Sustainable development tertiary education and training:
Strengthening the transformative learning experience

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Abstract

The need for sustainable development education and enabling pedagogy to create transformative learning and change for a more resilient future has long been acknowledged and is gaining traction around the world. Consequently, the diverse array and number of tertiary education programs featuring sustainable development and / or the Sustainable Development Goals (SDGs) has increased. Ensuring learning and teaching integrates transformative competences and pedagogy (education for sustainable development) is critical to support students develop their position regarding meaning, beliefs and actions related to sustainability. While such educational approaches are recognised as an essential input for transformative learning, there seems to be limited regular evaluation of how education programs map to the theoretical frameworks and whether they achieve the desired learning and don't leave students behind.

This study provides early insights into a benchmark assessment of education for sustainable development (ESD) competences and pedagogical approaches and evaluation of student perceptions and impact of three programs. Utilising a framework of ESD competences and pedagogy synthesised by Lozano et al (2017), the study reveals a reasonably high alignment and level of awareness among educators about their learning and teaching practice but also points to areas of potential strengthening.

Key words: Higher Education for Sustainable Development; competence; education for sustainable development, transformative learning approaches, sustainability pedagogy; teaching and learning.

Introduction

The need for sustainable development education and enabling pedagogy to create transformative learning and change for a more resilient future has long been acknowledged and is gaining traction around the world. Consequently, the diverse array and number of tertiary education programs featuring sustainable development and / or the Sustainable Development Goals (SDGs) has increased. However, concern is growing amongst sustainability educators around observations that following participation in these programs students as future citizens are still being 'left without real insight, commitment or a sense of

their position regarding meaning, beliefs and action related to sustainability' (Scarff Seatter & Ceulemans 2017, 47).

Academics point to the 'paradox that arises when educators approach sustainability curriculum which has the potential to transform students' thinking and actions, with a reductive and non-substantive pedagogy' (Scarff Seatter & Ceulemans 2017, 47). Too often they assert, potentially transformative teaching is thwarted by passive, transmissive, didactic approaches.

Concerted efforts are being made by many within the sustainable development education community worldwide to address these concerns. From a theoretical perspective this has led over many decades to a series of conceptual insights and frameworks discussing competences and pedagogy leading to transformative learning, which in turn contributes to achieving sustainable development. In practice, educators are increasingly committed to support transformative learning of students towards more sustainability focused mindsets, behaviours and practices through their programs.

Ideally this is done through the integration of education for sustainable development (ESD) principles, competences and pedagogical approaches into program design, delivery and review and revision of existing programs. 'Education for sustainable development' or ESD is defined as teaching and learning approaches that equip educators to develop students' knowledge, competences, attitudes, and practices in order to contribute to more sustainable pathways (UNESCO, 2014; UNESCO 2015b). ESD approaches encompass the interlinkages across the environmental, societal, economic and cultural domains (Wals & Kieft, 2010; UNESCO, 2014) and have been promoted and advocated over the last few decades by global frameworks such as the United Nation's Decade of Education for Sustainable Development (2005-2014) and more recently the Global Action Programme on Education for Sustainable Development both led by UNESCO (Buckler & Creech, 2014; UNESCO, 2014). Within higher education, effective ESD equips students to be responsible global citizens and agents of change (Moore, 2005; Svanstrom, Lozano-Garcia, & Rowe, 2008).

While such educational approaches as described above are recognised as an essential input for transformative learning, there seems to be limited regular evaluation of how education programs map to the theoretical frameworks and whether they achieve the desired learning and don't leave students behind.

Monash Sustainable Development Institute (MSDI) strives to adhere to the above principles and we are committed to continuous improvement of our programs. This study reports early insights of a period assessment of some of its programs. This paper firstly presents the context of the programs assessed. This is followed by an evaluation of the programs against Lozano et al's framework. Also, student perceptions and impact of the courses are provided in this section.

The study confirms a reasonably high alignment and level of awareness among educators about their learning and teaching practice but also points to areas of potential strengthening.

