



Auditing a case study: Enhancing case-based learning in education for sustainability

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ABSTRACT

Case-based learning is a long-standing pedagogic practice involving students undertaking a single dimensional, independent analysis of a text case study which feeds forward into a class discussion. However, this poses several challenges for education for sustainability within the current culture of Higher Education; learners are required to analyze interlinked, multi-faceted aspects of sustainability whereas a traditional text case study generally presents a single situation for consideration; students are reluctant to prepare for classes; a text case study promotes backward reasoning rather than the forward thinking that education for sustainability requires to develop work ready graduates who are change agents for sustainable futures; case-based learning cannot substitute for the active, experiential learning that students find engaging.

This paper presents the findings of a three-year research study into enhancing case-based learning within education for sustainability. It proposes utilizing an extensive mixed media case and facilitating multi-dimensional analysis through the completion of a sustainability audit in an active learning environment to overcome the challenges of traditional case-based learning. The inclusion of an audit to frame the case study analysis may enhance case-based learning as it provides a more immersive experience that guides students through the collection, collation, synthesis, and communication of case study information.

The study's findings suggest students are more engaged and develop the knowledge skills and values required for work readiness and to become sustainability change agents through their immersion in an audit. Consequently, this paper may be of interest to educators seeking an innovative approach to education for sustainability that may overcome the challenges of traditional case-based learning and promote active, experiential learning of the multi-faceted aspects of sustainability.

1. Introduction

Case-based learning is a long-standing pedagogic practice that was pioneered by the Harvard Law School over a century ago (Thomas, 2015). Traditionally case-based learning involved students undertaking a single dimensional, independent analysis of a text-based legal case study which fed forward into an educator-led class discussion of a single issue or situation. This discussion was facilitated to highlight the knowledge demanded by the educator. Subsequently, this evolved into a widely used teaching technique within management education. The traditional text-based case is the favoured input for case-based learning within management education (McDade, 1995), thus it remains a single dimensional analysis process as the case narrative contains one issue or situation that needs to be resolved (McDade, 1995; Popil, 2011) or a point the tutor wants to emphasize (McCarthy and McCarthy, 2006). Despite this, the analysis of the issue or situation within the case-study

has grown to foster a meaningful, active learning environment through which management educators attempt to stimulate learners' critical thinking and analytical skills required for their future management careers (McDade, 1995; Davis and Wilcock, 2003; Habasisa and Hlalele, 2014). The perceived success of case-based learning is generally held to result from its' ability to contextualize theoretical concepts in the experiential learning environment that students find most engaging (Davis and Wilcock, 2003; Herreid and Schiller, 2013). Eliciting active involvement in, and experimentation with, an issue to bridge the gap between theory and practice can stimulate self-directed learning (Kreber, 2001).

However, within education for sustainability within management education, issues and situations have unique features. They are increasingly complex and frequently transdisciplinary (Tejedor et al., 2018), and so require learners to explore multi-faceted aspects of the case rather than the single dimensional issue or situation of a traditional

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text case-study. In addition, it is now expected that management education will take a leading role in promoting sustainable futures (United Nations, 2015), hence additional tools to situate subject complexity for learners and promote a more extensive and structured case study analysis are needed. These are required to enable learners to explore the multi-dimensional, complex interactions and personal values of Environmental and Social Governance (Svoboda and Whalen, 2007), which is now becoming an increasingly critical component of education for sustainability within Higher Education (Seatter and Ceulemans, 2017). The author suggests that case-based learning does not offer sufficient flexibility to engage students in the increasingly complex, trans-disciplinary, and multi-dimensional concepts of sustainability for management education and the forward thinking required to develop work-ready graduates.

In response, this paper proposes that case-based learning can be enhanced to offer greater effectiveness for education for sustainability through the application of a real-world audit as a tool for analysis of the case study. This paper adopts the term 'audit-based learning' for this new approach to education for sustainability to demonstrate the opportunities that the inclusion of an audit as a tool for case-study analysis offers to build on the successes of case-based learning within management education.

To deliver this novel approach to encourage the multi-dimensional analysis required within education for sustainability, a modified real-world sustainability audit based on the Global Reporting Initiative Audit (GRI, no date), has been introduced. This presents students with an analysis process and framework that can promote a more extensive and structured analysis of an extended mixed media case study and proposal of improvement actions, which in turn offers students an experiential learning opportunity, thus enhancing case-based learning for sustainable futures.

Within an organization an audit is a methodical examination of procedures and practices deployed, which has long been recognized as a tool to enable the detection of problems before they affect operations (Hillary, 2004) and to provide a benchmark from which to measure subsequent change (Clark and Whitelegg, 1998). With the growing focus on sustainable business practices within many business sectors to develop Environmental and Social Governance, social and environmental audits have become recognized as a means to collate evidence of sustainability performance and a method of improving it (Gray, 2003; Viegas et al., 2013). Within management education, incorporating the real-world tool of a sustainability audit may reframe the traditional teaching approach of case-based learning. The audit offers a multi-dimensional teaching technique in which multiple, interlinked complex management issues can be addressed and students enabled to explore and evaluate sustainability in a real world business simulation rather than being presented with a single issue or situation as the point of focus. Immersing students in a structured, systematic review and evaluation of the complexities of organizational sustainability performance may also situate the development of critical thinking and analytical skills in a business environment, thus helping to develop work-ready graduates. The practical business skills along with the higher order cognitive skills developed during the audit may then be carried forward by students into their future careers thus helping to realize the expectation that Higher Education Institutions will help to address sustainability issues through management education.

This paper presents an appraisal of the ability of this novel approach to case-based learning for education for sustainability within management education to further build on the successes of traditional case-based learning. Initially the paper presents a comparison of the traditional case-based learning and case-based learning framed by a real-world audit. The author then situates audit-based learning within a third-year undergraduate business environmental and social sustainability module in which learning, teaching, and assessment are designed around the audit. Finally, the paper presents the findings from a 3-year study into the effectiveness of audit-based learning to validate it as an

effective teaching technique for management education.

This paper develops current conversations on teaching techniques that can advance the effectiveness of education for sustainability with management education and offers an innovative teaching technique that may overcome the challenges of traditional case-based learning and promote the active, experiential learning of the multi-faceted aspects of sustainability that students will need to become work-ready graduates. Consequently, it may be of practical use to educators within Higher Education and management educators seeking tools for experiential learning and/or a multidimensional approach to education for sustainability, and of interest to graduate employers.

