Chapter 2
Pedagogy and Learning for Sustainability in a Virtual World Scaffold

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Introduction

The United Nations (UN) proclaimed the years 2005 to 2014 the Decade of Education for Sustainable Development (UNDESD), and in response many universities are encouraging education for sustainable development (EfSD) within their curricula. In 2012, James Cook University (JCU) in Cairns, Australia, introduced the *Bachelor of Sustainability*, a cross disciplinary undergraduate degree offering majors in business, science, and social science. A key strategic intention of JCU is to better meet sustainable education and lifestyle outcomes, while also responding to an expanding green job sector looking for sustainability professionals.

This chapter presents a case study of the use of Second Life, a virtual world, to augment sustainability learning in *EV2011 The Case for Sustainability*, a core second year subject in the *Bachelor of Sustainability,* presented at JCU for the first time in 2013. Second Life was created by and is hosted by Linden Lab, a private company established in 1999 to provide shared 3D entertainment and learning opportunities. Second Life was made available to the public in 2003 (Linden Research Inc 2016). In this learning activity, exploratory learning in Second Life was free for the university and for students.

Sustainability learning typically involves practical application of real-world critical thinking and problem-solving experiences (Orr 1996; Sipos et al. 2008). Cortese and McDonough (2001) contend that real-world problems provide a solid foundation for EfSD learning experiences. These authors also emphasise, ‘we must

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increase group work learning so students may be able to effectively collaborate as managers and leaders on complex problems' (Cortese and McDonough 2001, p. 3).

Being a virtual world, Second Life can simulate real-world situations and can provide opportunities for students to deal with challenges (albeit virtual challenges) in a collaborative manner. In effect, virtual world sustainability-related sites provide a platform to experience sustainability initiatives and as such they facilitate problem-oriented, place-based learning (POPBL) (Sipos et al. 2008). Some virtual worlds within Second Life are a virtual presence for a real-world place or activity (e.g. part of a university campus). These offer students tangible real-world connections. Others exist only as a virtual world. However, real-world linkages were not important in achieving the subject learning outcomes.

The capacity and affordances of virtual worlds and Second Life in higher education learning is subject to robust exploration as increased use of virtual world pedagogy in tertiary education is encouraged (Ahmad et al. 2011; Jarmon et al. 2009; Siragusa et al. 2007). Virtual worlds are well suited to project-based experiential learning (Jarmon et al. 2009; Yalcinalp et al. 2012), and Second Life is the most popular tertiary virtual world learning platform in the UK (Warburton 2009). In Australia, the Virtual Worlds Working Group (VWWG) was formed in 2009 to support teaching and learning in virtual worlds, and the group has members from over 54 higher education institutions in Australia and New Zealand (www.vwwg.info).

This subject departed from solely positioning sustainability learning in a real-world context and extended student learning experiences to enhance learner engagement to better meet subject learning outcomes and develop graduate attributes (Ahmad et al. 2011; Dawley 2009; Garrison and Kanuka 2004; Jarmon et al. 2009; Raes et al. 2012; Siragusa et al. 2007; Warburton 2009). The specific subject learning outcomes and graduate attributes of *EV2011* are explored in the methodology section of this chapter and are listed in Fig. 1.1.

Working in pairs, students undertook a review and comparison of *Etopia Island Community*, a virtual world in Second Life dedicated to advancing sustainability, by comparing it with one other sustainability focused virtual world in Second Life identified by the class tutor. The review framework was constructed by teaching staff to meet subject learning outcomes and graduate attributes and resembled an explore, review, compare, evaluate and disseminate process (see theoretical framework in Table 2.1). The review process involved students in: developing familiarity with Second Life in-world protocols, conceptual understandings of the sustainability issues presented in Second Life, appraisal of the effectiveness of the sustainability messages presented, and evaluation and comparison of the two sustainability focused virtual worlds as tools to support education for sustainability. After discussion and evaluation, students presented team findings in real-world assessable written and oral formats. A real-world assessment format was chosen to authenticate learning tasks, as virtual world assessment rubrics require further development (Reiners et al. 2011).

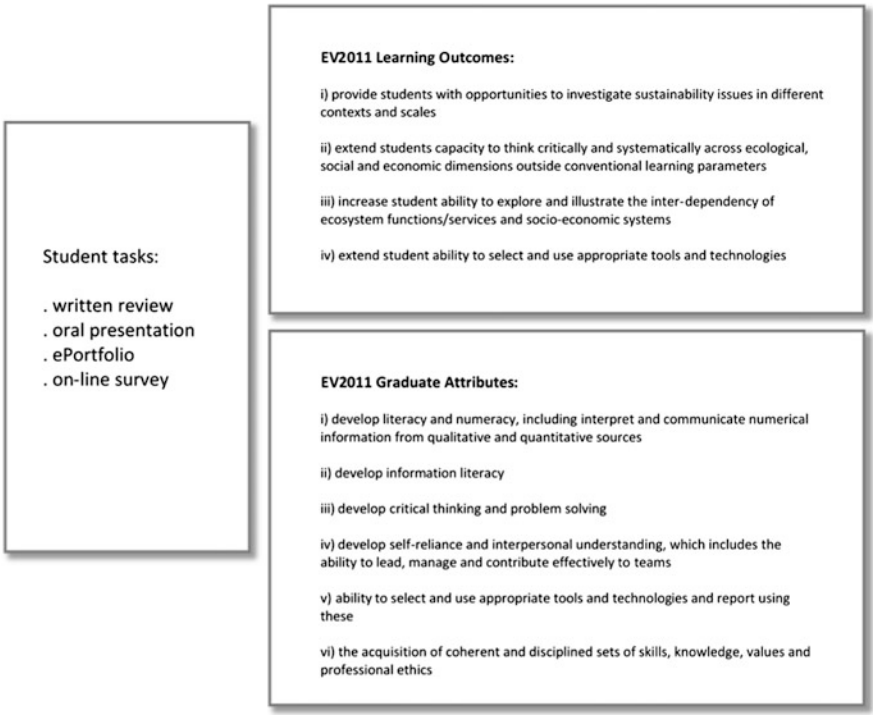

Fig. 2.1 Student tasks and EV2011 learning outcomes and graduate attributes

Table 2.1 Theoretical framework for blended learning in Second Life

Theoretical Framework for Blended Learning for Sustainability in a virtual world		
Recognise the importance of:	*To develop a:*	*To achieve:*
Considerations for virtual world teaching and learning Technical infrastructure, immersion and socialisation (Warburton 2009)	Community of Inquiry (CoI) Cognitive, social and teaching presences (Dawley 2009; Garrison and Kanuda 2004)	Communal Constructivist Learning Interact with the environment, collaborate, dynamic knowledge construction, publish (Girvan and Savage 2010)
Desired competency:	*Desired competency:*	*Desired competency:*
Engagement with Second Life space	Interaction with Second Life, peers and learning activity	Collate and present findings

Theoretical Framework

A blended learning environment supported the theoretical framework of *EV2011s* virtual world learning activity (Garrison and Kanuka 2004). Identifying and adopting theoretically appropriate pedagogy to match the student cohort was important (Dawley 2009; Girvan and Savage 2010; Lorenzo et al. 2012). Pedagogy was informed by a number of theoretical frameworks, as depicted in Table 2.1. This 'assemblage' of virtual world pedagogical theories afforded development of a structured praxis inclusive of critical and reflective thinking suitable for the diverse needs of a multi-age student cohort with varied computer skills (Garrison and Kanuka 2004; Kozan and Richardson 2014; Traphagan et al. 2010).

All 28 students in EV2011 were new to Second Life, and most were not regular computer game players. A third of the cohort expressed concern about the relevance of situating sustainability learning in a virtual world. Therefore, when introducing the learning task, Warburton's considerations for teaching and learning were adopted. The aim was to allow time and provide support to students as they became familiar with the technical infrastructure, immersion in the Second Life space, and the in-world socialisation protocols (2009). Time spent gaining familiarity with navigating and communicating in Second Life proved to be an essential foundation to learning in this particular virtual world.

A Community of Inquiry (CoI) learning space was established to support cognitive, social and teaching presences (Dawley 2009; Garrison and Kanuka 2004; Lorenzo et al. 2012). The CoI supports interactive oral and written communication in a blended learning environment and fosters higher order learning through critical discourse and reflective thinking (Garrison and Kanuka 2004). The desired teaching outcome was competent interaction with Second Life, peers and the learning activity. This occurred through in-world communications as students attended in-world talks and events and communicated with their study pair and with peers. A CoI learning space also existed in the real world as students interacted with each other, tutors and reference materials.

A communal constructivist learning space (Girvan and Savage 2010) was established to complement the CoI. In communal constructivist learning, students interact with the environment (in this case, Second Life) and actively collaborate and engage in: knowledge construction, publishing that knowledge and transferring that knowledge between groups within a dynamic and adaptive learning environment (Girvan and Savage 2010). In *EV2011,* it was found that students recognised the support this learning space provided and were generally very motivated to engage.

Context

JCU's Bachelor of Sustainability is a multidisciplinary degree offering science, business and social science majors. In 2013, the degree sat within the Faculty of Science and Engineering with collaborative delivery involving five schools: Earth

and Environmental Sciences, Education, Marine and Tropical Biology, Business, Arts and Social Sciences. *EV2011* builds on understanding and knowledge gained in the first year subject, *EV1011 Introduction to Sustainability*. Therefore, *EV2011* students have a rudimentary understanding of the considerable environmental, social and economic challenges facing humanity in the twenty-first century and are developing an appreciation for the philosophy and ethics foundational to a sustainability vision. *EV2011* also provides students with the opportunity to explore, compare and contrast a variety of sustainability case studies such as: natural resource management, energy generation and distribution, forest management, community development and planning, sustainable towns and cities, sustainable design and use of technology, climate change adaptation, sustainable decision-making, and policy development. Teaching and learning in *EV2011* involves guest lecturers and tutorial and workshop activities employing a variety of engagement techniques and media, for example, fieldwork, student presentations, creation of an ePortfolio, as well as the Second Life virtual world exploratory learning activity.

Methods

The Second Life virtual world learning activity took place over two, 2-h class tutorials in a computer laboratory. The 2013 student cohort of 28 was divided into two groups of equal size, necessitating a repeat of each tutorial. In the first virtual world tutorial, students were introduced to *Etopia Island Community*, a virtual world in Second Life dedicated to advancing sustainability, and students learnt the in-world protocols. In the second tutorial, students continued with exploratory learning, addressing learning tasks that were designed to allow students to fulfil the subject's learning outcomes (see Fig. 1.1). Specific activities in these tutorials are discussed more fully in the following paragraphs. Note that tutor support was available throughout the learning process to assist students gain familiarity with the medium and to assist them in understanding the requirements of the learning tasks. Note also that the Second Life client had previously been installed in the computer laboratory by university IT personnel.

In tutorial one, students were introduced to Second Life via an in-world demonstration with a live application of Second Life projected onto a screen to assist students to familiarise themselves with the Second Life space. This direct and demonstrated instruction session was foundational to creating a collaborative learning process (Dawley 2009) and instrumental in establishing a CoI (Garrison and Kanuka 2004). Students met the 'avatars' (in-world identities) of the class tutors and learnt rudimentary navigation procedures. Students created an account by joining Second Life (free of charge), whereupon they created their own avatar. Approximately thirty minutes of guided instruction about the specifics of Second Life prepared students for individual and team exploratory learning. This included rudimentary instructions about 'teleporting', navigating, communicating (including instant messaging—IM), avatar animation, menu locations and changing avatar

appearance. Several URLs for tutorial videos were provided. These offered instructions on how to: connect with Second Life communities, find interesting places and how to approach and chat with other 'residents' (virtual world users). As Second Life is an open community, students were briefed about 'griefers' (virtual world bullies) and the correct response protocol. Students were also shown how to: a) install the Second Life client software on personal computers for out of laboratory access to Second Life; b) take in-world photographs and copy and paste these into *Paint* and *Word*, as a basis for the review tasks; and c) co-ordinate the local time zone within Second Life time in order to attend in-world events.

After gaining familiarity with *Etopia Island Community* (approximately halfway through the first tutorial), students self-selected into teams of two and were provided with the learning tasks. Class tutors randomly nominated each team their comparative sustainability focused virtual world from the following list: *CNDG Virtual Campus, The Frontier Project HUB, Four Bridges Innovation Centre South, Loving the Rainforest* and the *Giving Circles Network,* all separate 'islands' (virtual worlds) within Second Life. Students assessed each of their virtual worlds by examining their contribution to sustainability learning from a triple-bottom-line perspective (environment, economic and equity). Class tutors provided one-to-one assistance as required but it was evident that peer-to-peer learning was also taking place during tutorials.

Team reviews of findings were presented in a 600-800 word report and a five-minute oral presentation using *PowerPoint*, with each contributing 10% of the total assessment for *EV2011*. Both of these documents were saved in PDF format, and they made important contributions to the students' ePortfolios. It is notable that for ePortfolio assessment, students were required to comment on their impressions of how all the learning experiences in *EV2011* contributed to development of the subject's learning outcomes and graduate attributes.

Assessment of student review papers and oral presentations revealed a depth of penetration and understanding of the sustainability issues presented by the virtual worlds and a high level of student engagement with the Second Life platform. Figure 1.1 outlines student tasks and summarises *EV2011* subject outcomes and graduate attributes relevant to this virtual world pedagogy.

The formal assessment criteria for the written review and the oral presentation of the Second Life learning activity are summarised in Table 2.2. Each assessment piece involved students taking a unique perspective when evaluating and presenting the sustainability content found. Learner engagement was formally and informally

Table 2.2 Formal assessment criteria for the Second Life learning activity in EV2011

Formal assessment criteria		
Written review	70%	Methods of inquiry, relating findings, quality of discussion
	30%	Review style and technique
Oral presentation	40%	Evaluation of triple bottom line of sustainability
	60%	Presentation style and technique

assessed through: (a) tutor in-class observations; (b) self-assessments presented by students in ePortfolio submissions; and, (c) responses in a voluntary, confidential online student survey.

Findings

The findings from this project are organised around four student engagement processes, which are:

(1) assessable tasks:

   (a) written review;
   (b) oral presentation; and
   (c) comments provided in ePortfolios;

(2) data from survey results;
(3) tutor in class observations;
(4) tutor conversations with students.

Assessable Written Review and Oral Presentation

More than one-third of *EV2011* students achieved either a high distinction (HD) or distinction (D) grade for the assessments associated with the Second Life virtual world learning activity. Responses in the written reviews indicate multi-level learning and higher order thinking. Assessment of the virtual world tasks demonstrated learning in four of the five learning outcomes for the subject (Table 2.3).

The distribution is slightly above what was found with the other assessment tasks in *EV2011*. Indeed, these grades are higher than has been typically found with most other assessment tasks in other subjects in the *Bachelor of Sustainability*. This may imply students were better able to demonstrate progress in meeting the specified learning outcomes in the virtual world learning activity compared with

Table 2.3 Formal assessment grades awarded for the Second Life learning activity in EV2011

Grade awarded	Virtual world written review (No. of students)	Virtual world oral presentation (No. of students)
HD	2	2
D	8	10
C	15	12
P	3	4

Note HD-High Distinction, D-Distinction, C-Credit, P-Pass

other more traditional learning activities. As this was the first delivery of *EV2011,* there were no comparative data for sustainability learning in a virtual world.

Assessable EPortfolio Submissions

In ePortfolios, students self-assessed how the virtual world learning activity assisted them in achieving the learning outcomes and graduate attributes identified for *EV2011*. The ePortfolio task contributed 15% to the overall assessment of EV2011 so the Second Life activity was just one aspect of the students' ePortfolio. Table 2.4 summarises students' comments about the Second Life activity that are relevant to graduate attributes. Students expressed overall improvements in: sustainability knowledge, the benefit of teamwork to address sustainability issues, critical thinking to analyse and evaluate data, and improved communication and reporting skills. Students' comments on average were 77% positive about outcomes achieved

Table 2.4 Students' ePortfolio comments about graduate attributes from EV2011

Graduate attribute	Supportive comments (n = 51)	Non-supportive comments (n = 12)
Literacy and numeracy	Has enhanced my knowledge of useful links	
	Dynamic way of collecting and analysing data related to sustainability and sustainability education	
Information literacy	Good to see the different applications a virtual world can provide, and the future potential (×2)	Found it difficult to connect with the worlds in such a short period of time but can understand their potential benefits (×2)
	Useful links	True potential might be hindered by technological issues and the lack of knowledge of computer systems by some individuals
Critical thinking and problem-solving	Thinking critically to analyse and evaluate data, to reason a response clearly and logically, to think systematically (×8)	Provides a somewhat superficial representation of sustainability —not realistic (×2)
	Possible strategies for increasing a globalised understanding of sustainability.	There are better ways to teach about sustainability
Self-reliance and interpersonal understanding	Benefit of teamwork for sustainability problems, for self-improvement (×10)	Experience was hindered by a lack of commitment and enthusiasm from partner students (×2)
	Collaborative effort so we were able to overcome the difficulties	

(continued)

Table 2.4 (continued)

Graduate attribute	Supportive comments (n = 51)	Non-supportive comments (n = 12)
Using tools and technologies	Gaining a broad knowledge of how to use appropriate tools for interpreting and assessing sustainability (×3)	Searching around to find something useful was a waste of time
	Enhanced my ability in public speaking (×5)	There are better tools and programs available when looking for sustainable education
	Enhanced my computer skills (×7)	
Learning achievement	Extremely useful for examining how sustainable design and planning principles in relation to the three pillars of sustainability can be incorporated and adapted to reality	Found the delivery of the content for the task to be ineffective
	Overall the virtual world was a useful experience in modern-day education techniques (×2).	
	Provided the opportunity to view sustainable education and learning from an entirely new point of view (×2)	
	Enhanced communication skills (×4)	I didn't really understand the exercise and I don't feel that this is a skill I need
	Use a more open mind in future for learning in a different way	
	A flexible and creative way to deliver messages about sustainability	

Note ×2, ×3, ×4, etc., indicates the number of similar comments

from this learning experience and 23% were either negative or they questioned the value of this virtual world pedagogy. These findings are based on the 51 supportive comments and 12 non-supportive comments as listed in Table 2.4.

Online Survey

At semester end, students were offered the opportunity to comment about this virtual world learning experience in a confidential, non-assessable survey. Students were emailed a *Survey Monkey* URL providing access to a 15-min online questionnaire. The eight, five-point Likert scale questions were framed to understand student engagement with the virtual world learning experience. Answer options were: Not Sure, Very Little, OK, Quite Helpful and Excellent. An open comment field was attached to each question to receive any further comments. Of the class cohort of 28, five surveys were completed (response rate = 18%).

Table 2.5 summarises the survey questions and responses. The first two questions are concerned about whether or not students found the Second Life activity helpful

Table 2.5 Summary of online survey questions and responses in EV2011 s Life learning activity

Question	Positive comments	Negative comments
How did you find the Second Life activity?	Helpful—3 respondents	Not helpful—2 respondents
What do you feel you learnt from the Second Life activity?	Learnt about sustainability—4 respondents	Learnt very little about sustainability—1 respondent
How well did the Second Life activity assist in achieving subject learning outcomes?	Met in a small way —3 respondents Met quite well—2 respondents	
How well did the Second Life activity assist in achieving graduate attributes?	Met in a small way —2 respondents Met quite well—2 respondents	Not met—1 respondent

for sustainability learning. Seventy per cent indicated it was helpful and 30% unhelpful. However, in questions seven and eight of the survey, students were asked about how well the activity assisted them achieve the subject's learning outcomes and graduate attributes. Ninety per cent felt the activity was helpful, and 10% felt it was not. In summary, students evidently found this to be a positive learning experience and data from student ePortfolios and the online survey indicate the activity assisted students meet the subject's learning outcomes and graduate attributes.

Observed Learner Engagement

The degree of learner engagement with Second Life in *EV2011* was primarily gauged through tutor in-class observations and conversations with students. Most students were open to the new platform and ready to engage. Within the first half hour of the first tutorial, over 90% of students were positive about exploring and learning in Second Life and actively engaged. As the classes progressed, however, interacting with Second Life became challenging for some students, particularly mature age students with limited IT skills. Approximately 40% expressed annoyance and frustration about sustainability learning in a virtual world platform. One-to-one tutor support and peer-to-peer learning had alleviated most frustrations by the end of the first tutorial. Ten per cent of the student cohort expressed annoyance at having to engage with Second Life and questioned the validity of learning about sustainability in a virtual world.

Discussion

This section will focus on the profile of the student cohort, choice of pedagogical design, student responses, learning outcomes achieved, the challenge of developing virtual world pedagogy using Second Life, possible future improvements to this pedagogy and JCU's research alignment.

The student cohort was challenged by this pedagogy. Students were asked to view sustainability learning from a new perspective, that of reviewer in an unfamiliar context. Learning comfort zones were stretched. The virtual world learning format was completely foreign to all students as 100% of the cohort were new to Second Life and most were not computer 'gamers'. Students were from disparate backgrounds and had wide ranging computer skills. Student ages and life experiences in the *EV2011* cohort were diverse, ranging from direct high school graduates (20%), young mature age students with ages ranging from early 20s to 35 (30%), mature midlife students aged from 35 to 60 (40%), to retiree aged students over 60 (10%). All students were passionate about sustainability and keen to learn and communicate sustainability to the wider community.

To facilitate learning ease, pedagogy utilising a blended learning environment proved effective. The theoretical framework was a combination of Warburton's considerations for teaching and learning in a virtual world, which established a CoI learning space and encouraged communal constructivist learning. Pedagogy involved stepped introduction of content, one-to-one support and peer-to-peer learning. Class time focused on developing effective in-world communication skills and formalising work teams to assist students' in-world socialisation and collaboration.

In the first tutorial demonstration and instruction segment, just under half the students displayed varying levels of apprehension about the usefulness of this learning activity and some were concerned about their ability to engage with Second Life as a learning platform. This was revealed in students' questions, comments and even body language. Prior discussion about the benefits and discomforts of the learning activity could perhaps have eased this learning transition from real world to a virtual world. As the first tutorial progressed, students became familiar with the virtual world medium and the exploratory learning mode and most were impressed with the depth of sustainability information and the global connectivity provided by Second Life. We believe the establishment of a CoI assisted this process. Frustrations visibly lessened as tutorials progressed, mainly as a result of the one-to-one in class assistance provided by the tutors and because of peer-to-peer communication. However, some resistance and a lack of resonance to learning in a virtual world were evident. Approximately 10% of the cohort continued to express frustration as they engaged with content. As noted above, this was also expressed in some negative survey comments.

Assessable learning tasks focused students' exploratory learning and provided data about student engagement with the learning activity. Students benefited from knowledge sharing as each group prepared their written review and delivered an

oral presentation using *PowerPoint*. Students compared two virtual worlds for their ability to support EforSD. Both these assessments demonstrated that students had achieved a high level of engagement with the sustainability issues presented in Second Life. In future *EV2011* learning, the oral presentation—knowledge sharing with the whole cohort—will precede the written review to facilitate greater peer-to-peer learning. The written review may also be set as an individual task to consolidate reflective and critical thinking.

Online survey responses provided rather ambiguous feedback perhaps in part because of the low number of respondents. Nevertheless, it was valuable to solicit non-assessable student feedback about feelings and thoughts, benefits gained, motivation to engage and satisfaction derived (López-Pérez et al. 2011). The honest confidential student feedback about the quality of learning engagement in Second Life has assisted the subject coordinator in making pedagogical adjustments to ensure successful learning transactions (Warbuton 2009). The low response rate to the online survey was disappointing but not surprising. Nevertheless, the limited data from the survey impacted on the adaptive management capacity (learning by doing) of the subject (Domask 2007), where the intention is to review and adapt the subject partly in response to student feedback. In future *EV2011* delivery, the online survey will be a compulsory component of the virtual world assessment task and will be included in a later tutorial.

Using Second Life as a teaching and learning platform was new to both authors. Initial low-level resistance to engaging with Second Life to develop pedagogy had to be overcome by the first author (a non-gamer). Second Life is an Internet-based immersive environment suitable for education, and while it is not a game (Dawley 2009), it can be viewed from a gamer's perspective. Interestingly, White's 2007 manual Second Life—*A Guide to Your Virtual World*—supported the first author's transition to thinking and working within a virtual world to develop the virtual world pedagogy. Familiarity with Second Life led to excitement about the potential offered by Second Life for learning about sustainability. The teaching and learning experience was rewarding, and additional improvements for future delivery of this virtual world pedagogy are an on-going conversation.

Development of this virtual world pedagogy and learning aligns with one of James Cook University's learning and teaching priorities, that is, to support EfSD. This learning activity also aligns with the JCU's Strategic Intent, 'A brighter future for life in the tropics, world-wide', and through use of technology in a blended learning environment to develop critical thinking and problem-solving skills. This blended learning format is also consistent with global higher education teaching and learning values (Garrison and Kanuka 2004). An added value of learning in a virtual world is that continued and lifelong learning is supported through access to the Second Life platform by students' post course work (Gregory 2011).

Conclusion

This virtual world blended learning environment created team-based exploratory learning through review and comparison of sustainability centric virtual worlds to enhance critical thinking and problem-solving for real-world sustainability. The pedagogy followed Warburton's (2009) virtual world teaching and learning considerations to develop a Community of Inquiry learning space (Garrison and Kanuka 2004), and it resembled Girvan and Savage's (2010) communal constructivism learning. Student grades for the virtual world learning activity, feedback on learning and teaching in *EV2011*, and in-class conversations between tutors and students confirmed that learning in a virtual world platform supports knowledge sharing between students and enhances creative thinking and problem-solving. Students were introduced to the power of networking in a virtual world and to global connections of sustainability advocates. Overall, the authors contend that this learning activity enhanced students' capacity for sustainability, and they acknowledge and value the contribution this virtual world pedagogy has made in achieving *EV2011's* subject learning outcomes and graduate attributes.

The major factor contributing to a successful student learning experience within this virtual world blended learning study was the stepped introduction of content to better engage the diverse class cohort and to create a Community of Inquiry learning space. To enhance future delivery of *EV2011,* it will be important to put more emphasis on promoting the learning activity to students through discussion of the benefits of participation, addressing any discomforts students may have, and in carrying out further research as to how to maximise learning in this format. The suggested minor changes to assessment tasks should improve student engagement with learning outcomes and graduate attributes.

This blended learning project has been very valuable professionally, from a teacher and a researcher perspective, and we believe from a student perspective. An innovative sustainability discourse that incorporates an online teaching–learning platform is readily available through a virtual world. Some of these spaces are an online representation of real-world sustainability projects, linking the virtual and physical. In addition, this virtual world pedagogy provided ready access to professional global sustainability networks and valuable new ideas for sustainability pedagogy.

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Marcia Thorne is a PhD student in the School of Education at James Cook University in Cairns, Australia, and is employed as a research officer and tutor in the Bachelor of Sustainability. Marcia returned to university studies in 2008 to complete a Bachelor of Education (Professional Development) and a Master of Education (Sustainability) after a career in teaching and as an IT business owner and company director. Marcia's PhD research mirrors her lifelong commitment to conservation and preservation of the natural environment and looks to understand what ethic of care for the environment is developed in today's adolescents through formal education.

Colin Macgregor has worked as a sustainability practitioner and researcher in government agencies, as well as the corporate sector, for almost 20 years. He completed his PhD at James Cook University (JCU) in Sustainable Development in 2002 before joining the University of St Andrews where he established an undergraduate degree program in Sustainable Development. Colin returned to Australia and the University of Western Australia in 2006 but rejoined JCU as a Senior Lecturer in 2012 to establish and coordinate JCU's Bachelor of Sustainability. Colin also chairs JCU's Sustainability Action Group and is a member of the University's Sustainability Advisory Committee.

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