Context and research approach

Monash Sustainable Development Institute (or MSDI) located within Monash University (Melbourne, Australia), is a leading interdisciplinary research and education institute committed to progressing the Agenda for Sustainable Development Goals 2030 (United Nations, 2015). Its mission is to find solutions to some of the most significant challenges facing the world today and it does this in part through designing and delivering educational programs

that enable for students a process of transformative learning towards sustainability focused change to occur.

For this study, and as part of a commitment to periodic assessment and revision of its sustainability education and training programs, MSDI educators selected three relatively new and / or recently refreshed programs to be part of an audit and evaluation process assessing the degree to which identified ESD competences and pedagogies were integrated and adopted or not within each program.

The selected programs were three distinct sustainable development education programs (masters unit, undergraduate final year unit and extra-curricular training program) designed, developed and delivered by MSDI. The first program is an elective (non-compulsory) unit within the cross faculty Master of Environment and Sustainability on interdisciplinary sustainable development (*Interdisciplinary project for sustainable development solutions)* with teams of learners working in collaboration with external industry partners on consultancy projects addressing complex organisational challenges; the second is an undergraduate 'capstone' unit (*Sustainability practice and organisations*) requiring teams of students to approach and engage actual businesses and undertake a sustainability impact assessment and individually interview other businesses around positive sustainable development goals (SDGs) impacts; and the third is a refreshed extra-curricular, competitive-entry, sustainability leadership training program (*Green Steps)* featuring multi-disciplinary teams working on real life on-campus sustainability projects addressing a challenge with Monash University.

This study was carried out over four months over 2019 and used a qualitative case study approach to assess and evaluate the degree to which three MSDI tertiary education and training programs embed and reflect recognised education for sustainable development competences and pedagogical approaches.

The study draws upon a recent paper discussing a framework synthesising ESD competences and pedagogy that demonstrate transformational learning towards sustainable development. The authors considered several other ESD competence frameworks (van Kerkhoff & Lebel, 2006; Wiek at al, 2011; Vermeulen, 2014; Lozano et al, 2017) Lozano et al (2017) was selected as it represents one of the most comprehensive, recent, applicable and current synthesis of ESD approaches

The framework devised by Lozano, R., Merrill, M., Sammalisto, K., Ceulemans, K. and Lozano, F. (2017) consists of a synthesis of established twelve sustainability competences and twelve pedagogical approaches from the literature. It intends to guide sustainability educators in revising and developing effective sustainability education programs for 'future professionals and leaders' (Lozano et al, 2017). The framework goes as far as identifying specific competences combined with specific pedagogical approaches in a matrix to optimise transformative learning for sustainable development.

This study drew upon components of the paper; specifically, the syntheses of ESD competences and pedagogies. Due to time and resource constraints, the study did not go as far as applying the specific combinations of ESD competences and pedagogical approaches identified by the framework authors to the three program case studies.

The process involved educators responsible for those programs discussing and self-identifying the degree to which particular ESD competences and pedagogical approaches were evident in current program delivery against an extensive list with explanations and definitions from Lozano et al (2017). Educators then selected from a choice of four short descriptors ('strong', 'moderate', 'limited' or 'none') one option that most closely matched.

In addition, the study also drew upon 2019 sample student testimonials and university student evaluation of teaching scores (for overall satisfaction) in order to provide student feedback on the three programs.

Findings

Table 1 (below) maps three MSDI programs (masters unit, undergraduate capstone unit and the co-curricular program) against a cluster of twelve education for sustainable development competences (adapted from Lozano et al, 2017).

Table 2 (below) maps three MSDI programs against a cluster of twelve education for sustainable development pedagogical approaches (adapted from Lozano et al, 2017).

Table 3 (below) maps the three MSDI programs against additional competences and pedagogical approaches identified as frequently used by sustainability educators within MSDI. These additional competences were not specifically referred to within the clusters of competences and pedagogical approaches discussed by Lozano et al (2017). However, they arose in discussions with the three MSDI sustainability educators as important approaches currently utilised in transformative learning in their respective programs. Hence a decision was made to include these.

Tables 1 – 3 have been colour coded based on the four responses ('strong' = green, 'moderate' = light green', 'limited' = light yellow, 'none' = light red).

Table 4 (below) provides sample testimonials from students and university student evaluation and teaching scores for all three programs over 2019.