2. Case-based learning

2.1. The approach of case-based learning in management education

Although case studies were first adopted for professional training by the Harvard Law School in the 1920s (Thomas, 2015) they have evolved into a widely used teaching technique that enables educators to present a problem for analysis (McDade, 1995). The growth in the use of case studies as a pedagogic tool may be due to the recognition that they can foster a meaningful and active learning environment through which educators can promote critical thinking and analytical skills (McDade, 1995; Davis and Wilcock, 2003; Habasisa and Hlalele, 2014), and engage students in an exploration of realistic or real-world situations (Servant-Miklos, 2019). In addition, case-based learning is recognized to stimulate independent learning by promoting self-direction on the part of the students and reducing the role of the educator from transmitter of knowledge to one of session facilitator (Servant-Miklos, 2019). Consequently, it is now a common teaching technique within multiple Higher Education settings around the world, particularly health and social care and management education.

As might be expected, this extensive adoption within multiple curricula has resulted in several different names being given to the teaching approach; for example, case study teaching, case method of teaching and case-based learning. Despite this difference in terminology, which is largely dependent on the subject area in which they are used (Thistlethwaite et al., 2012), the use of case studies as a teaching technique has the same expectation of learners; to analyze issues, exercise judgement, evaluate potential difficult decisions and suggest courses of action (Harvard Business School, 2021). Together, these are recognized as a process in which students, by engaging in a real world or realistic (i. e., one that replicates the real world) case study, can learn by solving real world problems (Braunstein et al., 2019; Servant-Miklos, 2019). This paper adopts the term case-based learning to emphasize that using a case study within teaching and assessment aims to promote learning.

2.2. The benefits and challenges of case-based learning

Researchers have long agreed that a case study within management education can be used as a narrative to stimulate dialogue (McDade, 1995; McCarthy and McCarthy, 2006; Badger, 2010; Bonney, 2015). More recently, however, the purpose of case studies has evolved so that they are now viewed as learner-centric teaching materials (Nkhoma et al., 2017) that can involve students in critical thinking, problem solving and decision making to transfer theoretical knowledge into theory informed knowledge (Thistlethwaite et al., 2012; Habasisa and Hlalele, 2014). Critical thinking and problem solving can be promoted through the independent study, guided classroom discussion and collaborative analysis that are key features of case-based learning and may, in turn, promote students' engagement and academic performance (Pintrich and Schunk, 2002; Yalcinkaya et al., 2012; Bonney, 2015).

Despite the popularity of case-based learning, several challenges may impact its effectiveness for the multifaceted, complex situations encountered within management education, including the growing topic of education for sustainability. Firstly, a case study most commonly

offers single dimensional analysis, i.e., the narrative contains one problem or situation that needs to be resolved (McDade, 1995; Popil, 2011) or a point the tutor wants to emphasize (McCarthy and McCarthy, 2006). Cases provided as simple text documents are readily available to educators but promote backwards reasoning, as the analysis starts from the question posed by the educator then works backwards through the case study to come to a solution and they are unable to represent real world situations (Braunstein et al., 2019). This is less effective for education for sustainability as it does not deduce multi-dimensional answers. In turn this limits learners' exposure to the multi-faceted problems they will face within their future careers and does not promote the forward reasoning skills that gather information and generate new knowledge and opportunities for change, and encourage multiple conclusions, which students require to become work ready graduates (Braunstein et al., 2019). Together these hamper the development of cognition skills that learners gain from multi-dimensional learning experiences (Svoboda and Whalen, 2007).

Secondly, learners' engagement with learning activities continues to decline (Leach, 2016), so that willingness to undertake pre-class preparation is now recognized as a serious problem (Abeysekera and Dawson, 2015; Zeivots, 2021). Despite this, case-based learning continues to expect learners to prepare their case analysis, have relevant knowledge and act as quasi-professionals within the discussion (Servant-Miklos, 2019). However, if educators cannot rely on the class having undertaken the pre-class case study analysis, that is a pre-requisite for effective case-based learning (Bowe et al., 2009; Servant-Miklos, 2019), in-class work obliges the tutor to identify the case study problem and contextualize its' theoretical concepts (Davis and Wilcock, 2003; Stjernquist and Svalenius, 2007) rather than simply supporting the learners in their in-depth exploration of the case, as was the original process of case-based learning. In turn this may impact students' recognition of learning, which can impact the quality of education (Kurnaz and Cimer, 2010) and student outcomes, as those recognizing their learning will perform better than those who do not (Flavell, 1976; Hannon et al., 2004).

Thirdly, the quality and format of the case study will determine learners' interest so developing bespoke cases has become extremely resource intensive (Mostert, 2007). Finally, traditional case-based learning may be undermined by learners' growing demands and preferences for collaborative, experiential and real-world learning within management education (Freeman et al., 2017). As case-based learning cannot substitute for experiential learning, which provides students with a personal encounter with the situation being studied (McCarthy and McCarthy, 2006), it may be time to rethink the practice of case-based learning and design of case studies within management education. An increased use of diverse problem triggers within the case, a more interactive approach to the case-study analysis and greater focus on the discussion phase may build on the successes of case-based learning to develop a more effective case-based teaching technique (Braunstein et al., 2019; Servant-Miklos, 2019).

To achieve this advocated approach to case-based learning, and further build on the successes, and overcome the challenges identified, a new teaching technique of audit-based learning has been designed. This study uses its' incorporation into an Environmental and Social Governance module to appraise the effectiveness of using a sustainability audit to provide a process and framework with which to analyze a case study.

2.3. Audit-based learning

Audit-based learning is defined by this study as 'learning achieved through preparing and undertaking an audit of a case study company and reflecting on its' outcomes'. It is designed to advance the single dimensional analysis of text cases by introducing a real-world audit to promote the multi-dimensional analysis of a case study. To facilitate the multi-dimensional analysis, the case study should contain mixed-media inputs such as photographs, business reports, corporate records,

communications (e.g., emails, letters, and transcripts of conversations) in addition to descriptive text providing context and details. This can enable students to become immersed in an organization as it can be studied over a longer period. Together these inputs can simulate a company and enable complex, multiple issues to be examined and their interactions explored. The audit introduces a business tool that provides a framework to analyze the complex real-world situations provided in the case study whilst promoting both an interactive teaching technique preferred by students (Freeman et al., 2017) and the forward reasoning advocated by Braunstein et al. (2019).

