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研究課題名（和文）高等教育における「持続可能な開発の為の教育」評価可能な枠組開発と普及構造の構築

研究課題名（英文）Developing an evaluative framework for Education for Sustainable Development in tertiary education

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研究成果の概要（和文）：高等教育における「持続可能な開発の為の教育（ＥＳＤ)」の評価可能な枠組を再現性のあるモデルアプローチとして開発し、普及構造を構築した。
特に、①ベトナム・フエ大学及び京都大学で、教室での講義と野外活動を組み合わせた総合的なＥＳＤコースを発展させた。②学生のＥＳＤコンピテンシー（形成能力）を行動化させる為のユニークかつ評価可能なＥＳＤの枠組を開発した。
大学の教育システムと学生のＥＳＤの事前知識はＥＳＤコンピテンシーに影響を及ぼし、野外活動とグループ討議は、学生のＥＳＤコンピテンシーを行動化させる重要な役割を担った。一方で、ＳＮＳの活用は学生の学習効果を制限する傾向にあった。

研究成果の概要（英文）：The Tertiary Education for Sustainable Development Initiative (2011-2014) sought to develop a widely replicable model approach to tertiary-level sustainability education. Key achievements include the development of 1) a modular course combining interactive, interdisciplinary classroom learning with sustainability-themed fieldwork in campus, city, rural and coastal communities, piloted at Kyoto University and Hue University, Vietnam, and 2) a unique evaluative framework designed to gauge the effectiveness of the course in fostering essential sustainability competencies and encouraging students to not only think but to act sustainably. The universities' educational framework and students' prior knowledge of sustainability were found to be important influences on course effectiveness. Fieldworks and group discussion played an important role in leading students from theoretical knowledge to pro-sustainable behaviours, while social networking had limited success as a learning tool.

研究分野：総合教育・続可能な開発のための教育

キーワード：持続可能な開発の為の教育（ESD）　環境教育　エコ・リテラシー　サステナビリティ学　積極的環境行動　ESDコンピテンシー（形成能力）

１．研究開始当初の背景

The Tertiary Education for Sustainable Development (ESD) Initiative was established to improve implementation of education for sustainability at the tertiary level. It seeks to answer many of the questions arising from earlier ESD research, specifically: How does ESD differ from traditional environmental education? What are the requisite competencies that ESD courses should foster? How can ESD be incorporated into university curricula across disciplines? How can ESD courses be tailored for application in both developing and developed nations?

2．研究の目的

The Tertiary ESD Initiative had three stated project objectives: 1) develop an ESD course, to be offered to undergraduates not majoring in environmental studies at Kyoto University; 2) develop an evaluative framework for gauging the effectiveness of the ESD course in enhancing students' ecoliteracy and fostering environmental advocacy, and 3) determine the adaptability and replicability of its model approach to sustainability education.

i) *Designing the course and evaluative framework*

Project activities in 2011 and 2012 focused on the development of a comprehensive, widely replicable approach for tertiary-level education for sustainable development and an evaluative framework to assess the approach's efficacy. The "Building a Sustainable Future: Principles and Challenges" (BSF) course was implemented for the first time in 2012, through the Kyoto University International Education Program. The course included special curricula, learning materials, classroom activities and fieldwork conducted on campus, in Kyoto city and in the mountainous and coastal regions of northern Kyoto. The initial evaluative framework incorporated tools for student self-grading, qualitative assessments of student engagement in a class online Bulletin Board System, and quantitative tools such as a carbon footprint survey.

The course and a revised evaluative framework were piloted at Hue University, central Vietnam for 13 Vietnamese students from 20 February-22 March 2013, then in Kyoto from 11 April to 25 July 2013, for a class of 19 short-term international students. The new framework added comprehensive pre- and post-course questionnaires and follow-up interviews conducted with students one year after the course to the evaluative tools used in 2012.

ii) *Aims of the assessment*

The evaluative framework was used to assess the effectiveness of course components and the course as a whole in enhancing students' ecoliteracy and fostering environmental action. The Japanese and Vietnamese courses were also compared to determine whether the course transferred effectively from one country to the other. The assessment used the "knowledge-action" spectrum to understand how students progressed from the beginning to one year beyond the end of the course with regards to improving their knowledge and moving towards taking greater practical action for sustainability in their daily lives. Changes in "motivation" were introduced into the spectrum when the researchers observed more emotional and intuitive aspects such as values acting as a bridge between students' understanding and practical activity (Figure 1). The addition of motivation into the knowledge-action spectrum represents an important contribution to research in this field, and work is currently underway on a publication including this concept.