Table 1: Education for Sustainable Development (ESD) competences applied to three MSDI programs

Competences	Principles	Masters Unit	UG Capstone Unit	Co-Curricular Program
Systems thinking	• Analysis of complex systems across different scales and domains of inquiry • Understanding of connectivity and cause-effect relationships	MODERATE	MODERATE	STRONG
Interdisciplinary work	• Appreciation, evaluation, contextualisation, and use of knowledge and methods of different disciplines • Ability to work on complex problems in interdisciplinary contexts	STRONG	STRONG	STRONG
Anticipatory thinking	• Envisioning, analysis, and evaluation of possible futures, including scenarios with multi-generational timescales • Application of precautionary principle • Dealing with risks and changes	STRONG	STRONG	STRONG
Justice, responsibility, and ethics	• Application of concepts of ethics, justice, social and ecological integrity, and equity • Description, negotiation, and reconciliation of principles, values, aims, and goals for sustainability • Ethics and sustainability of personal and professional behaviour	MODERATE	STRONG	STRONG
Critical thinking and analysis	• Ability to challenge norms, practices, and opinions • Reflection on one's own values, perceptions, and actions • Understanding of external perspectives	STRONG	STRONG	STRONG
Interpersonal relations and collaboration	• Participatory and collaborative approaches to solving problems or conducting research • Skills and understandings in communication, deliberation, negotiation, empathizing, leadership, and collaboration • Participation in community processes • Learning from other perspectives	STRONG	STRONG	STRONG
Empathy and change of perspective	• Accepting and embracing of a diversity of opinions, experiences, or perspectives • Ability to identify own and external perspectives • Ability to deal with internal and external value orientation	STRONG	MODERATE	MODERATE
Communication and use of media	• Ability to communicate effectively in intercultural contexts • Ability to use appropriate information and communication technologies • Critical consideration and evaluation of media • Ability to design and implement interventions, transitions, and transformations for sustainability	STRONG	MODERATE	STRONG

Strategic action	• Active and responsible engagement in sustainability activities • Development and application of ideas and strategies • Planning and executing projects • Organisation, leading, and controlling processes, projects, interventions, and transitions	STRONG	STRONG	STRONG
Personal involvement	• Participation in creating sustainability initiatives • Willingness and ability to take action • Willingness to learn and innovate	STRONG	LIMITED	STRONG
Assessment and evaluation	• Develop assessment and evaluation standards and guidelines • Independent evaluations with respect to conflicts of interest and goals, uncertain knowledge, and contradictions	STRONG	MODERATE	MODERATE
Tolerance for ambiguity and uncertainty	• Coping with conflicts, competing goals and interests, contradictions, and setbacks	STRONG	STRONG	STRONG

Table 2: ESD pedagogical approaches applied to three MSDI programs

Pedagogical Approaches	Description	Masters Unit	UG Capstone Unit	Co-Curricular Program
Case studies **(Universal)**	Real world examples, problems, controversies, diversity of perspectives	LIMITED (STUDENTS ENGAGE IN REAL LIFE CASE STUDIES)	MODERATE	MODERATE
Inter-disciplinary team teaching **(Universal)**	Team teaching with specialists from a range of discipline backgrounds	STRONG	STRONG	STRONG
Lecturing **(Universal)**	Structured, theory focused learning. Didactic approaches.	LIMITED	LIMITED	LIMITED
Mind and concept maps **(Community and social justice)**	Graphical representation of relationship between ideas, actors. Non-linear.	MODERATE	NONE	STRONG
Project- or Problem-based learning **(Community and social justice)**	Complex real-world learning. Collaborative group work. May engage external stakeholders to address problems similar to professional consultation.	STRONG	STRONG	STRONG
Community Service Learning **(Community and social justice)**	Student engagement in activities benefiting others.	MODERATE	MODERATE	STRONG
Jigsaw/Interlinked Teams **(Community and social justice)**	Students assigned to develop expertise on sub topics and share with others in team.	NONE	NONE	NONE
Participatory Action Research **(Community and social justice)**	Collaborative approach to research; co-production of knowledge with non-academic 'subjects'.	MODERATE	LIMITED	MODERATE
Eco-justice and community **(Environmental education)**	Deep transformation of mindset of facilitator & students away from mechanistic metaphors to ones rooted in ecological systems.	LIMITED	LIMITED	MODERATE
Place-based environmental education **(Environmental education)**	Cultivating a richer sense of place; and knowledge and care for the environment.	NONE	NONE	MODERATE
Supply chain/Life Cycle Analysis **(Environmental education)**	Sustainability taught through a lens of product or commodity; understanding economic, social and environmental contexts.	NONE	STRONG	MODERATE
Traditional ecological knowledge **(Environmental education)**	Indigenous knowledge systems and values for biodiversity conservation; sustaining threatened cultural diversity.	LIMITED	NONE	LIMITED