Despite the potential benefits of incorporating this business tool as a teaching technique, previous research suggests that whilst environmental audits have been used to offer extracurricular learning (Ferreira et al., 2006; Alshuwaikhat and Abubakar, 2008) or been incorporated within a science based environmental module (Bardati, 2006), audits have not been utilized as a formal or informal teaching technique in management education. Research does agree, however, that audits can offer a valuable approach to management education as they stimulate students to be active learners instead of knowledge consumers as the audit process requires them to collect, analyze and synthesis information (Juarez-Najera et al., 2006) which can deliver the active, experiential learning for generative sustainability that is required to promote sustainable futures (Alcaraz and Thiruvattal, 2010; Segalas et al., 2010; The Quality Assurance Agency for Higher Education, 2014).

Audit-based learning is designed to combine three learning styles: learning by doing, project-based learning and active learning. Through this the students are engaged in a student-centred, relevant, and meaningful pedagogic approach that delivers deeper sustainability learning in a context of how it will be used in the real world. The three learning styles combine to embed learning in real world contexts through which students gain conceptual insight and practical expertise offering personal encounters that may promote self-efficacy and motivation to participate (Bandura, 1991), which in turn may stimulate learners' development of knowledge, capabilities, cognitive skills and forward reasoning (Flynn and Klein, 2001).

Learning by doing has long been advocated as a pedagogic approach that overcomes the inability of traditional, passive teaching to equip students with skills that are required for their future careers and to shape the future of society (Dewey, 1916; Bradberry and De Maio, 2019). It is a unique learning process as it can guide the student to be an independent learner, which in turn can foster skill development and generate student engagement as the content is delivered in a context that is relevant and meaningful for the learner (Dewey, 1916; Drayson, 2015). Within this research, learning relevance comes from the audit as the assignment and graduate employers' expectation that sustainability skills are possessed by potential graduate employees.

The integrative approaches to sustainability offered by project-based learning create a valuable pedagogic approach in which the project serves as a stimulus for students to recognize their learning needs (Leal Filho and ShielPaço, 2016). Hmelo-Silver (2004) takes this further and suggests the complex problem focus of problem-based learning, and lack of a single correct answer, can promote self-directed learning, intrinsic motivation and thinking strategies by encouraging students to identify what knowledge is needed to address the task. In turn, such outcomes can help to equip students with higher order cognitive skills such as enquiry, problem solving and critical analysis, and softer employment skills such as collaboration, negotiation and influencing (Shepherd, 1998). For audit-based learning the project is the collection of data and its collation into audit findings.

Active learning is an instructional approach involving students in undertaking activities and thinking about what they are doing (Bonwell and Eison, 1991). This can promote thinking, problem solving and writing, thus assisting students to develop academic skills (Worrell, 1992). Writing is now becoming a key challenge for higher education, as it is increasingly receiving public attention and negative publicity in the public arena (Guardian, 2021).

Incorporating active learning in a real-world setting can help students find their place in the world by doing what they learn (Bardati, 2006). This is particularly valuable when teaching sustainability, as a goal of education for sustainability is to equip students with the knowledge, skills, and values to become change advocates and address the interconnected global challenges increasingly faced (United Nations Education, 2020). Through this student-centric, active learning approach students' ability to analyze, evaluate and synthesize information is developed through cooperative learning and active inquiry (Bonwell and Eison, 1991), which Johnson and Johnson (2008) suggest will result in stronger academic self-esteem and lead to improved learning outcomes.

Audit-based learning can offer the valuable double loop learning advocated by Argyris and Schon (1974) and Beckett and Murray (2000) as it can expose learners to a variety of possible future scenarios through a critical evaluation of their own decisions in a multidimensional learning experience. Whilst single loop learning can enable the learner to achieve an objective, double loop learning focuses on solving complex problems by enabling them to think more deeply about their own assumptions and beliefs (Argyris and Schon, 1974). Through this, learners are enabled to obtain and integrate new information and develop new skills to question and possibly discard familiar ways of thinking that may transform the way complex problems are considered and resolved (Cartwright, 2002). Double loop learning may therefore promote the forward reasoning that Braunstein et al. (2019) suggest is needed for work readiness. This, in turn, may promote students' learning awareness, as the audit requires them to select what case study information is important and what can be discarded to frame appropriate solutions, as advocated by Taylor (1974) and Sadler (2016). As knowledge gained in this active audit environment may be retained for longer than knowledge gained in passive learning experiences (Gardiner and D'Andrea, 1998), audit-based learning may take students beyond just-in-time learning and encourage them to take ownership of their learning needs, which is a critical component of learning (Savery, 1995).

The active, collaborative, and immersive learning environment of audit-based learning provides a distinctive, experiential perspective to management education, which may offer a structured learning experience and be considered a more easily accessed equivalent of a field experience as the students can be introduced to new real world learning experiences without leaving the classroom. Structured learning experiences are valuable for education for sustainability as they have a strong emphasis on the application of knowledge and are designed to elicit emotion, motivation, and attention (Ellis et al., 2017). In this study the structured learning experiences emanate from the completion of the sustainability audit and participation in audit-based learning interventions included. Such structured learning experiences can enable students to explore a topic more fully from a behavioral rather than purely conceptual perspective (Dougherty, 1975), which is valuable within education for sustainability as behaviour change will drive sustainable futures. The personal and behavioral responses to the structured learning experiences highlighted by Cattell (1996) may enable students to recognize their levels of academic attainment and develop the personal goals that will drive future sustainable changes.

Field experiences are considered to make the learning environment more relevant for students which, in turn, is more likely to promote knowledge and knowledge retention (Bonwell and Sutherland, 1996; McCarthy and McCarthy, 2006). Such active, experiential real world teaching techniques as provided by the audit, are the equivalent of a field experience and can help to deliver the long-acknowledged need for learners to see the relevance of the topic being studied and to be actively engaged in it (Alcaraz and Thiruvattal, 2010; Knowles et al., 2005). This alternative learning environment of a field experience can help students understand theory and build and integrate knowledge and meaning by seeing theory in practice (Hvenegaard, 2012). Field experiences can also encourage students to actively engage in the learning task with peers rather than being passive recipients of information and accessing

answers online, thus developing deeper learning (Armier et al., 2016). In practice, an audit may therefore be both an outcome and a process of learning (Corcoran and Wals, 2004).

The structure provided by the audit process and framework allows the case study to be longer, more detailed and comprised of increasingly complex inputs, actions, and outcomes which traditional, single dimensional case-studies do not display. This enables the case-study to be analyzed in themes over an extended period, thus enabling students to become fully immersed in the organization and have time to understand the complexity, interconnections and implications of the issues presented. In this study the case-study is analyzed week by week over the course of a semester.

2.4. A comparison of audit-based learning and case-based learning

A comparison of the effectiveness of inputs into, and outcomes of, case-based learning and those designed into audit-based learning is shown in Table 1. This highlights the potential for audit-based learning

Table 1
Case based learning vs. audit-based learning.

Case-based learning	Auditing a Case Study
The case study provides a story about a situation (McDade, 1995; McCarthy and McCarthy, 2006)	Within audit-based learning students can create their own story through their synthesis and evaluation of a more extensive case study
The case study is a vehicle of pedagogy that teaches and models thinking processes in the classroom by presenting a problem for analysis (McDade, 1995; Thomas, 2015)	Audit-based learning is a technique that can promote the co-creation of knowledge through experiential learning, reflection, and application of experiences from the case study and audit within in-class activities
The case study requires students to think about a single situation or dilemma (McCarthy and McCarthy, 2006; Popil, 2011)	Audit-based learning can provide direct personal encounters with several interlinked situations; students come face to face with decisions that are real and relevant
Case-based learning uses a case to emphasize the process of analyzing information to drive theory from practice (McDade, 1995)	Audit-based learning can immerse students in the processes of collecting, collating, synthesizing, evaluating, and communicating information to drive practice and theory
A case study is most frequently analyzed in classroom discussion (McCarthy and McCarthy, 2006)	Within Audit-based learning the case study is analyzed, and the findings applied through practical, collaborative, experiential in-class learning activities
The tutor prepares questions to lead case-based learning's discussion method teaching (McDade, 1995)	The tutor can prepare practical, collaborative activities to promote the personal, peer-to-peer learning and learning through interaction with experts advocated by Dunlevy and Milton (2008)
Pre-class preparation informs in-class activity, so knowledge is a basic requirement for effective teaching; pre-class preparation is a significant problem within management education (Abeysekera and Dawson, 2015)	Audit-based learning's progressive taught sessions do not rely on students' pre-class preparation; in-class activities engage students with the case study and complex company interactions
Learning outcomes of case-based learning typically relate to the critical thinking process (McDade, 1995)	Learning outcomes of audit-based learning can typically relate to wide ranging learning through experiential activities supporting the audit process; cognitive skills, subject knowledge, employment skills, personal values, learning awareness, self-efficacy, etc. (McCarthy and McCarthy, 2006)
The teaching technique of using a case study enables students to develop listening and analysis skills	The teaching technique of incorporating an audit to analyze a case study enables students to develop listening and critical analysis skills plus creative and innovative thinking collaboration, negotiation, influencing, flexibility, and self-direction (Van Wyk, 2011)

to be a teaching technique that can take the most successful elements of case-based learning and develop them into an even more effective teaching tool.

As suggested in Table 1 the inclusion of an audit to frame the case study analysis may enhance case-based learning as it provides a more immersive experience that guides students through the collection, collation, synthesis, and communication of case study information. Aligning learning, teaching and assessment to the case study and working with it across the semester may help students to develop academic confidence and self-efficacy by giving them the time they need to understand, absorb, assimilate, and apply the learning and develop subject knowledge and personal values. Incorporating the collaborative, experiential and active in-class learning activities may engage students in their preferred learning environment (Willms et al., 2009) and support them to engage with the complex, multi-dimensional nature of sustainability and the higher order academic skills that promote critical thinking, information synthesis and self-direction as well as the recognition of learning, which Sadler (2016) recognizes as a challenge for Higher Education.

3. Design of the study

This paper reports the findings of a three-year study into the effectiveness of using audit-based learning as way to further develop the successes of case-based learning and overcome the challenges of single dimensional analysis, learners' limited preparation, labour intensiveness of case study creation and students' preferences for experiential, real-world learning described above. The study, which utilizes self-reported learning, was conducted with 116 students studying an Environmental Social and Governance module over the three academic years 2018–19 (39 students), 2019–20 (34 students) and 2021–22 (43 students).

The validity of using self-reported data in higher education research has been widely debated over the last 50 years, with various authors confirming its soundness (e.g., Pohlmann and Beggs, 1974; Astin, 1977; Pace, 1985) and questioning its accuracy and appropriateness (e.g., Porter, 2009; Pascarella and SeifertBlaich, 2010). However, the validity of self-reported studies utilizing higher education students has now been accepted and, despite inherent difficulties from students' frequent inability to recognize learning, they are considered extremely valuable as they can help to address challenges such as students' relationships with higher education, learning preferences, engagement, and outcomes (Pike, 2011). Such research findings are now influencing educational practices, policy making, and educational accountability (Rosen et al., 2017).

The research uses the benefits and challenges of case-based learning defined within the literature explored above to create the Five Indicators of Learning and Teaching Effectiveness Framework. This framework is used in this study to frame the research and structure the synthesis, evaluation and presentation of research data that is used to determine the effectiveness of including an audit to enhance case-based learning. These five indicators are sustainability knowledge, capabilities, cognition skills, forward reasoning, and engagement. They are termed Effectiveness Indicators 1–5 in the presentation of research findings. Together these five indicators offer an evaluation of effectiveness from multiple perspectives that contribute to learners' academic success, workplace readiness and sustainability values, which are the desired outcomes of Education for sustainability.

To undertake this study pre- and post-module surveys were issued in the first and last lectures of the module (Appendix 1). The same first twelve skills-based questions were used in both the pre- and post-module surveys to establish students' self-reported growth of knowledge and skills during the module. An additional four free-text questions were included in the post-module survey to encourage students to reflect on their learning awareness and assess levels of engagement. This study adapts the definition of engagement used by HuKuh (2002) that focuses

on students' quality of effort in contributing to their academic outcomes and defines engagement as 'motivation to participate in educationally purposeful activities'.

The benefits and limitations of self-reported surveys have been widely debated (Razavi, 2001; Fan et al., 2006; Deminriou et al., 2015; Koundinya et al., 2016; Liu and Wronski, 2017; Schonlau et al., 2002). Razavi (2001) suggests the validity of self-reported surveys can be affected by the context in which they are used. Responses can be influenced by the presence of the researcher making the participants thinking they are being observed, a personal bias of answering questions 'yes' or 'no' or a lack of flexibility through fixed choice questions which prevent participants expressing their feelings (Deminriou et al., 2015). In additional, practical challenges of engaging students in research have been identified by Saleh and Brista (2017), particularly the difficulty of contacting students by email as they infrequently access their accounts.

The benefits of self-reported surveys are generally considered to outweigh the limitations and the validity of the data collected is generally accepted. Key benefits include the ease of administration, the ability to establish an individual's experience, the generalizability of responses and the tendency for more accurate responses as participants are closer to the topic surveyed (Razavi, 2001; Fan et al., 2006; Deminriou et al., 2015). The benefits of a self-reported survey can be enhanced if it is administered online, as online surveys generally receive significantly higher response rates (Koundinya et al., 2016; Liu and Wronski, 2017).

The researcher minimized the limitations, and maximized the benefits, of self-reported surveys, by having a colleague introduce the survey, separating it from module outcomes, and administering it online. To maximize participation, the survey was completed anonymously and a link to it was posted on the module's Virtual Learning Environment (VLE) which could be accessed by phone in class. An additional announcement was issued via the VLE's messaging service to request those students who were not in class at the time the surveys were introduced complete the survey. In total the link was provided to 146 students with 116 responses received over the course of this 3-year research project.

To maximize the likelihood of valid responses to the quantitative and qualitative questions used, questions were simplified, and a pilot study was undertaken in the first year of the study. Although no changes to the survey were required following the pilot survey, the responses to the 5 surveys completed in the pilot study were discarded.

The quantitative element of each skills' question presented an initial statement that required a response on a four-point rating scale to gather students' reflections on their perceived skill levels. This unipolar scale utilized four possible responses, which Deminriou et al. (2015) suggest will prevent the common in-between rating when an uneven number of possible responses is applied. Deminriou et al. (2015) advocate utilizing explicit rating options to increase the reliability of how respondents use the scale. Consequently, the rating scale in this study included simple rating options of 'no knowledge', 'a little knowledge', 'some knowledge', and 'very good knowledge'. This also helped to reduce source error variance by eliminating the need for the researcher to interpret the responses given (Herbert et al., 2014).

A comparison of responses between the pre- and post-module surveys enabled the appraisal of the effectiveness of audit-based learning as a learning and teaching tool. The rating scale responses are collated and presented graphically as the percentage of responses per rating option to highlight the development of knowledge and skills. Qualitative responses are reported verbatim to illustrate students' self-perceived development of skills and knowledge, to demonstrate reflections on self-efficacy and recognition of learning.

To evaluate students' self-reported development of learning for Effectiveness Indicator 1, quantitative responses to the six dimensions of sustainability knowledge used in the surveys are evaluated. The first three of these six dimensions are taken from the traditional view of sustainable development and coined by Elkington (1997) as the 'Triple

Bottom Line': environmental, social, and economic sustainability. The remaining three dimensions of sustainability are included to reflect the areas of sustainability highlighted as key skills for work ready graduates (Guardian, 2014): corporate social responsibility, global issues, and global issues for business. They, in turn, drive the areas of sustainable governance taught by the author.

Students' quantitative responses to the seven dimensions of academic and workplace skills are used to evaluate Effectiveness Indicator 4: communication, problem solving, critical thinking, collaboration, negotiation and influencing. These are combined from the Framework for 21st Century Learning (Partnership for 21st Century Skills, 2009) and the higher order cognitive and softer employment skills recognized by Shepherd (1998) to create a structure with which to assess development of academic and workplace skills. Effectiveness Indicators 2, 3 and 5 are explored through the qualitative responses to the surveys.

4. Enhanced case-based learning through auditing the case study: results

The questionnaire used within this study (Appendix 1) asked students to reflect specifically on their learning from undertaking the audit. The self-reported quantitative and qualitative research findings presented here suggest students believe auditing a case study has developed their knowledge and skills have developed across all Five Indicators of Learning and Teaching Effectiveness.

Previous research into student engagement through undertaking an audit identified that participating in the reflexive, critical enquiry required to undertake it can develop personally and professionally responsible students, with the necessary knowledge, skills, and values to enable them to identify and address irresponsible business practices (Emblen-Perry, 2020). The findings reported below support this and further develop an understanding of the value of audits as a learning and teaching approach.

Analysis of students' reflections on participating in the audit of a case study suggest that audit-based learning can promote the first three of the Five Indicators of Learning and Teaching Effectiveness (knowledge, capabilities, cognition skills) by exposing students to a variety of perspectives offered by the multimedia case study and double loop learning. This can engage learners with the multi-faceted problems that can overcome the focus on single-dimensional analysis in a traditional case study (McDade, 1995; Popil, 2011) and convert backwards reasoning to forward reasoning (Braunstein et al., 2019) in a collaborative, experiential and real-world learning environment. For example, in response to Question 14 a student indicated:

"The audit has allowed me to develop within my life and career but also my knowledge as I have been able to discuss and listen to a variety of perspectives."

Results of the study also suggest audit-based learning can achieve the fourth and fifth Indicators of Learning and Teaching Effectiveness; forward reasoning and engagement, which may overcome the case study challenges of pre-class preparation and engagement with learning activities. For example, in a response to Question 14, a student indicated:

"The variety of activities used to develop audit knowledge is engaging"

This may result from learning being relevant and undertaken within the collaborative, real world learning environment preferred by students (Abdel Meguid et al., 2017).

Overall, the study suggests that audit-based learning can deliver all Five Indicators of Learning and Teaching Effectiveness by engaging students in the audit's multidimensional learning experience as advocated Beckett and Murray (2000). This multidimensional learning experience may encourage learners to critically evaluate their own decisions and focus on problem solving by encouraging reflection on their own assumptions and beliefs (Argyris and Schon, 1974). In turn, this

may also enable learners to obtain and integrate new information and develop the new skills to rethink problem-solving approaches to complex issues as advocated by Cartwright (2002). The study suggests these combine to promote the forward reasoning that Braunstein et al. (2019) suggest is needed for work readiness. The effectiveness of audit-based learning against the Five Indicators of Learning and Teaching Effectiveness is explored against each Indicator in turn below.

4.1. Effectiveness Indicator 1: sustainability knowledge

Students' reflections on participating in audit-based learning across all three years of the study suggest that auditing a case study and utilizing an audit as the focus for learning, teaching, and assessment can develop sustainability knowledge (Fig. 1); students reported an increase of knowledge in all five dimensions of sustainability knowledge surveyed as a result of conducting an audit, although it is noticeable that environmental and social sustainability are reported as the biggest growth areas.

As shown in Fig. 1, within four of the five dimensions of sustainability knowledge, most students reported that their audit of a case study enabled them to develop 'good knowledge' or 'a fair amount of knowledge', with knowledge growth in the dimensions of environmental and social sustainability and globalization issues for business particularly strong. More than 85% of respondents suggested they had good knowledge in each of these three dimensions in the post-module survey. However, good knowledge in corporate responsibility and economic sustainability appears to have developed to a lesser extent than the other three dimensions of sustainability knowledge. This study suggests that engaging in audit-based learning can enhance learners' knowledge, and importantly their recognition of this knowledge, across all five dimensions of sustainability knowledge. For example, in response to Question 15 students reported:

"I understand a lot more about the use of sustainable practices in businesses ... and the impact of sustainability on everyday life"

"I feel like I have learned a lot of applicable knowledge for my working life"

"[It was] easy to relate this case study to real life business sustainability"

"Relevance to real life was good"

The knowledge growth demonstrated in this study suggests auditing a case study has delivered learning and teaching Effectiveness Indicator 1 and promoted the employment skills by enabling students to engage in the multi-faceted, complex situations that represent those that they will face in their future careers. This may promote a future generation of change agents who are equipped to promote advocacy for sustainable futures and develop business from within. For example, in response to Question 13, students reported:

"The audit helped to give a holistic view of the problems"

"The audit helped to consolidate my knowledge"

4.2. Effectiveness Indicator 2: capabilities

The responses received in this study suggest capabilities (sustainability skills required for academic success and workplace readiness) can be developed through participation in an audit, which can enhance education for sustainability. Reflecting on their audit of the case study and participating in the aligned in-class activities such as film making, quizzes and drawing sustainability, students reported they had developed academic and employment skills, which suggests auditing the case study can deliver Effectiveness Indicator 2 in a student-centred learning environment. For example, in response to Question 14 in the post-module survey, students recognized their learning of:

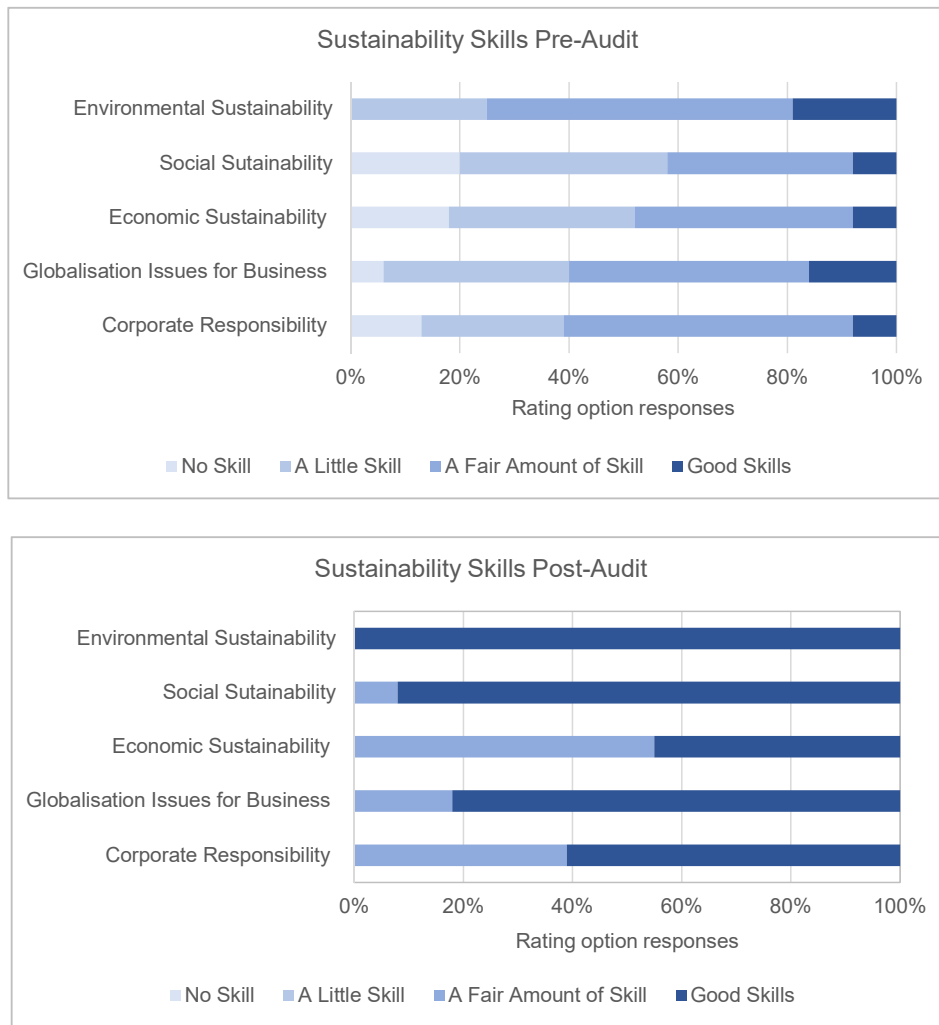


Fig. 1. Students’ perceptions of sustainability knowledge and skills pre- and post-audit (responses collated by rating option across the study).

“Managing business analysis with a structured approach”

“Analyzing and synthesizing information from a case study is a skill in itself”

“Greater awareness of sustainability and personal actions”

Students also recognized their development of personal workplace skills. For example, in response to Question 16 in the post-module survey, students reported:

“A lot of team-working skills were developed ”

“I developed skills such as leadership and communication”

As well as fostering sustainability knowledge, the employment skills expected by graduate employers, and life and career skills, the study suggests engaging students in a sustainability audit and associated activities can stimulate personal sustainability values, which hopefully can in turn promote advocacy for sustainable futures. For example, students reported that auditing the case study encouraged them to:

“Think how you can adapt to be more sustainable”

“Pull in as much information as you can, as what is taught here is kind of life changing. I started with the knowledge that something is happening in the world but I can’t change it and at the end I have the feeling that the change isn’t impossible and that small step leads to big changes.”

It is encouraging that students recognize their personal impact as well as that of businesses and the module’s applicability to real life. This resulted in some clear personal changes in behaviors such as bringing reusable coffee cups and water bottles to the lectures.

In addition to deeper learning, research findings suggest students matured in learning awareness by participating in audit-based learning. For example, students recognized:

“Auditing is a very useful business skill”

“I learned analytical skills needed to be applied to a job or workplace”

“Auditing helped analyzing and reflecting on a business situation”

This learning awareness may have been promoted by the audit’s structured approach to the collection and collation of case study information to create audit findings. This structured approach to learning, in which learners must select and utilize the pertinent information and discard the rest, can help students develop self-discipline which in turn is a key factor in improving learning outcomes and promoting learning awareness (Taylor, 1974); Sadler (2016); Gorbunovs et al. (2016). For example, in response to Question 15 in the post-module survey, students recognized auditing a case study:

“Furthered my self-discipline to complete tasks/assignments”

“[I recognized] the importance of taking accountability due to learning from case study”

4.3. Effectiveness Indicator 3: higher order cognitive skills

The research findings presented here suggest that auditing a case study may develop students' higher order cognitive skill levels in all seven skills dimensions included in the surveys (Fig. 2).

However, the students' self-reported skills development within the quantitative survey findings suggests their cognitive skills did not develop as significantly as sustainability knowledge (Effectiveness Indicator 1). The author suggests that this may be a matter of perception, including a lack of academic confidence and/or self-efficacy, as the development of learners' cognitive skills was clearly perceived in class and through assignments. This perception may have negatively impacted the mapping of reflections against the Effectiveness Indicators. Whilst the author recognizes the development of most students' cognitive skills during the module across all three years of the study, additional work is required to further improve student's recognition of learning and learning outcomes advocated by Flavell (1976) and Han-non et al. (2004).

In their reflections, students recognized the value of the auditing the case study in developing cognitive skills and softer employment skills such as problem solving, critical thinking, collaboration and influencing. This may have been driven by the engagement with complex, multi-faceted and interlinked sustainability situations and collaborative activities that were designed into the audit and case study to overcome the single dimension of traditional case studies identified by McCarthy and

McCarthy (2006) and Popil (2011) and to promote the listening, critical analysis, collaboration, negotiation and influencing skills that Van Wyk (2011) advocates for promoting employment skills. Students' reflections on auditing the case study demonstrate the contribution to Effectiveness Indicator 3:

"Auditing helped me get more involved with the case study and question more"

"[It] encouraged me to think and analyze critically"

"[It] encouraged us to read between the lines for evidence to use in arguments"

4.4. Effectiveness Indicator 4: forward reasoning

The multi-dimensional nature of the case study audited by the students and the learning relevance provided by the problem-solving nature of the post audit reflection required for the assignment may have encouraged forward reasoning and challenged the promotion of backwards reasoning that Braunstein et al. (2019) consider is driven by traditional single dimensional case studies. The problem-solving focus of the required post audit recommendations, which require learners to suggest improvement actions, may enable the transfer of theoretical knowledge into theory informed knowledge to promote the forward reasoning that Thistlethwaite et al. (2012) and Habasisa and Hlalele

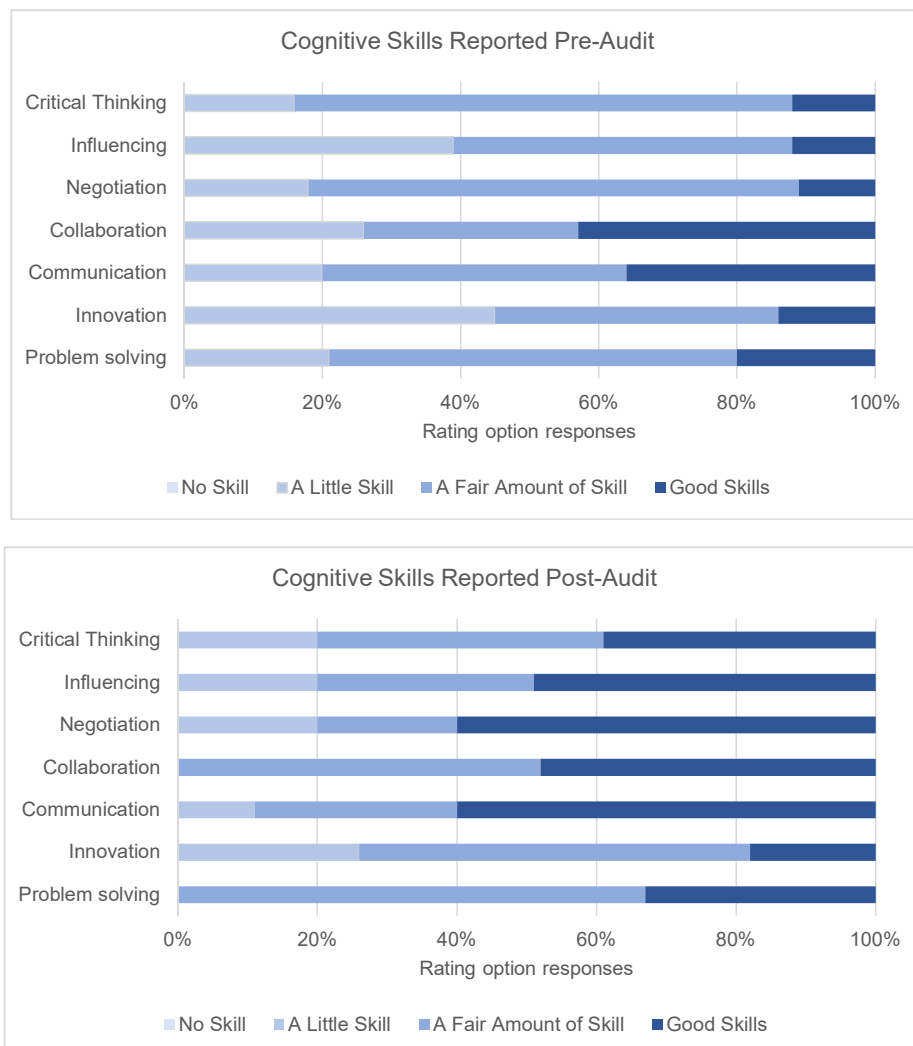


Fig. 2. Students' perceptions of cognitive skills pre- and post-audit (responses collated by rating option across the study).

(2014) advocate. Students' reflections on their engagement with learning from audit-based learning demonstrate the achievement of Effectiveness Indicator 4: Forward Reasoning:

"I now understand how you can give companies recommendations to improve their sustainability performance bit by bit"

"I obtained a lot of useful information in relation to future business situations"

4.5. Effectiveness Indicator 5: engagement

The research findings suggest that participating in an audit can increase students' motivation to participate in educationally purposeful activities, which HuKuh (2002) suggest can lead to enhanced outcomes, and promote an increased quality of effort, i.e., engagement. This motivation to participate was established through students' use of related words in survey responses such as 'engaging', 'engaged', and 'engagement'. Students recognized their engagement in the pedagogic approach used with auditing the case study:

"The activities for the audit were informative. I always felt engaged."

"I like to get involved. It keeps me engaged"

"My engagement was strong"

The findings of this study suggest audit-based learning can achieve Effectiveness Indicator 5: Engagement. Engagement may be promoted by the module's learner-centric teaching materials and approaches, and collaborative activities, which Yalcinkaya et al. (2012) and Bonney (2015) suggest will promote students' engagement and academic performance.

5. Enhanced case-based learning through auditing the case study: discussion

Overall, the survey findings presented here suggest that including a real-world audit as a tool to analyze a case study can enhance the case study's pedagogical value for education for sustainability in management education. Auditing a case study can further develop the successes of the traditional single-dimensional case-based learning by providing a more structured approach to frame the case study process and outcome within the active, experiential learning environment preferred by students. This learner-centric learning environment created, and real-world audit tools and audit processes and practices implemented, can enable an extended case study to be used. This is applied across a semester in this study which enables learners to explore the complex, transdisciplinary and multidimensional facets of sustainability that Svoboda and Whalen (2007) and Seatter and Ceulemans (2017) recognize as becoming increasingly critical within Higher Education. This enhances the effectiveness of traditional case-based learning as it offers students the time and space needed to understand, absorb, assimilate, and apply the learning and develop subject knowledge and personal values, which can develop employment skills and promote the sustainability advocacy expected by the United Nations (2015).

Students' reflections on their personal encounters with the audit and the case study demonstrate the effectiveness of including a real-world audit to enhance case-based learning. Their self-reported survey responses demonstrate that the student-centred approach of audit-based learning can deliver the students' preferred collaborative, active and experiential learning styles advocated by Davis and Wilcock (2003) and Herreid and Schiller (2013), challenge the declining engagement with learning activities recognized by Leach (2016) and Abeysekera and Dawson (2015), and deliver effective academic learning and employment skills outcomes.

Survey responses suggest audit-based learning is an effective approach to education for sustainability as it encourages learners' to

willingly engage in the collaborative, in-class learning interventions as advocated by Bandura (1991). It appears that the learning interventions and adopted learning styles (learning by doing, problem based learning and active learning) can create a meaningful pedagogic approach that helps students gain conceptual insight and the practical expertise they prefer. For example, playing games can immerse students in the case-study detail in an active and fun manner, whilst group work focused on the audit, such as environmental impact assessments, crosswords and film making, is designed to involve them in the design of audit findings and collaborative, creative problem solving. The teaching approaches used are also practical, consequently they offer the active and problem-based learning advocated by Bonwell and Eison (1991) and Hmelo-Silver (2004) whilst engaging students in the learning by doing advocated by Dewey (1916) and Bradberry and De Maio (2019). In addition, as the in-class activities are designed without a requirement for pre-class preparation, they also help to overcome the challenge of pre-class preparation identified by Abeysekera and Dawson (2015) whilst enabling to author to support students through their learning experiences.

6. Recommendations for future research and knowledge exchange

Several opportunities to extend audit-based learning research and knowledge exchange streams emerged whilst undertaking this study. The author recognized the need for further research into means and methods to develop learners' knowledge of social responsibility and the economic aspects of sustainability as well as their learning recognition to ensure they can maximize the positive outcomes of audit-based learning. In addition, further research exploring opportunities to extend audit-based learning across and beyond the wider management education curriculum is recommended.

An additional opportunity to develop audit-based learning into a student-led knowledge exchange project is now underway. This consultancy project connects audit trained students and local organizations to implement an audit of environmental management practices to establish a benchmark for future organizational improvements. Research into the impacts of this approach to environmental management improvements is planned.

7. Conclusion

Although case-based learning is a long-standing and widely applied pedagogic practice, this study has suggested that implementing a real-world audit as a tool to analyze the case study can offer greater effectiveness for education for sustainability within management education. The evidence presented suggests that the inclusion of a real-world audit to analyze a case study can realize all Five Indicators of Learning and Teaching Effectiveness, which are the desired learning outcomes within education for sustainability. The self-reported evidence collected in this study suggests these are achieved as audit-based learning can develop learners' self-efficacy, academic confidence, and motivation to participate in learning, which in turn stimulates knowledge, capabilities, cognitive skills, and forward reasoning. Findings also suggest that unlike traditional, single-dimensional case-based learning, audit-based learning can engage students in the increasingly complex, transdisciplinary, and multi-dimensional concepts of sustainability that they will encounter in their future careers. Consequently, the study suggests that audit-based learning can enhance case-based learning and, within management education, can make education for sustainability more effective.

CRedit authorship contribution statement

Kay Emblen-Perry: Conceptualization, Methodology, Investigation, Analysis, Visualization, Writing – review & editing.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

The data that has been used is confidential.

Appendix 1

Pre- and Post-Module Survey.

i) Sustainability Skills

At the start/end of this module what is your knowledge of the following:

1. Environmental Sustainability?
 - Good knowledge
 - A fair amount of knowledge
 - A little knowledge
 - No knowledge
 2. Social Sustainability?
 - Good knowledge
 - A fair amount of knowledge
 - A little knowledge
 - No knowledge
 3. Economic Sustainability?
 - Good knowledge
 - A fair amount of knowledge
 - A little knowledge
 - No knowledge
 4. Globalisation issues for business?
 - Good knowledge
 - A fair amount of knowledge
 - A little knowledge
 - No knowledge
 5. Corporate Responsibility?
 - Good knowledge
 - A fair amount of knowledge
 - A little knowledge
 - No knowledge
- ii) Academic/employment skills

What is your current skill level of the following skills required to succeed at university and in your future workplace?

6. Problem Solving i.e., thinking differently, creativity
 - Good skills
 - A fair amount of skill
 - A little skill
 - No skill
7. Innovation i.e., applying your ideas
 - A good skill
 - A fair amount of skill
 - A little skill
 - No skill
8. Communication i.e., giving or sharing information by speaking, writing, drawing, or using some other medium
 - Good skills
 - A fair amount of skill
 - A little skill
 - No skill

9. Collaboration i.e., working with someone or a group of people to undertake a task
 - Good skill
 - A fair amount of skill
 - A little skill
 - No skill
10. Negotiation i.e., discussion aimed at reaching an agreement
 - Good skills
 - A fair amount of skill
 - A little skill
 - No skill
11. Influencing i.e., the ability to produce effects on the actions, behaviour, opinions, etc of others
 - Good skills
 - A fair amount of skill
 - A little skill
 - No skill
12. Critical Thinking i.e., giving or sharing information by speaking, writing, or using some other medium?
 - Good skills
 - A fair amount of skill
 - A little skill
 - No skill

Additional Post-Module Survey Questions.

Reflecting on your audit and the audit-linked in-class activities, please comment on the following:

13. Your sustainability knowledge development
14. Your academic skills development that will help you in your academic career
15. Your employment skills development that will help you in your future career
16. Any personal skills that you developed during the module.

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