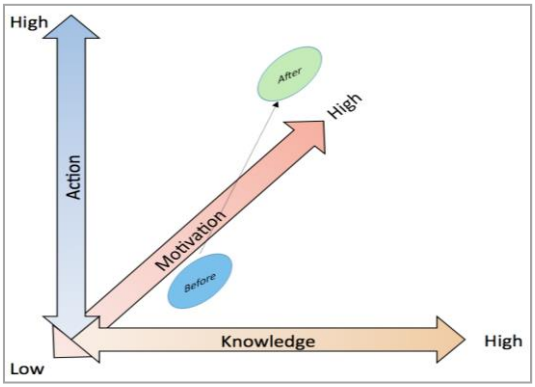

Fig.1: Knowledge-Motivation-Action spectra

3．研究の方法

The assessment of the data obtained through the evaluative framework was conducted as a training and collaboration exercise involving two social research students from Macquarie University, Australia. It set out to answer two key research questions: 1) How have the students developed over the course with regards to: a) knowledge, b) motivation/ values, and c) action?, and 2) How effective

has the course been, and what have been the most effective elements?

The BSF course generated large amounts of quantitative and qualitative data. Due to the primarily qualitative nature of the data obtained from the course pilots, the NVivo software program was used for the majority of the data analysis. First, the pre- and post- course surveys, fieldwork activity sheets, online discussion threads and follow-up interviews were imported into the program for coding. The contents of each data set were closely read to locate words and short passages that indicated students' knowledge, skills, actions and perceptions of the different course elements. A brief descriptor or 'code' was then attached to the textual fragments. Where two pieces of data conveyed a similar idea, they were labelled using the same code. This led to the emergence of general trends in the progression of student knowledge, skills and action and their perspectives on the most effective aspects of the course. Some examples of common codes include 'eco-centric view of sustainability', 'pro-sustainable action' and 'changed perspective of sustainability.'

A second round of coding was then undertaken whereby existing codes were examined for links and relationships. Through this process, connections between different course elements and developments in students' knowledge, skills and actions were particularly considered. This provided an indication of which elements of the course were most effective at improving understanding and inspiring action among students.

4. 研究成果

Although a significant proportion of the results were compiled as qualitative analyses, these are not included in this report except as brief descriptions. Quantitative indicators were also used, and are displayed where relevant.

i) Research Question 1

Knowledge

With regards to knowledge, the students were assessed within the course as well as responding to survey questions. Students' responses to how much they know or understand about sustainability (scaled from 1 = very little to 5 = very much) are shown in Figure 2. As the sample size for those taking the survey was small, it is difficult to argue any statistical significance, and as there was less than one full point change (average increase from 2.98 to 3.78) the results cannot be clearly argued. In the case of the Vietnam cohort, a greater than one point increase on average across the sample was recorded.

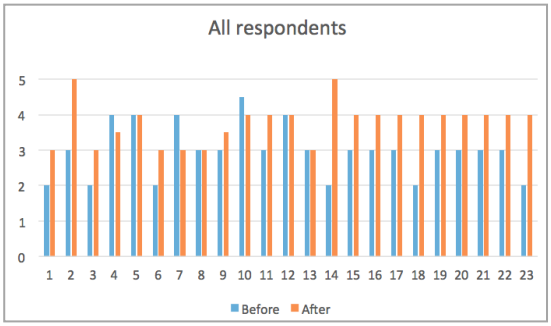

Fig.2: Students' responses before and after the course regarding how much they understand about sustainability

The use of word mining to identify the use of key words and phrases related to sustainability in the pre and post course surveys helped to clarify the progress in knowledge. The word bank accumulated from this process is extensive and the quantifiable results are not yet available.

Motivation

Although students' motivation was found to be difficult to trace, the application of a semi-quantitative analysis identifying words and phrases and their development in sophistication of expression as well as increase in frequency indicated an increase in motivation for many students.

Action

Action was also traced using qualitative techniques, as often students did not directly state that they were undertaking sustainability related activities, but their response still indicated indirectly that they were. Such statements were traced and tracked using NVivo.

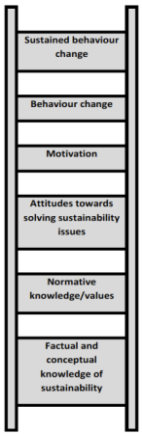

Fig.3: Conceptual model of progress from knowledge to sustained behaviour change

The model in Figure 3 illustrates the progress from knowledge through motivation to sustained sustainable behaviour. The assessment indicated an increase in the number of students taking more pro-active sustainable actions even one year after the course.

ii) Research question 2

Part I: Was the course effective in achieving its aims?

Results for course effectiveness overall were obtained by examining the survey responses provided at the beginning and end of the course, as well as follow-up interview data from the students taken 12 months after the course.

Evaluation of the data for both student cohorts reveals that the course successfully realised its aim of developing students' knowledge and awareness of sustainability-related issues. In Kyoto, despite students' various cultural backgrounds and levels of pre-course suitability awareness, there was a general shift away from previously narrow views on sustainability towards understandings more consistent with triple bottom line principles, as students developed a new awareness of rural sustainability issues and displayed greater appreciation for the interconnectedness of sustainability issues more generally. In Hue as well, students' thinking developed from one-dimensional, environmentally-biased conceptualisations of sustainability to multifaceted, multidisciplinary understanding with an increased awareness of the scale and complexity of sustainability-related issues.

The data sets also show the course to have been effective at developing existing key competencies related to the comprehension and solving of sustainability issues (Figure 4). Many students in Kyoto became more flexible, open to other views and to compromise. The Kyoto students also reported improved collaboration skills and an increased ability to synthesise ideas and take leadership. For the Hue students, communication competences and the ability to listen well to others showed particular improvement, as did the ability to make links and draw ideas together. This ability to unravel complex concepts was particularly evident in students' inclusion of local sustainability problems and their place within the broader global context into their evolving conceptualisations of sustainability.

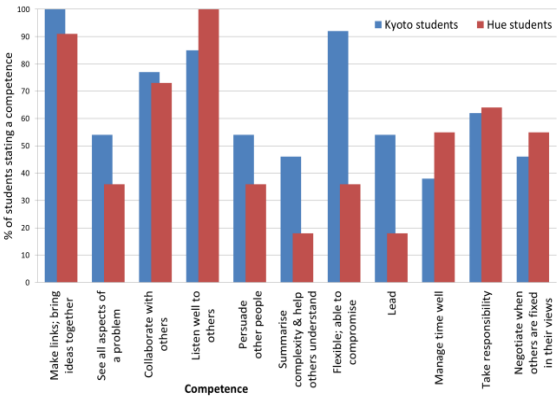

Fig.4: Competencies developed by students

The course was shown to be particularly effective at empowering students in Kyoto and Hue to take pro-sustainability action in the immediate aftermath of the course. Most commonly, students in Kyoto transformed their behaviours in relation to their consumption of food and other resources. However, the follow-up interviews revealed that these changes were not always maintained in the long-term. Significantly, although individual actions had not always been sustained, most students had promoted more sustainable behaviours to others after returning to their home countries in the 12 months after the course.

For the Hue cohort, pro-sustainable actions identified prior to the course transformed from commonplace recycling and energy conservation to reduced motorcycle use and growing plants and food organically for family consumption, or – in one case – for sale online. Students were driven to promote such behaviours amongst their families, colleagues and social circles as greater passion followed their growing knowledge base.

Part II: What have been the most effective elements of the course?

This section of the assessment examined students' survey responses and their responses to tasks assigned during the course in order to identify the most and least effective elements of the course.

Five tools were used in the delivery of the course (lectures, group discussions, fieldwork, online course support and online discussion forum). The most effective elements as ranked by the students were fieldwork and group discussions. Representing a vastly different approach to the conventional classroom experience, these aspects enabled students in both cohorts to actively engage with course content and their peers on a

more-than-conceptual level. They also emerged as the most successful at developing students' systems-thinking and interpersonal competencies including the negotiation of complex, multifaceted issues, collaboration and communication, and – for students in Hue – generated a keen desire to transfer course knowledge into everyday life through pro-sustainable actions. While less effective at fostering competencies and motivating action, the course's lectures succeeded in inspiring students in both cohorts to rethink their understandings of sustainability and pro-sustainability behaviours. When considered independently of the other elements of the course, the online-based content and discussion platform were least effective for both cohorts. Although both tools still had value in reinforcing the knowledge and skills gained through other aspects of the course, they provided little in the way of new knowledge and understanding.

iii) Further work

The project was able to demonstrably improve students' knowledge, motivation and action with regards to sustainability. However there is further need for better methods to quantify and semi-quantitatively analyse such progress – particularly as a long term trend. Cross-cultural transferability of the course was also determined. It was not possible to gain an adequate snapshot of the permanency of any observed changes. Further work on the developed Knowledge-Motivation-Action framework and identification of thresholds needed to enable changed behaviours are currently under consideration for future research.

５．主な発表論文等
（研究代表者、研究分担者には下線）

〔雑誌論文〕（計　22　件）

1. Jane Singer, Hai Hoang and Chihiro Ochiai, Post-displacement community resilience: Considering the contribution of indigenous skills and cultural capital among ethnic minority Vietnamese, Asia Pacific Viewpoint, 2015 査読有
2. 深町加津枝、NPO等の市民活動が里山の景観にもたらすもの―宮津市上世屋を事例に、森林技術、巻869、2014、pp.2-6 査読有
3. 深町加津枝、里山の自然資源の利活用を巡る伝統的な仕組みの意義、農村計画学会誌、33(1)、2014、pp.13-16 査読有
4. Jane Singer, Ty Huu Pham and Hai Hoang, Broadening stakeholder participation to improve outcomes for dam-forced resettlement in Vietnam, Water Resources and Rural Development, Vol. 4, 2014, pp. 85-103 査読有
5. Jane Singer and Hai Hoang, Participating in resettlement decision-making by dam-displaced villagers in central Vietnam, Asia Journal of Global Studies Vol. 6, No. 1, 2014, pp.16-29 査読有
6. Tracey Gannon, Collaborating for change: piloting a widely replicable tertiary-level course on community sustainability in Hue, Vietnam, Sansai Newsletter No. 4, Graduate School of Global Environmental Studies, Kyoto University, 2013, pp.3-5 査読無
7. Jane Singer, Faculty unveils tertiary-level education initiative with a focus on sustainability, Sansai Newsletter No. 2, Sansai Gakurin, Kyoto University, 2012, p.1-2 査読無
8. Watanabe, T., Okuyama, M. and Fukamachi, K., A review of Japan's environmental policies for Satoyama and Satoumi landscape restoration, Global Environmental Research Vol. 16, No. 2, 2012, pp. 123-135, 査読有

〔学会発表〕（計　16　件）

1. Fukamachi Katsue, Sustainable local resource use and continued bio-cultural diversity in a satoyama landscape on the west side of Lake Biwa, Shiga, Japan, 7th International Conference on Traditional Forest Knowledge and Culture in Asia: Resilience of Local Community and Ecosystem Services in TFK, 25 September 2014, Seoul, South Korea.
2. Ji Binxian, Tracey Gannon, Katsue Fukamachi and Jane Singer, Revitalization strategies in rural Japan: a case study of Kamiseya, Kyoto prefecture, 日本景観生態学会、金沢, 29 June 2014.
3. Tracey Gannon and Jane Singer, Building a Sustainable Future: Principles and Challenges, Mutual Learning on the Establishment of Sustainable Campus Workshop, Kyoto University, 29 March, 2014.
4. Jane Singer, The contribution of cultural social capital to reconstruction of minority villages in central Vietnam, NZASIA 2013 Conference, Auckland, New Zealand, 24 November 2013.
5. Tracey Gannon and Jane Singer, Collaborating for change: piloting a widely replicable tertiary-level course

on community sustainability in Vietnam, Regional Conference of the International Geographical Union, Kyoto International Conference Center, Kyoto, 6 August 2013.

6. Tracey Gannon, 変化するためにコラボする：「持続可能な未来の構築・基本原則と挑戦」コース紹介、6th Higher Education for Sustainable Development Forum, Kyoto University, 18 Nov. 2012.
7. Tracey Gannon, Collaborating for change: piloting a comprehensive, widely replicable approach to tertiary-level sustainability education in Vietnam, ESD: International Greening Education Event, Karlsruhe, Germany, 11 Oct. 2012.
8. Jane Singer, Introduction to the Tertiary ESD Initiative, Higher ESD Forum, Tokushima University, Japan, 20 Nov. 2011.

〔図書〕(計 9 件)

1. Susanna Price and Jane Singer, Global implications of Development, Disasters and Climate Change: Responses to Displacement from Asia Pacific, Routledge UK, 2015 (印刷中)
2. Jane Singer, Tracey Gannon, Osamu Abe and Fumiko Noguchi, Education for Sustainability in Japan: Fostering resilient communities after the triple disaster, Earthscan Routledge, 2015 [forthcoming]
3. 深町加津枝ら(京都大学地球環境学堂編)、地球環境学−複眼的な見方と対応力を学ぶ(第4章「地域に根ざした文化的景観の保全」)、丸善出版 2014、 254 pages.
4. Jane Singer et al. (京都大学地球環境学堂編)、地球環境学—複眼的な見方と対応力を学ぶ(第1章「開発による強制移住—経済成長が引き起こす犠牲とは？」、丸善出版、2014、254 pages.
5. Fukamachi, K. et al. (eds. Shimizu, N., Tateno, R., Kasai, A., Yamashita, Y.), Connectivity of Hills, Humans and Oceans: Challenge to Improvement of Watershed and Coastal Environments, Kyoto University Press 2014, 310 pages.
6. 深町加津枝(西村幸夫、中井祐、伊藤毅編)、「風景の思想」身近な自然と風景～里地里山の再生による風景づくり、学芸出版社 2012、219 ページ。
7. Fukamachi, K., Rackham, O., Sacred groves in Japanese satoyama landscapes: a case study and prospects for conservation, in Pungetti, G., Oviedo, G., Hooke, D. (eds.) Sacred Species and Sites: Advances in Biological Conservation, Cambridge University Press, 2012 (450 pages)

〔その他〕
当該研究のホームページは公開終了致しましたが、下記に研究概要を公開しております。
http://tjgannon.web.fc2.com/tjg/Pages/J/ESD/ESD.html

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