Source: Adapted from Lozano et al, 2017; MSDI, 2019.

Table 3: Other competences and pedagogical approaches applied to three MSDI programs

Competences & Pedagogical Approaches	Description	Masters Unit	UG Capstone Unit	Co-Curricular Program
Facilitation (vs lecturing)	Encouraging student's role to be active learners, engaged, critical, questioning. Shared inquiry.	STRONG	STRONG	STRONG
Critical Thinking	Encouraging students to question assumptions, use evidence, employ reason and analysis to evaluate information.	STRONG	STRONG	STRONG
Learning by Doing	Experiential learning or learning through reflection on doing.	STRONG	STRONG	STRONG
Self-Reflection and Reflexivity	Learning tool to engage students in their own learning process, develop their capacity to reflect on and critically evaluate their own learning and development.	STRONG	STRONG	STRONG
Peer to Peer Assessment	Encouraging students to take responsibility for assessing and evaluating the work of others and recommending strategies for improvement.	STRONG	STRONG	MODERATE
Futures / Visioning / Back casting	Engaging students in developing shared visions of desirable futures and working backwards to identify policies, processes and approaches to reach these.	NONE	STRONG	STRONG
Appreciative Inquiry	Strengths based inquiry and engagement approach that seeks to engage stakeholders in self-determined change.	NONE	MODERATE	NONE

Source: Monash Sustainable Development Institute, 2019.

Table 4: University Student Evaluation of Teaching Scores and testimonials from the three MSDI programs

MSDI Program	Student Testimonials	Overall Satisfaction
Masters Unit (Interdisciplinary project for sustainable development solutions)	*"From all the units I undertook ENS5910 was without a doubt the highlight of the entire masters for it was the perfect blend between theory and practice and more importantly, it gave me a chance to experience the best aspects of an internship as well as research. Credit is really (to the educator} for making this such developmental experience"* (2019)	4.60 / 5.00
	"I really enjoyed having a whole semester to work on a project and to do so with one team. You could really see the project and team members, including myself, develop and change over the time" (2019)	

UG Capstone Unit (Sustainability Practice & Organisations)	*"This unit allowed me to understand the importance of sustainability and equip me with the relevant skills to integrate sustainability in the future" (2019)*	4.30 / 5.00
	"It has helped me change the way I think about business and what its aim should be. This is something I will be keeping close to my heart for a long time to come" (2019)	
	"I believe this unit should be accessible to more units. I personally don't know why this unit is a core unit or why it was only in my final year I learnt about sustainability. I do honestly believe that this unit should be mandatory for any future business/commerce students". (2019)	
	"I have greatly enjoyed and benefited from your class as your class really helped me to grow more and realise how strong my desire to become a leader and an entrepreneur, especially in the beauty industry, and I would really love to create a sustainable business". (2019)	
Co-Curricular Program (Green Steps)	*"It is so easy to get bogged down in the negativity of sustainability issues, but Green Steps provides a truly inspiring, hands on experience that equips you with the skills and knowledge to make an actual difference in the world. The Green Steps team is so engaging and fun to work with and make the entire process so worthwhile - I cannot recommend enough!" - Bachelor of Laws (Honours) and Global Studies (2019)*	9.4 / 10
	"*Amazing opportunity to learn more about sustainability issues! Equipped me to become a change agent. Definitely one of the highlights of my time with Monash Uni!" - Master of International Sustainable Tourism Management (2019)*	
	"Gave me skills and knowledge that I can utilise in all areas of my life, as well as educating me in all aspects of sustainability, and creating a community of like-minded people who give each other belief that the world can be a better place." - Bachelor of Engineering/Science (2019)	

Source: Monash Sustainable Development Institute, 2019.

Discussion and concluding remarks

The need for effective sustainable development education to support tertiary level transformative learning and change towards more sustainable futures is well recognised by sustainability educators. Ensuring learning and teaching integrates transformative competences and pedagogy (education for sustainable development) is critical to support students develop their position regarding meaning, beliefs and actions related to sustainability.

Monash Sustainable Development Institute (MSDI) undertook a study on three of their programs to assess the extent to which education for sustainable development (ESD) competences and pedagogical approaches are integrated. Further they reviewed student overall satisfaction scores and student testimonials for the programs as a gauge of student engagement and satisfaction.

Overall the study reveals a range of ESD competences and pedagogical approaches currently being implemented in three MSDI programs. Findings confirmed that MSDI selected programs were generally strong in the integration of ESD competences while application of ESD pedagogical approaches were mixed – strong in some programs and not in others. Discussions with program educators revealed additional competences and pedagogical approaches were regarded to be critical in enabling transformative learning for students. MSDI educators employ a greater range of approaches for effective ESD than identified in the literature discussed by Lozano and that some traditional approaches can still be useful. Student evaluations of overall (program) satisfaction and testimonials reflected a high level of engagement, satisfaction and altering of views and beliefs as a result of completion in all

programs. These outcomes indicate a shift towards more sustainability focused mindsets, behaviours and practices of the students.

The findings pointed to areas of potential strengthening for future course revision and consideration for new course design. For example; integration of Indigenous and Traditional knowledge is weak across the three programs. Educators acknowledged this to be a challenging domain they struggle with for a range of reasons (such as; lack of educator knowledge and confidence to authentically reflect Indigenous knowledge perspectives, absence of Indigenous educators and voices in sustainability disciplines). Place-based education was also weak across the programs reviewed. These findings while not surprising, provide further impetus MSDI to consider how to address this gap in these programs and bring Indigenous knowledge and place-based education into learning and teaching in more meaningful and authentic ways.

The findings revealed notable strengths inherent in the programs. One consistent strength across all three programs is the embedding of real-world and problem-based learning - often through collaboration with external partners. MSDI educators observed real-world and problem-based learning to be powerful approaches employed to create transformative learning. A recent study corroborated this in finding that practice-oriented learning and collaborative projects with a range of societal stakeholders demonstrates higher success in building interpersonal, strategic and normative competences (Trencher et al, 2018).

The study confirms a reasonably high level of awareness among educators about their learning and teaching practice and what contributes to effective transformative learning for sustainable development. MSDI educators hold regular education capability building sessions and undertake mentoring of and provide support to less experienced staff. However, it was noted that educators need time and resources invested to build their professional capacity for learning and teaching using ESD approaches.

Real world, problem-based learning approaches needs time to build and maintain relationships with external collaborating stakeholder organisations. Often educators are dependent on involvement with external stakeholders and need to have strong partnerships to allow some competences and pedagogical approaches to be fulfilled. The requires sometimes long process of relationship building, development of procedures (to overcome possible risks associated with the programs) and considerable time for mentoring students (and employers) in the work place.

Educators acknowledge there is no 'one right way' to create transformative learning environments. This study has made the program design and delivery process more 'conscious'. It has helped MSDI to reflect on what aspects of programs need to be strengthened. It has also raised questions whether it is necessary to address multiple ESD competences and pedagogical approaches in particular programs; and if not; how many are sufficient to enable the sort of shift in mindset required.

This study contributes to an internal process of periodic evaluation of sustainability education programs and how they map to the theoretical frameworks and whether they achieve the desired learning and don't leave students behind.

This study provides early insights into a benchmark assessment of education for sustainable development (ESD) competences and pedagogical approaches of three MSDI programs. It confirms a reasonably high alignment and level of awareness among educators about their learning and teaching practice but also points to areas of potential strengthening.

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