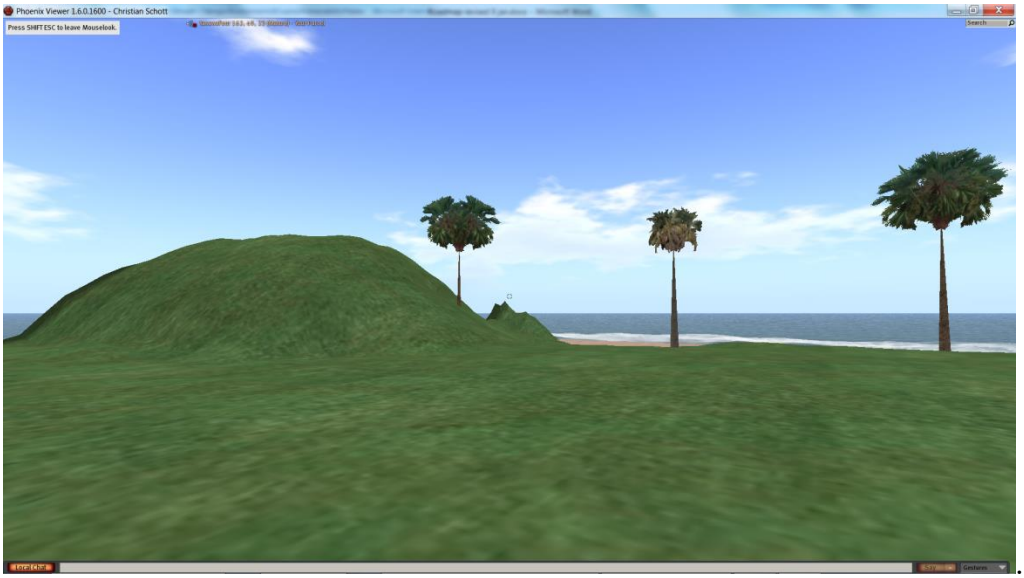

Figure 2 - Example of early stage of creating the island

The next step was to add buildings and the vegetation. Most of the buildings had to be specifically created for this project and could not be copied from a digital object library as the distinctive identity of the island had to be retained. Such buildings included the chiefly houses, the community hall, the Church Minister's house, island bures, and school buildings amongst others (see Figure 3).

Figure 3 – The Yasawa-i-rara community hall, both real and virtual

Infusing the virtual island with real-world videos and photographs

Videos were placed in the same spot on the virtual island where they were initially recorded. They were displayed as a framed image of the person talking in the video. When users left clicked on the framed image, the video appeared in an in-world web browser. The video files were stored on 'YouTube' which allowed for free storage and streaming of the videos. However, because the people in the videos requested for these videos not to be publicly available (for educational purposes only), the video files were categorised as 'unlisted' on You Tube, which means that they can only be viewed by those with the exact URL (or a hyperlink). Videos categorised as 'unlisted' will not appear in search results, the browser page, nor on the author's

channel, and this approach appears to have been effective. To also represent the tourists' perspectives of the island in the most authentic manner, two videos posted on You Tube by tourists who visited the island were also incorporated. These videos portrayed the typical tourist perspective (arriving by small plane and by cruise ship). Additionally, a tourist who was staying on the island was video-interviewed about his views about the island and tourism during his visit to the village school. The intention was to video-interview a larger number of tourists, however, significantly less tourists than expected were on this remote island at the time of the visit.

Photographs were also used in a few cases to emphasise the similarity between the virtual world and the real world; or to illustrate a particular scene/activity which was very challenging or time consuming to meaningfully replicate in the virtual world (such as a woman washing clothes in a bucket to illustrate the scarcity of water and electricity, or tropical fish on a coral reef to illustrate pristine and attractive marine environment surrounding large parts of the island). Photographs were also positioned in the same area where they were taken and stored digitally on an image hosting server (ImageShack.us), which provides this service at no cost.

Figure 4 – Example of integration of videos in-world

In-world communication between Users

OpenSim offers an inbuilt text chat system in which users can send messages to each other through the use of a text field. This was considered a very important facility to allow groups of students to collaborate on the fieldwork tasks while in-world. An additional benefit was that

they can collaborate in world in this manner even when group members are at their home computers several kilometres apart. Users could create groups, allowing them to have a discussion with only their group members. The text chat function also proved very useful during the island's design phase as it allowed the project leader to communicate specific instructions about placement of objects to the technical RA in-world.

PROBLEMS AND CHALLENGES ENCOUNTERED

After the project had been piloted as part of the Sustainable Tourism course the virtual island was attacked by a hacker. Significant damage was inflicted as numerous random objects were placed on the virtual island and bugs inhibited normal movement of the avatars. As a result, the program could not be used for a period of six weeks while the vandalism was rectified. The initial solution was to clean the virtual world of any foreign objects and bugs. However, this cleaning process was unsuccessful in two regions which lead to the decision to replace the two regions with earlier copies. One approach for countering such attacks is to increase security by restricting access to the virtual island; although it is unclear whether this cyber vandalism attack could have been halted by this security measure.

As can be expected from a pilot project of this nature a number of more specific problems were also encountered; suggested solutions are also listed:

- When first using the program students were removing objects in-world (mostly unintentionally) as well as creating 'random' objects. This occurred when students right clicked (for example to activate a video) instead of left clicking.

  Solution: ensure 'build' privileges are removed from all student users, anchor any objects, and educate students about the need to be careful about any changes and the impacts they can cause.

- Instabilities in the programme's or specific region's accessibility were noted on several occasions.

  Solution: the problem either self-resolved when it was network related, or more commonly, was generally quickly resolved by the technical team hosting the server.

EVALUATION AND CONCLUSIONS

After using and refining this digital immersion learning tool for two years the project team strongly believes that virtual fieldtrips, both as a concept and as implemented in this project (using OpenSim), present a very valuable and effective learning tool. This assessment is based on: i) the project team's own pedagogical assessment of the virtual island ii) student engagement with this virtual learning tool observed during the workshops, iii) the quality of the virtual fieldwork and subsequent proposals presented by student groups, and iv) informal student feedback about the virtual island as a learning tool.

However, this overall positive assessment of the project should not be understood to suggest that either the program or the related student fieldwork tasks are 'flawless'. The process of reflection and further refinement will continue for many years and, where time and financial support permit, further improvements to the virtual island will be made. As such, a more recently developed software platform from the game design domain is currently being explored for this project due to its higher quality visuals

Based on the experience documented, we recommend that greater use of digital immersion should be encouraged for learning in general, and for learning about complex and applied concepts such as sustainable tourism development in particular. To embrace and harness these new and exciting digital opportunities to enhance education, institutions need to support the development of digital learning tools in three ways: provision of hardware if Internet based (servers), development of the virtual world which can be multi-functional to serve the needs of different courses (shaping of geography, topography, building of objects, etc according to specific requirements), and availability of technical skills related to digital immersion technology. Although a collaborative approach to sharing hardware and technical skills has a number of strengths, the provision of a server and technical skills within each institution using virtual fieldtrips can assist greatly in minimising the amount and severity of problems that may occur. Although the funding needs required to design a digital immersion learning tool for a single course may appear high, there is significant potential to lower the per course costs. This can be achieved by allowing a variety of courses to use a common virtual learning environment and for digital immersion learning to be used across a variety of disciplines, which would rapidly justify the hardware and technical skill investment. With increasing recognition that

the educational experience of current higher education students needs to align more solidly with 21st century technology, it is only a question of time before such digitally immersed, situated and active learning experiences are embraced by a wider range of tertiary education institutions; in particular for critically important, yet complex topics such as sustainable development. Technology will continue to innovate rapidly, leading to more refined digital immersion experiences over the coming years. However, for the moment OpenSim software presents an effective introductory option to allow students to learn about the sobering realities of life in developing countries, the positive and negative impacts of tourism, and the inherent interconnectedness of environmental, socio-cultural and economic factors – in other words it is an effective tool for sustainable tourism education.

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Appendix 1 Assessment Criteria

Assessment Criteria Scores from 1 (lowest) to 5 (highest)	Building (Authors) Score	Building (Authors) Comments	Maintenance (Instructor) Score	Maintenance (Instructor) Comments	Daily Use (Students) Score	Daily Use (Students) Comments
User Friendly (overall)						
○ Accessible						
○ Attractive						
Adaptable (overall)						
○ Accommodates various media formats						
○ Capacity to develop large amount of material and detail						
○ Expandability (students able to add content in separate area)						
○ Scale of space (can island 10km *1km be replicated?)						
Versatile						
○ useable by different disciplines **Cost (start up and annual fees)**						
Time Effectiveness						
Interactivity (overall)						
○ Can learners communicate while 'in world'?						
○ Can interactive datasets (modifiable by user) be incorporated? ○ Level of user control (teleportability, movement control, etc)						
Other (delete as appropriate)						
○ Longevity & accessibility of software (around in 5 years?)	100%	75%	50%	25%	0%	
○ can access be restricted?		Yes	No			

Computer Specifics

Demand on computer Specs (graphics card/processor)	Comments:
Demand on bandwidth (if 80 students using at same time)	Comments:
Demand on bandwidth (if 40 students using at same time)	Comments:
Other (added during development process)	
Usage of Internet Data (important for use of home computers)	Comments:
Ease of Installation on home computers	Comments: