

**Infusing Sustainability in Higher Education in Ireland: The Green Curriculum Model (GCM) and the Dispositions, Abilities and Behaviours (DAB) Competency Framework**

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**July 2017**

## **Declaration**

I hereby certify that this material, which I now submit for assessment on the programme of study leading to the award of PhD is entirely my own work, and that I have exercised reasonable care to ensure that the work is original, and does not to the best of my knowledge breach any law of copyright, and has not been taken from the work of others save and to the extent that such work has been cited and acknowledged within the text of my work.

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## **Acknowledgements**

The task of accomplishing a piece of work like this one, requires sacrifices on the part of both the researcher and other people who in varied ways helped in the realization of this work. In this respect, I would like to extend my deep gratitude and appreciations to my family, especially my children and grand children-Marian, Eleanor, Emmanuella Faith, Bate and Audrey Besong, for their patience, undetrstandings and encouragements which have given me the boost and fortitude to continue till the end of this six years' academic journey.

I would also like to express my sincere gratitudes to my supervisors Dr Charlotte Holland and Dr Carmel Mulcahy for all the scaffolding, mentoring, advice and proof reading of this work. Your confidence in me has paid off through the realization of this work, thank you.

I would also like to thank the Independent panel member Dr. John Lalor for all the advice, suggestions and guidance and reading the manuscript.

I would also like to thank all my friends who have been there for me throughout this academic journey. It's been a wonderful experience.

This work is dedicaded to my children and posthumously to my father Mr. Elias Etta Besong. Thank you, pa for watching over me all this while.

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## Abbreviations

ASU	Arizona State University
CCP	Country Contribution Process
CMEC	Council of Ministers of Education, Canada
DAAD/UNU-VIE	German Academic Exchange/United Nations University Vice Rectorate in Europe
DAB	Dispositions, Abilities and Behaviours
DCU	Dublin City University
DES	Department of Education and Skills (Ireland)
DESD	Decade of Education for Sustainable Development
DOIU	Department of the Interior University
EDC	Education for Democratic Citizenship
EfS	Education for Sustainability
ESD	Education for Sustainable Development
ET	Education and Training
EXCONTRA	Experiential, Constructivist and Transformative
GAP	Global Action Programme
GCM	Green Curriculum Model
GMIT	Galway-Mayo Institute of Technology
HE	Higher Education
HEA	Higher Education Authority
ICT	Information and Communications Technology
IAU	International Association of Universities
NEP	New Ecological Paradigm
N.D.	No Date
NGO	Non-Governmental Organisation
N.P.	No Page Number
SE	Sustainability Education
RCE	Regional Centre of Expertise
RUCAS	Reorienting University Curriculum to Address Sustainability
SALIS	School of Languages and Intercultural Studies
SULITEST	Sustainability Literacy Test
UCC	University College Cork
UE4SD	University Educators for Sustainable Development
UN	United Nations Organisation
UNECE	United Nations Economic Commission for Europe
UNESCO	United Nations Education, Scientific and Cultural Organisation
US	United States of America
WCED	World Conference on Environment and Development

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# **Infusing Sustainability in Higher Education in Ireland: The Green Curriculum Model (GCM) and the Dispositions, Abilities and Behaviours (DAB) Competency Framework**

**Frida Agbor Besong**

## **Abstract**

There are numerous sustainability challenges facing the world today, including: climate change, pollution, consumerism and poverty. To make the world a more sustainable and better place to live in, humanity needs to be able to generate solutions to increasingly complex, and ever growing global sustainability challenges. Education is an important vehicle in this respect, in that it can be used to re-orient perspectives and attitudes of learners towards sustainability, motivating learners to seek to transform themselves and society, and thus promote actions for sustainability. In Ireland, despite various initiatives from the turn of the 21<sup>st</sup> century, the integration of sustainability in academic programmes within higher education has remained largely unchanged. Educators within higher education in Ireland and elsewhere need specific guidance on how best to integrate and/or infuse sustainability in their programmes and courses of study. This research set out to do this – thus, it explored how sustainability might be integrated/ infused in higher education, with a particular focus on identifying the key sustainability themes, principles, pedagogic practices and specific competencies that should underpin a model for infusing sustainability in higher education, while also investigating how the effectiveness or otherwise of particular competencies (developed within a sustainability-infusion curriculum process) might be evaluated at a meta-level. This mixed methods research study focused on the Irish context, primarily researching and analysing developments within Dublin City University, which was engaged in the reorientation of its curricula towards sustainability in the EU Tempus RUCAS project from 2010-2013. The outcomes of this study have resulted in the design and development of the Green Curriculum Model, a conceptual-design framework for educators to re-orient curricula towards sustainability. The research also resulted in the design, development and evaluation of a sustainability competencies assessment tool called the Dispositions, Abilities and Behaviours (DAB) Framework for profiling learners' sustainability competencies across higher education faculties, programmes and courses.

# Chapter One: Introduction

## 1.1 Introduction

The 21<sup>st</sup> century is a period with complex challenges including climate change, global economic inequalities, overconsumption and poverty, which call for human societies to transform their relationships with each other and the Earth to become more mutually beneficial. If humanity fails to preserve and protect the earth as well as the human communities, then the earth's impoverishment will adversely affect societies as well as human development efforts (Bardaglio, 2007). To overcome the sustainability issues facing mankind, we as members of the global community need to change our values orientations, attitudes and behaviours to embrace more sustainability friendly ways of living and being, thus enabling us to efficiently use (without exploitation of) the planetary resources for our individual and collective development, taking into consideration the implications of our actions at the local, national and global levels. Wade (2012) highlights the urgent need for sustainability education to address some of these sustainability related difficulties facing humanity. She explains that humanity is facing "*major challenges of climate change, environmental degradation, poverty and social inequality... [and it has become clear] that learning to live sustainably has never been more urgent*" (p.147). Therefore, people all over the globe need to build the knowledge, awareness, understanding, and skills, so that they can individually and collaboratively play their part in seeking solutions to such sustainability related problems (Scottish Executive, 2006).

The resolution of sustainability problems calls for deeper interrogation of the root causes and effects of unsustainable practices, so that effective solutions to them can be developed. In this regard, higher education has the potential to become a major player in disseminating knowledge, and honing skills, from which alternative thinking and innovative ideas and solutions could be produced that respond to these societal and environmental challenges. This research study thus set out to examine how the curricula of higher education might be re-oriented to enable learners to become more critically aware of challenges in sustainability facing the world, and more proactive in seeking solutions to them, thus becoming agents of change to foster the development of more sustainable future communities. This study examined the paradigmatic pathways for integrating sustainability in the curricula of higher education, which resulted in the design



of the Green Curriculum Model (a sustainability curriculum ‘conceptual design’ framework for educators in higher education) and the Dispositions, Abilities and Behaviours (DAB) competency framework (a sustainability assessment tool for profiling higher education learners’ sustainability related competencies).

## **1.2 Overview of Research Study**

This research study adopted an exploratory sequential mixed-methods approach to ascertain the key elements that would inform a framework for infusing sustainability in the curricula of higher education in Ireland (Green Curriculum Model), and the design of an instrument that could be used to profile higher education students’ sustainability competencies called the Dispositions, Abilities and Behaviours (DAB) Framework. The study initially engaged in a deep review of the literature and extant research related to sustainability education, policy and practices, and through a process of reflexivity on research and practice, framed the Green Curriculum Model and DAB framework for infusing sustainability in higher education and profiling higher education learners’ sustainability related competencies. This study did not attempt to design a universal curriculum model that could inform the infusion of sustainability in higher education globally, but rather set its course to explore key elements and processes for infusing education for sustainability, and for assessing sustainability competencies of learners, in higher education in the context of Ireland. This study thus centred on considering how sustainability could be infused within higher education curricula in an Irish context; and makes no claims as to the generalizability of the findings of this study within other contexts or countries. The central research question was framed as follows: *Why and how should sustainability be integrated in higher education programmes and courses in Ireland?* In this respect, the study explores the following sub-questions:

- *Why should sustainability education be integrated in academic programmes and courses in higher education in Ireland?*
- *What paradigmatic framework could guide educators in infusing sustainability in higher education programmes and courses in Ireland?*
- *What paradigmatic frameworks could guide the profiling of learners’ sustainability competencies in higher education in Ireland?*

In terms of validating the Green Curriculum Model and the DAB framework, a range of data collection tools was used, including: interviews, and online surveys. This data was triangulated using the literature, experiences from interactions in the Tempus RUCAS project, interviews with staff implementing sustainability education, and three online surveys tool deployed with higher education students. The findings present the emergent Green Curriculum Model, which has potential as a conceptual guide for educators wishing to infuse sustainability in their curricula and pedagogic practices, and the DAB framework, which can be used to profile learners' sustainability related competencies at a given point in time in higher education.

### **1.3 Rationale for this Study**

The rationale for engagement in this study on educating for sustainability in higher education is two-fold; the first is connected to the need to redress the paradox of (higher) education that contributes to advancements in knowledge and skills, yet results in the most educated countries leaving '*the deepest ecological footprints meaning they have the highest per capita rates of consumption*' McKeon (2002, p.12), and the second refers to my personal quest to effect changes in education for sustainability in the Global North in the hope of enabling more sustainable futures for my country-folk situated in the Global South.

Higher education is generally perceived as the citadel of learning through which innovative ideas and knowledge can be developed to help humanity forge a better path towards the enablement of more equitable and sustainable futures for all. Yet the reality is that although higher education produces the so-called *cream of society* - the 'intelligentsia', who become the decision and policy makers (political leaders, economic and administrative leaders at various levels, such as: entrepreneurs, church leaders, financiers/ bankers, political leaders and administrators) and whose policies and decisions influence the behaviours of members of society from the individual to the collective, these higher education elite are the greatest promoters of unsustainable behaviours and practices. The behaviours and practices of higher education graduates have consequent negative effects on society and are aggravating the sustainability challenges facing the world. McKeon (2002) observes that: "*generally, more highly*

*educated people, who have higher incomes, consume more resources than poorly educated people, who tend to have lower incomes. In this case, more education increases the threat to sustainability”* (p.12). There is thus the need to address sustainability in higher education programmes and courses so that higher education can produce future graduates who are sustainability change agents vested with sustainability competences and knowledge to take actions through behavior changes that promote sustainability. Education plays a key role in fostering more sustainable behaviours and higher education is called upon to play a leading role in developing graduates who are ‘global citizens’ who understand better how the world works, and take their own responsibilities to build more sustainable future societies (Sterling, 2009).

Secondly, having experienced the effects of unsustainable ways of living in the Global South (when growing up in Cameroon) and especially the effects of the drying up of Lake Chad caused by the effects of climate change (plunging more the 30 million people whose livelihoods depended on the lake’s waters and other resources into poverty), I felt compelled to try to forge a research study that had the potential to promote action for sustainability, and / or reduce unsustainable behaviours of those in Global North, and thus reduce the effects of challenges such as Climate Change in the Global South, by educating people in the global north to make pro-ecological decisions, take actions to promote sustainability and seek alternative sources of income and energy resources to improve their quality of life. Living and working in Ireland, since 2003, has also given me the opportunity to witness the unsustainable actions of many members of the Irish society, and thus propelled me towards choosing ESD in Ireland as the context for this study, which is further elaborated in the next section.

#### **1.4 Researcher Context and Genesis of Thesis**

I (the researcher) in this study come from Cameroon in Africa. I lived and worked in Cameroon as an educator and have lived experiences of global issues related to poverty, climate change, drought and poor governance that affect the sustainability and quality of life of people in the global south. I have witnessed firsthand the daily struggles of African citizens (men, women and youths) to earn a living with enormous difficulties stemming

from unsustainable human practices and policies like poor administrative and governance policies, overexploitation of natural resources as well as natural catastrophes, including desertification and the effects of climate change. Examples abound in the global south of unsustainable human practices that are affecting people's quality of life as well as the quality of the environment such as the case of the drying up of the Lake Chad in Sub-Saharan Africa, which has been precipitated partly by human actions through the over extraction of the lake's waters for irrigation farming as well as increasing evaporation of the lake waters caused by increasing temperatures which are the results of climatic changes. The drying up of Lake Chad, losing more than 90% of its volume has affected the livelihoods of more than 30 million people living around the lake, inducing poverty, lack of clean and drinking water which has left many people in the region especially children vulnerable to health and sanitation hazards like the out breaks of diarrhea and cholera and increasing infant mortality rates in the region (Glantz, 2004).

Also, I have lived and worked in Ireland for well over a decade and have come to witness how the western values of individualism, materialism and capitalism are promoting unsustainable practices in the western economies like consumerism (the 'throw away culture') which promotes a "culture of waste" with consequent effects throughout the world. Examples abound of the effects of these unsustainable western practices on the sustainability of other regions of the globe. Suffice here to mention a few examples of the effects of the unsustainable western practices of the "culture of waste" in the sustainability of regions in the global south. The promotions of western values of materialism, consumerism, individualism and capitalism have seen the proliferation of automobiles in the globe, which helps in increasing atmospheric temperatures through carbon emissions into the atmosphere. Also this "culture of waste" further promoted through globalization and neoliberalism has led to the overexploitation of natural resources in the global south by multinational companies, causing the destruction of the environment through (deforestation for lumbering of timber); pollution (through the dumping of manufacturing wastes); enabling the occurrences of socio-ecological disasters induced by human errors like the deadly chemical explosion of the Union Carbide chemical plant in Bhopal India in 1984 that killed 3800 Indians living around the plant and contaminated the environment with long term humanitarian and environmental effects (Broughton, 2005).

As an educator interested in sustainability, these unsustainable practices of people in both the global north and south encouraged me to want to research on how to increase knowledge about promoting sustainability, by seeking new ways of enhancing learners' competencies that could enable them to become change agents for sustainability. Nowhere else could this desire be met more adequately than in higher education, which has the potential to provide an enabling environment to educate learners with innovative ideas, knowledge and skills to become change agents for sustainability. This need is more so urgent in higher education in Ireland, which despite increasing interest in the area of sustainability has in the past developed a narrow focus (mainly an environmentally oriented lens) towards sustainability issues. Consequently, there is a growing need for research that explores ways in which sustainability can be infused in the curricula and practices of higher education such that educators promote holistic approaches and thinking on sustainability issues (taking into consideration all the four cornerstones of sustainability- the environment, economy, society and culture) and enable students seek solutions to them in order to contribute to more sustainable futures for all.

## **1.5 Intellectual Foundations**

This research study has its roots in sustainability education. To fully understand sustainability education and its variants: 'education for sustainable development' or 'education for sustainability', an examination of the concepts of 'sustainability' or 'sustainable development' is necessary.

### **1.5.1 Exploring Sustainable Development and Education for Sustainable Development**

The concept of sustainability remains controversial with no universally acceptable definition. Generally, sustainability is conceived as the ability to maintain something for a long time at a specific rate or level. It is an undefined set of ideals which allow people and other living and non-living things to have dignity and satisfaction, and for human actions to be geared towards protecting the environment, fostering societal justice, economic prosperity and equity, and promoting cultural vitality and diversity. The concept of sustainable development (often used interchangeable with sustainability) is

heavily loaded with meanings and interpretations, vague and ambiguous, so much so that many scholars view the concept as an oxymoron - a concept that remains “*fundamentally contradictory and irreconcilable*” (Kates et al., 2005, p.20). For example, sustainability entails development to improve human quality of life but development in itself whether sustainable or not entails the degradation of the natural environment and a de-stabilisation of some sort of the natural ecosystem of which humanity is a subsystem. The interjection of human society within the ecological system obstructs the natural system’s homeostatic balance and when nature returns to homeostatic balance it causes disaster to human societies (such as earth quakes, tsunamis to name but a few). The ecological economist Herman Daly (1989) asked the question *what use is a sawmill without a forest?* This analogy pictures vividly the controversies associated with the concept of sustainable development. Development in one sector is a loss or degradation in the other sector of the ecological system although the view of sustainable development is to ensure the minimisation of the effects of the actions of one subsystem on the overall functioning of the main ecosystem.

Since the publication of the Brundtland Report in 1987 of United Nations (UN) sponsored World Commission on Environment and Development, *Our Common Future* which defined sustainable development as “*development that meets the needs of the present without compromising the ability of future generations to meet their own needs*” (WCED, 1987), sustainable development has become a global catch phrase giving rise to a widening of the discourse of the concept with many definitions (Mebratu, 1998). According to Huckle and Sterling (1996), sustainable development means: “*improving the quality of life whilst living within the carrying capacity of the supporting ecosystems*” (p.2). Sustainable development has also been further articulated by Makrakis, Kostoulas-Makrakis & Kanbar (2011) as: “*making informed, contextual and conscious decisions driven by the principles of solidarity, justice, accountability, equity and transparency for the good of present and future generations, locally and globally and to act upon those decisions for advancing social, economic and environmental wellbeing*”, p. 6). Sustainability can be perceived as both a process and end-point of sustainable development, as articulated by the Parliamentary Commissioner for the Environment, (2004): “*Sustainability is the goal of sustainable development – an unending quest to improve the quality of people’s lives and surroundings, and to prosper without destroying the life-supporting systems on which current and future generations of humans depend.*”

*Like other important concepts, such as equity and justice, sustainability can be thought of as both a destination and a journey”* (p.14). Thus, despite the divergent definitions and criticisms, the concept of sustainable development is open to interpretations and adaptations to different socio-cultural, economic and ecological contexts. Sustainable development can be viewed as a dynamic, evolving and contested concept, that needs to be responded to within the practice of education. This study will focus on the aforementioned UN definition of the concept, which is widely accepted globally. The UN definition of sustainable development focuses on intergenerational equity and implies that there are limits on the carrying capacity of the environment *“to absorb the effects of human activities”* (Kates, Parris & Leiserowitz, 2005, p.11).

As Vare & Scott (2007, p.1 cited in Makrakis, 2011b) argue, *“whether we view sustainable development as our greatest challenge or a subversive litany, every phase of our education system is being urged to declare its support for education for sustainable development”* (p.6). Education is crucial in fostering the ideals of sustainability and improving the capacity of people to address environment and development issues. Education is also critical for achieving environmental ethical awareness, values and attitudes to promote sustainable development (Huckle & Sterling, 1996). Education for Sustainable Development (ESD) is a process of learning how to make decisions that consider the long-term futures of the economy, ecology, and the equitable development of all communities as well as the promotion of their cultures. It enables people to develop the knowledge, skills, values and competencies that promote sustainable actions and lead to improved quality of life now without destroying the environment for future generations. ESD provides individuals with the competencies to make judgments and choices towards more sustainable behaviours. Shaeffer (2007) views ESD as a partnership that engages multiple sectors and stakeholders including media and the private sector and using different methods for raising public awareness, education and training to promote sustainable development. It enhances people’s understandings of the complexities and synergies of the sustainability challenges facing the world, related to *“their own values and those of the society in which they live”* (p.4). People all over the world need the basic life necessities of employment, health, education, food, shelter and sanitation, which promote their quality of life. These necessities should be obtained while protecting and preserving the environment and ensuring that future generations will also

can enjoy the same. The global economic recession of 2008, as well as the catastrophic impacts of climate change and other environmental hazards, provides evidence of the unsustainable economic, financial and ecological actions of humanity. The impacts of such unsustainable human actions call for the need to promote a shift in human mindsets to embrace more sustainable values, behaviours and lifestyles which can make the world safer, healthier and more prosperous for all, thus improving both the environmental and human quality of life. Huckle and Sterling (1996) view ESD as a process which enables people to develop awareness, competences, attitudes and values to become sustainability change agents in their local communities, helping them to work towards the attainment of more equitable and sustainable future for all.

### **1.5.2 Importance of Education for Sustainable Development**

Education for sustainable development is vital for human development. UNESCO's vision of sustainability centres on developing a world where everyone can benefit from quality education and learn the values, behaviours and lifestyles required for a sustainable future and for positive societal transformation (UNESCO, 2006b). ESD "*informs people's values through an exploration of the fundamental principles of the way we live our lives now and the impact our lifestyles have on the environment and society*" (Scottish Executive, 2006, p. IV). ESD "*is a life-wide and lifelong endeavour which challenges individuals, institutions and societies to view tomorrow as a day that belongs to all of us, or it will not belong to anyone*" (UNESCO, 2006a, n.p.). Thus, Education for Sustainable Development is a process of learning how to make decisions that consider the long-term effects of human actions on the environment, promoting diversity in cultures, values and beliefs, equitable and green economic development as well as societal justice.



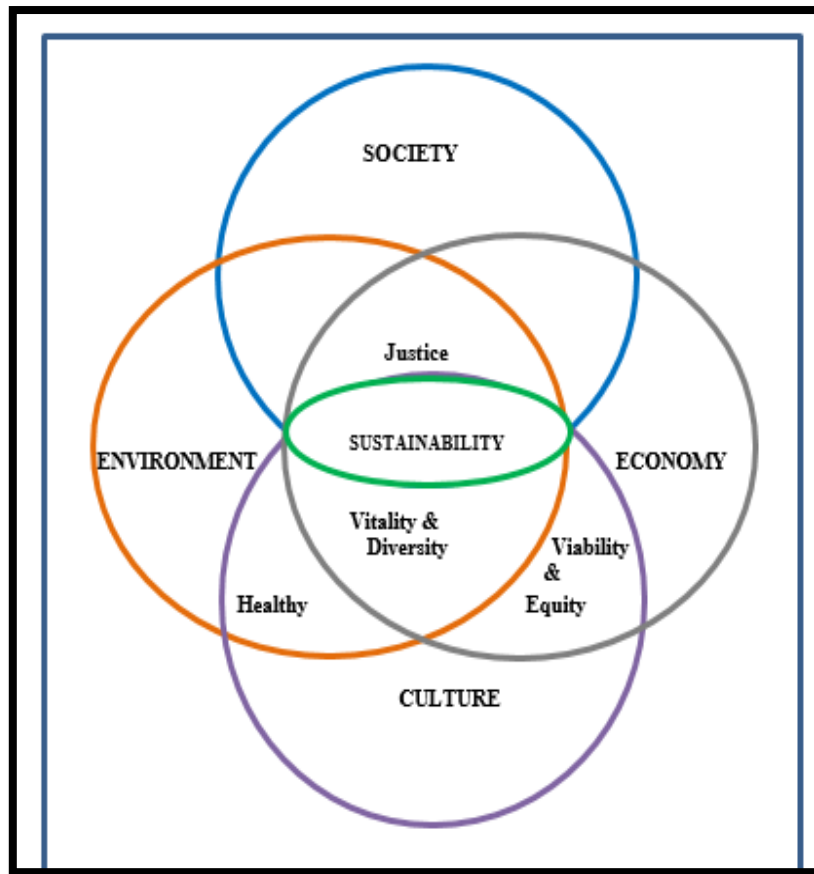


Figure 1. Four Cornerstones of Sustainability

Education for Sustainable Development (ESD) is synonymous with Education for Sustainability (EfS) and Sustainability Education (SE), and can be conceptualised as a holistic system with four interconnected and interdependent components, as shown in Figure 1. These components: economy, society, culture and the environment are important in attaining sustainability. Any actions in one area have positive and/or negative consequences on the other components. According to Yencken and Wilkinson (2001), the goal is to attain a positive balance on all the four components.

In the context of this thesis, the terms education for sustainable development (ESD), sustainability education (SE) and education for sustainability (EfS) are considered to mean one and the same thing, and are used interchangeably.

## **1.6 Sustainability Education Landscape of Irish Higher Education Institutions in 2011-2012**

It is somewhat unusual to discuss findings from a baseline review in the opening chapter of a thesis. In this case, the findings refer to an initial desk-based documentary review undertaken at the outset of this study in 2011 of the integration of sustainability in the undergraduate and post-graduate curricula (and related activities) of Irish Higher Education Institutions. The landscape of sustainability integration across the higher education sector in Ireland revealed differing levels of coverage of all four cornerstones of sustainability, and cross-cutting themes, within programmes and courses on sustainability, thus, justifying the need for guidance on sustainability education within higher education programmes and courses in the context of Ireland. It was felt that presentation of this information here would provide the reader with a useful overview of sustainability education in higher education in Ireland at the outset of the research study.

A critical review was undertaken in 2011-2012 of programmes, courses and related activities within the themes of sustainability education, and broader campus sustainability activities, detailed on institutional websites of the 7 Universities and 14 Institutes of Technology in the Republic of Ireland. [See Appendix A for additional information] The findings showed that all the institutions reviewed were engaged in one way or the other in integrating elements of sustainability education in curricula and broader campus activities especially in campus greening. The data collected showed that on the whole, most higher education institutions' activities were focused on promoting the environmental, economic and social pillars of sustainability in programmes and courses with less emphasis placed on promoting the cultural pillar of sustainability except in the case of the university sector. In general, 30 percent of higher education institutions were geared towards promoting environmental sustainability; 33 percent covered the society pillar; 23 percent cover the economy pillar and only 14 percent cover the culture pillar, in their programmes and courses. The results showed that much needs to be done in all the higher education institutions in Ireland to promote content and activities which foster cultural diversity, inclusion and intercultural communications in their programmes and courses.

Moving to examine the sectoral context, and starting with the Institutes of Technology, we begin to see differences in emphasis with respect to integration of the four

cornerstones of sustainability education in programmes, courses and related activities. Within the Institutes of Technology in Ireland, 33% of their sustainability education covered the environment pillar; 30% covered the society pillar; 20% covered the culture pillar and 17% covered the economy pillar in programmes and courses. Thus, within the Institutes of Technology the emphasis within sustainability education was on promoting mainly environmental and social pillars of sustainability. This reflects the reality that sustainability education in Ireland is often viewed from the environmental lens, fostered through the Green Campus Programme activities that culminate into the award of the Green-Flag (an initiative of An Taisce, the government environmental protection agency) which is promoted by the Department of Environment and Heritage. The Green Flag initiative is an international environmental education and award scheme, which encourages colleges and schools to foster environmental sustainability activities within their campuses. Also, most of the promotion of the social pillar of sustainability by Institutes of Technology has been through the promotion of civic engagements. However, although a greater percentage of the sustainability activities of the Institutes of Technology focused on promoting environmental sustainability, as of 2011 when this review was carried out only one institute of technology (GMIT Castlebar, 2011), had obtained the green flag award for its campus greening activities. [However, GMIT, Letterfrack followed three years afterwards in winning the green flag in 2014 for its campus greening activities].

In the university sector the picture was different. The reviewed data showed that 32% of the programmes, courses and related activities of universities were geared towards promoting the cultural pillar of sustainability education, 25% addressed economy pillar, 22% addressed the environmental cornerstone, and 21% promoted the social pillar (societal justice). It was positive to see the higher integration of cultural dimensions of sustainability education within university programmes, courses and related activities. The potential for further enhancement of this came through the subsequent Higher Education Authority's strategic policy shift to foster internationalization (DES, 2011), which was embraced by the university sector. The result has been the attraction of greater numbers of foreign students especially from South East Asia (China, India, Japan,), the Middle East, Brazil, the European Union and other parts of the world into Irish universities and other higher education institutions (HEA, 2012). The shift to embrace cultural diversity especially in Irish universities has been further facilitated by the current Irish Higher

Education Authority's strategic policy shift to foster institutional cooperation between the Irish higher education institutions as well as between these institutions and other higher education institutions globally (HEA, 2012).

An interesting outcome of the review of sustainability education programmes, courses and related activities within the university sector, is the fact that despite the considerable emphasis on environmental sustainability through campus greening activities, many of the universities had not won the Green Flag. As of 2011 when the review was carried out, only University College Cork had received the Green Flag Award (UCC, 2010). Despite these short-comings, there was growing interest in infusing sustainability activities in Irish universities. The University of Limerick spearheaded the integration of education for sustainability within Higher Education in Ireland, with its acknowledgement by the United Nations University as a Regional Centre of Expertise for Ireland in sustainability education in 2007 (RCE Ireland, 2007). Also, many other universities established sustainability committees within their various institutions to oversee the implementation of sustainability activities within the institutions. Interestingly, by 2016 many other Irish higher education institutions had engaged in campus greening activities and had won green flag awards. These included: Waterford Institute of Technology; University of Limerick; Dundalk Institute of Technology; St Patrick's Training College Drumcondra (now the DCU Institute of Education); National University of Ireland Galway, Dublin City University and Trinity College Dublin (Oliver, 2014) and University of Limerick (Fogarty, 2015). Others like University College Cork and Trinity College Dublin have had their green Flags renewed for three years (Baker, 2016). Furthermore, DCU gained acknowledgment from the United Nations University for its Regional Centre of Expertise in ESD for the greater Dublin region, (RCE Dublin) in 2014. RCE Dublin promotes the integration of sustainability within Dublin City University, through activities of its partners, DCU staff and students across the Dublin region.

Conclusively, the critical review of sustainability education programmes, courses and related activities in Irish higher education sector in 2011 indicated that infusing sustainability education in higher education activities in Ireland remains an important issue. All Irish higher education institutions are engaged in infusing sustainability education in one way or the other in their programmes and courses, and in addition through campus greening. However, the focus in their programmes and courses is varied

with differing emphasise on environmental, social, economic and cultural pillars of sustainability across the Institute of Technology sector and the University sector. It is not surprising that in most higher education institutions until about 2014 when a national policy on sustainability in education was published by the Irish government (National Strategy for ESD), sustainability was primarily viewed through the environmental lens and even where the other cornerstones of sustainability were considered as in the university sector, the different institutions took different approaches to engaging with sustainability education with a lesser focus by some institutions on addressing sustainability explicitly in study programmes and courses. The integration of sustainability education in higher education requires a systemic and holistic approach. The current approach in which individual or groups of institutions are taking different approaches to integrating some elements of sustainability education within their activities is unsustainable. The result is significant variation in approaches and the degree to which issues of sustainability education are considered important in institutional activities.

### **1.7 Challenges in Infusing ESD at Macro and Micro Levels**

There is an urgency for the infusion of sustainability within the curricula of higher education, including but not limited to the need to respond in a timely manner to global challenges of climate change, poverty, and issues associated with migration, as already mentioned. There are many varied and complex challenges to infusing ESD at the micro and macro levels within Higher Education. The micro level here refers to challenges (such as: ethos, hidden curriculum, disciplinary silos) at institutional and programme-based levels of ESD infusion, and the macro level refers to challenges (such as: lack of political will or knowledge of ESD) in ESD infusion at national and international levels.

In considering processes of ESD at institutional or local levels, Huckle (2008) argues that ESD being cross-curricular in nature, is often marginalised in the curricula and this in turn reproduces and perpetuates academic divisions of knowledge that separate the natural, social sciences and the humanities, and fails to acknowledge lay and tacit knowledge. UNECE (2007) as well as UNESCO (2005a) lament the fact that there is the continuous persistence of practices of disciplinary boundaries by subject areas in higher education which does not encourage cross-disciplinary or transdisciplinary learning. UNECE (Ibid.) also laments the fact that faculty and discipline silos make the idea of

jointly developing courses unacceptable to some higher education staff. UNESCO (2005a) identifies the lack of in-service training related to ESD as a hindrance to addressing sustainability in higher education. Huckle (2008) concurs with UNESCO in highlighting the lack of trained professionals to provide inspired ESD as being a huge challenge that hinders addressing sustainability in higher education. UNESCO (Ibid.) further laments the difficulty of positioning education for sustainable development alongside many other competing interests and values (*hidden* or *explicit* non-ESD inspired ethos and/ or *hidden* curriculum) either at faculty or departmental levels as well as the lack of educational leadership to support the infusion of sustainability in learning and teaching in higher education. Also, UNECE (2007) laments the fact that even where the teaching of sustainability education is carried out, the focus has been on the environmental pillar of sustainable development, neglecting the other three pillars (social, cultural and economic). This trend is evident in the local case of Ireland, whereby a critical review of the state of play with regards to infusing sustainability in Irish higher education carried out as part of this study in 2012 uncovered the fact that many higher education institutions were focusing their sustainability practices on campus greening activities. Furthermore, UNESCO (2005a) highlights the lack of awareness of the importance and understanding of the concept of ESD among higher education staff as a challenge to addressing sustainability in higher education. UNESCO (Ibid.) also laments the fact that many higher education academics argue that they have “too many disparate initiatives [and] too little time for thinking about new ideas” like ESD (p.29). UNESCO (2005a) identified that another challenge (the lack of inclusivity or participatory forms of engagement with relevant bodies/ communities) which hinders the integration of sustainability in higher education as being the fact that most often ESD programmes are developed without inputs from local community members and other stakeholders, thus ignoring the realities of the local context and this makes such programmes irrelevant especially to the local communities and stakeholders. Makrakis & Kostoulas Makrakis (2012) highlight that this issue of lack of engagement of key stakeholders was still prominent in the fact that even where curriculum revisions have been carried out to address sustainability in many cases this has often been done by experts without consideration of end-users’ inputs.

At a macro level, the political climate plays a key role in furthering ESD agenda. UNESCO (2005a) identifies the absence of inter-ministerial coordination efforts in the

political spheres between ministries like environment, education, health and agriculture which have responsibilities for tackling sustainability issues and/or promoting sustainability as a hindrance to addressing sustainability in higher education, and at local and global levels. UNESCO (Ibid.) also identifies the lack of support from many national education ministries promote sustainability as a hindrance to addressing sustainability in higher education. In the same light, the UNECE Joint Ministerial Conference (2007) calls on the development of educators' competences for them to engage in ESD because educators' inadequate and/or lack of ESD competencies are a hindrance in achieving ESD. According to UNESCO's (2012) Report 'Shaping the Education of Tomorrow', much needs to be done by politicians and policy-makers to "further ESD's as a catalyst for innovation and transformation" (p.67), with an accompanying call for capacity building amongst ministries or departments of education and key stakeholders on ESD.

## **1.8 Contributions of this thesis**

This thesis offers a new conceptual-design framework in the form of the Green Curriculum Model that can guide the infusion of sustainability in higher education programmes and courses in Ireland. The GCM presents an overview of key considerations to be made in re-orienting higher education curricula to address sustainability in programmes and courses at five levels: the content, principles, pedagogic approaches, competencies and indicators, and can be used by educators in third level to stimulate discussion on, and re-orientation of, their curricula to address sustainability. Furthermore, this study offers a useful tool, the DAB framework, which can be used to profile sustainability competencies across cohorts of students in a range of disciplinary and trans-disciplinary contexts in higher education contexts in Ireland.

At a national level, the development of both the GCM and DAB framework respond to calls for guidance on the infusion of ESD in higher education, and objectives of operationalizing ESD articulated within the Irish National Strategy for ESD in 2014, and thus, they could be utilized by government agencies to inform workshops and forums promoting the infusion of education for sustainable development in higher education in Ireland.

Internationally, the findings from this study respond to UN calls for models/ frameworks for reorienting education curricula to address sustainability within the higher education sector. The development of the GCM framework and DAB tool will thus engender diversified ESD efforts globally, while also contributing a conceptual-design framework for infusing sustainability and a tool for assessing sustainability competencies *for trialing and critique* in other higher education settings in countries across the globe.

## **1.9 Overview of Chapters**

This section outlines the structure of the thesis and a brief overview of the content of each of the chapters.

**Chapter 1:** This chapter provides the reader with an introduction and background to the study, an overview of the research, its contribution to the broader research body of sustainability education, the genesis of the thesis, as well as an explanation of key concepts of sustainability, and education for sustainable development.

**Chapter 2:** This literature review presents and critiques the existing research on sustainability education.

**Chapter 3:** This research design chapter begins with an examination of the philosophical underpinnings of this research. It describes and justifies the exploratory mixed methods approach used. The data collection tools (interviews and online surveys) are outlined. The data analysis process including the statistical analysis of quantitative data and the thematic coding of qualitative data is described.

**Chapter 4:** This chapter presents the Green Curriculum Model, which emerged through a critique of the literature on ESD in higher education, and was informed and validated by the work of the Tempus RUCAS project, feedback from academic colleagues in a range of national and international settings, interviews with colleagues implementing



ESD in their practice at Dublin City University, and reflective considerations by the researcher.

**Chapter 5:** This chapter discusses the findings from the university staff interviews and the validation of the Green Curriculum Model through extant literature, higher education staff interviews, conference and workshop presentations, appreciations and critiques from key sustainability experts, suggestions and recommendations from ESD lead organisations and the researcher's personal reflections.

**Chapter 6:** This chapter presents the findings from the piloting of the DAB framework, which was formulated through a review of the literature, informed by the work of the Tempus RUCAS project, and piloted initially with a small cohort of higher education students in Dublin City University.

**Chapter 7:** This chapter discusses the findings from the testing of the DAB framework at a larger scale (university-wide level) with undergraduate students of a higher education institution in Ireland and responds to the study research questions.

**Chapter 8:** This chapter discusses the findings from the comparative testing of the DAB framework vis-à-vis a standardized sustainability measuring instrument (the New Ecological Paradigm-NEP) tool with a case-group of undergraduate learners in a higher education institution in Ireland.

**Chapter 9:** The chapter summarises the conclusions from this study, makes recommendations for future studies in this area and reflections of the researcher on this research study.

## **Chapter Two: Literature Review**

### **2.1 Introduction**

This chapter opens with an overview of the various calls for integrating sustainability in education, and critiques the role of higher education in promoting sustainability education. In the review of literature that follows, the key concepts and contexts of embedding sustainability in higher education are examined, focusing on the areas of: transforming and effecting change in higher education through sustainability; paradigmatic pathways for embedding sustainability in higher education; sustainability principles; sustainability related pedagogies; sustainability competencies; and sustainability indicators.

### **2.2 Why ESD infusion: Calls for Integrating Sustainability in Education**

Education for sustainable development has its roots in the environmental education movements of the 1950s, 1960s and 1970s, with first forays into sustainability education including initiatives connecting people and nature (such as educational field-trips to national parks). ESD achieved a particular focus and prominence at the World Conference on Environment and Development in 1987, which highlighted the role of education for sustainable development in raising awareness of the intergenerational implications of unsustainable ways of living, and promoting more sustainable actions. The important role that education plays in promoting and achieving sustainable development was further highlighted at the United Nations Conference on Environment and Development in Rio de Janeiro in 1992, through articulation of specific objectives of ESD within Chapter 36 of Agenda 21 (UN, 2016). In the same light, the importance of embedding sustainability in education at all levels, including formal and informal learning contexts, was also emphasized in the United Nations Conference on Sustainable Development, Rio+20, in 2012 through its outcome document the Future We Want (UN, 2016).

In 2005, UNESCO launched the United Nations Decade of Education for Sustainable Development (DESD) which emphasized the important role which education plays in enhancing citizens' knowledge and skills in sustainability and thus enabling them to re-orient their values and beliefs towards those that support and promote sustainable development (UNESCO, 2007). However, by the close of the decade in 2014, much had not been achieved globally in meeting the goals in educating for sustainable development set within DESD. Thus in 2014, following the UNESCO World Conference on Education for Sustainable Development held in Nagoya, Japan, UNESCO launched the Global Action Programme (GAP) on ESD, as a follow up plan of the DESD to promote actions at all levels and areas of education and learning to speed up progress towards sustainable development globally (UN, 2016a).

In the same light of furthering the course of sustainable development, during the September 2015 summit for the adoption of the post-2015 sustainable development agenda 2030, the UN outlined 17 Sustainable Development Goals, and member states were called upon to take actions to address inequalities and poverty in society and tackle climate change. Goal four of the sustainable development goals (SDG 2030) call on member states to ensure inclusive and equitable quality education and promote lifelong learning opportunities for all. Within this goal, the UN (2015) called on member states to ensure that by 2030 *“all learners acquire the knowledge and skills needed to promote sustainable development, including, among others, through education for sustainable development and sustainable lifestyles, human rights, gender equality, promotion of a culture of peace and non-violence, global citizenship and appreciation of cultural diversity and of culture’s contribution to sustainable development”* (p.17), further enshrining the role of education in enabling sustainable futures for all.

The call for ESD infusion at global levels is highlighting the need for action for sustainability to redress the forementioned global challenges (climate change/ justice, poverty, migration, conflict resolution) in sustainable development. There is an urgency to support learners at all levels of education to develop the knowledge, skills, values, attitudes and behaviours to become change agents in sustainable development. The fourth goal of SDG 2030 calls for ‘Quality Education’, with a specific purpose of improving people’s lives and sustainable development. Specifically, it calls for learners to be empowered to facilitate “help create a more sustainable, equitable and peaceful world”, to “engage personally with ESD” and to take action in “everyday situations to

promote sustainable development” (UNESCO, 2017, p.18). Therefore, the integration of ESD in higher education responds directly to goal four of SDG 2030 by empowering learners to actively engage in learning for sustainability, and to promote engagement in actions that help foster fair and sustainable futures for all.

### **2.3 Role of Higher Education in Promoting Sustainability**

The sustainability challenges facing the world today are a product of human thoughts, perceptions, values and actions, thus “*it is a challenge to...institutions presuming to shape the minds, perceptions and values*” of learners (Orr, 1994:22). Seeking solutions to the wicked sustainability challenges facing the world requires a change in human belief and value systems, thoughts, perceptions, attitudes and behaviours. Hence changes in human behaviours to embrace sustainability can be activated through formal, non-formal and informal educational processes. Higher education institutions have a key role to play as drivers of information and training on sustainability education. In this regard, higher education provides an enabling environment for the dissemination of information, knowledge, understanding and enhancing sustainability related skills among learners and the wider community (Scottish Executive, 2006). According to Calder & Clugston (2003), higher education needs to play the key role in society of discerning truth, imparting values and preparing learners to gain knowledge and skills to achieve a sustainable world.

As advocated within the University Charter for Sustainable Development (Copernicus, 1994), the Talloires Declaration 1990 (ULSF, 1990), 1991 Halifax Declaration, the 1993 Kyoto Declaration (International Association of Universities, 1993) and the Council of the European Union’s Strategic Framework for European Cooperation in Education and Training (ET 2020), universities and other higher education institutions are called upon to play a critical role in mobilising and promoting sustainability to enable learners acquire the necessary sustainability knowledge and skills to become agents of change for sustainability and help in building more sustainable future communities. Higher education institutions have the expertise to foster the knowledge and skills necessary to enable students devise preventative strategies and/or solutions to sustainability related challenges now and in the future. The dawn of the 21<sup>st</sup> century has thus witnessed a global

rallying call for higher education to play a more significant role in fostering ideals that promote change in and action for sustainable development (UNESCO, 1998). However, as Roorda (2000 cited in Shriberg, 2002) argues, although these documents have important guidelines, they do not expressly clarify at an operational level how and what higher education institutions should do to address sustainability in their activities. The challenge is therefore the lack of guidance on what strategies, processes or practices need to be invoked to successfully integrate sustainability in higher education.

Integrating sustainability principles and practices is of vital importance in higher education. The DAAD/UNU-VIE (2009) report shows that embracing sustainability in higher education helps institutions in promoting the attainment of excellence in teaching and high quality research; improving the efficient use of resources; promoting social cohesion and projecting the status of higher education institutions as sustainable institutions. Education for sustainable development can be fostered through educating the citizenry on the principles and practices of sustainability. Education for sustainable development is the driving force to promote citizens' change of attitudes to embrace sustainability. It entails educating the citizens on processes and practices that enable people to develop the knowledge, skills and competences that foster actions to promote a sustainable future for all.

In light of this, in its education for sustainable development strategy (2010), the Council of the European Union called on member states to promote education and research on education for sustainable development in the vocational and higher education sectors. The Council views education and training in sustainable development as how European citizens will be equipped with the skills and competences needed to develop smart and innovative economies and enhance sustainable economic growth and inclusive societies in Europe (Europe 2020).

In addition, the Council of the European Union's Strategic Framework for European Cooperation in Education and Training (ET 2020) emphasises the crucial role which education and training plays in seeking solutions to the many socio-economic, demographic, environmental and technological challenges facing Europe and its citizens today and in the future (Council of Europe, 2011) and further states that higher education should take centre-stage in playing such a significant role in fostering the ideals and practices of sustainability education.

At the national level in Ireland, the Irish Government's National Sustainable Development Strategy (Department of Housing, Planning and Local Government, 2012), provides a national policy framework which encourages and promotes national actions to transform Ireland into an innovative green economy with inclusive and resilient communities; fostering and respecting cultural diversity as well as promoting actions to safeguard environmental health. This policy framework among other issues calls for the integration of education for sustainable development at all levels of the formal, informal and non-formal education sectors in Ireland (Department of Housing, Planning and Local Government, 2012). In the higher education sector, the national sustainability policy framework emphasises the need to embed education for sustainable development in higher education, and calls on higher education institutions to: promote the integration of sustainability education across all disciplines; promote capacity building in support of sustainability education; promote, high standards of environmental protection and undertake innovative research and development in all aspects of sustainability education to build inclusive societies and move towards "*a low-carbon and resource efficient economy*" (Department of Housing, Planning and Local Government, 2012, p.82).

In the same light, the Department of Education and Skills published the National Strategy on Education for Sustainable Development 2014-2020 in July 2014. The aim of the strategy is to ensure that education contributes to sustainable development by equipping learners with the relevant knowledge, skills and values that empower them to become informed citizens and motivates them to take actions to promote sustainability and contribute in building future sustainable communities (DES, 2014). The strategy calls on higher education institutions in Ireland to "*introduce more undergraduate and post-graduate programmes that are relevant to sustainable development. They should also explore the potential for introducing the principles of sustainable development into existing disciplines*". (DES, 2014, p. 22).

The complexity and ambiguity of the concept of sustainability makes difficult the application of sustainability in higher education programmes and courses (Shriberg, 2002). Throughout the Decade of Education for Sustainable Development (DESD 2005-2014), there was limited information and guidance on evidence-based approaches and tools to enable educators integrate sustainability in higher education programmes and courses or to assess learners' sustainability competencies. In terms of the latter, the inherent ambiguities involved in defining sustainability and the complexities of applying

the concept to diverse institutional settings have also thwarted comprehensive measurement efforts until quite recently. However, cross-institutional sustainability assessment is needed to advance strong initiatives and assist lagging colleges and universities.

At the national level, the integration of sustainability education in the Irish higher education sector has remained problematic. Among the many hindrances to infusing sustainability education is the fact that, despite the Irish government's interests in sustainability education, no specific roadmap or paradigmatic framework has been put in place by the Department of Education and Skills to guide the integration of sustainability education in the higher education sector. Furthermore although the Higher Education Authority strategic policy framework -Towards a Future Higher Education Landscape (HEA, 2012) called on higher education institutions to play a significant role through education, training and research to contribute to the development of a dynamic, just, creative and productive society, the strategic policy framework failed to come out with a roadmap for integrating the four cornerstones of sustainability education in a holistic manner, in Irish higher education institutions' activities especially within academic programmes and courses. Thus, with the absence of any policy guides, the integration of sustainability education remains a matter for the individual institutions, and has resulted in focus on those dimensions of sustainability education that have roadmaps and success indicators (such as Green Flag initiatives). It is not surprising therefore that many Irish higher education institutions have now won the green flags, which is good progress albeit on a specific angle of sustainability education. However, these awards are based mainly on campus greening initiatives, and not on infusion of sustainability within the curricula, and thus there is a clear need for better articulation and guidance on how to infuse sustainability in the curricula of higher education.

## **2.4 Paradigmatic Guides for Addressing Sustainability in Higher Education**

There exists abundance of literature on what should be taught and learned to garner knowledge, skills and values associated with sustainable development (Seitz & Schreiber, 2005; De Haan, 2006; International Association of Universities [IAU], 2006; Makrakis,

Kostoulas-Makrakis, & Kanbar, 2012, Makrakis & Kostoulas-Makrakis, 2012). UNESCO (2005) points to the fact that ESD is a new vision of teaching and learning that places emphasis on the interconnectedness of people and nature in addressing sustainability challenges related to issues such as poverty, peace, consumerism, environmental degradation, climate change, pollution and health etc. It emphasises holistic, interdisciplinary and cross-disciplinary approaches to learning and teaching that enhance in learners the knowledge and skills needed to develop future sustainable communities (Huckle, 2008). Sterling (2004) in his review of the infusion of sustainability in curricula of higher education, identified three ways in which sustainability was being embedded in academic courses as follows:

- *Education about sustainability*: An “add-on”, Bolting-on, approach: This encapsulates awareness raising and developing separate courses on sustainability. In this approach, the existing education system and the disciplinary approaches remain basically unchanged.
- *Education for sustainability*: A “built-in”, Reformation approach: This involves “critical reflective practice in integrating sustainability in different disciplinary courses”. Sterling (2004, cited in Christensen & Zhang, 2011, n.p.)

*Education as sustainability*: A “re-build”, Transformation approach: This approach focuses on re-designing university education based on sustainability principles (Sterling, 2004). The approach involves “quest[ioning], contextualizing, negotiating and integrating sustainability in education; Paradigm shift and learning as change” (Sterling, 2004 cited in Christensen & Zhang, 2011, n.p.). Sterling (ibid.), calls this sustainable education.

Despite its cross-curricula nature, the enhancement of ESD knowledge has remained limited in many curricula, due to ‘bolt-on’ or ‘built-in’ approaches underpinning sustainability integration and thus, emphasising on the disciplinary focus of education, “which in turn reproduces and perpetuates academic divisions of knowledge that separate the natural and social sciences and the humanities and fails to acknowledge lay and tacit knowledge” (Huckle, 2008 as cited in Makrakis & Kostoulos, Makrakis, 2012, p.7).

Furthermore, there are limited paradigmatic frameworks internationally to guide the integration of sustainability in education despite increasing interest in sustainability since



the UN declaration of the Decade of Education for Sustainable Development (2005-2014) with the objective of advancing the cause of sustainable development through education at all levels (Burns, 2011).

## **2.5 Pedagogic Processes and Practices of Sustainability**

While there is a clarion call for infusing sustainability in education, higher education has been slow in reacting to this call because of the relative newness of the sustainability field of studies, its multi-disciplinary, transdisciplinary and inter-disciplinary nature and its demands for the use of constructivist, learner-centred, green management and organizational learning approaches, (Sterling, 2009). Coupled with these difficulties is the reality that a majority of higher education teachers have limited knowledge on how to teach this area of study as it does call for new approaches to pedagogic practices (ibid.).

In the specific case of the higher education sector in Ireland which is the focus of this study, there are no available paradigmatic instruments for infusion of ESD, be they from specific higher education institutions, or directed through government policy frameworks of either the Higher Education Authority or the Department of Education and Skills which are directly responsible for developing guidelines on higher education activities in Ireland. Also, there is no specific government policy guideline on integrating sustainability in higher education academic activities despite the launch of the Irish government's National Strategy on Education for Sustainable Development in 2014.

The review of the literature identified many ideas on the sustainability curriculum design process and different teaching and learning strategies, approaches and/ or practices that could individually be used to frame and implement education for sustainability, included but not limited to: Experiential Learning, Authentic Learning, Ethical-Values Learning, Constructivist Learning, Transformative Learning, Democratic Learning. We will read later that some of these well-honed approaches to teaching and learning have been re-framed within a strategy (such as: Experiential Learning, Constructivist Learning, Transformative Learning combined within the ExConTra strategy) and promoted in the reorientation of higher education curricula towards sustainability. Others such as Democratic Learning may be recognized as fundamental principles of ESD, as well as a pedagogic process of ESD.

### **2.5.1 Sustainability Curriculum Design**

Addressing sustainability in programmes and courses in higher education centres on the curriculum design and application processes. A curriculum can be envisaged from different perspectives. UNESCO (2010) defines a curriculum as “*the sum of all the formal and informal teaching and learning experiences*” in educational courses or programmes (n.d.). The general discourse on educational curriculum is not within the remit of this study which focuses more on examining the re-orientation of higher education curriculum to address sustainability. The sustainability infused curriculum embodies the totality of all the learning experiences of learners in the sustainability learning and teaching process. This includes the sustainability content, principles, pedagogic approaches, implicit and explicit norms and values inherent in the sustainability learning and teaching process. Burns (2011) argues that the sustainability curriculum design process should be rooted on ecological principles. Meanwhile, for Makrakis and Nelly Kostoulas-Makrakis, the sustainability curriculum “*is not simply a set of plans to be implemented, but rather is constituted through an active process in which planning, acting and evaluating are all reciprocally related and integrated into the process*” (Grundy, 1987, p. 115 cited in Makrakis& Kostoulas-Makrakis, 2012, p. 11). The effective infusion of sustainability in the learning and teaching process is thus anchored on the sustainability curriculum design process.

### **2.5.2 Experiential Learning**

Learning is a process of creating knowledge. Experiential learning is a philosophy of learning based on a theory of experience. According to Kolb (1984), learning is “*the process whereby knowledge is created through the transformation of experience. Knowledge results from the combination of grasping and transforming experience*” (Kolb, 1984, p.41). Experiential learning is thus a process of constructing knowledge through experiencing, reflecting, thinking and acting over what is being learned (kolb, 1984). Kolb (1984) presents the learning process as an idealized learning cycle where the learner creates knowledge through experience by touching on all the bases of learning: experiencing, reflecting, thinking and acting in a recurrent process that is responsive to

the learning situation and what is being learned. The experiential learning model exhibits two dialectically related modes of grasping experience-Concrete Experience (CE) and Abstract Conceptualisation (AC), and two dialectically related modes of transforming experience-Reflective Observation (RO) and Active Experience (AE), as shown in Figure 2.

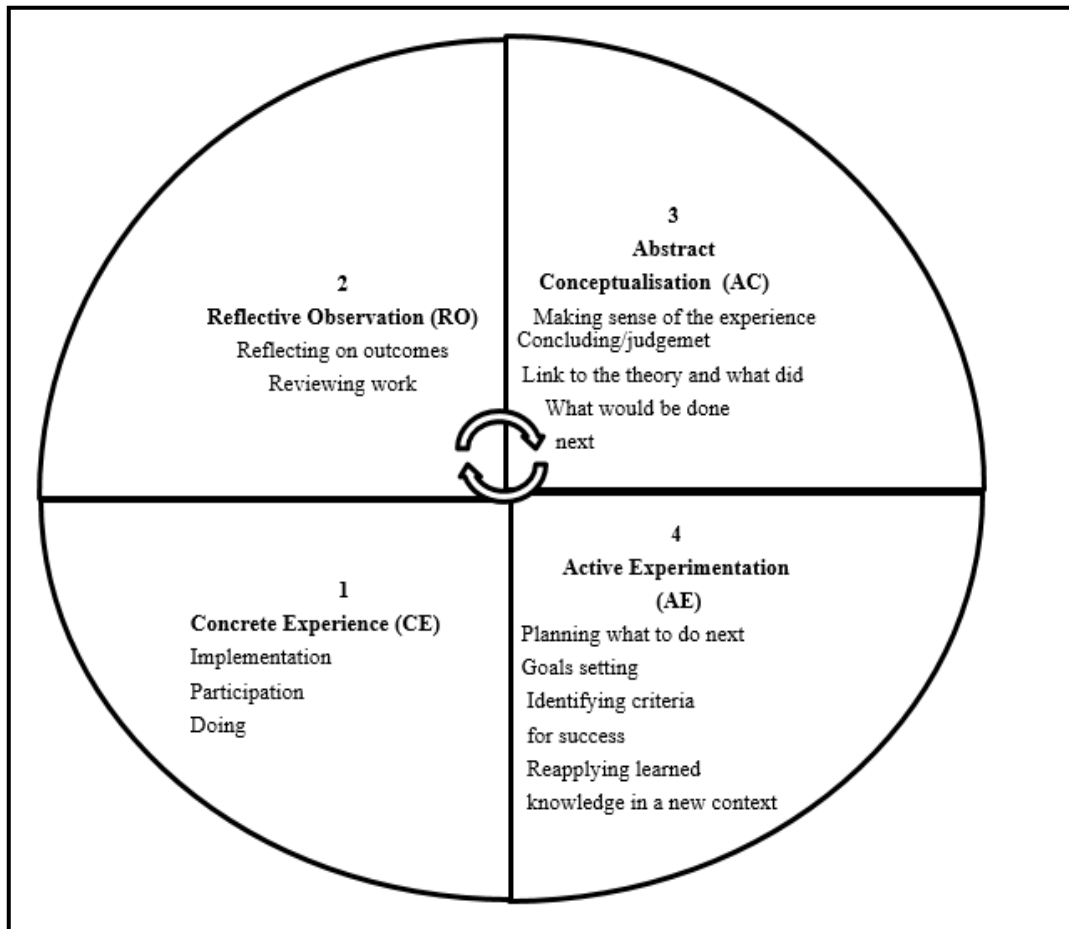


Figure 2: Kolb's Experiential Learning Cycle

### 2.5.3 (Socio-) Constructivist Learning

Higher education educators are often advised to integrate social constructivist pedagogic approaches like experiential learning, service learning, project-based learning, and active learning in the sustainability teaching and learning processes so as to enhance learners' skills and competencies in collaborative and cooperative decision making and in working cooperatively with other learners to seek solutions to the challenging sustainability problems (Allen, Gill, Walker, Thomas, Sherory and Shapiro, 2005; Burns, 2011).

Educators in higher education also need to embrace discursive teaching approaches so that sustainability is taught in such a way that allows learners to engage in the learning and teaching process to address the different ways in which sustainability is interpreted and developed in real life contexts (Alvarez and Rogers, 2006; Burns, 2011).

#### **2.5.4 Transformative Learning**

Transformational pedagogic approaches are vital in teaching and learning for sustainability. The particular types of pedagogic approaches to be used depend on the sustainability themes and inherent sustainability principles that the educator intends to foster in the sustainability teaching and learning process. Teaching for sustainability requires more than just information transmission. It requires the use of transformative learning processes. O'Sullivan (2003) explains that transformative learning involves: "*experiencing a deep, structural shift in the basic premises of thought, feelings, and actions. It is a shift of consciousness that dramatically and irreversibly alters our way of being in the world. Such a shift involves our understanding of ourselves and our self-locations; our relationships with other humans and with the natural world*" (p. 327, cited by Makrakis & Kostoulos Makrakis 2012, p. 12).

Other aspects of transformative learning also include "*becoming conscious of how social structures are oppressive, sense-making within a holistic and contextual approach, and a spiritual dimension of soul-based learning*" (Dirkx, 1998, cited in Burns, 2011, n.p.). Burns also explains transforming one's own frame/s of references can lead not just to transformations of self but also in society: "*one of the clearest underlying assumptions of sustainability learning is to understand that our taken for granted perspectives and mind-sets are too narrow (unsustainable), and to generate new beliefs that guide sustainable action. While this is an individual process of transformation, it may also lead to community transformation*". (2011, n. p.). The integration by higher education educators of opportunities to engage in transformative learning could help to enhance learners' knowledge and skills to become sustainability problem solvers and change agents, and will be demonstrable through the manifestations of their acquired sustainability competencies to develop sustainability oriented communities. Thus, as Burns (2011) previously mentioned, although the transformative learning processes of sustainability "*centres on the individual, its actions will eventually trickle down to other*

*members of the community, culminating into a process of collective transformation for sustainability"* (Makrakis & Kostoulas-Makrakis, 2012, p.12).

The effective transfer of sustainability knowledge, aptitudes and competences is in itself anchored on the educator's ability to weave together transformative and learner-centred pedagogies, and the given sustainability themes to foster sustainability knowledge and principles embedded within the sustainability themes, to produce in the learner the anticipated sustainability related competencies in the teaching and learning process. Transformative learning in sustainability focuses on *"learning-based change that involves 'learning to know', 'learning to do', 'learning to live together', 'learning to be' and 'learning to transform oneself and society'"* (Makrakis & Kostoulos-Makrakis, (2012, p.7). Transformative learning for sustainability is 'mind'-altering and brings about significant behavioural change needed for re-orientation towards sustainability, and develops the types of competencies required for action, as outlined by Makrakis & Kostoulos-Makrakis, (2012,): *"a shift of consciousness that alters: our way of being in the world (learning to be), our way for discovering others by discovering ourselves (learning to live together), our way of learning how to learn as well as acquiring, constructing, disseminating and managing knowledge (learning to know)... and our way of putting knowledge into action (learning to do)"*, and above all learning that *"transforms problematic frames of references – sets of fixed assumptions and expectations – to make them more inclusive, [non] discriminating, open, reflective and emotionally able to change ourselves and other members of our community (Learning to transform oneself and society)"* (p.8).

Transformational learning incorporates contextualised learning- knowledge about the local context (place-based or community knowledge) and it also requires a shift to embrace learner-centred pedagogic approaches such as the use of inquiry-based learning, experiential learning, reflexive-learning, problem-based learning and collaborative learning (Cress, 2004; Moore, 2005; Burns, 2011). In this light, Chambers (2009) and Burns (2011) argue that educating for transformative sustainability requires the educators to reorient education courses to integrate socio-constructivist learning approaches which help imbue in learners' skills and competencies to engage in participatory decision making and collaborative actions to develop systemic solutions to sustainability challenges facing the world. In the same light (Vela, 1994; Knowles, 1970 and Burns,

2011) explain that the learning experience among adult learners is enriched when they engage in relationships, dialogue and direct experience.

### **2.5.5 ExConTra Learning Paradigm**

The ExConTra Learning paradigm is a pedagogic framework developed by Makrakis and Kostoulas Makrakis (2012) that recognises the combination of **Experiential Learning** and **Constructivist Learning** and **Transformative Learning** theories within learning interventions as pivotal to education for sustainability. The ExConTra learning paradigm is based on an interdisciplinary approach to addressing the four pillars (environment, society, culture and economy) of sustainability.

Makrakis and Kostoulas-Makrakis (2012) argue that sustainability learning begins with experience (Experiential learning) which cuts across the other two approaches of learning (constructivists and transformative). They explain that learning for sustainability begins with experiential learning through which learners identify a sustainability problem, engage in data collection through inquiry methods and in the process, reflect, observe, make further inquiries and make meaning from the new information. This process involves learners making meaning, either individually and/or collectively, and reflecting on their own experiences, “leading them to develop more abstract understandings of their experiences (conceptualising)” (p.18). This process leads them to making individual and collective meaning (constructing) “through continuous reflection, re-conceptualisation and active experimentation” (Ibid.) When constructed knowledge merges with action it leads to change agency. “Acting as change agents, learners are empowered to transform experience through critical reflection and active experimentation. When critical reflection is transformed into an action, it transforms the [learners and society as well]” (Makrakis & Kostoulas-Makrakis, 2012, p.19).

The ExConTra framework was developed as part of the Tempus RUCAS (Reorienting Universities Curriculum to Address Sustainability) project. The Tempus RUCAS international project involving twelve partner universities within the EU and Middle East, aimed at promoting the integration of sustainability concepts, themes, principles and practices within higher education programmes and courses both at undergraduate and postgraduate levels. Through the Tempus RUCAS initiative some higher education staff from six participating country universities in the Middle East and Europe (among them

were higher education staff with interest in sustainability education from different universities), were involved in training in reorienting university course curricula in addressing sustainability.

However, despite its strength, a key weakness of the ExConTra learning framework is that it focuses specifically on experiential, constructivist and transformational learning experiences and omits to explicitly recognise ethical-values learning as the linchpin in enablement of transformational learning to embrace sustainability. The centrality of values learning in sustainability is based on the fact that sustainability education emphasizes on learners' behavioural changes to embrace pro-ecological values through the critical reflections on educators and learners' ethical values-bases in the sustainability learning and teaching process.

### **2.5.6 Ethical Values-Based Learning**

Ethical Values-based Learning recognizes the key role that ethics and values orientations have on decision-making and action for sustainability. Powney et al. (1995) assert that: *“a value is more than a belief and more than a feeling”* (p.3). In this light, Hill (1991) explains that: *“holding a value involves believing in it as an idea related to worth or obligation (knowing); believing in it with a degree of intensity (feeling); and, therefore, having a disposition to act consistently with it (doing)”* (cited in Powney et al., 1995, p.3). In the same light, Powney et al. (1995) argue that: *“the precise relationship between [values] knowing, feeling and doing may be unclear, and may change according to circumstances”* (p.3). In an explanation of the Ethical Values-based learning model, Holland et al. (2012) explain that: *“an ethical-value expresses the appropriateness of specific ethical principles and practices, with the aim of determining which principles or practices are best to guide our actions. In the context of learning, it essentially involves learners and educators prioritising a series of positive values and actions necessary for participatory and democratic learning. These positive actions may take the form of valuing ‘other’s perspectives’ or ‘solidarity’ or ‘otherness’ and are central to the creation of a participatory, democratic ethos and culture, that underpins transformative learning environments. It is important for the learner, community of learners and educators to reflect on how their ethical values bases enhance the cognitive experience of all within a learning environment”* (p.45). Therefore, the implementation of an ethical

values-based learning approach within education for sustainability requires a participant-centred approach, where the type of learning and nature of content is negotiated by learners and educator/s, and there is a high degree of reflection in, reflexivity on and critique of values-bases and orientations impacting on the learning experience, and promoting action for sustainability.

### **2.5.7 Authentic Real World Learning**

In authentic real world learning, the learning environment is multidisciplinary. It uses real world scenarios "*multiple perspectives, multiple ways of working, habits of mind and community*"(Lombardi, 2007, p.2-3). Lombardi (2007) identifies ten characteristics of authentic real world learning activities which include: real-world relevance; ill-defined problem; sustained investigation; multiple sources and perspectives; collaboration; reflection; interdisciplinary perspectives; integrated assessment; polished products and multiple interpretations and outcomes. Lombardi (Ibid.) explains that when students are engaged in authentic learning activities although in the beginning they may find the activities difficult or they are disorientated or frustrated, they are motivated to persevere if the exercise stimulates what really counts and makes meaning and is relevant to the learners' interests. Also, authentic learning allows learners to compare their interests with those of a working disciplinary community.

### **2.5.8 Contextualized Learning**

Contextualization is "*the process of embedding knowledge in history, culture, philosophical questions, and personal experience*" (Nikitina, 2003, p.9). Sustainability is context specific. The meaning of sustainability depends on the context in which it is used. Sustainability needs to be contextualized because the concept is slippery and open to multiple interpretations (Wals & Jickling, 2002). In the same vein, Wade et al. (2014) argue that sustainability education "*should be rooted in the actual experiences and realities of people in their own communities*" and this should take into consideration the *indigenous knowledge of the community members* (p.164).



## **2.6 Principles of Sustainability Education**

In the context of this literature review, the principles of sustainability education refer to key processes that must be supported or invoked within the infused curricula to promote transformative learning experiences for sustainability. From a review of the literature, the following principles for a sustainability infused curriculum were identified: 1) Foster Change Agency for Sustainability; 2) Facilitate Trans-disciplinarity Engagement; 3) Critically Examining Sustainability Worldviews, Ethics and Values; and 4) Promote Sustainability Frames of Thinking, as discussed in the following sections. These principles provide a guide to key processes in educating learners to become sustainability minded citizens.

### **2.6.1 Foster Change Agency for Sustainability**

Sustainability education focuses on critically examining information about sustainability problems and seeking practical solutions to them. To prepare learners to be able to effectively engage with the complex sustainability challenges, educators need to design or redesign and re-orient education about and for sustainability so that such a process could foster change and transform learners to become sustainability change agents. Thus, an important objective of integrating sustainability in higher education programmes and courses is to equip learners with knowledge, skills and competencies to become change agents for sustainability.

Agency is “*a sense of personal power, as well as personal responsibility*” (Goldberg, 2012, p.107). A person’s sense of agency apportions responsibility for action. It pushes an individual to internally question whether to intervene in a social or ecological problem, or whether someone else should do so. As Giddens (1976, p.111 cited in Cadwell, 2006) explains, it is the “*capacity to have acted otherwise*” and a *condition of intentional conduct that is necessary to effect change*” (p.19). The transformative capacity of human agency is the capability of actors to intervene in a series of events to alter their course (Giddens, 1976 cited in Cadwell, 2006). In the same light, it implies being “*an active participant in planning and conducting one’s life and... is characterized by one’s ability*

*to pursue goals that one values and that are important for the life an individual wish to lead” (Lozano, Boni, Peris & Hueso, 2012, p.134).*

Agency is an important aspect of human well-being. It is important for individual freedom as well as collective action and democratic participation (Sen, 1999; Lozano et al 2012). It enables change agents to transform external structures and systems (Habermas, 1987). Education provides actors with the capacity to: apply reason to personal decisions and preferences; reflect critically on the world; envisage desirable changes and accomplish such changes in practice (Lozano et al., 2012).

In relation to sustainability, Thomas (2009), argues for the need for citizens to take responsibility to effect change towards promoting sustainability. Change to embrace sustainability can only be effected if actors undertake actions to foster behaviour changes to promote sustainability. Such changes could be successful if people become involved as change agents to promote sustainability. Tilbury, Adams and Keogh (2005) argue that for all sectors of society to actively engage in change for sustainability, there is the need to change all higher education curricula to integrate sustainability.

Change agents need to develop capacity for creativity and innovation in areas of futures thinking and design and such competencies should be developed through action oriented and project-based learning. Successful change agents need to be more inquiring and more sensitive to others (Schein, 1995). Change agents define, research, plan, build, support and partner with others to create change. Thus, the ability to engage in change agency is an important sustainability principle that is necessary for fostering and infusing sustainability in educational programmes and courses.

Change agency for sustainability is in line with Lewin’s theory of change process in human systems, which focuses on three basic principles: 1) *Unfreezing*, 2) *Changing or Transition* and 3) *Refreezing*. Lewin considers these processes as the foundations upon which meaningful change can be built. In the Unfreeze phase, the change process involves reducing the forces that are striving to maintain the status quo. Schein (1995) explains that “*human change whether at the individual or group level [is] a profound psychological dynamic process that involves painful unlearning without the loss of ego and identity, and difficult relearning as one cognitively attempt[s] to restructure one’s thoughts, perceptions, feelings and attitudes*” (p. 2). Lewin’s unfreezing processes include: disconfirmation of information; survival anxiety and learning anxiety. Learning

and change begin from some sort of dissatisfaction or frustrations brought about by information that disconfirms people's expectations or hopes (Schein, 1995). Schein gives examples like the frustrations that people face in *"trying to adapt to some new environmental circumstances that thwart the satisfaction of some need"* (1995, p.3). In the case of Ireland, we can situate this to the adaptations that shoppers had to make with the changes in national policy over the use and provision of plastic bags in super markets. Because of the environmental hazards that plastic bags are causing to the environment, the Irish government put forward a plastic bag levy in 2002, which was a tax on the purchase of disposable plastic shopping bags and placed restrictions on super markets for the provision of plastic carrier bags to shoppers through taxes. Consequently, super markets imposed prices (ranging from 22 cents/per bag to about 1.00 Euros depending on the type and quality of the plastic carrier disposable bag, and at the same time introduced more eco-friendly shopping bags on the market. These actions engendered a process of behaviour changes in shoppers to use reusable bags for shopping instead of increasing volumes of "throw away" plastic bags (Department of Housing, Planning, Community and Local Government, 2016). However, Senge (1990) argues that creating some new knowledge or generating *"some disequilibrium based on disconfirming information is a pre-requisite for change [because such] disconfirmation whatever its source is the primary driving force in the quasi-stationary equilibrium"* (Cited in Schein, 1995, p.1).

However, the disconfirming data on its own cannot bring about change because actors can ignore the information, refuse to accept its merits or simply dismiss it as irrelevant. This has been vividly exemplified in the global climate change debate, whereby skeptics still view the scientific evidence of increasing global temperatures and the resulting consequences on the earth system as nothing more than global politicking despite all the hazards and global problems associated with increasing global temperatures. Disconfirming information can only become a motivating force for change if we accept the information and *"connect it to something we care about"* (Schein, 1995, p. 4). The acceptance of this disconfirmation arouses *"survival anxiety"* that is the *"feeling that if we do not change we will fail to meet our needs or fail to achieve some goals or ideals that we have set for ourselves"* (ibid). The transition or change state is the state at which the learner develops the new behaviour, values and attitudes which occur through change.

However, for change to become more stable it must be refrozen. For refreezing to occur, the “*new behaviour must to some extent be in harmony with the personality and behaviour of the learner, otherwise the learner will simply fall back into old habits (a state of denial) which may result in the unlearning of the very things that one has learned*” (ibid). Examples of such unlearning are found in the reoccurrences of drug addiction habits in drug addicts who after undergoing an elaborate process of rehabilitation eventually fall back to the old habits of addiction if the acquired habit of non-drug intake have not been stabilized by the sufferer. For personal or individual refreezing to take place, the learner must avoid identification and undergo scanning (the search for new knowledge) and solutions that they prefer (Schein, 1995). In the case of a group or community, relational refreezing can only occur when the entire group that “*holds the norms that support the old habits*” are trained to change from those habits (Schein, 1995, p. 11).

As far as education is concerned, (Lozano et al. 2012, p.134) argue that “*the concept of agency is particularly relevant for reflecting on education*” as it implies three levels of claims:

*the claim that it is possible to educate people to apply reason to personal decisions and preferences;*

*the claim that it is possible to enhance people’s capacities to reflect critically on the world and to envisage desirable changes, and;*

*the claim that capacities to accomplish such changes in practice can also be cultivated.*

In education, agency can be reflected through educating people to “*apply reason to personal decisions and preferences... enhanc[ing] people’s capacities to reflect critically on the world and to envisage desirable changes, and... [providing people with] capacities to accomplish such changes in practice*” (Lozano et al., 2012, p.134). In the same light (Lozano et al., 2012) argue that people can cultivate agency through education and this could enable them make decisions and be authors of their own lives. Thus, while most often educators feel constrained in their practices, politically they are recognized as being “*best placed to change society by changing the habits and instilling the ideas of future citizens*” (Tripp, 1992, p. 22 cited in Wayman, 2012, p.95).

## 2.6.2 Facilitate Trans-Disciplinarity Engagement

There are many different dimensions of disciplinarity that can be considered within ESD. A review of the literature in the context of ESD revealed the following: Disciplinarity, Co-disciplinarity, Con-disciplinarity, Cross-disciplinarity, Infra-disciplinarity, Inter-disciplinarity, Intra-disciplinarity, Multi-disciplinarity and Trans-disciplinarity. However, a quality ESD infusion offers opportunity of movement beyond singular disciplinary perspectives, towards trans-disciplinary engagements.

- **Disciplinarity:** Traditionally a discipline is characterized by a particular subject as well as “... *a method which establishes specific descriptions and explanatory tasks for the said subject*” (Kotter & Balsiger, 1999, p. 91). Education for sustainability requires deep knowledge and skills in particular disciplines so that learners are abreast with knowledge and skills in the given discipline in order to use such disciplinary knowledge to foster sustainability.
- **Co-disciplinarity:** Co-disciplinarity describes “*a closer form of scientific collaboration between two scientific disciplines*” (Kotter & Balsiger, 1999, p. 100). The term was coined by the American scientist Margaret Baron Luszki (1958) in her work on Interdisciplinary Team Research: Methods and Problems (Luszki, 1958, p. 119). Co-disciplinarity is necessary for sustainability education since sustainability related problems are complex and require the use of multiple perspectives and cross-disciplinary knowledge and skills.
- **Cross-disciplinarity:** refers to the use of both multidisciplinary, pluridisciplinary and transdisciplinary approaches in solving a given problem (Jantsch, 1972). This approach is very important in solving complex and multifaceted sustainability problems.
- **Infra-disciplinarity:** Infra-disciplinarity describes a form of cooperation which is not oriented towards integration of any scientific achievement, but which finds comparable kinds of problems in various disciplines (Kotter & Balsiger, 1999). The term was coined by the German psychologist Paul Lorenzen in 1974 (Ibid).
- **Inter-disciplinarity or Integrative Studies:** Inter-disciplinarity or integrative studies is concerned with “*the transfer of methods from one discipline to another*” (Nicolescu, 2006, p.143). In such circumstances the researchers “*go beyond establishing a common meeting place to developing new methods and theories*

*crafted to transcend the disciplines in order to solve problems*” (Repko, 2005 cited in Choi & Anita, 2006, p. 353). Through such transfer of methods, interdisciplinarity develops the capacity to “*generate new disciplines*” (Nicolescu, 2006, p. 143). Nicolescu (2006) gives the examples of interdisciplinary studies or approaches that led to the development of other disciplinary fields like quantum cosmology and chaos theory. UNESCO (2005) explains that ESD is interdisciplinary in nature and, all disciplines can contribute to sustainability. In Sustainability studies, interdisciplinary approaches involve the search for answers to sustainability problems using different methodologies that culminate into developing sustainability education approaches.

- **Intra-disciplinarity:** Intra-disciplinarity occurs when there is scientific collaboration between scientists in disciplines “*with the same theoretical level of integration*” (Kotter & Balsiger, 1999, p. 101). Kotter and Balsiger (ibid.) explain that the concept of intra-disciplinarity was coined by the German psychologist Heinz Heckhausen in the course of analyzing work from projects that he carried out at the centre for interdisciplinary research at the university of Bielefeld (Ibid.). However, the American scientist Margaret Luszki had used the term thirty years earlier to describe contacts established in a scientific discipline (for example in a discipline like psychiatry) but Heckhausen was not aware of the earlier use of the term by Luszki (Ibid.).
- **Multi-disciplinarity:** Involves the use of knowledge and information from different disciplines to solve a sustainability problem, taking a holistic approach to the problem (Jantsch, 1972). Nicolescu (2006) defines multidisciplinary as “*studying a research topic in not just one discipline... but [using] several disciplines at the same time*” (p.143). He explains that the topic or subject under study will ultimately be enriched through incorporating the perspectives of different disciplines. Such a multidisciplinary approach “*transgresses disciplinary boundaries while its goal remains limited.... within the framework of [the topic’s] disciplinary research*” (Ibid). On his part, Dillon (2001 cited in Youngblood, 2007, n.p.), argues that multidisciplinary occurs “*when members of two or more disciplines cooperate, using the tools and knowledge of their disciplines in new ways to consider multifaceted problems that have at least one tentacle in another area of study*”. It involves “*draw[ing] on knowledge from*

*different disciplines but stay[ing] within the boundaries of those fields*” (NSERC, 2004 cited in Choi & Anita 2006, p.353). Grossman (1979 cited in Choi & Anita, 2006) views multidisciplinary as “*group research whereby individuals from different disciplines work together on a common problem but with limited interaction*” (p.353). When considered in relation to sustainability education, multidisciplinary involves the use of knowledge and information from different disciplines to solve a sustainability problem taking a holistic approach to the problem. A good example of sustainability problem solving that engages multidisciplinary approaches include attempts at seeking solutions to the issues of climate change and its effects on both the environment and human society. Any meaningful approaches to tackle the issues associated with climate change should involve the use of cross disciplinary approaches because isolated disciplinary approaches to seek solutions to the issues of climate change will yield little or no results. In order to seek solutions to the devastating effects of climate change, scientists and researchers need to devise solutions for example ranging from resolving the issues, of ozone depletion, increasing atmospheric temperatures to desertification. Seeking solutions to such problems will involve inputs from disciplinary areas such as physics, biogeography, climatology, environmental education, physical geography, chemistry, urban geography, transport and automobile, pollution, agriculture, forestry and sociology. Considering the above given definitions, despite seeking inputs from the different subject areas mentioned above, the solutions for climate change problems could be resolved sticking with the sustainability framework developed without necessarily deviating from the disciplinary boundaries.

- **Trans-disciplinarity:** Trans-disciplinarity is concerned with what is between, across and beyond the disciplines (Nicolescu, 2006). The goal of trans-disciplinary approaches is the understanding of the present world taking a holistic picture of the issues. In relation to sustainability, trans-disciplinary approaches foster systemic thinking and interconnectedness. As Nicolescu (2006) observes, there is no single big sustainability problem facing mankind on earth, rather there are numerous “*overlapping and interconnected problems which mankind is facing on earth*” (p.143). From a trans-disciplinary perspective, it is necessary to use all available knowledge be it theoretical, spiritual, scientific, non-scientific or

practical to seek sustainable solutions to such problems because if such problems remain unresolved, their negative consequences will affect all of humanity in one way or the other (Ibid). *“ESD is interdisciplinary. No one discipline can claim ESD for its own, but all disciplines can contribute to ESD”* (UNESCO, 2005a n.p.).

### **2.6.3 Critically Examine Sustainability Worldviews, Ethics and Values**

The concept of worldview has its basis in extensive literature in sociology, psychology, and anthropology (Banuri & Marglin 1993; Weber, 1930; Durkheim, 1933; Parsons, 1954; Mead, 1934; Dumont, 1977; Geertz, 1973). As John Studley (1998) explains that we develop our worldviews unconsciously, without questioning from our communities and local cultures and these values and belief systems are passed on from generation to generation without changes. Studley (1998) explains that *“a worldview provides an integrating function for new information, values, philosophies or experiences”* (n.p.). He further argues that worldview gives a culture *“structure, a subconscious legitimacy in the minds of the people. It serves as the basis for evaluation, judging and validating experience. It is a yardstick with which people measure events and circumstances in the culture, providing criteria of acceptability. It provides psychological reinforcement for a society's way of life. It creates a “we-they” dynamic; through a common worldview people identify with their society as opposed to all other societies”* (n.p.). Sterling (2003) describes cultural worldview as *“a story about the way the world works. It is both a projection and reflection of how the world is seen and is a characteristic of any society from history to present”* (p.33). Agreeing with Fromm (1976), Sterling (Ibid.) argues that there is no society or person without a cultural worldview, when he states that in any given stable society, *“the dominant and mainstream story accommodates differences of views and debate within accepted parameters, and on the basis of accepted axioms and assumptions which are often unexamined and unarticulated. It has a descriptive aspect, influencing which aspects of and how the world is seen, and a normative and purposive aspect which legitimises courses of action”*(p.33).

Sterling (Ibid) explains that two components of worldviews or paradigm can be distinguished. These are the eidos - which refers to the cognitive or intellectual paradigm, in other words the guiding idea, and the ethos, *“which refers to the affective level, values*



*and norms". These two dimensions of worldview "give rise to and influence the praxis or otherwise seen as the 'theory in action' and behaviour, both what is done (and not done) and how it is done". Although world view is comprised of three components- eidos, ethos and praxis, often the ethos of worldview is "most hidden from people's awareness" (Ibid).*

In any given society, *"the dominant shared worldview supports a comprehensive epistemological and ontological sense within which both examined and unexamined values, beliefs, assumptions, ideas and actions are played out"* (Sterling, 2003, p. 33). However, agreeing with Marglin (1990), Sterling (2003) argues that there is increasing evidence that the knowledge system or worldview *"that has dominated western society for more than three hundred years is unsustainable as a system of thought and has given rise to unsustainable patterns in human activity systems"* (p.33).

Many writers (Sterling, 2003; Koestler, 1959; Berman, 1981; Capra, 1982; Marshall, 1992; Tarnas, 1991; Spretnak, 1997) trace the roots of western modernist worldview in Greek thought which flourished to its climax in the 17th century with the scientific revolution. Others like Eisler (1990) argue that the western modernist worldview evolved in the period of chaos and disruption which occurred in western prehistoric times that led to a shift from the *"original direction in mainstream [western] cultural evolution [of partnership to that of a] dominator model"* (pp. XV11-XX). Eisler further argues that the cultural evolution of ancient and medieval western societies *"that worshipped the life-generating and nurturing powers of the universe... to sustain and enhance life...symbolised by the ancient chalice or grail- was interrupted [and replaced with] technologies 'designed to destroy and dominate' [the universe] and symbolised by the Blade. It is the continuation of the dominance of the Blade form of technologies... rather than technology per se, that today threatens all life on our globe"*(Ibid). In the same light, Sterling (2003) explains that the changes in western thought which came as a result of the 17th century scientific revolution present clues to understanding the crises of late modernist and postmodernist thoughts. He argues that *"a fundamental shift in [western] worldview took place between 1500 and 1700 away from the relatively ordered world of medieval Christendom, to the new post-Renaissance age (what historians later called) the scientific revolution"* (pp.141-142). These developments in western thought undermined the old order and built the platform of new ideas, beliefs, values and

assumptions which became the bedrock of modernist thought. Because of this shift the geocentric worldview of Ptolemy and the Bible was replaced by the astronomy and physics of Copernicus, Galileo and later, Isaac Newton (1643-1727), science became re-visioned particularly through the work of Francis Bacon (1595-1626) in developing empiricism and inductive reasoning, and analytical reasoning propounded by Rene Descartes (1595-1650), (Sterling, 2003). To sum up the history of scientific ideas about the universe Koestler (1959), argues that prior 17<sup>th</sup> century western worldviews were Aristotelian and became Newtonian afterwards. Sterling (2003), agreeing with (Berman, 1981, p. 31) argues that, although "*Bacon performed no scientific experiment; his legacy was the rethinking of science as experiment, of science as utility and the questioning of nature under duress*" (p.142). He further argues that in relation to western thought Descartes' scientific legacy centres on his emphasis on dualism, and binary thinking that separates the mind and body, subject and object, observer and the observed, people and nature which became the fundamental characteristic of modern western worldview (Sterling, 2003). Sterling (Ibid.) argues that through this binary orientation of western thought, Descartes is seen by many as the father of the western reductive thinking and atomistic worldview.

The scientific revolution of the 17th century changed the western worldview that stretched from the Aristotelian period to the medieval era. The modern western world view inherited an ontology which emphasized a mechanistic cosmology and was primarily determinist and materialist; with an epistemology that was objectivist, positivist, reductivist and dualist (Sterling, 2003). The western dualist and mechanistic worldview inherited from the 17<sup>th</sup> century scientific revolution was reflected in Darwinist economics, behavioural and social sciences, philosophy, ethics, science and popular culture (Sterling, 2003). This western mechanistic worldview, which propagated the myth of progress, remained unquestioned and was reflected in the promise of progress and development for all in the 20th century based on a false premise of modernism (Sterling, 2003). Norgaard (1994) argues that modernism betrayed progress by preventing westerners from seeing and understanding the interwoven link between environmental, organisational and cultural problems. All the same Norgaard (Ibid.) agrees that modernist beliefs and values contributed enormously in the development of western science and other institutions. However, Norgaard (Ibid.) argues that these modernist belief and value systems are "*embedded in western public discourse to the exclusion of other metaphysical and*

*epistemological premises which are more appropriate for understanding the complexities of environmental systems and which are more supportive of cultural pluralism”* (p.63). In the same light, Sterling (2003) argues that the underpinning feature of modernist worldview is the dualist feature of subject/object, mind/body, people/nature etc. Sterling (2003) further argues that western belief and value systems shifted from that of "*identity with 'the other' in the pre1500 worldviews to a profound sense of, as well as intellectual belief in separateness*" from the era of the scientific revolution (p.143). Bateson (1972) describes these binary features of western modernist worldview as constituting an "*epistemological error*" (p. 456).

Thus, the mechanistic, reductionist and atomistic modern western worldview that has blinded people's thinking from taking pro-ecological and holistic views is the root cause of many world crises be them economic, ecological, social and/or cultural (Boehner, 2011). Such crises include:

- Economic crisis like the 2008/2009 financial crisis;
- Social/political crises such as political unrests, family breakdowns, overpopulation, poverty;
- Environmental crises associated with climate change and ozone depletion; loss of biodiversity; natural resources depletion and
- Cultural crises such as the loss of indigenous knowledge systems, to name but a few.

These crises are increasingly epistemological in nature and to redress these errors it is necessary to promote and foster ecological literacy (Boehner, 2011). In order to improve our economic, social and cultural wellbeing, it is necessary to foster actions and practices that promote the attainment of ecological stability. However, our current social, environmental, economic and cultural practices do not take into consideration the interrelatedness of our complex ecological systems. As Boehner (2011) argues, humanity fails to recognise the fact that our economic, social and cultural systems are indeed subsystems of the ecological system. Our present economic, social and cultural systems create strains on the ecological system which in turn weakens our capacity to create better and more secured socio-economic and cultural systems. Thus the stresses of our economic and socio-cultural systems are creating deepening crises both within the

subsystems - economic (financial crisis); social (social and moral decadence, political and social unrest, breakdown of family values, deepening poverty and poverty related crises, increasing gap between the have and have not); cultural (erosion of indigenous cultures, increasing socio-economic and cultural globalization and its accompanying consequences, increasing monetization and erosion of socio-cultural values). All of this being a consequence of the myth of global progress anchored on an epistemological reductionist worldview and the failure of our socio-economic and cultural systems to recognize and act on the feedback loops of both the subsystems and the overall ecological system to effect actions towards attainment of a state of stability or homeostasis. Boehner explains that while the socio-economic, cultural and political crises that humanity is facing are painful, "*an ecological collapse is terminal*" (Boehner, 2011, p.2). To avoid this dire scenario, we need to recognize that "*feedback from [the subsystems-economic, social and cultural] will be significantly faster than feedback from the ecological system which has evolved for a period of millions of years and has significant buffers*" (Boehner, 2011, p.2).

Thus, the dominant western worldview is reductionist and promotes practices that are dysfunctional and conflict with the complex ecological systems on which humanity depends. Although progressively over time the modernist reductive and dualist worldview has seen some changes in the development of other cultural paradigms (postmodernism, structuralism, deconstruction etc.), the development and practice of an ecological worldview which emphasises whole systems thinking has remained limited in western thought and practice. As Boehner (Ibid) observes, our present socio-economic and cultural systems of thought and practice "*do not reflect the philosophical and geophysical imperatives*" of sustainability thinking and practice which requires the move to embrace an ecological epistemological paradigm or worldview and this can only be fostered through raising awareness and adoption of an ecological worldview (Boehner, 2011, p.2). This epistemological position should be advanced through the promotion of ecological literacy which embodies the recognition of whole systems and ecological complexity, limits (that is geophysical constraints or carrying capacity) and ... putting these insights in practice" (Ibid).

An ecological worldview recognises the fact that our economic, socio-political, cultural and ecosystems are complex and interrelated systems "*that cannot be entirely understood*

*through reductive analysis*" (Ibid). These systems are hierarchical, dynamic and interrelated (interdependent). Gregory Bateson (1972) thus argues that "*the organism which destroys its environment destroys itself*" (p.491). Our present beliefs and value systems have led into actions and practices that have pushed nature into dire ecological limits in many fronts. With increasing human populations, our demands for ecosystems services such as food, shelter, clothing, clean water, health care inputs, air, energy (wood etc. etc.) to improve on human wellbeing are increasing continually while at the same time diminishing the stock of available natural resources and hence the "*capacity of many ecosystems to meet these [increasing] human demands*" (Millennium Ecosystem Assessment, 2003, p. 26).

Sustainability requires a shift from the modernist reductionist worldview to embrace an ecological worldview. This shift in epistemological paradigm is reflected in ecological thought which stresses on relationism, unity and connectivity (Sterling, 2003, p.163). In this light, ecological worldview places emphasis on relationship "*where reality for both is seen as co-creation of both*" (Heron, 1992, p.35). Sterling explains that "*reality, presentness [and] wholeness exists only in so far as this relation of meeting exists*" (2003, p. 158). Agreeing with David Orr (1992) and Smith (1992), Sterling (2003) explains that relation and the quality of relation is at the heart of the ecological worldview, which calls for an education which gives importance to relations and the discourse on education that values relations has been variously termed- empathetic education (Laura & Cotton, 1999), partnership education (Eisler, 2000) and sustainable education (Sterling, 2001, 2003).

The ecological worldview emphasises valuing the other, thus bringing to the fore the sustainability ethics of care and mutuality. It emphasises the valuing of fellow humans and nature. Gibson (1979, p. 25) explains that "*to perceive the world is to co-perceive oneself*". This sense of mutuality lies at the heart of ecological ethics which emphasises a deep appreciation of and profound respect for, one's relations with others (Bawden, 2002, p.10). This appreciation and respect for the other is highlighted in the Earth Charter's [2000] values which call for:

- "*Respect [of the] Earth and life in all its diversity.*
- *Care for the community of life with understanding, compassion, and love.*

- *Build[ing] democratic societies that are just, participatory, sustainable, and peaceful.*
- *Secure Earth's bounty and beauty for present and future generations.*
- *Promoting a culture of tolerance, non-violence and peace” (Earth Charter 2000, n.p.).*

Wade et al. (2014) highlight the importance of worldviews, values and ethics in sustainability education. They argue that the infusion of sustainability in education can only be effectively implemented if politicians in the global north and south re-orient their worldviews to embrace values of integrity, probity, accountability, transparency and promote policies that foster social and ecological justice, valuing the contributions of local and indigenous knowledge (Ibid.).

#### **2.6.3.1 Respect Ethics Foundations of Sustainability**

The ethical foundations of sustainability rest on the premise of care, justice and love. One of the ethical concerns of sustainability is to foster intergenerational justice and this is reflected in the UN definition of sustainable development which calls for humanity to promote *development that meets the needs of the present generations without compromising the ability of future generations to meet their needs* (WCED, 1987). The UN definition of sustainability raises the issue of concern and compensation to future generations by the present generations for their actions in reducing the stock of available natural resources on which future generations will depend for their own livelihoods. The ethical values of intergenerational justice require the present generation to foster value systems that promote care and compensation to future generations through the development by the present generation of value systems that foster care, love and preservation of natural resources so that future generations will have the opportunity to enjoy the same stock of natural endowments as the present generation.

In line with the call for intergenerational equity, sustainability ethical bases also require the fostering of intra-generational equity. Intra-generational equity is concerned with the "*reduction of resource disparities*" among the present generation (Gallopín, 2003, p.20). The ethical basis of intra-generational equity requires the equitable distribution of resources (economic, financial, human capital, natural resources, technological) among

members of the global human family. Actions to foster intra-generational equity are reflected in the UN millennium development goals (UN, 2001).

Sustainability also requires humanity to appreciate the intrinsic values in nature (Gallopín, 2003), otherwise called biophilia (Wilson, 1986). The objective of biophilia is the preservation of nature (Bergh vanden, 1996). It urges human concern and empathy with non-human life (Harding, n.d.) and this concern is reflected in deep ecology values (Drengson and Inoue, 1995). As far as the values for ecological worldview are concerned, Harding (n.d.) explains that: *“when an ecological worldview is developed, people act from their whole personality, giving rise to tremendous energy and commitment. Such actions are peaceful and democratic and will lead towards ecological sustainability. Uncovering the ecological self gives rise to joy, which gives rise to involvement, which in turn leads to wider identification, and hence to greater commitment. This leads to extending care to humans and deepening care for non-human.”* (n. p.).

An ecological worldview requires people to live according to values and principles of sustainability which include: ensuring social equity, democracy and peace, appropriate development and conservation, mutual recognition and respect. These values and principles reflect the values necessary for a sustainable world and future. Such values require the integration of different belief and value systems and the recognition and respect of alternative worldviews and indigenous knowledge systems.

#### **2.6.3.2 Promote Democracy within Learning**

Sustainability requires the promotion of democracy and human rights in society. Fostering democratic values in sustainability education is not just about imparting knowledge and skills in the learners (Hartley & Huddleston, 2010). It encompasses enabling the learners to acquire attributes and attitudes that enable them to live and relate with others in the community, cherishing values like respect for the rights of others, peaceful resolution of disputes and living friendly ways of life (Ibid). In order to become sustainability minded citizens, learners need to acquire the competencies *“to work together in the interest of common good; respect all voices, even the dissenting ones; participate in the [civic and] political processes; and cultivate the habits and values of democracy and human rights in their everyday life and activities....[When democratic values are fostered in the teaching and learning process, learners... feel they are useful*

*and recognized members of their communities, and are able to participate and make a difference to society"* (Hartley & Huddleston, 2010, p. 13). Such civic and democratic values can be acquired by learners through education for democratic citizenship. Education for democratic citizenship (EDC) involves education, training, awareness raising, information, practices and activities aimed at providing learners with knowledge, skills and competencies which empower them to exercise and defend their democratic rights, civic duties and societal responsibilities, value diversity and participate in promoting and protecting democracy and the rule of law (Council of Europe, 2010). Such education is not restricted only to formal education but also involves learning through experience through service learning, volunteering and political participation (Hartley & Huddleston, 2010).

As far as sustainability education is concerned, educating learners in democratic values also encompasses imbuing in them the capabilities for promoting universal human rights, fundamental freedoms and the rule of law (Council of Europe, 2010). Because of its complex nature, educating for democratic citizenship should not only be limited to formal education institutions but rather such education should also be given in non-formal and informal settings, given by the state and civil society, parents, the media and youth organizations (Hartley & Huddleston, 2010). Such education should promote social cohesion, intercultural dialogue, the valuing of diversity, difference and equality including gender equality. It should also help learners to develop knowledge, personal and social skills and understanding that reduce conflict, increase appreciation for and understanding of differences between faiths and ethnic groups, build mutual respect for human dignity and shared values, encourage dialogue and promote non-violence in the resolution of problems and disputes (Hartley & Huddleston, 2012).

### **2.6.3.3 Value Inclusivity & Multiple Voices**

Sustainability requires the building of a culture of inclusion in society be it in our work places, or communities. When an inclusive environment is developed, it allows people with multiple backgrounds, mindsets and ways of thinking to live and work together effectively (Pless & Maak, 2004). As humans, we owe each other mutual recognition for our coexistence. Mutual recognition provides humanity with a platform to develop moral



respect for one another. It helps us balance the needs for individual recognition as a unique person on the one hand and the recognition of others as important members of the human family. This helps us to recognize "*the difference in [others] while looking for the common bond*" (Pless & Maak, 2004, p. 130). Mutual recognition enables us to value diversity and this is guaranteed through provision of the same rights for everyone and encouraging people to be good citizens thus creating space for recognition, both of cultural differences, values, norms and beliefs. This is enhanced through reciprocal understanding, openness to different viewpoints, the establishment of "*an inclusive discursive environment... with open and participative dialogue [which] integrates different voices..., enables other voices to speak up, discuss and weigh different arguments and finds a common approach on an issue. Such an environment promotes moral discourse, emphasizing on inclusiveness, equality, sincerity and absence of force*" (Pless & Maak, 2004, p. 133). An inclusive learning environment accommodates different views, the marginalized voices, and mutual trust and integrity is developed in such environments.

#### **2.6.4 Promote Sustainability Frames of Thinking**

From a review of the literature, it was evident that differing frames of thinking were promoted within ESD, including: Systemic Thinking, Futures Thinking, and Reflexivity/ Reflexive Thinking, and that the promotion of these frames were considered pivotal to empowering quality ESD learning experiences.

##### **2.6.4.1 Enable Systemic Thinking**

Meadows (1999, p. 368) explains that the realisation of human needs for wellbeing depends on healthy functioning natural, economic and social systems. In the general ecological system, "*systems health at any level depends on systems health at the sub and supra systems levels*" (Sterling, 2003, p. 166). The sustainability of the socio-economic, cultural and ecological systems requires a shift in human values and belief systems to embrace whole systems thinking. Sterling (Ibid) explains that systems thinking is "*concerned with the 'ecology' of whole systems*". Sterling (2003) explains that systems thinking emphasises the co-evolution of organisms and their environment. Sterling (2003, p. 167) argues that organisms and their environment affect each other and change together in systemic relationships. In the same vein, Harman (1994) explains that as

complex adaptive systems, "*organisms both make and are made by the environment and are thus actors in their own evolutionary history*"(p.385). Sterling (2003, p. 167) explains that Lovelock's Gaia theory has been influential in advancing the co-evolutionary theory. The co-evolutionary theory emphasises the "*notion of the world as a systemic [and] participatory place and refutes separateness and simple causality*" (Ibid). Thus Jackson (1991) reiterates this argument by holding the view that we are all a constituent part of the world and our daily actions create and influence the world in which others live in. In the same light Sterling (2003) calls to question the dominant belief and value systems of the western world which are based on the ideas that humanity "*must dominate the earth; that [people] are masters of their destiny; that the world is vast and unlimited; and that history is a process of advancement with every problem solvable*"(p.170). The views of the above writers point to the fact that there is increasing realisation that for humanity to move towards a sustainable world, there is the need for a shift from our mechanistic and reductionist worldview to embrace an ecological worldview that emphasises on whole systems thinking (holism) which valorises the ecological values of "*sufficiency, conservation, equity and justice, community, respect for and appreciation of the other, diversity, inclusion, democracy, self-reliance, self-organisation, partnership, futurity, trusteeship, resilience and durability and system health and viability*" (Sterling, 2003, p. 171).

#### **2.6.4.2 Facilitate Futures Thinking**

Futures thinking in sustainability education relates to envisioning a better future for the world. It entails envisioning how the past and present influence the future, and strategies to enable positive change for sustainability. Through futures thinking, learners acquire the skills and knowledge to understand how human present and past actions might become problems for the future and develop the capabilities of forecasting and envisioning a range of possible solutions for such future problems (ASU, n.d.). Futures thinking thus involves developing foresight capabilities in learners. Foresight is "*a human capacity that allows human beings to order their priorities, navigate a complex 'present' and ... actively deal with the [future]*" (Gidley et al., 2004, p. 2). Futures thinking involves imbuing in learners, skills in envisioning futures. Through futures thinking learners envision desirable and undesirable scenarios. Hicks (2002) argues that it is important for learners to know what they are anticipating actions to attain rather than what they are

trying to prevent. In this light, Wayman (2012) argues that such judgement could motivate learners' interests in sustainability to imagine the possible futures they anticipate. It also incorporates activities that enhance learners' skills in strategic thinking -"*developing a plan or strategy to achieve a particular vision*" (ASU, n.d., n.p.). The acquisition of strategic thinking skills for sustainability enables learners to think in terms of long-term strategies for achieving a sustainable future instead of giving more consideration to short term solutions for sustainability problems.

#### **2.6.4.3 Support Reflexive Thinking/ Reflexivity**

Finlay (2008) explains that the concepts of reflection, critical reflection and reflexivity are "*often confused and wrongly assumed to be interchangeable*" (P.6). In this light Finlay and Gough (2003) argue that these three concepts form a continuum in which reflection, defined simply as "*thinking about something after the event*", stands at one end and reflexivity, viewed as "*a more immediate and dynamic process which involves continuing self-awareness*" stands at the other end. While critical reflection lies somewhere in between" (p.ix).

As far as the concept of reflection is concerned, Dewey's (1991) seminal work highlights the positive role which reflection plays in enhancing learners' self-reflection and critical thinking. Since then the concept of reflection has been variously defined in literature. Dewey defined reflection as "*active, persistent and careful consideration of any belief or supposed form of knowledge in the light of the grounds that support it and the further conclusion to which it tends*" (p. 9). In this light, Mann et al. (2009), explain that Dewey's definition of reflection shares similarities with the understandings of critical thinking. Meanwhile, Boud et al. (1985), placing emphasis on learners' contexts of learning and personal experience, define reflection as "*those intellectual and affective activities that individuals engage in to explore their experience, which leads to new understanding and appreciations*" (p. 19). In the same vein, focusing on the role of reflection in the learning process, Moon (1999) defines reflection as "*a form of mental processing with a purpose and/or anticipated outcome that is applied to relatively complex or unstructured ideas for which there is not an obvious solution*" (p. 23, cited in Lew & Schmidt, 2011, p. 530). Despite differences in contexts, many definitions of reflection are similar in the fact that they "*emphasize purposeful critical analysis of knowledge and experience to achieve deeper meaning and understanding*" (Lew & Schmidt, 2011, p.530).

As far as sustainability education is concerned, despite the varied meanings and definitions, reflection/or self-reflection is an important skill in sustainability learning. It offers the learners the opportunity for self-critique, engaging in a process which enables them to look back on past learning experiences, what they did to enable learning to occur (i.e. self-reflection on how learning took place), and to explore the connections between what was taught and their own ideas about knowledge (i.e. self-reflection on what was learned) (Lew & Schmidt, 2011). In such a context, the process of self-reflection can lead to informed and thoughtful deliberations on the learner's behaviours and actions, and better academic achievement (Lew & Schmidt, 2011). Taking the example of teacher education, Larrivee (2000) explains that, teachers need to develop the practice of critical reflection, otherwise they will allow their own unexamined judgments, interpretations, assumptions, and expectations to predominate the teaching and learning processes. Instead, teachers need to engage in teaching as reflective practitioners involved in blending their personal beliefs and values into a professional identity (cited in Finlay, 2008). For learners, critical reflection involves "*attending to discourse and social and political analysis [and] it seeks to enable transformative social action and change*" (Finlay, 2008, p.6). Fook (2006) explains that critical reflection enables social change that begins with the individual. Through critical reflections, individuals question ideas that they have absorbed unintentionally from their social contexts and begin to make values and belief choices on their own terms, which enable them to absorb more empowering ideas, assumptions and practices (cited in Finlay, 2008). Reynolds (1998) distinguishes four characteristics of critical reflection which include: "*Its concern to question assumptions; Its social rather than individual focus; The attention it pays to the analysis of power relations; and, Its pursuit of emancipation*". (cited in Finlay, 2008, p.6).

In the context of learning and teaching Brookfield (1995) explains that critical reflection to the educator involves inquiry and openness to further investigation as well as experimentation and modification of practice. Meanwhile, the concept of reflexivity "*implies the use of meta-cognitive skills (thinking about thinking), creative abilities and taking a critical stance. It is not just about how individuals think, but also about how they construct experience more generally, including their thoughts, feelings and social relations. This requires individuals to reach a level of social maturity that allows them to distance themselves from social pressures, take different perspectives, make*

*independent judgements and take responsibility for their actions*” (Rychen & Salganik, 2005, p. 9).

Reflexivity in sustainability learning and teaching is a two-way process, undertaken by both the teacher and the learners. For the educator, it involves the educator’s self-critical approach that questions how knowledge is generated and transferred to the learners and “*how relations of power operate*” in the learning and teaching process (D’Cruz et al., 2007, n.p.). For the learners, it is a “*process of self-discovery in which the learner searches, reflects on how [he/she] sees [himself/herself] through [his/her] own eyes (self-perceptions, views, values and beliefs) as well as how others perceive [their] worldviews, values and beliefs*” (Brookfield, 1998, p.2).

Despite the different understandings of the concept of reflexivity and reflective practice, many view it as “*the process of learning through and from experience towards gaining new insights of self and/or practice*” (Finlay, 2008, p.1). This involves examining assumptions of everyday practice. It involves the individual practitioner in being self-aware and critically evaluating their own responses to practice situations by recapturing practice experiences and critically evaluating them to gain new understandings and so improve future practice. This is part of the life-long learning process (Finlay, 2008).

Critiques of reflexivity argue that the concept can lead to transdisciplinary misunderstandings or miscommunications because reflexivity is understood in different ways depending on the objectives of the reflective exercise and the theoretical/methodological traditions used (Finlay & Gough, 2003). To some it may primarily be “*a personal, confessional account while for others it is a means to deconstruct socially situated action*” (Finlay, 2008, p. 14). Therefore, it is necessary to ensure that participants have a common understanding of Reflexive Thinking/ Reflexivity, in order to maximize the learning value in the promotion of this way of thinking within the practice of, and action for sustainability.

## 2.7 Sustainability Competencies

Sustainability competencies are “*complexes of knowledge, skills, and attitudes that enable successful task performance and problem solving with respect to real-world sustainability problems, challenges, and opportunities*” (Wiek, 2010, n. p.).

The US Department of the Interior University (DOIU, 2013) defines competency as “*a combination of skills, knowledge, characteristics and traits that contribute to outstanding performance in a particular job*” (n.p.). These are “*individual abilities or characteristics that are key to effectiveness in work*” (Carltonglobal, n.d.). Examples of competencies needed for work include: “*adaptability, commitment, creativity, motivation, foresight, leadership, independence, emotional stability, analytical [and critical] reasoning, and communication skills*” (Carltonglobal, n.d.).

Neilson Bryant (2011) defines competencies as “*human capabilities and work related behaviours that provide a competitive advantage to an organization*” (p.2). In the same light Arnim Wiek (2010) defines a competence as “*a functionally linked complex of knowledge, skills, and attitudes that enable successful task performance and problem solving*” (n. p.). Meanwhile, Weinert (2001) defines competencies as “*the positive combination of knowledge, ability and willingness... of the individual to cope successfully and responsibly with changing situations*” (cited in Adom̄bent and Hoffmann, 2013, p.3). Adama Ouane (2002) explains that “*generally, competence is interpreted as the possession of actual capacity to use some skills in order to learn something, to do something or to reach an aim. This can be applied to individual dispositions or to the distribution of such dispositions within a social group or an institution*” (p. 135). According to the US Department of the Interior University (2013), competencies provide a means for understanding performance. While for Nelson (2011), competencies include aptitudes, attitudes (beliefs, values, traits and motives) skills and knowledge.

Aptitudes: are “*the natural abilities that prepare a person to fulfill responsibilities*” (p.6).

Attitudes: “*are way[s] of thinking or behaviour needed to fulfill responsibilities*” (Ibid).

Knowledge: is “*the information and understanding needed to fulfill responsibilities*” (Ibid). Skills: are the “*acquired ability or experience needed to fulfill responsibilities*” (Ibid).

Ouane (2002) argues that, “*the normative, generic and derivational definition of competence may conflict with an inductive search for the same competence in a real-world situation. Thus, the question to ask will not only be how competence is defined in*

*general, but also how it is defined in particular situations, i.e., how the normative agreements are constructed. Ultimately, only performance, the real manifestation of the competence, establishes its existence"* (p. 135).

However, Gonczi (2002) explains that competency is inferred from performance and is not directly observable. He explains that: "*while the activities an individual performs are observable, the attributes that underlie the performance are...inferred*" (p.120). Thus, he argues that competency is the amalgamation of knowledge, skills, dispositions and values. Individuals' performance of tasks and activities "*rests on more general capacities such as reasoning and making judgements as well as specific knowledge and individuals' dispositions*" (Gonczi, 2002, p. 120). Therefore, in viewing the concept of competency in this way, there is no dichotomy between generic competencies and key competencies, because the capacity to perform specific activities will always entail some combination of knowledge, skills and dispositions. This approach reinforces the sustainability principle of holism. To live sustainably individuals, need to develop capabilities to bring together a range of attributes, skills, knowledge, values and dispositions which promote sustainability actions in a given context.

The Delors report to UN Commission on Education for the 21st century (1996) identified four key competencies of education for the 21st century which include: *Learning to know (including Learning to learn); Learning to do; Learning to be and Learning to live together*. In addition, Shaeffer's report to UNESCO (2007) identified an additional cluster of competencies necessary for sustainability education which is: *Learning to transform oneself and society*. Together these five clusters of competencies form the clusters of key competencies for sustainability education identified within the Green Curriculum Model. These key competencies align with the focus and anticipatory skills, attributes and behaviours required for sustainability practice.

**Learning to know:** relates to "*acquiring the instruments of understanding, or learning how to learn*" (Delors,1996, p.21). **Learning to learn:** refers to "*part of learning to know is the ability to assess how new tasks can be tackled; the capacity to transfer skills and capabilities to a new situation; internal acceptance of a given task, internationalization of motivation; autonomy and self-control; the willingness and readiness to engage in tasks-oriented activity*" (Etelalahti &Sahi, 2001, cited in Rychen, 2002, p. 31).

**Learning to do:** relates to "*applying learned knowledge in daily life, to be able to act creatively and responsibly in one's environment*" (Delors, 1996, p.21).

**Learning to be:** relates to "*acquiring universally shared values; developing one's personality, self-identity, and self-knowledge; becoming immersed in one's own culture and its wisdom; being empowered to learn about oneself and become more fully human*" (Delors, 1996, p.21).

**Learning to live together:** relates to "*education for international and intercultural understanding; the social dimension of human development; the basis for cohesion and harmony, conflict avoidance, non-violence, and peaceful coexistence; the recognition that difference and diversity are opportunities rather than dangers and are a valuable resource to be used for the common good; the ability to tolerate, respect, welcome, and even celebrate difference and diversity in people and in their histories, traditions, beliefs, values, and cultures, and to use this diversity to enrich our lives and our classrooms*" (Delors, 1996, p.21).

**Learning to transform oneself and society:** relates to "*work toward a gender-neutral, non-discriminatory society; to act to achieve social solidarity and international understanding; above all, to live sustainably*" (Shaeffer, 2007, p.17).

A sustainability competence is not a pointer to the acquisition of general competencies but rather the acquisition of a specific cluster of sustainability competencies which considers all the sustainability attributes, attitudes, qualities, and skills that "*enable an individual to act in a given situation and at a given time*", to foster sustainability (Emin, 2002, p. 199). A competence does not exist as such, independently of any action. It is the merging of cognitive elements, of abilities and of relational capacities. It is a combination and not a mere juxtaposition of acquired elements and is relevant for an individual, not an organisation (Emin, 2002). Sustainability education is action oriented. It is thus necessary for learners to acquire these sustainability competencies to transform themselves to become change agents for promoting sustainability.



## 2.8 Sustainability Education Indicators

Hart et al. (n.d.) define an indicator as “*something that points to an issue or condition [and] its purpose is to show you how well a system is working (n.p.)*”. They explain that “*the role of an indicator is to provide useful information that guides the user to identify if there is a problem and to determine what direction or actions are needed to address the problem*” (Ibid). An indicator is quantifiable and thus it is not the same thing as ‘indication’ which generally is not quantifiable but rather a clue to something. An effective indicator has the following characteristics:

- **Relevance:** *The indicator must be relevant and fit the purpose for measuring.* (Hart et al, n.d.). *The indicator should tell or show the user “something about the system” or the competencies that he/she needs to know (Ibid).*
- **Understandable:** The indicator should be easy to understand and learners need to know what the indicator is measuring and what actions need to be taken.
- **Reliability:** The indicator should “*be reliable, and provide a good picture of the system or the competencies [it is] measuring*” (Ibid.).
- **Accessible Data:** An effective indicator should provide information that helps educators to carry out timely interventions where necessary to resolve problems of non-incorporation of the necessary sustainability related elements within the curriculum or non-acquisition and manifestation of the necessary sustainability competencies by learners.

Indicators are important in sustainability education. They provide instruments for evaluating both the ESD learning and teaching process and learners’ competencies. Capelo et al. (2012) argue for the need to develop ESD monitoring and assessment instruments to elucidate which educational approaches are necessary in ESD and to assess the quality of these approaches in relation to promoting sustainable development. In this light, Tilbury and Janousek (2006) explain that ESD indicators serve as guiding instruments for ESD practitioners at all education levels which they can use to adapt their practices to the objectives and methods of ESD. On their part, Rode and Michelsen (2008) argue that the ESD indicator, serves as “*a tool for [the educator’s] self-evaluation*” [and a] “*support instrument for implementation and dissemination of [ESD] educational*

*processes*” (cited in Capelo, 2012, p.99). Capelo et al. (2012) explain that an ESD indicator “*constitute an essential learning tool for promoting ESD at all levels of education, formal, informal and non-formal, trying to guide the citizens in making decisions on facing problems concerning SD*” (p. 100). In the same vein, Siemer et al. (2006) explain that the ESD indicator helps to disseminate, implement and clarify ESD intentions (Cited in Capelo et al., 2012).

In the context of community ESD education, Ortega-Cerdà (2005) argues that the ESD indicators “*help increase the understanding of the community and to raise questions such as: what is sustainability, what does the community want in relation with sustainability and what are their limits to action*” (p.10, cited in Capelo et al., 2012, p. 100).

To support the promotion of ESD, there is the need to develop ESD monitoring and evaluation instruments at the international, national, regional and local levels. Rode (2006, cited in Capelo, 2012, p.99) identifies three levels of ESD indicators to support education for sustainable development and these include:

- Macro level ESD indicators: used at the level of federal, regional and national structures,
- Meso level ESD indicators: used within institutions and
- Micro level ESD indicators: used at the classroom level.

Huckle (2006) suggests six types of ESD indicators necessary within the UK formal education system, which include: the sustainability literacy approach; the citizenship survey approach; the frame of mind approach; the sustainable schools approach; the dilemma approach; and the action research approach (or sustainable schools approach). These ESD indicators are mostly framed as objective type questions. The Sustainability literacy test (Sulitest), (2014) is a standardised online multiple choice sustainability test, focusing on assessing learners’ sustainability literacies. It is made up of 50 questions. The first 30 questions test the level of understanding of candidates on sustainability global trends and the last 20 questions are specialised questions that cover local, regional and cultural specific sustainability related issues and practices (Sulitest, 2014).

### **2.8.1 International Standardized Sustainability Assessment Tools**

In terms of available international instruments to guide the assessment of learners' sustainability competencies in higher education, there are two main standardized ESD measuring tools: the revised version of Dunlap & Van Liere's (1978, 2000) New Ecological Paradigm (NEP) created to measure the degree to which people view humans as a part of nature rather than separate from nature (ecological worldview). This is a sustainability assessment tool that measures whether learners have pro-ecological worldviews. However, despite its strength the NEP instrument does not specifically guide educators on ways to integrate sustainability in their programmes and courses, neither does it provide a university-wide assessment tool to profile higher education learners' sustainability related attributes (knowledge, skills and behaviours). A holistic assessment of higher education learners' sustainability competencies should include the profiling of both learners' worldviews and their knowledge and behaviours (actions taken) in promoting sustainability. Thus, the need for a more holistic higher education learners' ESD assessment tool.

Another available standardized instrument used to assess learners' sustainability competencies is the Sustainability Literacy Test (Sulitest). The Sulitest (Volume 1) was launched in 2014 and (Volume 2) was launched in 2016. The Sulitest is one of the few available standardised sustainability education tests that can be used globally. It is an online multiple-choice questionnaire made up of 50 questions. The first 30 questions test the level of understanding of candidates on sustainability global trends and the last 20 questions are specialised questions that cover local, regional and cultural specific sustainability related issues and practices (Carteron, 2016). The idea of developing such a global standardised sustainability testing tool was developed following suggestion from the United Nations Conference for Sustainable Development (Rio +20) 2012, during which observations were made about the apparent lack of knowledge on the sustainability issues facing mankind by political and economic leaders in the world, and the need for them to be given some training to that effect, to enable them make future sustainable decisions (Carteron, 2016).

The Sulitest aims at raising awareness of both local and global sustainability challenges. The test was developed with contributions from the United Nations Environment Programme (UNEP), the United Nations Department of Economic and Social Affairs

(UNDESA), the Globally Responsible Leadership Initiative (GRLI), The Principles for Responsible Management Education (UNGC PRME), United Nations Education, Scientific and Cultural Organisation (UNESCO) and the International Association of Universities. (Ibid.). The Sulitest, tests people's understanding of the socio-economic and environmental challenges facing humanity. It includes country specific modules as well as modules designed for organisations. It has tailored questions for organisations and the future intent is to design industry and profession specific testing questions (Carteron, 2016). Thirty countries world-wide are already undertaking the test and volume two of the sulitest was launched at the United Nations Environmental Assembly in Kenya, in 2016 (Ibid.).

However, though a standardised tool that tests both corporate and individuals' sustainability literacy, at the level of higher education, educators need first and foremost pedagogic tools to guide them in addressing sustainability in programmes and courses to master the knowledge area that will enable them to realistically customise the Sulitest to the contexts of their students' learning. Also, in terms of cost, although when obtained by institutions, the test is free for their students, the institutional cost of obtaining access to the test which stands at €3000/€6000 per year in case institutional members need to customize the test, makes it less affordable to some regions of the world where some higher education institutions may not afford the costs of paying for the test, thus still engendering the gap in sustainability education between the haves and have not globally.

## **2.9 Conclusions**

This literature review examined and critiqued existing research on addressing sustainability in higher education, looking at the role of higher education in promoting sustainability; sustainability change agency, worldviews, ethics and values; sustainability related pedagogies; paradigmatic frameworks for addressing sustainability in higher education and sustainability practices and action in higher education in Ireland. Sterling (2009) identifies two approaches that can bring about change in education which include: *“Education for change, [which is] concerned [with] the role of education in bringing about change in the person or society [and]... achieved through educational practice [and] education in change [which] refers to the policy changes made to educational*

*rationale, theory and practice that affect and may facilitate (or hinder) education for change*” (p.34). Promoting such changes in sustainability education in learning and teaching for sustainability requires the use of transformative, constructivist and participatory pedagogic approaches. In this light Sterling (2009) calls for the use of transformative pedagogies that are both constructive (‘engaging the learner in constructing and owning meaning’) and participative where knowledge is gained respecting existing knowledge, local conditions and cultural context and practices. While in practice the use of constructivist pedagogies can be difficult, unpredictable and time consuming, Sterling (2009) argues that the use of such pedagogic approaches in sustainability learning and teaching processes enables the learners to own the educational change process and such changes are more likely to be sustainable. Sustainability issues are complex and deeply challenging in nature. Seeking solutions to such problems require higher order thinking and this call for the use of constructivist and transformative learning and teaching approaches. (Sterling, 2009).

In general, the review of literature shows that despite increasing interests in the area of sustainability education, much still has to be done in addressing sustainability in higher education programmes and courses. Educators need to change higher education culture to embrace systemic, connective, inclusive, transformative, ecological and values-based learning approaches that engender in learners’ real life changes that foster sustainability (Sterling, 2002; Burns, 2011). As mentioned in the first chapter, in the specific case of higher education in Ireland, while in some institutions sustainability is being infused in a few courses and programmes, the general focus of sustainability education has been more on campus greening activities instead of a whole system approach that addresses the four cornerstones of sustainability in curricula and wider practices. These shortcomings are further aggravated by problems such as the inherent complex nature of sustainability challenges and the absence of paradigmatic guides on infusing education for sustainability in higher education programmes and courses. This paradigmatic vacuum calls for the need for further research that could provide paradigmatic tools to guide educators in higher education in Ireland, in integrating sustainability in programmes and courses. This has prompted the focus of this study on developing a model for infusing sustainability in curricula of higher education. Within the context of higher education in Ireland, it can be realized that there were no available ESD indicator instruments to evaluate the sustainability education practices within academic programmes and courses

at the outset of this study, hence, the push to develop an ESD indicator instrument for this purpose and thus the rationale for developing an ESD indicator instrument as part of this study.

## **Chapter Three: Research Methodology**

### **3.1 Introduction**

This chapter presents an overview of the research methodology. In this regard, it reveals the underpinning strategic logic used to seek answers to the research questions (Mason, 2002). This study is a qualitatively-driven mixed methods study. Mixed methods research design is a research methodology which promotes the systemic integration or mixing of qualitative and quantitative data collection and analysis research techniques and tools within a single study or multiple linked studies (Wisdom & Creswell, 2013; Fakis et al., 2014; Creswell & Plano Clark, 2011). In mixed methods research, the researcher combines both qualitative and quantitative analysis to answer a given research question or questions, or to "*strengthen the findings from [his/her] research... or seek new insights into existing knowledge or phenomena*" (Creswell & Plano Clark, 2011, cited in Fakis et al., 2014, p. 139). The discussion that ensues opens with a discussion of the philosophical underpinnings of the research methodology, articulates the Mixed Methods approach, details the data collection tools, explains how rigour was ensured in the research process and ends with an overview of some ethical considerations and boundaries of this research.

### **3.2 Philosophical underpinnings of the study**

This research study set-out to explore how sustainability could be integrated or infused in higher education courses and programmes in Ireland. The mixed methods research approach has been used in this study because this approach allows for the weaving of qualitative and quantitative data-sets in the analysis process, presenting a more complete picture of the process of integrating sustainability in higher education. The mixed methods approach thus facilitated the synergistic use of data in this study that would have otherwise not been possible if using only one method (either the qualitative or quantitative research design techniques or tools). This study is thus grounded on a pragmatic philosophical premise which provides a more feasible and practical approach and offers a practical bridge between philosophy and methods (Tashakkori & Teddlie,

2010; Greene & Caracelli, 2003). Pragmatism is useful in this inquiry because it offers a more feasible ontological and epistemological approach that is “*practical outcome-oriented... based on action and leads, iteratively to further actions and the elimination of doubt... [and] offer[ing] a method for selecting methodological mixes*” (Johnson & Onwuegbuzie, 2004, p.17) that are helpful in answering the research questions of this study. The use of Pragmatism paradigm as the underpinning philosophy has been helpful in this study as it provided the opportunity for me (the researcher) to react and respond to my methodological biases that stem from my socialisation experiences (Patton, 2002, pp.71-2, cited in Cameron, 2011, p.102), as well as the possibilities for flexibility and adaptability of methods and tools. The use of pragmatic approaches made it possible to avoid too much paradigmatic leanings and instead prioritise the use of procedures that provide practical methodological options to meet the intended purposes of the study. This has helped in maintaining a balance between the philosophical, contextual, conceptual, practical and political considerations in this study (Cameron, 2011).

However, despite the methodological strengths of the mixed methods approach, grounded in philosophical pragmatism, critics of mixed methods research argue that qualitative and quantitative research methodologies use different epistemological and ontological assumptions and therefore cannot be mixed (Brown, Crawford & Hicks, 2003; Guba & Lincoln, 1988 cited in Fakis et al., 2014). In the same light, Fielding and Schreier (2001) argue that qualitative and quantitative research methodologies are grounded in different theoretical assumptions and use different terminologies and quality assurances. The issue of differences in theoretical approaches between qualitative and quantitative research methodologies is further highlighted by Lincoln and Denzin, (2005), who argue that in terms of focus, qualitative and quantitative research methodologies are different. They argue that qualitative research focuses on the interpretation of phenomena based on the multiple meanings of reality as construed by research participants and the researchers, while quantitative researchers explain reality through testing specific hypotheses using dependent and independent variables and objective methods. Other critics argue that pragmatism is a philosophically eclectic approach to research. However, Tashakkori & Teddlie (2010a) argue that this instead plays positively in favour of mixed methods research as this approach frees the researcher from the dualist grip of ‘either-or’ at all levels of the research and provides the possibilities for using iterative or cyclical processes in the study.



Furthermore, despite the arguments against the use of mixed methods research approach, other authors (Pattason, 1998; Hassard, 1993; Green, Caraceli & Graham, 1989; Brewer, 2000; Creswell & Plano Clark, 2011; Fakis et al., 2014) argue that although qualitative and quantitative research methodologies are underpinned by different epistemological and ontological assumptions, these assumptions are not fixed and it is possible to combine the two research approaches in a single study or a series of linked studies for analytical synthesis and triangulation to enhance the clarity, to reveal other dimensions of the research which otherwise could not have been possible using a single method, and to ascertain the robustness of research results.

In addition, it is important to note that not all research inquiries are straight jacketed into using only a single (qualitative or quantitative) research method. Some research inquiries like this study for example require the use of both the qualitative and quantitative research tools to enrich the results and provide a complete picture of the study findings.

However, despite the growing popularity of mixed methods research especially in the social sciences, this research approach has some methodological tensions which should be taken into consideration when using the approach in any given study. These include issues such as the priority or weight given to the quantitative and qualitative data collection and analysis in the study, the sequence of the data collection and analysis, and the stage/stages in the research process at which the quantitative and qualitative phases are connected and the results are integrated (Morgan, 1998; Creswell et al., 2003). Although these issues have been sufficiently discussed and explanations and steps for conducting mixed-methods sequential exploratory or explanatory studies have been given (Creswell, 2003, 2005), there are still some methodological aspects of this design procedure that require clarification. This includes areas like how the researcher(s) decides on which method to assign priority in the design, how to consider implementation issues, how and when to connect the quantitative and qualitative phases during the research process, and how to integrate the results of both phases of the study to answer the research questions (Creswell, 2003, 2005).

In such circumstances, therefore, the skills and competencies of the researcher in effectively using the different methodological data collection and analysis tools play a significant role in decision making with regards to priority or the weight given to the

qualitative and quantitative data collection tools, the stages for connecting both tools and ensuring methodological quality assurances for the various research tools used and the validation of the research results.

The Pragmatic paradigm was chosen above other paradigms (such as the Interpretivist paradigm) as the central focus of this research study was to explore the development of a conceptual framework with a philosophical sensibility that would provide for equal weighting of data from primary and secondary data sources. In this regard, the pragmatic paradigm gave rise to consideration of data sources within a ‘flat ontology’ that did not solely rely on primary data (from key participants) as critical informants of the conceptual framework for the Green Curriculum Model and DAB tool, but equally leaned on secondary data from research studies, key theorists, and experiences from sharing the framework in public realm (conferences, etc.). In terms of the chosen model of research, an Exploratory Mixed Methods model was selected instead of Grounded Theory, as the study was exploratory in nature, the data sources were multiple and varied and were analysed within the flat ontology of the pragmatism paradigm, and the focus was on generating a conceptual framework and validation of the DAB tool, rather than on developing a ‘grounded theory’.

### **3.3 Research Focus**

This research study sets-out to examine the research question: *Why and how should sustainability be integrated in higher education programmes and courses in Ireland?*

In this respect, the study explores the following sub-questions:

- *Why should sustainability education be integrated in academic programmes and courses in higher education in Ireland?*
- *What paradigmatic framework could guide educators in infusing sustainability in higher education programmes and courses in Ireland?*
- *What paradigmatic frameworks could guide the Profiling of learners’ sustainability competencies in higher education in Ireland?*

### **3.4 The Research Model: Exploratory Sequential Mixed Methods Research Design**

This research study adopted an *exploratory* sequential mixed-methods approach to ascertain the key elements that would inform a framework for infusing sustainability in the curricula of higher education in Ireland and the design of an instrument that could be used to profile higher education students' sustainability competencies. Research design deals with how the researcher conceptualizes the entire research process. It is "*the logical sequence that connects the empirical data to a study's initial questions and, ultimately, to its conclusions*" (Yin, 1989, pp. 28-29). It involves the particular research approach to be used as well as the research processes (Gibson and Brown, 2009). This study's design utilised an *exploratory* sequential mixed methods model. The research design process involved: the formulation of the research topic - development of the study design - data collection - data analysis and write up (Gibson & Brown, 2009). Although presented as a linear process, this research design process as a whole is characteristically: 1) Exploratory - exploring the weave and texture of the social processes and discourses and the meanings they generate to provide explanations related to the questions and issues of this study (Mason, 2002), 2) Fluid - with no clear-cut boundaries in the data collection and analysis stages, but rather a sequencing and/or combining of both qualitative and quantitative research data collection and analysis tools and techniques as informed by the study's progress at different stages, and, 3) Flexible, iterative and data driven - through the adjustment of data collection and analysis techniques and tools to answer the research questions in sequences as informed by data and taking into consideration the context sensitivities as the study progresses in line with what is being learned. The research design presented here did not start-out as a static blueprint for this study, but rather, evolved as the research process progressed. During the study, both qualitative and quantitative data collection and analysis tools were used at different phases of the research as shown in figure 3.

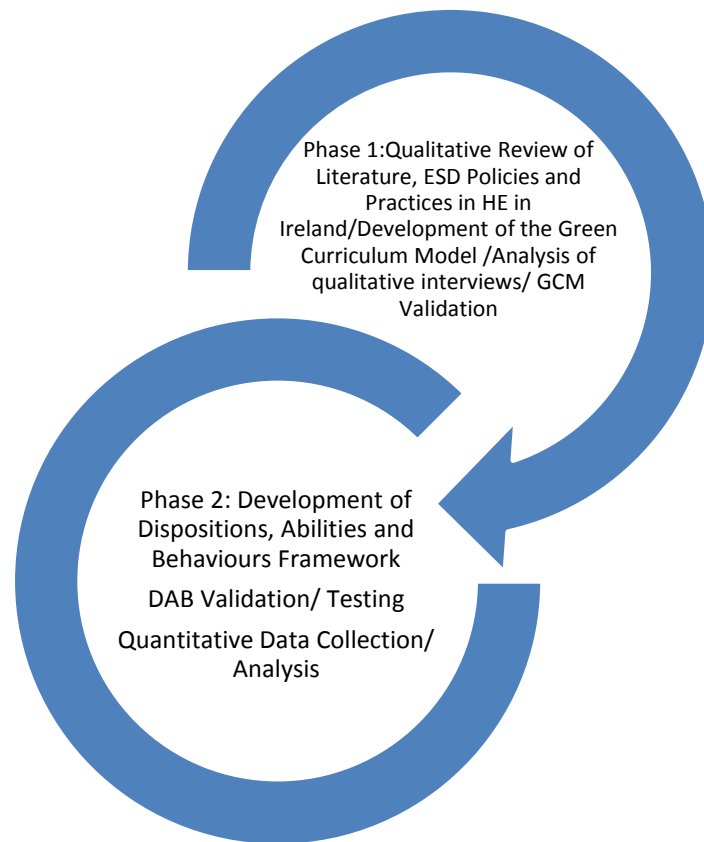


Figure 3. The Sequencing Approach

The study involves the use of both the qualitative and quantitative research techniques, data collection and analysis tools at various stages. The final discussion and analysis involves a triangulation of both the qualitative and quantitative data to obtain a broader picture of the processes and inherent actions and practices necessary for addressing sustainability in higher education programmes and courses in Ireland.

### **3.5 Phases of Research**

This research activities were carried out in two principal phases involving qualitative and quantitative investigation at different research stages.

### **3.5.1 Phase 1: Qualitative Research**

The first stage of phase one of this study began with the conceptualization of the study topic and the development of the research questions and the selection of the appropriate study methodology. The next stage of the qualitative research dimension involved carrying out extensive research review of the literature on sustainability education as well as a critical review of literature related to sustainability practices across higher education institutions in Ireland. The findings were presented during the DCU sustainability conference in December 2012. The findings together with the review of extant literature on sustainability education informed the next qualitative research stage which involved the conceptualization, design and development of the draft Green Curriculum Model, a conceptual design framework, that can be used to guide educators in higher education in infusing sustainability in courses and programmes in Ireland. (See figure 4 & chapter 4). After the draft Green Curriculum Model was designed and developed, the next qualitative phase of the study involved presentations and explanations of the GCM in the Tempus RUCAS Workshop on reorienting university curricula to address sustainability in Dublin City University in 2012. The GCM was then presented to members of the sustainability committee of Dublin City University (because at this time the institution had officially appointed a sustainability officer in charge of sustainability activities in the institution, albeit focusing on campus greening).

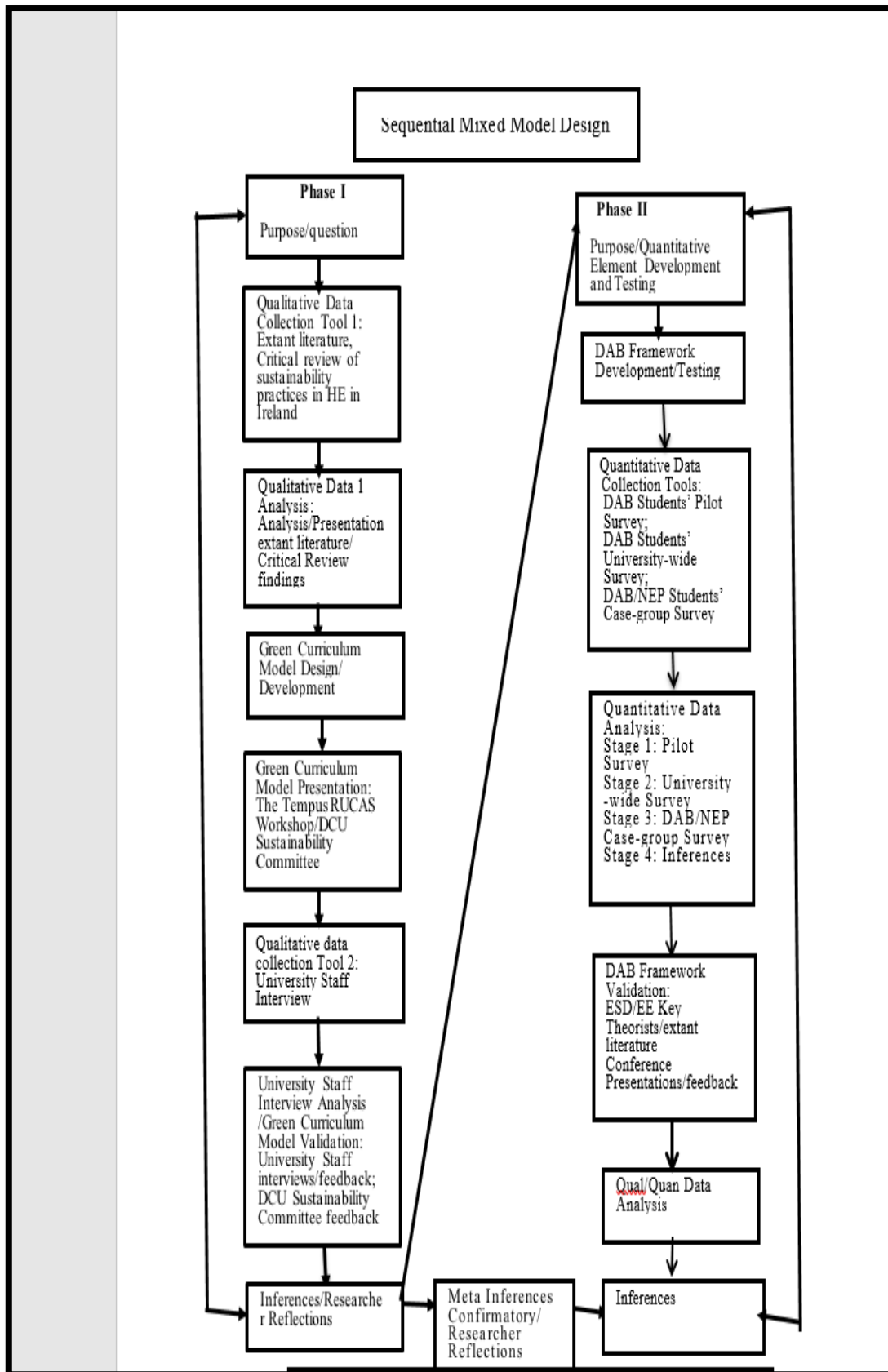


Figure 4. Sequential Mixed Methods Research Design

The next stage in the qualitative research involved the design and development of a staff-interview ‘questionnaire’ based on elements of the Green Curriculum Model (GCM). This was an open-ended questionnaire (to be implemented in face-to-face interviews) designed to investigate whether or not educators in higher education were integrating sustainability in their respective courses and programmes as well as to identify and examine the drivers and barriers which these university educators face in the process of infusing sustainability in their respective courses. The interview was also designed to investigate the usefulness of the green curriculum framework elements in guiding educators in the process of infusing sustainability in their respective courses and programmes. Hence, a number of the questions within the questionnaire posed questions relating to principles, practices, content, etc. articulated within the Green Curriculum Model. The interview questionnaire (See Appendix B) took the form of a set of sustainability-related questions used to ascertain the types of sustainability related principles and pedagogic/assessment approaches which university staff were using in sustainability teaching and learning processes; the types of sustainability related competencies that they were fostering in their courses and the challenges and opportunities they were experiencing in addressing sustainability in academic programmes and courses. The results of the interviews were used to inform and /or validate the Green Curriculum Model.

The next stage of the research activities involved the identification and contact of university staff interviewees and the eventual organization of university staff interviews. Once the university staff interview process was completed, the focus moved to analysis of the university staff interviews and making inferences and researcher reflections on the findings. The university staff interviewees were anonymized and coded with alphabetical letters. The interviews were electronically recorded. At the end of the interview process, the interview responses were then transcribed.

#### **3.5.1.1 Qualitative Coding and Analysis of Interviews: The Framework Method**

In this study, semi-structured interviews were used to collect data from 7 participants including university lecturers from the departments of Education, Language and Intercultural Studies and Law and Government in a higher education institution. The university staff interviewees were anonymized and coded with alphabetical letters. The

interviews were electronically recorded. At the end of the interview process, the interview responses were then transcribed.

The purpose of using interviews in this study is to authenticate and/ or validate the GCM (instrument building). Consequently, the focus of analysis is on content, identify patterns, themes and ideas within the interview response data rather than theory building and/ or making a discourse analysis of the structure and narratives of participant responses. Thus, the framework approach has been used in the analysis because it provides the researcher with opportunities for the development of themes both inductively from the accounts (experiences and views) of participants and deductively from extant literature (Gale et al., 2013). This involves a critical exploration of participant responses, identifying themes and emergent ideas.

- **Transcription**

The interest in this analysis was the content rather than the language structure or narratives of participants' responses. Thus, participants' pauses, interruptions and exclamations were not taken into consideration except in instances where these narratives were contributing to clarifying meanings and interpretations by participants. The transcripts were re-checked for errors by re-listening to the audio recordings for any errors and familiarising with the transcript. The transcripts were supplemented with notes made during the interview for example information that was taken in conversation when the video had been powered off.

- **Coding**

The transcribed text was copied into a three Column table. The main transcript was coded through underlining interesting segments of text. The left column of the table was used to describe the content of each passage with a label or code, which ranged from a few words, to parts of sentences or whole paragraphs. The right column of the table was used to record more detailed notes and ideas, such as questions to bear in mind as the analysis proceeded, and ideas for explanations or patterns in the data (See full coding excerpt in Appendix E). The underlining, emphasises interesting parts of the data that the researcher felt were worth coding or taken note of.



Coding Label	Participant C		Notes and ideas
Longevity	1	<u>Ehm, sustainability is the ability to keep going and to sustain living really.</u>	Keep going= long-term
Dispositions for sustainability	2	<u>I didn't realise that I have an interest in sustainability until speaking to yourself and your lecture during the workshop, when you did link things together... I am positively disposed for sustainability. I think when you appreciate that, the things that you've done and things that you are striving for is really to be more sustainable; is to be able to keep going in life, and not burn yourself out with stress, not run out of money, not, you know it's just to kind of evaluate things around you and to treat them with respect whether they are people, whether they are your students, whether the resources that you use; just appreciate them and do not waste them really.</u>	Capacity building ignites sustainability interest  Respect=sustainability values
Well-being as sustainability			
Sustainability values			
Collaborative learning	3	<u>Having all of my course content on moodle, so that makes the module sustainable, so if there was, anything to happen to me, my module can still go on because the notes are there and everything is there and sustainability in terms of the students learning.</u>	Student centred learning approaches/constructivism
Constructivist learning approaches	4	<u>I would like them to do some group work and figure things out themselves, I like them do individual work and work their way on things and I facilitate a work around the classroom and if they had any questions to ask me. I do some enquiry based learning with them, simulation of an experiment.</u>	
Inquiry learning	5	<u>Construct some kind of whether presentation or post or some kind of knowledge on the new concept and then to feed that back and present it back to the whole class and collaborate and then for the rest of the class and to evaluate what they have done and for the discussion to happen. So, to be really</u>	

Table 1. Interview Coding Excerpt

- **Developing a working analytical framework**

After the open coding process, each coding section was examined identifying what is considered meaningful, what it is telling the researcher about the participants' views

about the sustainability issues examined in the interview questions such: the concept of sustainability, how ESD could be addressed in courses, the types of pedagogic approaches used in sustainability education, the challenges associated with the process of embedding sustainability in courses etc. Once the ideas and themes were identified this formed the initial framework, taking note of any new codes that emerged that did not fit the identified a priori themes. The transcript was read through again to identify new codes and incorporate them into the framework.

The next step involved regrouping codes that were conceptually related to the a priori themes and naming the category (for example, the understandings/definition of sustainability). The process of refining the codes continued until no new codes were generated. The final framework consisted of several codes, clustered into different categories, each with a brief explanatory description of their meaning and what ideas or elements were summarised under that code (As shown in table 2a excerpt for the a priori theme understandings/definition of sustainability).

CODE	DESCRIPTION
<b>Understandings of Sustainability</b>	
Longevity	<i>Capacity to maintain something (idea, concept, resource); keep going so that we can enjoy the resources of the planet; continue on and on; longevity of the environment, ecology, fossil fuels</i>
Maintain environmental health/Greening	<i>Greening something (ecology, natural resources); healthy state of the environment; keeping the health of the environment</i>
Interconnectedness	<i>Interconnectedness, working together as a community</i>
The pillars of sustainability	<i>Sustaining the political, economic, social aspects of society; sustaining local cultures</i>
Timescale	<i>Looking at the past, present and future; long term in the future</i>

Table 2a. Coding excerpt for the a priori theme understandings/definition of sustainability

- **Applying the Analytical Framework**

The final analytical framework was then applied to each transcript manually. The process was carried out for each case. Once all the data had been coded using the analytical framework, the codes were summarized in a matrix for each theme in tabular form. As illustrated below, the matrix comprised of one row per case (participant) and one column

per code. The coding matrix provided an easy structure into which the researcher could systematically reduce the data, to analyse it by case and by code (Gale et al., 2013). A separate sheet was used for each category. Data was then abstracted from the transcripts for each participant and code, summarised using verbatim words and inserted into the corresponding cell in the matrix. The codes and summaries were laboriously inserted manually and the references to interesting quotations were also highlighted within the cells of the matrix as shown in the sample sheet of the framework matrix of themes for the definition of sustainability (See Appendix E).

- **Interpreting the Data**

Themes were generated from the data set by reviewing the matrix and making connections within and between participant and categories. This process was influenced both by the original research objectives and by new concepts generated inductively from the data. During the interpretation stage, themes were developed which gave possible explanations to what was happening within the data. Ideas were generated, explored and fleshed out through the use of analytical memos and interpretations. Below is an example of a memo that was written about the category sustainability definition, to map out ideas related to university staff understandings and definitions of the concept of sustainability. The same approach was taken to examine participants' perceptions, ideas and suggestions on the various aspects of addressing sustainability in higher education programmes and courses that were included in the interview questions. The memo is structured with sub-headings, including a definition of the category, specific codes that related to it, a summary of the raw data, discussion of points for consideration and emergent ideas. Bullet points, italic fonts and underlining were used to look for patterns within the data and included illustrative quotations with references to the original transcripts.

### **3.5.1.2 Analysing Data from Multiple Data-sets**

The key elements of the Green Curriculum Model emerged from a critical review of the work of key theorists and research studies in ESD and environmental education (EE); from engagement in the Tempus RUCAS project/workshop; the seven aforementioned interviews with university staff of a higher education institution in Ireland and from presentations of levels of the GCM framework at various conferences and workshops. In

some cases, the warrant for inclusion of an element was triangulated from the literature and interviews with staff and/or feedback from participants at conferences, as illustrated in Table 2b below.

Sample Elements from GCM	Inputs from Research Studies and/ or Key Theorists in ESD/EE	Reflections from Tempus RUCAS Project/ Workshop	University Staff Interviews	Feedback from Conferences
<b>A. Content Layer of GCM</b>				
<b>Economy, Environment, Society, Culture (validated across 4 data-sets)</b>	Key ESD theorists: Sterling (2003; Rieschild (2009) and UNESCO (2005), suggest a holistic integration of the four cornerstones of sustainability (environment, economy, society and culture) in ESD learning and teaching.	The TEMPUS RUCAS project recommends the holistic integration of the four cornerstones of sustainability	In relation to the content to integrate in sustainability learning and teaching, University staff interview ( <i>participants A and E</i> ), argue for the inclusion of “ <i>themes that overlap the four conerstones, environment, economy, society, culture</i> ”.	DCU Sustainability Conference, Dec 2012. Participant questioning of the relevance of cultural dimension of ESD, which led to discussion and articulation on the importance of cultural aspect within Sustainability, and thus emphasized the importance of the inclusion of Culture as cornerstone in the GCM.
<b>B. Principles Layer of GCM</b>				
<b>Multiple Voices (validated across 2 data-sets)</b>	Hartley and Huddleston, (2010), suggest enhancing the principles of the respect of multiple voices in sustainability learning and teaching process because it enables learners to acquire the skills and competencies for collaboration, cooperation and working together in the interest of common good		University staff interview ( <i>participant F</i> ), suggests consideration for all voices in the sustainability learning and teaching process, paying attention to “ <i>who gets to speak and who gets listened to (voices heard and unheard voices) because even if we think we are doing something in a participatory way,</i>	

	and respect for all voices, even the dissenting ones. They argue that the promotion of such values, makes learners feel they are useful and recognized members both within the learning environment and in their communities, and gives them the zeal to engage in promoting sustainability and make a difference to society.		<i>it may turn out we only listen to some voices and [some] people's voices are not listened to".</i>	
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Table 2b Sample Validation of GCM

The rationale for using the works of: ESD and Environmental Education theorists and researchers; Tempus RUCAS project; UNESCO, UNECE, Talloires Declaration and the Earth Charter; Contributions of 7 university staff members interviewed; and Contributions from the conferences in which the GCM elements were presented, are explained in detail in chapter 4, as is the subsequent validation of the Green Curriculum Model.

### 3.5.2 Phase 2: Quantitative Research

Phase 2 of this research activity involved the operationalization of the Dispositions, Abilities and Behaviours (DAB) framework. The activities of this second phase of the research involved various stages.

While the initial draft of Green Curriculum Model was being presented and critiqued, the work of designing and developing the Dispositions, Abilities and Behaviours (DAB) framework was initiated - the initial draft of DAB was based on ideas extracted from extant literature on competencies and indicators for sustainability education. The purpose of this DAB tool was to profile higher education learners' sustainability competencies at a given point in time. The DAB tool took the form of a questionnaire, which was divided into a number of sections, the initial section gathering demographic information and the

subsequent sections focusing on ascertaining their dispositions, abilities and behaviours in sustainability. A set of context specific sustainability-related statements or questions were used to profile learners' dispositions, abilities and actions (behaviours) in fostering sustainability. These surveys were designed in such a way that the questions covered the four cornerstones of sustainability (Culture, Economy, Environment and Society), as well as the five clusters of sustainability competencies (*Learning to do, Learning to know, Learning to be, Learning to live together and Learning to transform oneself and society*). The undergraduate students' surveys were deployed at various levels, opening with a Pilot Survey with undergraduate students undertaking a sustainability course. Following revisions, the survey was then deployed to a wider cohort of undergraduate students. The data was then collected and statistically analysed using SPSS, (see Appenidx G and Appendix H) for an overview of the range of statistical tests deployed. The final dimension involved the deployment of both the standarised New Ecological Paradigm NEP scale and the DAB instrument with a cohort of undergraduate students in the first year of study in university, and the findings were analysed as discussed in chapter 8.

The GCM framework and DAB tool were presented at various stages of the research to the research supervising panel, colleagues and the scholarly community for scrutiny, critiques, suggestions and feedback on improving the tools, through meetings, conference presentation and journal paper publication at various times throughout the period of study. The queries, and insights from these people further informed the design and development of the GCM and DAB tool.

The final stage of the research activity involved meta-analysis of the findings from the qualitative research data collection process, the quantitative research data collection process and the researcher's reflections through a triangulation process to make inferences about the research and provide a rich picture of the findings as discussed in the concluding chapter.

The research activities for this study were thus carried out within a time frame of six academic years. The research began in January 2011 with the initial registration of the researcher as a PhD student in DCU and continued until May 2017 when the final research report was written as presented in table 3.

### Research Activities Time Line

<b>DATE</b>	<b>RESEARCH ACTIVITIES</b>
January 2011- December 2011	<p>Formal application for PhD registration. Conceptualization of research topic.</p> <p>Write –out/ application for research ethical approval from DCU Ethics Committee</p> <p>Preliminary review of literature on sustainability in higher education.</p>
January 2012- December 2012	<p>General literature review on addressing sustainability in higher education courses and programmes.</p> <p>A critical review of infusing sustainability in programmes and courses and other sustainability practices in higher education institutions in Ireland.</p> <p>Presentation of the findings of the critical review of infusing sustainability in higher education in Ireland- DCU sustainability conference.</p> <p>Preliminary conceptualization and design of the Green Curriculum Model (GCM).</p> <p>Facilitation of Tempus RUCAS Workshop on re-orienting university curricula to address sustainability/ presentation of the GCM draft preliminary design.</p> <p>Paper write-up/ publication with supervisors- Ethical-values pedagogical Model- Journal of Teacher Education for Sustainability.</p>
January 2013- December 2013	<p>Development of elements of the GCM conceptual framework.</p> <p>In-depth discussions of the GCM design (with supervisors; university staff engaged in sustainability and DCU sustainability committee members).</p>
January 2014- December 2014	<p>Design and development of university staff interview questionnaire based on GCM.</p> <p>Conducted interviews with university staff.</p> <p>Conceptualization and design of the Dispositions, Abilities and Behaviours</p>

	<p>(DAB) framework- Indicator element of the GCM.</p> <p>Design and deployment of the pilot students' DAB online survey.</p> <p>Conference presentations of the GCM Post-Graduate Conference; ESAI Conference Athlone</p> <p>Analysis of students' pilot survey.</p>
January 2015 – December 2015	<p>Paper publication of students' pilot survey findings- Journal of Teacher Education for Sustainability.</p> <p>(Transcriptions/ analysis of university staff interviews/ write up of interview findings.</p> <p>Design and deployment of university-wide students' online DAB survey.</p> <p>Design and deployment of Comparative DAB/NEP students' case-group survey.</p>
January 2016- December 2016	<p>Analysis of university-wide students' DAB survey.</p> <p>Write-up of university-wide students' survey findings.</p> <p>Analysis of comparative DAB/NEP students' case-group survey.</p> <p>Conference paper presentations of DAB survey results/ GCM- (MIT Galway National Seminar on Sustainability Assessment <i>For and Of learning</i>; European Conference on Education and Research (ECER) Dublin.</p> <p>Meta-analysis of research data findings.</p>
January 2017- May 2017	<p>General revision of research work.</p> <p>Final write up of research thesis.</p>
<p>These research activities were carried out with constant monthly supervisory meetings with my supervisors during which every element and phase of the research activities were presented with ensuing discussions, critiques and suggestions on improving the research from my supervisors.</p> <p>Details of conferences during which research papers were presented are discussed in chapter 5.</p>	

Table 3. Research Activities Time Line



### 3.5.3 Statistics, Correlations & Validity Tests

In the case of the DAB tool, the following correlations tests were run in order to test the following research hypothesis, in Phase 2 of the research (see Figure 5 for summary explanations of tests).

**3.5.3.1 The Spearman rank-order correlations** (nonparametric alternative Pearson correlation) tests were run to determine if there were any statistically significant associations between respondents' profile attribute age(s) and the latent constructs (respondents' willingness to engage with sustainability issues; abilities to engage with sustainability issues and actions taken by respondents to promote sustainability). Thus, Spearman rank tests were run:

- To examine if participants' age(s) had effects on participants' willingness to engage with sustainability;
- To examine if participants' age(s) had effects on and participants' abilities to engage with sustainability;
- To examine if participants' age(s) had effects on actions taken by participants to promote sustainability.

**3.5.3.2 The Mann Whitney U/ Wilcoxon Rank Sum Independent Samples tests** (alternative parametric independent samples t-test) were run to determine if there is any statistically significant association between participant profile attributes (gender) and the latent constructs (willingness to engage with sustainability, abilities to engage with sustainability and (behaviours) actions taken to promote sustainability).

**3.5.3.3 The Kruskal Wallis Test** (alternative tests for Analysis of Variance ANOVA) were run to examine if there are any statistically significant associations between three or more groups of the independent variables (current year of study, and study programmes) and the latent constructs (willingness to engage with sustainability, abilities to engage with sustainability and actions taken to promote sustainability). Thus, the tests were run:

- To examine if learners' current year of study had effects on their:
  - willingness to engage with sustainability issues;
  - abilities to engage with sustainability issues and

- the actions they have taken to promote sustainability.
- To examine if learners' study programmes/ Faculty had effects on their:
  - willingness to engage with sustainability issues;
  - abilities to engage with sustainability issues and
  - the actions they have taken to promote sustainability.

**3.5.3.4 Spearman Rank tests** were also run to examine whether correlations exist between participants' dispositions, abilities and/ or behaviours to engage with and/or promote sustainability:

- To examine if participants' willingness to engage with sustainability had effects on and participants' abilities to engage with sustainability;
- To examine if participants' willingness to engage with sustainability had effects on and participants' behaviours to promote sustainability;
- To examine if abilities to engage with sustainability issues had effects on participants behaviours to promote sustainability.

### **Figure 5: Consistency Test and Non-Parametric Tests**

#### **Cronbach's $\alpha$**

The Cronbach's  $\alpha$  statistics is a standardised measure of the inter-correlations between variables that are used to make up a scale in research. The stronger the association between variables, the greater the consistency and the larger the Cronbach's  $\alpha$ . The Cronbach's  $\alpha$  test is used to determine good internal consistency and reliability of the scales used in a study. In this study, Cronbach's  $\alpha$  was used as a measure of reliability for all the scales that were constructed from multiple respondents' responses which included: their attributes-age, gender, current year of study and study programmes as well as their willingness to engage with sustainability issue; their abilities to engage with sustainability issue; and actions they have taken to promote sustainability, which were scales that combined 38 different students' responses into three respondents' scales for willingness, abilities and behaviours).

#### **The Mann-Whitney $U$ test or the - Rank-Sum Test:**

This is a nonparametric statistics test that is used to compare the differences in medians between two independent groups when the dependent variable is either ordinal or continuous, but not normally distributed. It is used to test whether two independent samples of observations are drawn from the same or identical distributions. It is also used to test whether medians between comparison groups are different, under the assumption that the shapes of the underlying distributions are the same. The Mann-Whitney  $U$  is used to test hypothesis on equality of medians. The  $U$  statistic tests if two samples are drawn from identical populations, and hence whether their medians are equal. In this study,  $U$ -tests were conducted to test for independence of observations for respondents' attributes (gender, current year of study, study programmes) in relation to the latent constructs (willingness/ abilities to engage with sustainability issue and actions taken to promote sustainability).

#### **Kruskal Wallis Test**

The Kruskal Wallis test is a nonparametric alternative test to the Analysis of Variance test. The test statistic compares the variance between groups to the variance within groups to determine if ranked medians derived from the group vary in a meaningful way from the ranked median of other groups. Its purpose is to compare ranked median differences when there are more than two groups to determine if the medians are statistically different from each other. In this study, the Kruskal Wallis test was used to examine whether respondent's current year of study had an effect on: respondent's willingness/abilities to engage with sustainability; actions taken by respondent to promote sustainability, and, whether respondent's study programmes had an effect on: respondent's willingness/abilities to engage with sustainability issue; actions taken by respondent to promote sustainability.

#### **Spearman Rank-Order Correlation Test.**

Spearman rank-order correlation test is a nonparametric statistical test alternative of the Pearson R correlation test. It measures the strength and direction of associations that exist between two variables measured at least on ordinal, interval or ratio, scale, where the data violates the assumptions of normality of data. The Spearman rank correlation test is used to ascertain the strength and direction of the link between two sets of data variables. The Spearman rank correlations tests were used to assess the relationships between: the levels of respondents' willingness to engage with sustainability and their ability to engage with sustainability issues; the levels of respondents' willingness to engage with sustainability issues and the actions they have taken to promote sustainability; the levels of respondents' abilities to engage with sustainability issues and the actions they have taken to promote sustainability.

### 3.6 Rigour in the Research Process

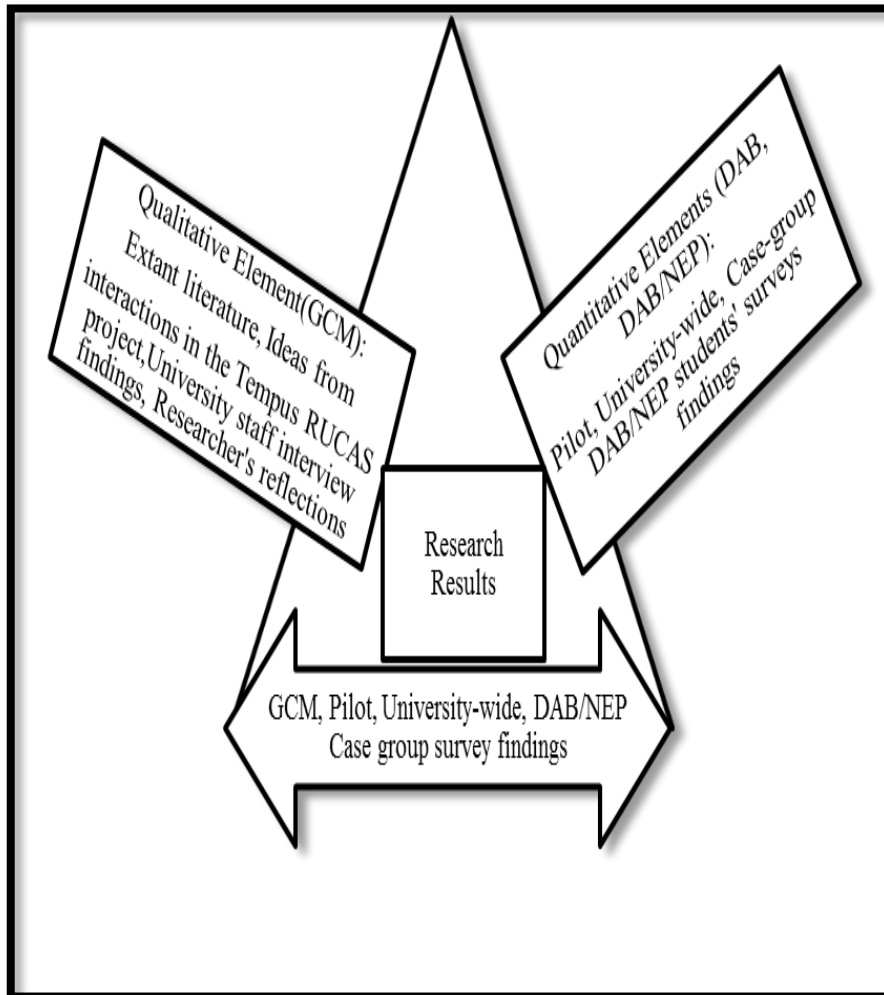


Figure 6. The Triangulation Analysis Process

The study employed triangulation techniques in analysis to ensure rigour across the research process as shown in figure 6. The analysis involved the use of both qualitative and quantitative data to elucidate complementary aspects of using elements of the Green Curriculum Model and the DAB instrument in addressing sustainability in the learning and teaching and assessment processes to address sustainability in higher education courses and programmes. As Caracelli and Green (1997 cited in Cameron, 2009, p.144) observe, triangulation in mixed methods research design involves the “*use of different [methodological research components] to assess the same phenomenon towards convergence and increased validity*”. The triangulation process in this study involved analysing the different sources of data at a point in time in the research process and testing the consistency of the findings from the different data tools which included: Extant

literature on sustainability, critical review of sustainability in higher education in Ireland, ideas from the Tempus RUCAS project, the DAB pilot survey, the university staff interviews responses, the DAB university-wide students' survey and the case-group comparative DAB/NEP survey findings. The data results from all these data collection tools were used to map out, explain and interpret the results to give a holistic and rich picture of the processes and elements involved in integrating sustainability and profiling learners' sustainability competencies in higher education in Ireland using the Green Curriculum Model and the DAB learners' sustainability competencies profiling tool.

The different data elements were used to add value through explaining different aspects of the process of integrating sustainability in higher education in Ireland. The critical review of sustainability in higher education in Ireland results were used to present a picture of the state of play with regards to infusing sustainability in Ireland prior to this inquiry, the progress made and the inherent difficulties, leading to the development of the Green Curriculum Model and the DAB instrument.

The findings from the literature, ideas from interactions with the Tempus RUCAS project, the review of sustainability actions and practices in higher education in Ireland and the researcher's reflections informed the preliminary design of the Green Curriculum Model (GCM). The elements of the GCM were then triangulated with findings from university staff interviews/ university staff feedback and the researcher's further reflections to inform and validate the elements of the Green Curriculum (GCM) Model, providing a detailed picture of the strengths and limitations of the GCM.

In the meantime, during the research activities, a learners' sustainability competencies assessment tool called the Dispositions, Abilities and Behaviours (DAB) framework was designed and developed using extant literature and the researcher's reflections. The operationalization of the DAB instrument, in profiling higher education students' sustainability competencies was then carried out through the deployment of an undergraduate students' DAB pilot survey and the findings of the pilot survey, informed the design and development of an enlarged undergraduate university-wide DAB survey. The deployment of the university-wide students' sustainability survey findings provided a rich and in-depth snapshot of the sustainability profiles of undergraduate students of Dublin City University (in the academic year 2014/2015) when the survey was deployed. The next stage of the research activity was the design and deployment of a case-group

comparative students' survey instrument based on the DAB instrument and the use of a standardized sustainability assessment tool (the New Ecological Paradigm, NEP). The survey instruments based on these two tools were deployed to test the application and comparative strengths/weaknesses of the DAB vis-à-vis the standardized NEP instrument. The results of the DAB/NEP case-group surveys provided a rich picture of the comparative strengths and weaknesses of the DAB and the NEP in profiling higher students' sustainability competencies.

Finally, the research triangulation process in this research involved the weaving together of the three research process findings which included:

- The results of the qualitative element of the research (design and development of GCM, informed and validated by extant literature, ideas from Tempus RUCAS, the researcher's reflections and university staff interview findings and feedback), leading to the development of the GCM elements.
- The results of the quantitative elements of the research which included the design and development of the DAB instrument (which is the indicator element of the GCM) through extant literature and the researcher's reflection. The application of the DAB in profiling learners' sustainability competencies was then carried out in three stages:
  - The piloting of the DAB tool with undergraduate students. The results of the pilot survey, then informed the improvements of the DAB survey instrument.
  - The university-wide deployment of DAB tool with undergraduate students. The results of the university-wide students survey provided a snapshot of the sustainability profiles of undergraduate students of DCU in the academic year 2014/2015.
  - The deployment of both DAB and standardised instrument, NEP, with a case group. The findings provided a picture of the comparative strengths and weaknesses of the DAB vis-à-vis the NEP and a profile of the case-group students' sustainability competencies.

The final chapter weaved together the results of the qualitative element (the GCM and its elements) with the quantitative elements of the research which involved the DAB instrument's applications through the students' surveys- the pilot, university-wide and

the comparative case-group using an additional NEP instrument, to provide a rich and holistic picture of the pedagogic processes and elements involved in integrating sustainability in higher education programmes and courses; the pedagogic processes involved in profiling higher education students' sustainability competencies using the DAB and the NEP instruments and the strengths and weaknesses of using the Green Curriculum Model and the DAB in addressing sustainability in higher education as well as the possible barriers and opportunities for using the GCM in addressing sustainability in higher education programmes and courses.

The triangulation of the results of this inquiry helped reduce sampling bias. The results of the pilot survey were obtained from a sample of 37 students. The results informed the improvement of the survey instrument which was further deployed to a larger group of higher education students in which 137 students responded from a random sample of 1000 students and this gave a better picture of profiling higher education learners' sustainability competencies using the DAB instrument thus reducing the margin of sampling error than if the results were only based on the pilot survey. The final level involved deployment of DAB and NEP with 38 undergraduate students.

### **3.7 Reliability and Validity**

The validation of the Green Curriculum Model was done through the use of suggestions and recommendations of key sustainability, education and environmental education theorists and researchers who have had significant impact on the sustainability education discourse, international organisations with the remit of promoting the scholarship and actions for sustainability as well as ideas from sustainability related projects like the Tempus RUCAS as explained in chapter 5.

In the case of the DAB instrument, the reliability of the data collection tools for this study (Survey instruments) was obtained through the Cronbach's Alpha ( $\alpha$ ) tests to ensure internal construct consistency of the statements used in the surveys.

### **3.8 Ethical Considerations**

Ethical clearance for this study was approved through a rigorous process of review undertaken by DCU Research Ethics Committee. Informed consent was sought by providing each participant with an information sheet detailing the purpose of the research (see appendix D). A consent form to gain participants permission to conduct the research was also issued to participants and the research activities were carried out only after participants' consent and acceptance had been given. In the case of student participants, in addition to research clearance procedures, permission was sought from the coordinator of the participating class students as well as emails seeking consent were sent to students and the research activities were only conducted with them following their expressed willingness and acceptance to engage with the research activities. Under no circumstances were research participants obliged in any way to engage with the research activities.

Participants were assured of confidentiality of all information obtained in the research process and it was made clear that the research process would not jeopardise participants' privacy of personal information. No participant was required to disclose personal information relating to participant identity. To enforce confidentiality participants were labelled with pseudonyms (A, B, C, D) etc. Participants were also informed that participation in this research was completely voluntary and the participants' decisions to participate or not participate were paramount. The participants were also assured that they could withdraw from the research at any time if they wished to do so without any consequences.

Also, to safeguard the research procedure against any unexpected risks to participants, participants were informed that the research report will be provided to them if requested and they will also be informed about the research progress and results.

The research participants were also informed that all the data collected in this research was to be used for writing the researcher's academic thesis. The information collected from the interviews for this research project would be kept private and only the researcher and the university supervisor(s) and examiners would have access to it. The recorded information would be confidential; no one else except the researcher and the university supervisor(s) will have access to the recorded information. The entire interview process was tape-recorded, but no interview participant was identified by name on the tape.



Alphabetical letters, for example, participant A, B or C were used. The transcriptions of recordings were kept in a safe and secure location and are to be destroyed thereafter following the DCU's internal procedures for research records destruction. Great consideration was thus given to ethical concerns of participants and the entire research process was guided by sensible and ethical practices, and professionalism.

### **3.9 Challenges and limitations in research**

The main difficulties that arose in this research was access: locating participants and having them accept to participate in the interviews. This problem was two-fold. Firstly, the focus of this research is higher education and the initial intention was to recruit research participants from at least two or three universities from the seven universities in Ireland to make a meaningful representation of the university sector of higher education in Ireland. Unfortunately, sustainability education being an emergent academic area, many higher education staff showed less interest to engage with the study because either it was considered not directly relevant to their disciplines, or they were too committed professionally to engage with the study. So, despite repeated attempts through Email requests to have university staff from other universities in Ireland engage with the study, all attempts made were futile as discussed earlier. Thus, the staff interviews for this study were limited to the seven staff from DCU Faculty of Humanities and Institute of Education who accepted to participate in the research. Secondly, the research activities were also to involve the operationalization of the sustainability assessment (DAB) tool developed to profile higher education students' sustainability competencies. The intention was to deploy the three students' surveys as well as conduct interviews with some students from the case group to find out whether there were any correlations between the students' survey self-recorded responses of the levels of their actions in promoting sustainability with confirmations and /or disconfirmations of the survey results through interviews with the participants. The intent of the students' interview was to enable students to have a stronger voice in the research findings. Unfortunately, although six students in the case study accepted initially to engage with the students' interview process, they finally did not engage with the interview process, despite explanations of the research aims and objectives and repeated reminders through emails. The students' interview aspect of the research activity was dropped and this phase of the study findings were limited to the findings from the students' surveys.

Another difficulty faced by the researcher in this study was identifying the appropriate research method to be used. The topic of this research appeared broad in the beginning and posed a problem to the researcher to identify the appropriate research method that could be used to answer the research question(s). However, as the research progressed and the research questions became clearer, it became evident that it was more appropriate to use the Mixed Methods research design as the study entailed the design and development of an ESD pedagogic instrument as well as the testing of elements of the instrument to validate its applicability in ESD learning and teaching in higher education in Ireland.

A limitation of this research is the fact that the researcher and research participants (staff interviewees) were of different cultural backgrounds, the researcher being non-Irish (of African origin) conducting interviews with principally Irish participants. While the researcher did everything possible to engage in the interview process professionally, studies have shown that when interviewers and interviewees are from different cultural backgrounds, this may present challenges such as misinterpretations in the interview process on both sides (Murray et al., 2010). In the case of any such occurrences, care was taken in this study to conduct the interviews professionally and seeking clarity where there were any misunderstandings of the participants' responses to avoid researcher biases in the interview process.

Another limitation of this study relates to the findings in some sections of the study. The case-group survey results showed that the case-group cohort of students recorded very high levels of purchasing environmentally friendly products which one would have expected not to be the case because most often environmentally friendly products (be them organic foodstuff or recycled products) are much more expensive than non-environmentally friendly ones. The researcher made several attempts to conduct interviews with the case-group to find out if there were any correlations between the survey results and the anticipated interview findings. However, the students failed to engage in the interview process as discussed earlier. Thus, the research findings in this section should be read with some caution as the researcher did not have the opportunity to further investigate the findings using other data collection tools like interviews given the students' non-engagements with the interviews.

## **Chapter Four: Evidence-Base and Validation of the GCM**

### **4.1 Introduction**

This chapter presents the evidence-base for the Green Curriculum Model, thus, it contains an overview of the key informants and validation process of the conceptual framework for guiding educators on the infusion of ESD in higher education. The discussion in this chapter is organized into five sections. The first section explains the rationale for using ideas, suggestions and recommendations from key ESD and environmental education theorists and researchers; suggestions from some internationally recognized ESD projects; the works and suggestions of internationally recognized ESD related networks, organisations and charters and contributions from university staff interview participants in informing and /or validating the GCM. The second section of this chapter explains and discusses the findings from the higher education staff interviews. The third section of the chapter explains the evidence-base for the validation of the GCM. The fourth section examines challenges and barriers for using the GCM in integrating sustainability in higher education programmes and courses and the fifth section provides the conclusion for the chapter.

### **4.2 Who Informed and/or Validated the GCM**

The key elements of the Green Curriculum Model emerged from a critical review of the work of key theorists and research studies in ESD and environmental education (EE); from engagement in the Tempus RUCAS project/workshop; interviews with university staff of a higher education institution in Ireland and from presentations of levels of the GCM framework at various conferences and workshops. In some cases, the warrant for inclusion of an element was triangulated from the literature and interviews with staff and/or feedback from participants at conferences. The chapter begins with the rationale for using the works of:

- ESD and Environmental Education theorists and researchers cited;
- Tempus RUCAS project;

- UNESCO, UNECE, Talloires Declaration and the Earth Charter;
- The Contributions of 7 university staff members interviewed;
- The contributions from the conferences in which the GCM elements were presented.

#### **4.2.1 Justification for inclusion of Lead Organisations**

**4.2.1.1 UNESCO:** UNESCO has been recognized globally as the lead agency conferred with the responsibility for promoting ESD by the United Nations General Assembly. Since the World Conference on Environment and Development (WCED, 1987) issues of Education for Sustainable Development have taken the limelight globally and UNESCO has been the lead UN agency in promoting sustainability. UNESCO supports countries to build ESD capacities, generate and scale-up actions, focusing on key ESD issues. It advises policy-makers on how to embed ESD into education plans and curricula. It develops ESD tools and materials for decision-makers, educators and students to promote ESD as well as helps link learning in schools to real life experiences. UNESCO also encourages reorienting initial teacher education training in higher education to integrate ESD (in higher education curriculum) and into teaching practices around the world. UNESCO was appointed lead agency for the Decade of Education for Sustainable Development (DESD, 2005- 2014) aimed at promoting ESD throughout the education system all over the world and the 2014 UNESCO World Conference on Education for Sustainable Development (10-12 November 2014, Aichi-Nagoya, Japan) marked the end of the UN Decade of Education for Sustainable Development (DESD, 2005-2014), and the launch of the Roadmap for the implementation of the Global Action Programme on ESD aimed at making important progress to the post-2015 ESD agenda (UNESCO, 2014), culminating with the UN adoption of the Sustainable Development Goals, 2016. The responsibilities conferred on UNESCO by the UN and its recognition internationally as the lead agency for promoting sustainability, coupled with UNESCO's actions in coordinating and promoting ESD actions and capacity-building for embedding ESD in education globally, justifies the incorporation of UNESCO's suggestions and recommendations on re-orienting educational curricula to address sustainability and to inform and/or validate the GCM in the context of this study.

**4.2.1.2 The United Nations Economic Commission for Europe (UNECE):** was set up in 1947 with the aim of promoting pan-European economic integration. UNECE is one of the leading agency for promoting ESD good practices, knowledge and competencies among educators and learners in Europe and beyond. UNECE adopted its ESD strategy following the Vilnius Conference of 2005 with the aim of “*encourage[ing] countries to integrate ESD into all forms of their education systems*” and covering all levels (primary, secondary, tertiary education, including vocational and adult learning), (UNECE, 2005). The objectives of the UNECE ESD strategy are to: “*Ensure that policy, regulatory and operational frameworks support ESD; Promote sustainable development through formal, non-formal and informal learning; Equip educators with the competence to include sustainable development in their teaching; Ensure that adequate tools and materials for ESD are accessible; Promote research on and development of ESD; Strengthen cooperation on ESD at all levels within the UNECE region*” (n.p.). Since 2005, UNECE has promoted initiatives, projects and actions within the European context and globally, aimed at promoting the attainment of its ESD strategy and it has sponsored research that has informed ESD globally, especially in the areas of developing ESD competencies through the competencies research and other initiatives. UNECE actions in promoting ESD through research and capacity-building thus provides the justification for using its suggestions and recommendations to inform and/or validate the elements of the GCM in the context of this study.

**4.2.1.3 The Talloires Network:** The Talloires Network was established by the Talloires Declaration on the Civic Roles and Social Responsibilities of Higher Education in France, September 2005 and ratified by leaders of 29 universities. Since then the network has grown to 240 member universities from 62 countries (Hollister, 2012). The Talloires network seeks to promote the civic engagement of university-communities through public awareness and support, “*promoting the exchange of ideas and best practices... and supporting other regional and global networks to foster civic engagements, educating funders on the value of civic engagement, hosting conferences and events, and providing direct financial and capacity-building support to members*” (p.81). The Talloires network has gained international recognition as an authoritative voice in best practices and capacity-building for civic engagements in higher education. This recognition provides grounds for the use of the Talloires Declaration and other ideas of the network to inform and validate the GCM in the context of this study.

#### **4.2.2 Justification for inclusion of Tempus RUCAS Project**

In a review of global projects addressing ESD in Higher Education, the report from the international project of the University Educators for Sustainable Development (UE4SD) consortium (Mader et al., 2014), listed the Tempus RUCAS as one of the notable examples of good practice in infusing education for sustainability in Higher Education. The report mentions examples of good practices in infusing sustainability in Higher Education promoted through the Tempus RUCAS in Ireland (p.29), and in Greece (p.31). This provides evidence of recognition at an international level of the importance and value of Tempus RUCAS in informing ESD in higher education, and thus it was appropriate to lean on its findings to inform the design of the GCM and DAB tool in this study.

#### **4.2.3 Justification for inclusion of Key ESD Theorists and Researchers**

Several works of key ESD researchers and theorists (namely, Daniella Tilbury, Stephen Sterling, John Huckle, Ros Wade and Vassilios Makrakis) particularly informed and validated the inclusion of elements of the GCM. Suggestions and recommendations from these ESD experts informed and/ or validated the GCM because of their internationally recognised contributions to the literature and knowledge of ESD to date. These scholars' contributions to advancing the course of ESD especially in addressing ESD in higher education justifies the use of their ideas and suggestions to inform and validate the GCM. The remit of this section of the study is not to provide a detailed review of all extant literature on sustainability in higher education across the globe. The information provided is to highlight the significant contributions of some internationally recognised ESD experts to furthering the course of addressing sustainability in higher education which provides the evidence internationally of the value of their work to inform ESD thus being the reasons for which their work informed and/or validated the GCM. The key ESD/ EE theorists whose work informed or validated the GCM included:

**Professor Daniella Tilbury:** Professor Daniella is Vice-Chancellor and CEO of the University of Gibraltar. She is internationally recognised for her expertise in leadership, learning and institutional change for sustainable development and is the recipient of

several research awards including the Macquarie Innovation Award for Research (Australia, 2007) and Marie Curie International Research Fellowship (European Commission, 2009). The institutional change efforts she led at the University of Gloucestershire were recognized with the Green Gown Awards (2007, 2011) in recognition of the institutional change efforts she led at the University of Gloucestershire. She was the founding Director of the Australian Research Institute in Education for Sustainability (ARIES). She assessed strategic higher education initiatives for government agencies in Australia, New Zealand, China, Morocco and Europe. Together with Dr Alex Ryan, she led a large HEFCE QAA funded 'Leadership, Governance and Management' project on embedding sustainability into quality assurance processes in higher education (2010-12) and a Higher Education Academy study into flexible learning and new pedagogical ideas (2013).

She was awarded a PhD (University of Cambridge, St Catherine's College) in early 1993. She acted as lead evaluator for projects funded by the European Union, United Nations, World Conservation Union (IUCN), World Wide Fund for Nature (WWF), British Council, and several government agencies and organizations in Tanzania, Madagascar, South Africa, Venezuela, Brazil, Colombia, China, Hungary, Vietnam, Australia, Spain, Tunisia, and Italy.

She chaired the UNESCO Global Monitoring and Evaluation Expert Group on Education for Sustainable Development (2005-2014). She leads the University Educators for Sustainable Development Project (UE4SD), which brings together 53 Universities across Europe, to embed sustainability into teaching and learning (UE4SD, n.d.).

She was a University Dean and Director at the University of Gloucestershire between 2007-2015. Professor Tilbury was responsible for the University's academic and operational performance in sustainability. Currently she is the Vice-Chancellor of the University of Gibraltar and holds a Chair in Higher Education for Sustainability since 2015 (Gibraltar Panorama, 2015).

Professor Daniella Tilbury is an internationally recognised key theorist and researcher in the field of sustainability and addressing sustainability in higher education and thus her research ideas and suggestion informed and/or validated the GCM.

**Professor Stephen Sterling:** is professor of sustainability education in the Centre for Sustainable Futures (CSF) at Plymouth University and an advisor to the UK Higher Education Academy on Education for Sustainable Development (ESD). He is also the National Teaching Fellow (NTF). He has worked in environmental and sustainability education in the academic and NGO fields nationally and internationally for over three decades. He has been a consultant and advisor on UNESCO'S education for sustainable development (ESD) programmes. He is widely recognized for many years as one of the leading voices in sustainability education and a frequent international keynote speaker on sustainability education. He has authored many books and peer reviewed articles on sustainability education, among them Education for Sustainability co-edited with John Huckle (1996); Scumacher briefing, Sustainable Education-Re-visioning learning and change (2001); Sustainability Education: Perspectives and Practice Across Higher Education co-edited with David Selby and Paula Jones (2010) and the Sustainable University-Process and Prospects (2014). He started the first Masters course in the UK on sustainability education (at London South Bank University). He led the WWF project on systems thinking Linking Thinking – new perspectives on thinking and learning for sustainability. His research interests centres around the interrelationships between ecological thinking, systemic change, and learning at individual and institutional scales to help meet the challenge of pushing forward the educational response to the sustainability agenda. He wrote one of the three papers informing the UN high-level World Conference on Education for Sustainable Development in November 2014, commissioned by UNESCO. He is co-chair of the International Jury for the UNESCO-Japan ESD Prize. He provided a summary of the contribution of education to meeting the UN Sustainable Development Goals (SDGs) which was part of the 2016 UNESCO Global Education Monitoring (GEM) Report, Education for People and Planet. He is the winner of the VC Enterprise Awards for Outstanding Contribution to Plymouth University in relation to its sustainability agenda (Plymouth University, 2016).

Professor Stephen Stertling is an internationally recognised key theorist and researcher in the field of sustainability and addressing sustainability in higher education and his research ideas and suggestion informed and /or validated the GCM.

**Mr. John Huckle:** is a geography, environmental education, development education and sustainability education teacher and has taught in the universities of Bedfordshire and London South Bank. He is a consultant and advisor of WWF. He developed many courses



for the WWF Global Environmental Education programme in the 1980s and 1990s. He coordinated consultancy activities in teaching and guiding ESD activities in many universities in China from 1997 to 2008. He has authored many books and peer reviewed articles in Environmental Education, Geography, Development Education and Sustainability Education, among which are Education for Sustainability, co-edited with professor Stephen Sterling (1996); Environments in a Changing World, co-authored with Adrian Martin (2001) and many others (Huckle, n.d.). Ideas and suggestions from his works informed and/or validated the GCM.

**Professor Vassilios Makrakis:** is Professor of ICT in Education with a focus on Education for Sustainable Development (ESD) at the Department of Primary Education, University of Crete. He is the UNESCO Chair in the field of ICT in ESD. He has taught ICT in education for sustainable development in many universities including: Stockholm University Institute of International Education 1988-89; National Institute of Educational Research of Japan, Japan Foundation Research Fellow, 1990-1999 and since 2001 he is teaching in the University of Crete, Greece and consultant in the ministry of Education United Arab Emirates (2001-2005).

Professor Makrakis has been involved in, coordinated and cooperated internationally with other researchers in more than ten national and international projects dealing with global education, e-learning, ICT teacher capacity-building and Education for Sustainable Development. These projects were funded by the European Commission, the Greek General Secretariat for Research, governmental institutions and international research foundations. He has been a resource person for UNESCO, the UAE Ministry of Education and Local Governments (University of Crete, n.d.). More importantly, he coordinated the European Commission funded Tempus RUCAS project for re-orienting university curricula to address sustainability which has received acclaim by the UE4SD consortium report (Mader et al., 2014), as examples of good practices in infusing sustainability in Higher Education, promoted through the Tempus RUCAS in Ireland (p.29), and in Greece (p.31). Professor Makrakis has authored many books and peer reviewed articles published in high ranking academic research journals in ESD and ICT in Education for Sustainable Development (University of Crete, n.d.). His work in ICT in Education for Sustainable Development especially in the Tempus RUCAS project and the subsequent publications associated with the Tempus RUCAS project informed and/or validated the elements of the GCM.

**Professor Ros Wade:** Professor Ros Wade is professor of Education for Sustainability (Efs) in London South Bank University. She is nationally (UK) and internationally recognized for her contribution in furthering the sustainability agenda. Professor Ros Wade has served on the UNESCO UK national coordination group for ESD. She is also a consultant for UNESCO and a recognised global expert in Education for all and ESD synergy.

Professor Wade is also a research fellow at the Schumacher Institute for Sustainable Systems and chair of RCE London. She has carried out research in several projects and leads the research on Leadership for Sustainability in the Learning and Skills sector. She has carried out research projects for WWF, Oxfam, UK Centre of Excellence in Leadership. She has been a keynote speaker in many conferences on sustainability issues. She was the winner for the London Company of Educator's Award in 2009 for her achievements in furthering Efs/ESD. Professor Wade has authored many books and peer reviewed articles and written reports for UNESCO on sustainability education, among which are: *The challenge of sustainability: Linking politics, education and learning* (2008), co-edited with Hugh Atkinson. She wrote the 2008 UNESCO report co-authored with Jenneth Parker entitled *EFA-ESD Dialogue: Educating for a sustainable world* (LSBU, n.d.). Ideas from her works, especially from her peer reviewed articles informed and/or validated the GCM.

In addition, all the other authors whose works have been cited in this study contributed towards ideas which helped to ignite the researcher's imaginations, conceptualisations and understandings of the sustainability discourse that has shaped the orientations of thought espoused in this study especially in the design and development of the GCM and the DAB indicator tool.

#### **4.2.4 Justification for inclusion of suggestions and feedback from Conference Participants**

The initial findings of this study from the critical review of literature on sustainability practices in higher education in Ireland, extant literature leading up to the development of the Green Curriculum Model conceptual-design framework and the Dispositions, Abilities and Behaviours framework were presented at various education and

sustainability education conferences in Ireland. During these conferences the researcher had the opportunity to present the elements of the GCM and the DAB frameworks to members of the sustainability community of experts, educationists interested in sustainability as well as government administrators and higher education institutional administrators interested in sustainability.

The presentations of the GCM and the DAB through these conferences and seminars garnered huge interest in the instruments culminating into requests from the Department of Education and Skills for further clarifications on the use of the instruments and when and how the instruments could be made available to the higher education community in Ireland. The presentations of the two instruments also gathered huge interests among conference participants culminating into requests for future research collaborative work on the instruments from other researchers in Europe. During these conferences which have been discussed in detail in the sections below, participants raised questions for clarity on the use of the instruments, made critiques, suggestions and feedback which helped in improving the design of the elements of the two instruments.

The huge interests and acceptability of the instruments from both government officials (Education policy makers) and conference participants (sustainability community of experts, other educationists and researchers), justifies the inclusion of conference participants' ideas and suggestions and feedback to inform and/or validate the GCM.

#### **4.2.5 Justification for inclusion of University Staff**

A series of seven interviews were conducted with higher education staff in DCU to inform and/or validate the design of the Green Curriculum Model. Some of the staff had attended the Tempus RUCAS workshop training in re-orienting university curricula to address sustainability while others had not been engaged in any training in addressing sustainability in higher education courses and programmes. This nuanced approach was taken so as to present a bigger picture of university staff understandings, perceptions and practices of sustainability.

The higher education staff interviews were designed and conducted to ascertain their dispositions towards sustainability; their understandings of the concept of sustainability; what content they thought should be included in sustainability related courses, the associated sustainability principles and pedagogic approaches and practices relevant in

sustainability teaching and learning; what sustainability related learners' competences should be fostered in sustainability education, and how higher education learners' competencies could be profiled and/or assessed. The interview questionnaire was also designed and conducted to find out what opportunities were available to university staff that could help them to address sustainability in programmes and courses and what were the barriers/ challenges they face in infusing sustainability in programmes and courses. Ideas and suggestions from the interviewed staff informed and/ or validated the GCM. The contributions of these staff suggestions and ideas were significant in informing the design and development of the GCM because some of them had undertaken capacity-building in re-orienting their course curricula to address sustainability through their participation in the Tempus RUCAS training workshop and were integrating sustainability in their courses. Also, ideas from staff who had not undertaken training in addressing sustainability in higher education courses and programmes were relevant because they provided a picture of what higher education staff were doing and/or not doing in relation to infusing sustainability in courses and programmes.

Due to difficulties of access as well as the lack of interest in sustainability shown by many higher education staff (which could be explained by the fact that ESD is an emergent field of study that is yet to garner sufficient interest in higher education especially in the case of Ireland), gaining staff consent in all the faculties of the university was problematic. Despite repeated requests made through emails and consent letter with detailed information about the study as well as phone calls requesting consent for participation in the interviews, many of the university staff contacted did not respond and/or were not interested in issues about sustainability. Consequently, the interviews for the thesis were focused mainly on staff from the Faculty of Humanities and Social Sciences. Attempts were also made to contact staff from other universities in Ireland through emails and phone calls to (University of Limerick and University College Dublin) but there was a similar disinterest in the study. Thus, the interviews report is based on the responses of university staff from the DCU School of Education Studies (now called the DCU Institute of Education), the School of Law and Government and the School of Languages and Intercultural Studies (SALIS).

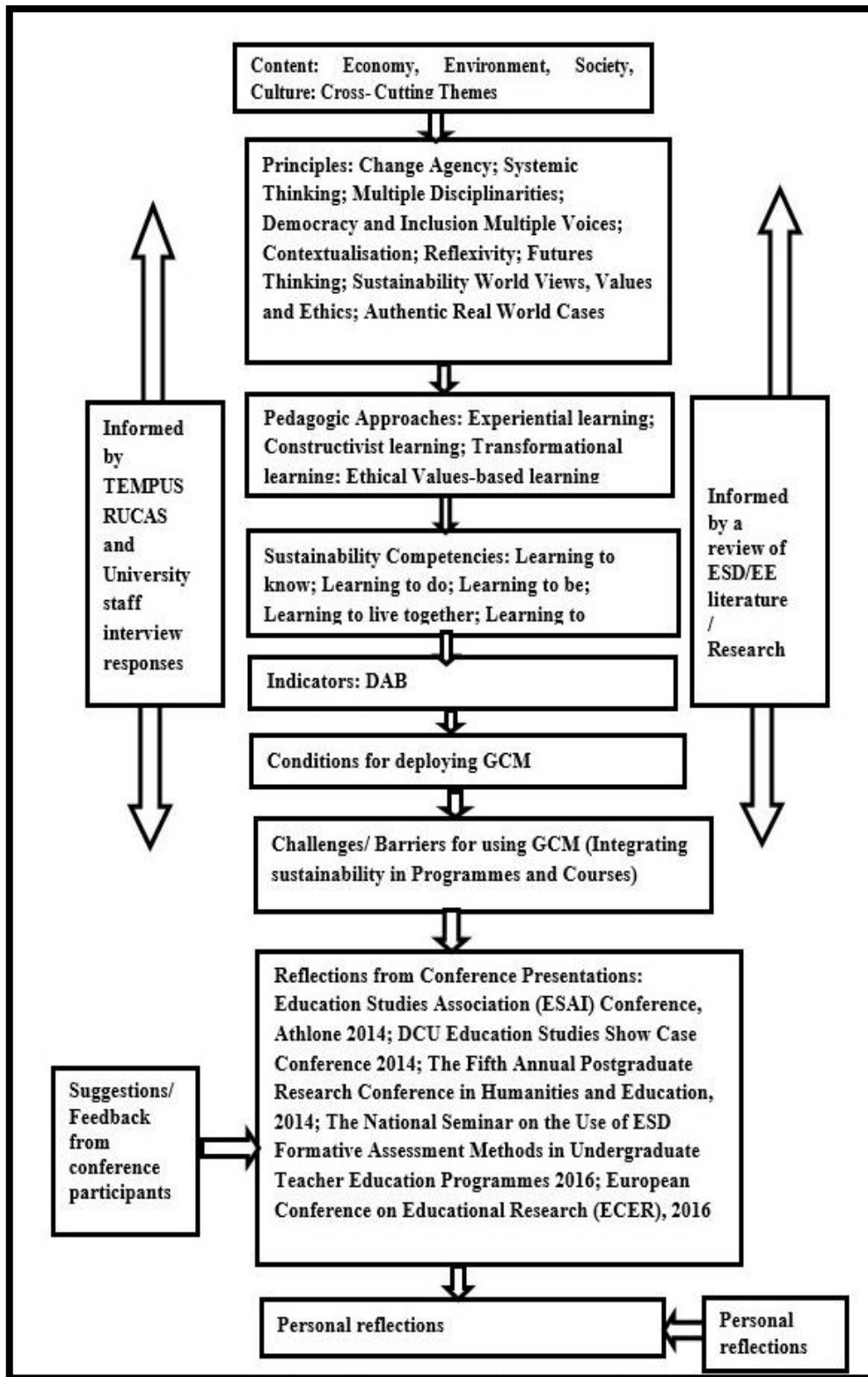


Figure 7. Green Curriculum Model Evidence-Based Validation

### **4.3 Validation of the Green Curriculum Model**

As illustrated in the next chapter, the Green Curriculum diagram comprises five levels of a sustainability infused curriculum, namely: (1) Content, (2) Principles, (3) Pedagogic approaches, (4) Competencies/ Outcomes, and (5) Indicators, and is activated through ecological course design processes articulated by Burns (2011) within goal five of her model of sustainability pedagogy, which takes inspiration from Hemenway (2000) five phases of ecological design.

This section of the thesis has been structured to present the evidence-base for each element and level of the GCM, as illustrated in figure 7. The works of key theorists in ESD and environmental education; internationally recognised projects on ESD, interviews with higher education staff, and documentary analysis of reports generated by internationally acclaimed leading ESD agencies in Europe and globally, informed and/or validated the GCM. Furthermore, as the study progressed, emergent elements and levels of the GCM were presented for critique at workshops, seminars and conferences at the national level in Ireland. The information gathered through these processes informed and/or validated the GCM.

**4.3.1 Sustainability-related Content:** The inclusion of the four cornerstones of sustainability, and cross-cutting themes, within the content level of GCM, has been inspired and validated by the work of key theorists, research studies, Tempus RUCAS workshop and interviews from university staff.

Two of the key ESD theorists, Sterling (2003) and Rieschild (2009), and UNESCO (2005b), recommend a holistic integration of the four cornerstones of sustainability (environment, economy, society and culture) in ESD learning and teaching, and thus inspired the inclusion of the four cornerstones as a critical dimension of the Content Level of GCM. UNECE (2005) recommend the inclusion of the following themes in sustainability education: poverty alleviation, citizenship, peace, ethics, responsibility in local and global contexts, democracy and governance, justice, security, human rights, health, gender equity, cultural diversity, rural and urban development, economy, production and consumption patterns, corporate responsibility, environmental protection, natural resource management and biological and landscape diversity.

Sterling (2009) further suggests the inclusion of the following cross-cutting themes in sustainability learning and teaching: Equity; Human rights and needs; Consumerism; Community and Participative democracy. In addition, Lozano & Peattie (2011) recommend the inclusion of the following themes: People as part of nature/Limits to growth; Systems thinking (holistic thinking) /application Human systems; Wellbeing: personal, family and community wellbeing; Responsibility (individual, community, corporate social responsibility); Environmental stewardship (Ecological systems); Governance; Futures thinking; Communication/Reporting; Ethics/Philosophy. UNESCO, (2006c, 18-20), framework for the DESD international implementation scheme, recommends the inclusion of the following themes in ESD learning and teaching : Human rights; Peace and human security; Gender equality; Cultural diversity and intercultural understanding; Health and HIV/AIDS; Governance; Natural resources management (water, energy, agriculture, biodiversity); Climate change; Rural development; Sustainable urbanization; Disaster prevention and mitigation; Poverty reduction; Corporate responsibility and accountability; Market economy.

The Tempus RUCAS project (2011) was influenced by the work of Sterling and thus also framed its content using the four cornerstones, but in addition it inspired the inclusion of additional cross-cutting themes to frame sustainability content. Within the survey instrument used in the Tempus RUCAS Project (2011), the project recommends the inclusion of the following cross-cutting themes in sustainability education: Scale: Time-scale (the immediate to intergenerational effects of human activity on sustainability) and Geographic-scale (the local to global effects of human impact on sustainability); Human Connections to the Physical and Natural World: (the acknowledgement of the interconnectedness of humans and nature, the impact of the physical (built environment) and the natural environment on human health), the need to balance human population needs with the needs of the biosphere and taking into consideration the limitations of its carrying capacity); Sustainability Ethics and Values: (equity, justice, respect, culture, inclusive and negotiated decision making and sustainable development at individual and community levels). How natural systems function; Technological and economic relationships to sustainability; and Motivating environmentally sustainable behaviour. Interviews conducted with university staff in 2014, in relation to what 'content' was important to integrate within sustainability learning and teaching, also

revealed the need for *themes that overlap the four conerstones, environment, economy, society, culture* (Participants A & E). Participant B suggested the inclusion of themes like *humanity and the effect it has on the planet... and the whole natural cycle*. While participant D suggested the inclusion of themes such as *economic volatility and uncertainty and the role of information*. Participant E suggest the inclusion of other cross-cutting themes such as *poverty reduction, the role of NGOs and the state*; Participant F suggests the inclusion of themes including *climate change, gender and power*; while, Participation G suggests the inclusion of the theme such as: *citizenship in managing and creating a sustainable society*.

### **4.3.2 Sustainability Education Principles**

The principles included within GCM were informed and/or validated by the work of key theorists and existing research studies, from the Tempus RUCAS project and from interviews with university staff involved in ESD. The principles include:

**4.3.2.1 Change Agency:** Key ESD theorists and UNESCO argue for the inclusion of sustainability principles in ESD learning and teaching. Cadwell, (2006, p. 19), argues for the inclusion of change agency because it provides learners with the capacity to embrace and effect change to build more sustainable future societies. Participant G from the University staff interview suggests the inclusion of change agency in sustainability learning and teaching because it enhances change and transformation in learners. Quoting Ghandi he explains that such transformation would make learners “*become the change they want to see in the world*”.

**4.3.2.2 Systemic Thinking:** Sterling, (2003), argues for the inclusion of systemic thinking in sustainability learning and teaching because it imbues in learners the capacity to embrace whole systems thinking- think in terms of the interconnectedness of the socio-economic, cultural and ecological systems which is required to engender a shift in learners’ values and belief systems to embrace more pro-ecological values.



#### **4.3.2.3 Multiple Disciplinarity - Disciplinarity; Multidisciplinarity; Transdisciplinarity; Interdisciplinarity:**

Nicolescu (2006), suggest the inclusion of disciplinarity in sustainability education because each discipline requires deep knowledge and skills in the subject area. Fostering disciplinary knowledge enables learners to be abreast with knowledge in the specific disciplinary area that they can use in promoting sustainability. He also suggests the fostering of multidisciplinarity in sustainability learning and teaching to enhance in learners the capacities and skills to use holistic approaches in solving sustainability problems which require knowledge and information from different disciplines. Barth & Reichmann (2012, p. 32), recognise the “*relevance of transdisciplinarity and its importance for sustainability related problem solving*” and argues for its inclusion in sustainability education. Jantsch (1972), suggests the inclusion of cross-disciplinary knowledge and information in sustainability education because it provides learners with the capacity to use multi-disciplinary, pluri-disciplinary and trans-disciplinary approaches in solving complex and multifaceted sustainability problems. Makrakis, Kostoulas-Makrakis & Kanbar (2011) in the Tempus RUCAS project suggest the use of multi/inter-disciplinary and systemic approach in embedding sustainability in higher education curricula. Meanwhile, staff interviewee (participant E) suggests the inclusion of perspectives from different disciplines in the content being taught for example a course on development should integrate “... *the political aspect i.e. the role of the state, economic aspects from the private sector, social and environmental principles from the NGO sector*”.

**4.3.2.4 Democracy and Inclusion:** Hartley and Huddleston, (2010), suggest the fostering of democracy and inclusion in sustainability learning and teaching to enable learners to acquire and practice values for reciprocal relationships, participatory and inclusive decision making, respecting and valuing differences and exercising their civic rights and responsibilities and promoting human rights and democracy. UNECE (2011) also calls for inclusivity in sustainability education. It calls on educators to be open about their own world-views so that they are not hidden from learners nor impose their own worldviews on learners.

**4.3.2.5 Multiple Voices:** Hartley and Huddleston, (2010), suggest enhancing the principles of the respect of multiple voices in sustainability learning and teaching process because

it enables learners to acquire the skills and competencies for collaboration, cooperation and working together in the interest of common good and respect for all voices, even the dissenting ones. They argue that the promotion of such values, makes learners feel they are useful and recognized members both within the learning environment and in their communities, and gives them the zeal to engage in promoting sustainability and make a difference to society. Staff interview (participant F), suggested consideration for all voices in the sustainability learning and teaching process, paying attention to *“who gets to speak and who gets listened to (voices heard and unheard voices) because even if we think we are doing something in a participatory way, it may turn out we only listen to some voices and [some] people’s voices are not listened to”*.

**4.3.2.6 Contextualisation:** Wals & Jickling (2002), argue for the fostering of context specific knowledge in sustainability learning and teaching, taking into consideration the local needs and problems of the people and the realities of the learners because of the fluidity and complexity of the concept of sustainability. Makrakis & Kostoulos Makrakis (2012) suggest that content of the knowledge produced and disseminated in sustainability learning and teaching should be sufficiently responsive to the problems and needs of the targeted populations and their societies.

**4.3.2.7 Reflexivity:** Key sustainability theorists suggest the inclusion of reflexivity in sustainability learning and teaching. Rychen & Salganik (2005), suggest its inclusion because its practice in sustainability learning and teaching involves developing creative abilities and taking a critical stance. It requires individuals to reach levels of social maturity that allow them to distance themselves from social pressures, take different perspectives, make independent judgements and take responsibility for their actions. D’Cruz et al. (2007) suggest its inclusion in sustainability learning and teaching because it enables the educator to make a self-critique that questions how knowledge is generated and transferred to the learners and taking into consideration power relations within the learning environment. Brookfield, (1998) suggests the inclusion of reflexivity in sustainability learning and teaching because its practice enhances in learners the capacity to engage in a process of self-discovery in which the learners search and reflect on how they see themselves through their own eyes (self-perceptions, views, values and beliefs) as well as how others perceive their worldviews, values and beliefs.

**4.3.2.8 Futures Thinking:** Sustainability theorists like Gidley et al. (2004), argue for the fostering of futures thinking skills in sustainability learning and teaching because it enables learners to envision better futures for the world. It also enhances learners' capacities for foresight, predicting, alternative possible scenarios, problem solving, imagination, creativity and strategic planning for the future. Staff interviewee (participant F) suggests the fostering of futures thinking in sustainability education because futures thinking enable learners *"to have the ability to imagine sustainable futures"*.

**4.3.2.9 Sustainability Worldviews, Values and Ethics:** Sterling (2009) argues for the shift of educational focus from its market orientation towards a pro-ecological-led paradigm and its promotion in sustainability education. Pavlova (2013); Campbell et al. (1992) and Parker et al. (1999), suggest the fostering of relational values rooted in the principles of weak anthropocentrism as an important guiding principle in sustainability education. Pavlova (2013, p.735), explains that weak anthropocentrism emphasizes on the ethics of *"valuing of the other person, moral responsibility and establishing a non-instrumental relationship with nature"*. Pavlova (2009) also calls for the fostering of relational values in sustainability education because it enhances learners' skills in promoting the mutual and healthy existence of both humanity and the environment and the respect and care for the community of life as called for in the Earth Charter (2000). Emmanuel Levinas (Cited in Peperzak et al., 1996) suggests the use of ethical values-based learning in sustainability education because it fosters relational approaches to learning which require learners to recognize the importance of the 'other' in the learning process and the understanding of other learners' identities and approaches. Holland et al. (2012), recommend the fostering of ethical values-based learning in sustainability learning and teaching because it promotes values like respect, equity, fairness, solidarity, democratic actions and behaviours within the learning environment. It also contributes to the development of learner's self-esteem and self-expression. It also creates a democratic, collaborative and safe learning and teaching environment for all engaged in the learning and teaching process.

**4.3.2.10 Authentic Real World Learning:** Lombardi (2007) suggest the use of authentic real world learning approaches because it focuses on real world, complex problems and enhances learners' capacities for problem solving using real world scenarios, role playing

exercises, problem-based activities, case studies and participation in both live and virtual environments. Barth & Rieckmann (2012) argues for the use of authentic real world learning approaches in ESD because ESD learning can provide learners with knowledge and skills to seek solutions to real-life sustainability related problems.

### **4.3.3 Sustainability Education Pedagogies**

The proposed pedagogies within the GCM were informed and/or validated by the works of key theorists and existing research studies in ESD; from the work of Tempus RUCAS project and from interviews with university staff involved in ESD. The Proposed pedagogies include:

**4.3.3.1 Transformative and Action Oriented Learning:** Many key theorists advocate for the use of sustainability related pedagogies in quality learning, like Transformative learning, Experiential learning, Constructivists learning and Values learning approaches in sustainability education. Mezirow (2000) argues for the fostering of transformative learning in education because it helps to “*transform [learners’] taken-for granted frames of references to make them more inclusive, open and reflective so that they may generate beliefs and opinions that will prove more true or justified to guide action*” (p.214). Makrakis and Kostoulas-Makrakis, (2012) suggest the use of transformative learning approaches in sustainability learning and teaching using the ExConTra framework. They argue for the use of transformative learning because it promotes in learners, experiences of deep, structural shifts in their thoughts, feelings, and actions that enable them to reflect and understand themselves, their relations with others and with nature. Bonnett (2002); Sterling (2001, 2004a, 2007); Stevenson (2006); Argyris and Schön (2004); Lundegård and Wickman (2007) and Peters and Gonzalez-Gaudio (2008), call for the use of transformative education approaches in learning and teaching in addressing the sustainability challenges facing humanity. Pavlova (2013) recommends the use of transformative learning and teaching approaches in sustainability education because it enhances learners’ skills and knowledge in systemic thinking and critical reflection. She also recommends the use of transformative learning and teaching approach because it enhances learners’ understanding and appreciation of the interrelatedness of humans and nature, as well as people’s relations with the others.

The Tempus RUCAS project facilitators recommend the use of alternative/innovative pedagogies in sustainability learning and teaching. In this light (Makrakis & Kostoulas-Makrakis, 2012) in the ExConTra pedagogic framework recommend the use of Transformative learning as one of the key pedagogies in addressing sustainability in higher education curriculum because the convergence of experiential, constructivist and transformative learning engenders change agency in learners which enables them to experiment new knowledge and put this into action to promote sustainability. University staff interview participant G argues for the use of Transformative learning pedagogies in sustainability education and explains that *“I use transformational learning to enable them see... themselves as agents of change rather than seeing themselves as passive receivers of knowledge”*.

**4.3.3.2 Constructivist Learning Pedagogies:** Sterling (2009) makes the case for the use of constructivist pedagogic approaches in sustainability education, arguing that because of the complex and challenging nature of sustainability issues, seeking solutions to them requires higher order thinking. Makrakis & Kostoulas Makrakis (2012), suggest the use of constructivist learning approaches in sustainability education, using the aforementioned ExConTra pedagogic approach. They argue that the use of constructivist learning enables learners to make critical reflections and construct meaning from their experiences. This approach to learning is critical in sustainability problem solving. The Tempus RUCAS project (2011) facilitators suggest the fostering of the following constructivist pedagogic approaches in sustainability education: Tempus RUCAS facilitators identify the following constructivist learning approaches which are critical in sustainability education: Lecture-based learning; Project-based learning; Case-based learning; Inquiry-based learning; Problem-based learning; Interdisciplinary learning; Service learning; Discovery learning and ICT-enabled learning. Through a survey instrument university lecturers were asked to identify which of the above pedagogic approaches they have been fostering in their respective courses to promote sustainability. University staff interview participants argue for the use of constructivist learning approaches like: student centred learning and discovery learning in sustainability education. In relation to student-centred learning, *participant C* explains that: *“I would like them do some group work and figure things out themselves, I like them do individual work and work their way on things and I facilitate work around the classroom and if they had any questions to ask me”*. University staff *participant A* reiterated the use of

constructivist learning in his course by explaining that *“I use discovery learning because it is really about empowerment, experience your learning...the learners take responsibility of the learning process”*. In the same light University interview participant G explains that discovery learning *“empower[s] students to have self-confidence and self-belief. [It is] an ability to spot opportunities and problems and to realise that they themselves can act on them”*.

**4.3.3.3 Experiential Learning:** Kolb (1984) argued for the use of experiential learning approaches in education because it enables learners to construct or gain knowledge through experiencing, reflecting, thinking and acting over what is being learned. Makrakis & Kostoulas Makrakis (2012) suggest the use of experiential learning in sustainability education using the ExConTra pedagogic approach. Makrakis & Koustolas makrakis (Ibid.) argue that learning to engender change for sustainability begins with experiential learning where the learners identify a realistic and authentic task related to a sustainability problem. Learners progress to collect information related to the problem and through self/collective reflections they examine information from the new experiences with the intent of making meaning. They then reflect on the new experience to develop abstract understanding and to construct meaning from the experiences. Through a process of continuous reflection, the learners re-imagine and actively experiment on the acquired knowledge. Makrakis & Kostoulas Makrakis (Ibid.) further argue that learners’ constructed knowledge becomes meaningful when *“it opens up opportunities for action”* (n.p.). The merging of knowledge, meaning and action engenders change agency in the learners who become empowered to effect change by transforming their experiences through critical reflections and active experimentations of the new knowledge. Makrakis in the RUCAS Toolkit (n.d.) thus argues that the *“the convergence of Experiential, Constructivist and Transformative learning is of critical importance in addressing sustainability”* in higher education courses (n.p.). University staff interview participant C argues for the use of experiential learning in sustainability education, explaining that *“I let them develop that themselves and then we kind of look at communities of practice as well where we get the students to create resources and share them with each other ... so they... get to practice the actual content of what they will be teaching before they go on school placement”*.

**4.3.3.4 Ethical Values-Based Learning:** Shephard (2007), argues for the fostering of affective outcomes in sustainability education, focusing on values, attitudes and behaviours that promote sustainability in the learning and teaching process because, the current focus on cognitive skills in learning, teaching and assessment, has led to many teachers attempting to stimulate critical analysis without encouraging proecological values, attitudes or behaviours. Holland et al. (2012) suggest the fostering of ethical values in sustainability learning and teaching because it promotes values like respect, equity, fairness, solidarity, democratic actions and behaviours within the learning environment. UNESCO (2005), recommend that sustainability education learning should involve the fostering of knowledge, skills, perspectives, and values that guide and motivate people to pursue sustainable livelihoods, participate in democratic societies, and live in a sustainable manner. Barth et al. (2007) recommend the fostering of skills which promote “*foresighted thinking; interdisciplinary work; cosmopolitan perception; transcultural understanding and co-operation; participatory skills; planning and implementation; empathy, compassion and solidarity; self-motivation and motivating others; and distanced reflection on individual and cultural models*” in sustainability education (p.418). In the same light Rieschild (2009) argues for promoting values based and participatory learning in sustainability education. UNECE (2005) recommends the use of “*participatory teaching and learning methods that motivate and empower learners to change their behaviour and take action for sustainable development*” (n.p.). The Earth Charter (2000) principle 2, calls for promoting an ethics and pedagogy of care: “*Respect and Care for the community of life with understanding, love, and compassion*”, in sustainability education (n.p.). The Earth Charter provides a framework for addressing sustainability related ethical values in the curriculum. Fostering critical reflections on the Earth Charter principles in sustainability education, provides learners with opportunities to orient their value-bases towards care and responsibility for themselves, the ‘others’ and nature.

In relation to participatory democratic learning, university staff interview participant F argues for the fostering of values learning, using participatory democratic approaches in sustainability education, explaining that “*I encourage learners to participate in discussions, to make their own inputs and examples, to question, and they were very good at that*”.

#### 4.3.4 Sustainability Competencies

The framing of the sustainability competencies was informed and/or validated by the work of Key ESD theorists, research studies and initiatives and international organisations involved in promoting sustainability among which are the Delors (1996) report to UNESCO, of the International Commission on Education for the Twenty-first Century which recommended four clusters of competencies (*Learning to know, Learning to do, Learning to be and Learning to live together*) necessary for the 21<sup>st</sup> century learning as well as Shaeffer's (2007) report to UNESCO which identified a fifth cluster of competencies necessary for sustainability education (*Learning to transform oneself and society*). Key education and sustainability theorists as well as organizations (such as UNESCO) have recommended many competencies needed in education and sustainability. Makrakis & Kostouslas Makrakis (2012), argue for the integration of these five clusters of competencies in sustainability learning and teaching because its application engenders learning and behavioural changes in learners that are essential for achieving sustainable thinking and living (learning to live sustainably).

Makrakis & Kostoulos Makrakis (2013) argue for the need to foster the five clusters of sustainability competencies in sustainability education in order to develop in learners, “*a shift of consciousness that alters: [their] way of being in the world (learning to be), [their] way for discovering others by discovering [themselves], (learning to live together), [their] way of learning how to learn as well as appreciating all sorts of knowing (learning to know) and [their] way of putting knowledge into action, (learning to do)*” (P. 32). It is above all learning to “*transform problematic frames of references – sets of fixed assumptions and expectations—to make them more inclusive, open reflective and emotionally able to change*” (Mezirow, 2003:57-58 as cited in Makrakis & Kostoulos Makrakis, 2013, p.32). Marinova & McGrath (2004) recommend the fostering of the competencies of *learning to do* in sustainability because it enhances in learners' skills to facilitate collective participation, collaboration, inclusive reflections and actions to solve sustainability problems. They argue that it also enhances in learners the ability to relinquish power and encourage the empowerment of others; promotes learners' skills in envisioning both at personal and collective levels. Marinova & McGrath (2004) further suggest the fostering of the competencies of *Learning to be* in sustainability education because it enables the learner not only to master knowledge but also to develop a sense



of self. It also enhances in learners, the skills to make reflections about the reasons for people's life on earth and the right of others to exist. It promotes a sense of self consciousness, empowerment, and a feeling of one's place within the wider network of life which transcends into a wider network of relational and empowerment. The Tempus RUCAS initiative calls for the integration of the five clusters of competencies: *Learning to know, Learning to do, Learning to be, Learning to live together* and *Learning to transform oneself and society*, because these competencies are necessary to engender transformative behavioural changes in learners to live sustainably. UNECE (2005) suggests the fostering of competencies like critical thinking, imagining future scenarios and collaborative decision making in sustainability education.

In relation to learning to know, university staff interview participant A explains that learners need to have *“deep understanding of what sustainability is and what it isn't”*. While University staff participants D and E explain that this involves learners developing skills in critical thinking and analysis. In relation to the competence of *learning to be*, university staff interview participant A explains that learners need to have communication competencies. He argues that learners need to develop *“inter personal and intra personal skills. Let students understand what intra personal means, knowing yourself and to know yourself; identifying weaknesses, identifying strengths”*. In relation to *learning to live together*, university staff interview participant A explains that learners need to develop competencies in active citizenship so that they become active citizens to help in building more sustainable future communities. As far as *learning to transform oneself and society* is concerned, university staff participant G explains that learners need to develop *“the ability to change and that all links to different types of competencies in ESD because if you want to make change you need to engage with the community and then you bring in the resources of the local community and that is [networking], sharing of knowledge, sharing of experiences....Empower learners so that they can make change and be the change they want to see in the world”*. With regards to sustainability competence of *learning to live together*, university staff participant A explains that learners need to develop competencies in active citizenship so that they become active citizens to help in building more sustainable future communities. In relation to assessments/measuring learners' sustainability competencies, university staff interview participant F explains that *“I use other assessment methods that “measure participation rather than giving marks but are rather towards deepening competencies and skills”*.

While university staff interview participant B explains that “*I do the pre-assessment of learners’ prior knowledge and understanding of sustainability and sustainability principles and then relate... them to the themes they are learning for their own understanding in sustainability learning*”.

#### **4.3.5 Sustainability Indicators**

The indicators developed within GCM were informed and/or validated by the work of key theorists and existing research studies, and the emergent DAB framework has been tested through a rigorous process of piloting, evaluating and revising using quantitative testing protocols. Furthermore, the NEP, a standardised tool for measuring learners’ pro-ecological worldviews, informed and partially validated the GCM emergent DAB tool (Dunlap & Van Liere’s (1978, 2000) New Ecological Paradigm scale).

Dunlap & Van Liere’s (2000) New Ecological Paradigm measures learners’ proecological worldviews in sustainability education. The NEP survey instrument is made up of 15 statements in which learners are asked to agree or disagree with the statements aim of ascertaining whether their worldviews are proecological or anthropocentric. The NEP, Tempus RUCAS project, university staff interview responses and extant literature on ESD informed the GCM emergent DAB tool. The DAB tool is a survey instrument made up of 49 sustainability related statements that requires learners to agree or disagree with some of the statements as well as state the frequency of actions they have taken within a given time frame to promote sustainability. The aim of the instrument is to profile learners’ sustainability related competencies within a given time frame.

In relation to evaluating and validating the DAB, the tool was vigorously tested through three online students’ surveys to profile their sustainability related competencies as well as examine the effectiveness of the DAB instrument compared with the NEP standardized sustainability competencies assessment tool. The three online surveys included: The students’ Pilot survey deployed in March 2014 with 37 students’ responses and the Students’ University-Wide survey deployed in April 2015, with 132 students’ responses. The results of the two students’ surveys show that despite being overwhelmingly positively disposed for sustainability, university undergraduate learners do not take

adequate actions to promote sustainability in areas like mitigating climate change and advocating for environmental justice. This finding calls for the need to address sustainability in higher education curricula. The third set of surveys used in this study involved the deployment of two survey instruments (DAB/NEP) to a case group of undergraduate university learners to make a comparative study of learners' sustainability competencies using the two instruments. Two online survey (DAB and NEP) questionnaires were deployed to the case group in September 2015, with 38 student responses.

#### **4.4 Conditions for deploying GCM**

The conditions for deploying GCM have been inspired from the work mainly of Burns' 2011 in her articulation of the sustainability pedagogy model (specifically the 5<sup>th</sup> goal of ecological course design process which drew inspiration from Hemenway's (2000) five-stage process of ecological design), and from interviews from university staff interview responses.

Sustainability experts at international level have made pertinent recommendations for reorienting higher education policies to embrace sustainability through policy actions which if implemented would ease the implementation of the Green Curriculum Model elements in sustainability learning and teaching. Addressing sustainability in higher education requires institutions to reorient policies and practices towards sustainability. At institutional level, it is necessary for policy makers to develop institutional visions for sustainability education.

Sterling (2009) argues that there is the need for a change in the policy climate as well as providing fertile conditions for change to address sustainability. He further suggests the following: that institutions need to implement policies that set the stage for sustainability practice; that educators need to be given the facilities, information as well as staff development through training workshops and conferences on addressing sustainability in programmes and courses and that such policy orientation should take a bottom-up approach that encourages collaboration, and the academic community should have a sense of ownership of the change process through engagements. Sterling (2009) also argues that "*people resist change if they feel it is externally imposed... innovation stands*

*more chance of success if it is perceived as 'helpful', 'plausible', 'possible' and likely to be 'fruitful'"* (p. 82). He further explains that higher education administrators need to be open minded and willing to learn about sustainability. As Sterling (Ibid.) highlights, higher education administrators should also be willing to embrace the need for consolidated policies with colleagues of other private and government departments in areas like commerce, environment, health, development and socio-cultural issues. He continues by explaining that higher education administrators should use the pool of existing sustainability experts within the institution, encourage their work and set up research and monitoring groups that can help to advance the institution's sustainability agenda. Sterling further argues that there is the need for change to effectively push forward the institutional sustainability agenda; such policy reforms should be inclusive, supportive, democratic, allowing people the time and space to think and engage with the reform process and resources and funding should be allocated for the implementation of such policy reforms (Ibid.). He goes on to suggest that higher education staff should value the contributions of other colleagues, collaborate and share ideas with colleagues of other departments on addressing sustainability in programmes and courses. Also, Sterling (Ibid.) calls on higher education staff to help policy makers and programme chairs and others on sustainability re-orienting schemes providing examples of addressing sustainability in the curriculum process and networking with others to share ideas about infusing sustainability in the learning and teaching process. Peperzak, Levy & Marans (2012) call for the need to create an institutional culture in higher education that is dedicated to sustainability and which promotes interdepartmental collaboration, where champions of sustainability take the responsibility in collaboration with the administration in providing training on what measures to take in addressing sustainability in the curriculum. Sterling (2002) and Burns (2011) also suggest the need for educators to change higher education culture to embrace systemic, connective, inclusive, transformative, ecological and values-based learning approaches that engender in learners' real life changes that foster sustainability. Alvarez and Rogers, (2006) and Burns, (2011), call on educators in higher education to embrace discursive teaching approaches to enable learners to better engage in the sustainability learning and teaching process.

The UNECE (2007) joint ministerial conference on ESD recommends the training of higher education staff to improve their competencies in ESD because higher education

institutions play a crucial role in preparing future leaders and specialists in a variety of fields, including education and ESD. UNECE (2011) also recommends the development of academic quality assurance instruments such as (institutional and departmental reviews and external evaluations based on ESD competencies and principles. UNECE (Ibid.) also suggests that existing and new academic programmes and educational strategies in higher education be underpinned by ESD principles and competences.

At the local level, UNESCO (2005a) calls on governments to allocate funding for in-service higher education staff development programmes on ESD. UNESCO also recommends that higher education institutions should ensure that the training programmes bring together essential skills, cross-cutting curriculum approaches and actions based learning models that are relevant nationally and in the local contexts. In the same light, Tilbury et al. (2007) call for the need to provide funding and training for educators to facilitate the adoption of educational approaches that incorporate ESD perspectives. UNESCO (2005a) highlights the need for higher education institutions to ensure that ESD learning and teaching is taken beyond the higher education campus by encouraging outdoor learning; encouraging senior civil servants in government departments to champion causes of sustainability as well as act as guest speakers to promote what they are doing in ESD. UNESCO (Ibid.) also calls on higher education institutions to make use of local community resources, NGOs, institutions, government agencies and private businesses in promoting sustainability. UNESCO (Ibid.) also recommends higher education staff to teach about local sustainability issues, effort to address these issues; local sustainable practices and sustainable business. UNESCO (Ibid.) further suggests the necessity for higher education institutions to build ESD partnerships among themselves locally and internationally to promote ESD, making sure that ESD becomes the norm instead of being isolated cases of institutions interested in ESD. UNESCO (Ibid.) also recommends that higher education institutional ESD audit and assessment policies be developed based on sustainability principles to create an enabling environment for the development and practice of ESD.

In terms of opportunities available that could assist university staff in the process of infusing sustainability in their respective programmes and courses, university staff interview participant A identified some policies put in place by the university to raise awareness on sustainability issues such as the introduction of sustainability as part of induction for newly recruited staff. University staff interview participants A, B and C

explained that the establishment of the United Nations recognised centre of expertise for sustainability (RCE Dublin) and the actions of individual sustainability champions in the university who are engaged in research projects like Tempus RUCAS have done a lot in promoting sustainability in the university. However, they argue that this has been a *“bottom-up approach where colleagues have taken the lead to engage with sustainability on their own”*.

The implementation of suggestions and recommendations from these key ESD theorists; ESD researchers; university staff interview participants’ responses; UNESCO and UNECE by higher education institutions provide useful advice for those contemplating using the GCM in addressing sustainability in higher education programmes and courses in the local context of Ireland.

#### **4.5 Challenges & Barriers for GCM in Higher Education**

Many challenges/barriers have been identified from the work of key ESD theorists, research studies and interviews from university staff responses which could pose significant difficulties in using the GCM and there is the need for governments and higher education institutions to take measures to address these challenges so as to ease the effective use of the GCM for addressing sustainability in higher education programmes and courses. As already mentioned in chapter 2, UNESCO (2005a), UNECE (2007) and Huckle (2008), identified need for transdisciplinary learning, upskilling of higher education staff and more participatory approaches in course design. Furthermore, more they revealed that more work is needed to engender politicians and policy-makers to support promotion of ESD. University staff interview participant C corroborates UNESCO (2005a) arguments on higher education academics’ time factor as a hindrance to addressing sustainability in their programmes and courses by arguing that because of *“lack of time to think about sustainability and to even do the other things, it makes it difficult to allow one to introduce any thoughts of sustainability within your module and if there was a policy change”*. In the same vein, higher education staff interview (participant A) explains that one of the setbacks with infusing sustainability in courses is the fact that: *“I think from a policy level or institutional level, its lip service that is paid to the social element of ESD, you know to the personal social element. The problem is*

*that universities and the other organisations follow the money. Public relations in universities look at the green side because that's where some funding is coming from. The social side is a lot more complex and there are some grey areas and it's very hard to implement. So, I think we probably as an institution avoided fully looking at this idea".* University staff interview participant A further argues that the Irish government is paying lip-service to the call for promoting sustainability in programmes and courses by highlighting the fact that this lack of interest on the part of the Irish government was reiterated when the representative of government during the launch of the RCE Dublin argued that with the advent of the 2007 economic crises the *"department of education were writing education for sustainable development policies up until 2007 and they had a try at it, and then came the economic downturn and the country went into recession, they said everything that wasn't about survival disappeared"*. Participant A further argued that *"something like sustainability is sometimes still seen as a luxury rather than a necessity. It sometimes falls off the agenda quicker than other things because maybe it's not fully understood, whereas I think if you put that [sustainability] first, everything else... comes out of it"*. Participant A also explained that the fear of the unknown and increasing staff workload is a challenge for educators to engage with sustainability, reiterating the argument by saying *"...another challenge is trying to get colleagues of my own department and my own programme and maybe part time staff to engage with this concept without making it seem like another piece of work. Because I realize that anything new you want to bring in colleagues feel it's just another piece of work. I would love to be able to let our colleagues know, if you list everything you do, the way you talk to students, the way you do tutorials, the way you assess it, you probably are doing a lot of sustainability practices without recognising them. So maybe the first stage is to get to recognise what we do under the ESD banner and then look at other people who are doing things even better"*.

All the above-mentioned challenges identified by sustainability theorists, researchers and higher education staff, play a contributory role in propagating the difficulties which higher education staff face in address sustainability in higher education programmes and courses and these challenges could also make it difficult for higher education academics to effectively use the GCM in infusing sustainability in their programmes and courses. It is thus incumbent on higher education institutions/leadership to ensure an enabling environment through the implement of policies that favour the promotion of

sustainability within their institutions to ease the use of the GCM to address sustainability in higher education programmes and courses. Also, overcoming these challenges requires higher education staff to show interest and the willingness to learn and engage with sustainability. There is thus the need for the use of both top-bottom as well as bottom-top approaches to promote the infusion of sustainability in higher education.

## **4.6 Reflections from Conference Presentations**

The presentations at workshops and conferences offered opportunities for feedback and suggestions from the sustainability community of experts, from those involved in ESD research, policy makers and practitioners, and these research inputs informed and/or validated the inclusion of elements within the GCM.

**4.6.1 DCU Sustainability Conference, 3rd December 2012:** A conference poster titled *A critical review of sustainability in higher education in Ireland* was presented during the DCU sustainability conference organized by the DCU sustainability committee in 2012. The preliminary findings of the critical review of the state of play with regards to infusing sustainability in higher education in Ireland were presented and explained to conference participants. The findings from the review showed that although some actions were being taken by higher education institutions to embed sustainability in higher education courses covering the three cornerstones of sustainability (environment, economy and society), the perspectives on culture, the fourth corner stone of sustainability remained neglected. Also, much emphasis was placed on promoting environmental sustainability more than the other areas. The findings presented a picture of the non-holistic approaches used in addressing sustainability in higher education courses, programmes and campus greening activities in Ireland.

During the poster presentation, some conference members questioned the relevance of the cultural perspectives of sustainability as well as raised disciplinary focused arguments that sustainability was not necessarily relevant in some disciplinary areas. These critiques prompted me to make explanations to highlight the importance of culture as the fourth cornerstone of sustainability as well as explain the multidisciplinary and crossdisciplinary nature of sustainability education.



The shortcomings identified in the prevailing practices in addressing sustainability in higher education in Ireland, as well as the environmentally focused perceptions of sustainability as identified from the arguments of conference participants, informed the need for developing an instrument with elements that could guide educators to take holistic approaches in embedding sustainability in their programmes and courses. The elements of the GCM were thus developed with the intent of having a paradigmatic instrument that catered for all the vital components necessary for holistically integrating sustainability in higher education courses and programmes.

#### **4.6.2 Education Studies Association (ESAI) Conference, Athlone, 12<sup>th</sup> April 2014:**

A Conference paper entitled *The Green Curriculum Model: A framework for infusing sustainability in higher education curriculum in Ireland*, was presented in the session for Development education and sustainability with positive feedback from participants on the explication of the GCM and DAB tools (interestingly mainly from teachers of second level education who showed interest in the DAB indicators instrument for profiling learners' sustainability competencies).

#### **4.6.3 The Fifth Annual Postgraduate Research Conference in Humanities and Education, 8th May 2014, St Patricks College Drumcondra, Dublin:**

A paper was presented on infusing sustainability in Higher Education with a summary discussion of the key elements of the Green Curriculum Model. The participants of the session expressed great interest in the model. An important question was asked on how the GCM could be used to embed sustainability in disciplinary areas like mathematics. Through contributions from other participants, clarifications were made on possible ways of addressing sustainability in subject areas like mathematics using the GCM for example in calculating the volume of atmospheric carbon dioxide emissions and the contributions such approaches could help in finding solutions for processes like carbon sequestration in the future economy and society. Another example that the presenter highlighted was from McKeown's (2002, n.p.) ESD Toolkit, in which she explains that "mathematics helps students understand extremely small numbers (e.g., parts per hundred, thousand, or million) which allows them to interpret pollution data".

**4.6.4 DCU Education Studies Show Case Conference 10th May 2015:** Positive Feedback and suggestions on the GCM were received following a paper presentation titled (*Infusing sustainability in higher education curricula*). Participants at the conference applauded the articulation of the different elements of the GCM. Two suggestions were made about the types of content necessary to include issues around climate change and cosmopolitan citizenship. A principal issue that was also raised was the need to think on possible assessment approaches that would be used in assessing learners' sustainability competencies in the sustainability teaching and learning the complexity and ambiguity of the concept. Further explanations were thus given to the audience about the progress made towards the future development of an indicator tool for assessing learners' competencies called the DAB that could be used in assessing learners' sustainability competencies.

**4.6.5 The National Seminar on the Use of ESD Formative Assessment Methods in Undergraduate Teacher Education Programmes 31<sup>st</sup> May 2016, GMIT Galway\*:**

A seminar paper entitled *Assessing ESD competencies, namely students' dispositions, abilities and behaviours, using the DAB framework*, was presented on DAB sustainability Assessment tool during which discussions focused on the use of the DAB framework as a tool for assessment *Of* and *For* sustainability learning. The presentation of the DAB sustainability assessment tool was received with a lot of interest as expressed by the participants. The feedback was very positive with expressions of interest in the framework shown not only by higher education staff participants but also representatives from the educational curriculum service of the Department of Education and Skills, who later sent in emails to me and my supervisor, requesting for more details about the framework and how it could be used in sustainability education assessment in schools and higher education institutions in Ireland.

**4.6.6 European Conference on Educational Research (ECER), Dublin 23<sup>rd</sup>-25<sup>th</sup> August 2016:**

A conference paper entitled *Profiling University Undergraduate Learners' Behaviours in Promoting Sustainability, Using the Dispositions, Abilities and Behaviours (DAB)*

Framework, was presented on the 25<sup>th</sup> of August 2016 in ECER conference session, Higher Education: New Perspectives to Learning. The paper presented parts of the results of an undergraduate students' university-wide survey deployed as part of this study in 2014 that profiled undergraduate university students' sustainability competencies and focused on the results of their sustainability related behaviours within a given time, which was an attempt to test the effectiveness of the DAB instrument in assessing learners' sustainability competencies. The presentation explaining the DAB and its use in profiling higher education learners' sustainability competencies and the results of the DAB survey on learners sustainability related behaviours, which showed that, although higher education learners are generally positively disposed for sustainability, there is a disjoint between their attitudes towards sustainability and the actions they take to promote sustainability issues, received great positive feedback from the conference participants. Attending participants were very interested in the framework and this led to requests from two participants from Austria and Denmark for further details on the framework and requests for collaboration in future projects related to the assessment of learners' sustainability competencies.

The ideas, critiques, feedback and suggestions from conference participants of the various conferences in which the GCM and DAB were presented helped in the refinement of the GCM and DAB tools and thus informed and/or validated the inclusion of elements of the GCM and DAB.

## **4.7 Conclusions**

This chapter brought together the key informants with respect to the design, development and refinement of the Green Curriculum Model. The process involved review of the literature, on-going reflection from engagement in the Tempus RUCAS project, interviews with staff from higher education, and critique from scholars and researchers at seminars and conferences within and beyond the field of ESD.

## Chapter Five: Green Curriculum Model

### 5.1 Introduction

This chapter presents the conceptual design framework, known as the Green Curriculum Model; the preceding chapter has explained the evidence-base for the formation of this framework. Since the UN declaration of the Decade of Education for sustainable development (2005-2014), sustainability education has become the hot topic globally and especially within academia. However, there is still limited research that provides specific theoretical or paradigmatic pathways to guide educators on how to infuse sustainability in higher education teaching courses. It is to fill this gap in literature that the Green Curriculum Model has been conceptualized and designed in this study.

The purpose of equipping learners with sustainability knowledge, skills and competencies in the sustainability education is to enable them become change agents and problem solvers to seek solutions to the ever-increasing sustainability challenges facing the world such as climate change, pollution, ozone depletion, consumerism, overexploitation of non-renewable natural resources like oil, poverty, social injustice and food insecurity, to name but a few. To make the world a more sustainable and better place to live in, humanity needs to seek solutions to these ever-growing world sustainability challenges. Education and awareness about these problems is vital. Through education possible solutions to address these sustainability challenges could be developed. In this light, therefore “*the basis of success of any sustainability initiative is a changed mindset which manifests in changed behaviour at an individual personal level*” (Solomonides, 2009, p.10). Within higher education sustainability competencies could be imbued in learners through re-orienting higher education curricula to address sustainability. Thus, a sustainability infused curriculum reflects the integration of elements of sustainability related content and principles, the use of sustainability related pedagogic and assessment approaches as well as fostering the acquisition of sustainability knowledge, skills and competencies by learners.

## **5.2 Green Curriculum Model**

The Green Curriculum Model provides a much needed comprehensive and practical conceptual design framework, highlighting theoretical and pedagogic approaches to guide the design and integration of sustainability in higher education programmes and courses based on sustainability education principles, sustainability related pedagogies, competencies and indicators.

The framework presents a critical sustainability education process that reflects the interrelationships that exist between the different components of the green curriculum. The emergent outcomes/competencies of the teaching and learning processes inherent in the green curriculum are a product of the interactions between the sustainability content, principles and pedagogic approaches used, which are facilitated by the educator(s) using constructivist, values-based, experiential and transformative pedagogic approaches and the learners' actions and interactions which are reflected through their engagements in the learning process. The framework guides the educator in the design of the sustainability infused curriculum and the learning, teaching and assessment process, using sustainability related content, principles, pedagogies and indicators to foster learners' acquisition and manifestations of sustainability skills and competencies and actions to become sustainability change agents.

The Green Curriculum illustrates the five levels of a sustainability infused curriculum, namely: (1) Content, (2) Principles, (3) Pedagogic approaches, (4) Competencies/ Outcomes, and (5) Indicators as shown in figure 8.



Figure 8. Levels in the Green Curriculum

The overarching goal of the green curriculum framework is to increase learners' knowledge of sustainability (through the sustainability content); imbue in learners the critical understanding of the ten key sustainability education principles; provide educators and learners with practical sustainability pedagogic, learning and assessment approaches and processes that weave together the sustainability related content and principles to create more transformational learning experiences that provide learners with the necessary sustainability competencies to help them develop the capacities, aptitudes and attributes to become sustainability minded citizens. The degree of embedding of sustainability within the curriculum could then be measured using the sustainability indicators which are a reflection of how well the curriculum design encompasses the different elements of the green curriculum. Also, through the indicators, a profile of a cohort of learners' sustainability competencies could also be assessed, through profiling their sustainability related dispositions, abilities and actions (behaviours) at a given point in time.

The Green Curriculum Model brings together content (that is the sustainability thematic areas to be taught or the disciplinary themes that incorporate sustainability); sustainability principles (which include the ten key sustainability principles incorporated in the green curriculum framework); sustainability related pedagogies (which include socio-constructivist, values-based, transformational and experiential learning pedagogies); sustainability related competencies which enable learners to acquire the necessary

aptitudes, attitudes, skills and knowledge to become sustainability change agents within their communities and in working life and the sustainability indicators, and can be used as a conceptual guide in framing the sustainability related programme or course curriculum as shown in figure 9.

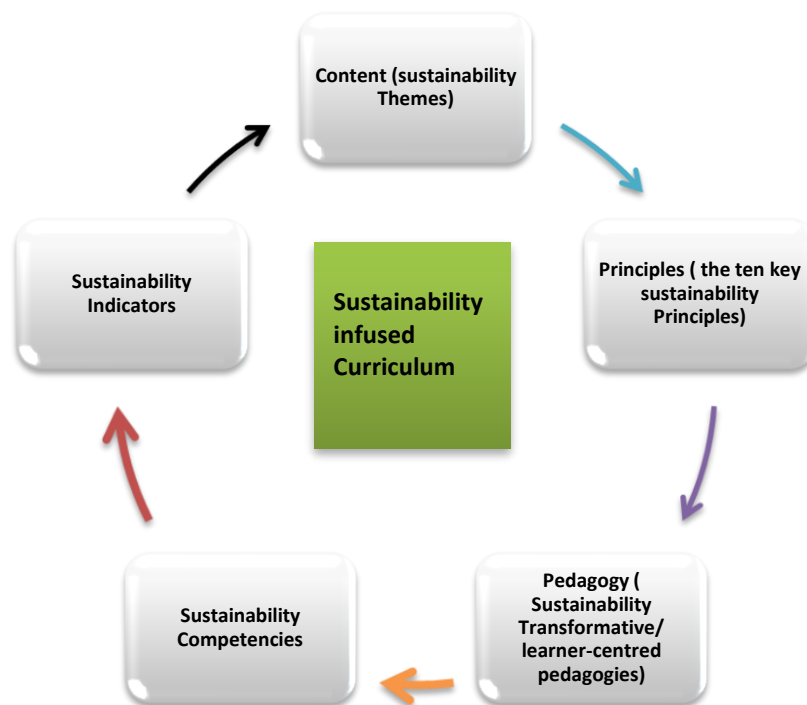


Figure 9. Interrelationships of the key elements of the Green Curriculum

The central goal of the Green Curriculum Model is to enable educators to infuse sustainability in a way that enables learners: to gain the knowledge, skills and aptitudes to become sustainability minded citizens; to understand the complex sustainability issues and challenges facing the human society at local and global levels; and to enable to take actions to seek solutions to the numerous sustainability challenges they will face in their local communities and in their working lives.

### 5.3 GCM Conceptual-design Framework

Figure 10 illustrates the five levels, and accompanying elements, of the Green Curriculum Model. This section provides an overview of the content at each level of GCM. The validation of the GCM (including the evidence-base for inclusion of these elements) is fully explained in the next chapter.

## Level 1: Content

Four Cornerstones of Sustainability, and Cross-cutting themes.

## Level 2: Principles

Change Agency; Multiple Disciplinarity Insights; Reflexivity; Sustainability World Views, Values and Ethics; Systemic Thinking; Authentic Real World Cases Learning; Democracy; Inclusivity & Multiple Voices; Futures Thinking; and, Contextualization.

## Level 3: Pedagogic Approaches

Experiential Learning; Constructivist Learning; Ethical Values-based Learning; Transformative Learning.

## Level 4: Competencies/ Outcomes

Learning to: Know, Do, Be, Live Together, Transform Oneself and Society.

## Level 5: Indicators

Sustainability Dispositions, Abilities and Behaviour (DAB) Indicators

Figure 10. Key elements of the Green Curriculum



### 5.3.1 GCM Level 1. Sustainability Related Content

The teaching of sustainability requires the incorporation of sustainability themes which cover the four cornerstones of sustainability- the environment, economy, society and culture. Culture is a vital cornerstone of sustainability. It includes “*our whole system of beliefs, values, customs, institutions and social relations*” (Polistina, 2012, p.117). As the fourth pillar of sustainability, culture is the adhesive that holds the other pillars (environment, economy and society) together (Hawkes, 2001, cited in Polistina, 2012). UNESCO (2005c) recommends the integration of the cornerstones of ESD – environment, society, economy and culture in sustainability learning and teaching. In the case of sustainability specific programmes or courses, it is vital that learners are educated on the complexities and sustainability challenges inherent in the four realms of sustainability. However, the disciplinary nature of third level education poses a challenge in emphasizing on all the four cornerstones of sustainability within a given course structure (Burns, 2011). In such instances the Green Curriculum Model guides educators towards implementing inter-disciplinary processes in fostering sustainability themes within the given sustainability content.

While the overall goal of the model is to foster all the cornerstones of sustainability, its application should be rooted in the specific course orientations and the use of multiple perspectives (be them disciplinary oriented, intra-disciplinary, inter-disciplinary, trans-disciplinary, multidisciplinary as well as non-disciplinary perspectives). Thus, the content should be “*general, indicative and allied to open-ended outcomes that can embrace emergence and the generation of knowledge in the learning situation*” (Sterling, 2003.p.330). In cases where the course is not specifically on sustainability, the educators could integrate sustainability themes which are related to their disciplinary orientations and foster the sustainability principles inherent in such themes using the Green Curriculum Model tools. Table 4, presents sample themes as well as cross disciplinary themes that cover the four cornerstones of sustainability that could be integrated in course curricula.

Table 4. Sample Sustainability Course Content/Cross disciplinary Themes

\*Author's compilation with adaptations from Lozano and Peattie (2011).

Economy	Environment	Society	Culture	Cross-cutting Themes
GNP Resource use, exhaustion (materials, energy, water) Finances and SD Production, consumption Patterns Development al economics	Policy/ Administration Products, services transport Pollution Accumulation of toxic waste/Effluents Biodiversity Resource efficiency, ecoefficiency Global warming Emissions, Acid rain, Climate Change, Ozone depletion Resources (depletion, conservation) materials, energy, water) Desertification/Deforestation, Land Use (agriculture, construction, housing) Alternatives	Demography, Population Employment, Unemployment Global citizenship. Poverty Governance Bribery and corruption Equity and justice Human rights Labour Education Health Social Cohesion World Views and Values Education.	Cultural diversity (own and others) Arts and literature Culture preservation Indigenous knowledge	People as part of nature/Limits to growth Systems thinking (holistic thinking) /application Human systems Wellbeing: personal, family and community wellbeing. Responsibility (Individual, community, Corporate Social Responsibility) Environmental stewardship: Ecological systems. Governance Futures thinking Communication/Reporting SD statement Disciplinarity/ cross-disciplinarity/ multi-disciplinarity/ non-disciplinarity Ethics/ Philosophy

### 5.3.2: GCM Level 2. Sustainability Education Principles

Within the Green Curriculum Model, ten key sustainability education principles have been identified which are necessary in sustainability education. To effectively prepare learners to face the ever-increasing sustainability challenges of the world as well as become sustainability minded citizens, educators need to foster these principles in sustainability learning and teaching processes. There is no hierarchy in this set of principles, nor is there a prescribed number or mode of integrating them in a particular part of the curricula. Rather the educator is asked to consider when and how these

principles could be integrated across the programme of study to facilitate quality, action-oriented, critical learning experiences with respect to sustainability. The principles include: Change Agency; Multiple Disciplinarity Insights; Reflexivity; Sustainability World Views, Values and Ethics; Systemic Thinking; Authentic Real World Cases Learning; Democracy; Inclusivity & Multiple Voices; Futures Thinking; and, Contextualization. It is necessary for educators to foster these key sustainability principles in sustainability teaching and learning and teaching so that through fostering these principles learners would be exposed to the necessary transformative learning experiences to become sustainability minded citizens.

#### **5.3.2.1. Change Agency**

Sustainability education is action-oriented. The purpose of sustainability is to enable learners to change their behaviours, values and attitudes to embrace sustainability. Thus, change agency is an important sustainability principle that is necessary for infusing and fostering sustainability in our daily lives.

#### **5.3.2.2 Multiple Disciplinarity Insights**

Because of the broad and complex nature of sustainability education, in fostering sustainability in university curricula educators need to integrate knowledge and activities in the learning and teaching process that take into consideration disciplinary, cross-sustainability and non-disciplinary perspectives so as to equip learners with knowledge and capabilities of using both disciplinary, cross-disciplinary and non-disciplinary knowledge and skills to seek and solve sustainability related problems. In this regard, there needs to be consideration of how disciplinary, co-disciplinarity, con-disciplinarity, cross-disciplinarity, infra-disciplinarity, inter-disciplinarity, intra-disciplinarity, multi-disciplinarity and trans-disciplinarity perspectives can be integrated in curricula, to offer critical insights into sustainability theme/s or challenges under examination.

#### **5.3.2.3 Reflexivity**

Reflexivity in sustainability education is necessary for both the learners and the educators. For the learners, it offers them the opportunity for self-critique, engaging in a process which enables them to look back on past learning experiences, what they did to enable learning to occur (i.e. self-reflection on how learning took place), and to explore the connections between what was taught and their own ideas about knowledge (i.e. self-

reflection on what was learned) (Lew & Schmidt, 2011). In such a context, the process of self-reflection can lead to informed and thoughtful deliberations on the learner's behaviours and actions. On the part of the educator, he/she engages in solitary introspection or a critical dialogue with others on the sustainability learning and teaching process. As Finlay (2008) explains, practitioners may embrace reflective practice "*occasionally in formal, explicit ways or use it more fluidly in ongoing, tacit ways. For some, reflective practice simply refers to adopting a thinking approach to practice. Others see it as self-indulgent navel gazing. For others, it involves carefully structured and crafted approaches towards being reflective about one's experiences in practice*" (p.2).

Reflexivity is an important principle of sustainability learning and teaching because it enables critical reflective practices both for the learners and educators, to think about their own learning and practices, engage in introspection, self-evaluation and re-orientation to engage with sustainability knowledge and practices that enable action to promote sustainability.

#### **5.3.2.4 Systemic Thinking**

Systemic thinking is a key principle within sustainability education, and thus educators must consider ways in which systemic thinking can be fostered within programmes and courses of study in ESD. The sustainability of the socio-economic, cultural and ecological systems requires a shift in human values and belief systems to embrace whole systems thinking – thus recognizing the interconnectedness of all entities, processes and systems (human and non-human) on our planet – and appreciating the co-evolution of organisms and their environment. Sterling (2003, p. 167) argues that organisms and their environment affect each other and change together in systemic relationships, and furthermore that there is the need for a shift from our mechanistic and reductionist worldview to embrace an ecological worldview that emphasises on whole systems thinking (holism). In doing this, according to Sterling (2003) the ecological values of "*sufficiency, conservation, equity and justice, community, respect for and appreciation of the other, diversity, inclusion, democracy, self-reliance, self-organisation, partnership, futurity, trusteeship, resilience and durability and system health and viability, are valued*" (p. 171).

### **5.3.2.5 Authentic Real World Learning**

In the technology, oriented world of the 21st century, learners are more interested in learning by doing (using technologies) instead of listening and learning through experience and practice. Authentic learning focuses on real world, complex problems and their solutions, using role playing exercises, problem-based activities, case studies and participation in [both live and] virtual communities of practice (Lombardi, 2007). Authentic learning enables students to develop good judgment skills (which enable them to distinguish between reliable and unreliable information. They are able to develop the ability to recognize patterns in unfamiliar context as well as "*the flexibility to work across disciplinary and cultural boundaries*" (Lombardi, 2007, p. 3).

Thus, authentic learning enables learners to engage in real world sustainability issues that are relevant and of concern to them, and such learning awakens their confidence to act to promote sustainability (Lombardi, 2007). Authentic learning also helps learners to develop skills in teamwork, critical thinking, organization, innovative and creative thinking (Lombardi, 2007).

### **5.3.2.6 Democracy**

Integrating democracy in a sustainability education curriculum involves integrating learning activities that foster the acquisition, development and application of civic skills and values in learners and to enable them become sustainability minded citizens. The fostering of democratic values in education enables learners to develop and apply values of respect and inclusion in their working lives and communities in problem solving and engaging in civic and political life. It enables learners to build stronger and more sustainable democracies. The fostering of democratic values in learning and teaching for sustainability enables learners to acquire and practice values for reciprocal relationships, participatory and inclusive decision making, respecting and valuing differences and exercising their civic rights and responsibilities, thus promoting human rights and democracy, as acknowledged by Hartley & Huddleston, 2010.

Education for democratic citizenship enables learners to be active in democratic life and exercise their rights and responsibilities as citizens in society. The acquisition and

practice of democratic values by learners enables them to shun unsustainable societal traits like ethnic or political conflicts, anti-semitism, xenophobia, racism, religious intolerance and other societal intolerance as well as undemocratic values like poor governance, lack of accountability, bribery and corruption in public office, and nepotism. In university settings, education for democratic citizenship should help learners to become active participants in democratic life and decision-making. It should also help the learners to develop knowledge and capabilities to actively engage in civic life in their communities, nationally and internationally and *“develop a sense of belonging as members of society with equal rights and responsibilities and able to have an influence on and make a difference to what happens in the world”* (Hartley & Huddleston, 2010, p.15).

#### **5.3.2.7 Inclusivity and Multiple Voices**

Sustainability requires the building of a culture of inclusion in society be it in our work places, or communities. The building of a culture of inclusion in the sustainability learning environment, empowers learners to value and respect different voices, viewpoints and perspectives (Pless & Maak, 2004). To effectively develop an environment of inclusive culture whether in the community or work place several factors come into play, which include: the development and practice of recognition. Recognition within an inclusive environment requires the reciprocal recognition of oneself and the "other". The respectability of the human being depends on mutual recognition. As humans *"we want our loved ones to love us, our friends and colleagues to recognize us for what we are and what we do, our employer (for example) to honour our achievement and our government and fellow citizens to respect us and our rights as free and equal citizens"* (Pless & Maak, 2004, p. 131). It is imperative that a sustainability informed curricula content and practices responds appropriately to all learners' needs (avoid exclusionary practices) and empowers learners to voice their own perspectives, and challenge others where necessary.

#### **5.3.2.8 Futures Thinking**

Educating learners in futures thinking involves envisioning possible futures and educating learners with activities that ignite their critical thinking, creativity and imaginations to seek and design possible solutions for future sustainability problems and building more sustainable futures. Such education enhances in the learners the

capabilities, attributes and attitudes to think and act with futuristic considerations and building human societies whose actions take into consideration the interests of future generations and thus effecting intergenerational equity both in resource use and management and building more sustainable future societies and environments.

Incorporating futures thinking elements in the teaching and learning processes in higher education requires educators to envision the types of skills needed in the next century and the next generation society to make effective decisions. It requires integrating what is important to tomorrow's decision makers and envisioning how to teach the "*next generation to consider a multitude of possible futures*"(ASU, n.d., n.p.).

Fostering futures thinking in university curricula requires the integration of futures concepts and tools in the curriculum. These include envisioning a plurality of futures such as: probable futures, possible futures, desirable or preferred futures, prospective futures and alternative futures (Gidley et al. 2004). Such futures thinking in learning and teaching should include activities that foster learners' skills in forecasting, prediction alternative possible scenarios, and empowerment for change, problem solving, creativity and imagination.

#### **5.3.2.9 Sustainability Worldviews, Values and Ethics**

The call for the reorientation of people's worldviews to embrace proecological worldviews, values and ethics (Wade et al., 2014) highlights the centrality of ethical values-based learning in sustainability education.

Although values education is a contested field because of concerns over "which" values and "whose" values are being promoted. Such concerns are less of an issue in sustainability education because the core values being promoted in sustainability represent "*core values that respect human dignity, are life affirming, and are consistent with those of many cultures around the world*" (Earth Charter, 2000, n.p.). The Earth Charter calls for a new sense of universal responsibility in the global community that can be fostered in sustainability education through the fostering of values such as: the ethics of care - "*Care for the community of life with understanding, love, and compassion.*"; Respect for all living beings; Ecological Integrity; Social and Economic Justice; Democracy; Universal responsibility; Human rights; Environmental justice; and to promote a culture of tolerance, nonviolence, and peace (Earth Charter, 2000). All the

same there is the need for critical reflection to consider what values guide people's decisions and actions to move towards building more sustainable future communities.

#### **5.3.2.10 Contextualization**

The sustainability problems/ needs of a particular local community may not necessarily be the same for different regions or communities. Sustainability education learning and teaching takes into consideration the local and cultural context of learning. UNESCO, (2005b) calls for the implementation of all ESD programmes taking into consideration the environmental, economic, and societal conditions that are locally relevant and culturally appropriate.

### **5.3.3 GCM Level 3: Sustainability Education Pedagogies (Green Pedagogies)**

Barth et al. (2007, p.418) make a case for the fostering of strategic thinking, futures thinking and trans-disciplinary thinking whilst enabling critical reflection on self and others in sustainability learning and teaching. Rieschild (2009) argues that the fostering of skills like these encourage values-based and participatory learning and would be relevant to graduate outcomes within any discipline. The Green Curriculum Model identifies four key pedagogic approaches necessary for embedding sustainability in the learning and teaching processes, and that would help enhance the fostering of the aforementioned skills, namely: Experiential learning, Ethical Values-based learning, Constructivist learning and Transformational learning.

#### **5.3.3.1 Experiential Learning**

Experiential learning is appropriate for sustainability learning because sustainability learning is action-oriented. The goal of education for sustainable development is to enable learners to change their behaviours and act to promote sustainability. The sustainability challenges that societies are facing require, learners to seek solutions to them by proactively taking actions for example to learn how to reduce, re-use and recycle resources to avoid the overexploitation and use of the limited stock of planetary resources. For example, learners need to learn different ways of re-cycling and reusing resources instead of the 'throw away culture' of consumerism. Such learning becomes



effective where learners put into practice the knowledge they acquire in sustainability through experiential service learning.

#### **5.3.3.2 Constructivist Learning**

Constructivist learning opportunities are critical in the development of critically-minded, action-oriented learners, willing to work collaboratively with others. Socio-constructivist pedagogic approaches such as: experiential learning, service learning, project-based learning, and active learning should be considered within ESD, so as to enhance learners' skills and competencies in collaborative and cooperative decision making and in working cooperatively with other learners to seek solutions to the challenging sustainability problems.

#### **5.3.3.3 Transformative Learning**

Transformative learning involves going through deep changes that result in modifications in the basic premises of thought, feelings, and actions. It is a shift of realizations that intensely and irreversibly alters our way of being in the world. The effective transfer of sustainability knowledge, aptitudes and competences is anchored on the educator's ability to weave together transformative and learner-centred pedagogies (such as: Critical reflective inquiry and critical discourse; Problem-based/scenario-based/discovery learning; Case-based learning), and the given sustainability themes to foster sustainability knowledge and principles embedded within the sustainability themes, to produce in the learner the anticipated sustainability related competencies in the learning and teaching process. Transformative pedagogic approaches are vital in learning and teaching for sustainability. The types of transformational learning strategies to be used depend on the sustainability themes and inherent sustainability principles and the intended learning outcomes that the educator intends to foster in the sustainability learning and teaching process.

#### **5.3.3.4 Ethical Values-Based Learning**

Enhancing ethical values in sustainability learning and teaching involves promoting values like *“respect, equity, fairness, solidarity, democratic actions and behaviours within the learning environment. For the individual learner, deep reflection on the ethical-values basis contributes to the development of learner’s self-esteem and self-expression”* (Holland et al., 2012, p.44). For the educator/s, promoting reflection on the ethical-values basis within educational contexts contributes to the creation of a democratic, collaborative and safe learning environment. Learners’ values-bases are important drivers *“for decisions by the individual learner, community of learners and educator/s on how to engage learning and to what extent learning will take-place”*. (ibid, p.45). Ethical values-based learning emphasises on a relational approach to learning which requires learners to recognize the importance of the ‘other’ in the learning process and the understanding of other learners’ identities and approaches (Peperzak et al., 1996), and thus is critical in learning how to transform oneself and society, a key ambition of ESD.

#### **5.3.4 GCM Level 4. Sustainability Competencies**

The acquisition or non-acquisition of sustainability competencies is a product of the sustainability teaching and learning processes. It involves the interactions of the different elements of the Green Curriculum Model, the educator, learners and the learning environment. The effectiveness in achieving the emergent and/or anticipated sustainability competencies in the learning process depends on the lively animation of the learning process including the use of transformative, learner-centred pedagogic approaches and the co-creation of knowledge through participative, collaborative, authentic situated and values-based pedagogies. These elements (the sustainability theme(s), principles and pedagogic approaches) are woven together using the green curriculum guide to enable the learner to develop the sustainability competencies which are a set of skills, knowledge, attributes, attitudes and values necessary to become a sustainability minded and active citizen. The sustainability principles are manifested through the curriculum content and are transmitted to the learners using the appropriate sustainability pedagogic approaches to yield in the learners the expected sustainability outcomes and competencies. The competencies required for becoming sustainability re-

oriented are too many to provide in a definitive list, and thus are best conceptualized as the knowledge, skills and dispositions to transform oneself and society. In this respect, the competencies include those that are specific to a disciplinary area (the knowledge specific to the disciplinary area or programme), the skills necessary to undertake actions for sustainability, and the values orientations to want, to prevent, respond to, and/or mitigate against, sustainability challenges.

### **5.3.5 GCM Level 5: Indicators**

The GCM learners' competencies indicator is a micro level indicator used both within the classroom by educators and by academic programme chairs to yield a snapshot of the sustainability competencies of a cohort of learners at a particular time, with a view to exploring how the curriculum process addresses sustainability.

The GCM ESD learners' competencies indicator (the Dispositions, Abilities and Behaviours) DAB, is used during the ESD learning and teaching process to profile learners' ESD competencies at a given point in time. That is, it measures learners' acquisition and manifestations of the necessary sustainability knowledge, attributes, qualities, skills, values, and dispositions that foster sustainability at a given point in time. The DAB provides data to gauge the degree to which the cohort of learners has acquired and are manifesting the necessary skills, aptitudes, attitudes, qualities, knowledge, values and dispositions that promote sustainability at a given point in time. Within the Green Curriculum Model the ESD indicators are crafted through the Dispositions Abilities and Behaviours (DAB) framework.

The Dispositions Abilities and Behaviours (DAB) indicator provides an appropriate tool to assess learners' dispositions, abilities and behaviours vis-a-vis sustainability. The DAB measuring tool was devised in the course of this study to profile learners' sustainability related competencies. Learners' sustainability competencies are reflected in the way students make sense of our complex world, through their attitudes, aptitudes, and behaviours in relation to sustainability; and ultimately in the extent to which they can transform themselves and society to become more sustainable. Such learner competencies encompass their related:

**Dispositions:** Refers to learners' dispositions for sustainability and this includes: learners' desires/willingness and motivations to engage with sustainability and learners' attitudes, beliefs and value orientations in relation to sustainability. Learners' dispositions for sustainability relate to their sustainability competencies in 'learning to be' and 'learning to live together' (Delors, 1996). Learners' values-orientations, belief-systems and attitudes, influence their desires, motivations and willingness to engage with sustainability. The impact of worldviews on engagements with sustainability is vividly explained in Escobar's arguments that communities actively construct their socio-cultural worlds "*through their laborious daily practices of being, knowing, and doing ... even if in the midst of other forces.*" (Escobar, 2001, p.153). Cultural constructs and contexts thus impact on learners' desires and motivations to engage with sustainability.

**Abilities:** Refers to learners' abilities in sustainability, including: learners' skills, aptitudes and knowledge for action on sustainability. Learners' abilities to engage with sustainability relate to their sustainability competencies in learning to know and do (Delors, 1996) and this involves learners' cognitive capabilities and skills to engage in thinking that reflects sustainability values. This involves learners' development of cognitive capabilities for systemic thinking, strategic planning, critical reflection, values thinking and futures thinking for sustainability.

**Behaviours:** Refers to learners' behaviours in relation to sustainability. Learners' behaviours to promote sustainability relates to their sustainability competencies in 'learning to transform oneself and society' (Shaeffer, 2007). This involves their manifestations of sustainability through the actual actions taken to embrace or foster sustainability, thus acting as change agents for sustainability.

The DAB framework is a guide towards understanding the key areas to profile learners' sustainability competencies which include:

1. Assessing learners' dispositions vis-a-vis sustainability (which involves the process of assessing whether learners' values, attitudes and beliefs are oriented towards promoting sustainability values like promoting environmental health, social inclusion and justice, intercultural communication, acceptance and preservation of indigenous knowledge).
2. Assessing learners' abilities to foster sustainability (which includes assessing whether learners have acquired the requisite cognitive skills in systemic thinking,

strategic planning, critical reflection, values thinking and futures thinking as well as skills, aptitudes and knowledge in sustainability).

3. Assessing learners' behaviours vis-a-vis sustainability (which includes assessing the actual actions carried out by learners to act as change agents for promoting sustainability) as shown in figure 11.

The DAB framework has been tested across a number of contexts, and is further detailed in latter parts of this thesis.

## **5.4 Activating the Green Curriculum Model**

The design and development of any sustainability education infused curriculum should involve the identification of the sustainability principles that are embedded within the sustainability content as well as the use of the appropriate sustainability pedagogic approaches which reflect the identified sustainability principles and can convey the knowledge, values and skills inherent in the given sustainability principle to yield in the learner the appropriate sustainability related outcomes and competencies.

The sustainability principle/s are thus manifested through the curriculum content and is translated and or conveyed to the learner using the appropriate sustainability pedagogic approaches to yield in the learner the expected sustainability outcomes and competencies. The green curriculum design is a practical systemic and interdependent sustainability education learning and teaching framework that brings together the five components of the green curriculum (content, principles, pedagogies, competencies and indicators) holistically to foster active, participative, democratic and situated learning that transforms the learners to become active agents for change by taking actions to foster sustainability in their local communities and working lives. The intentional weaving of the green curriculum components in to a sustainability related course curriculum forms the design (Burns, 2011).

The green curriculum design is more of a process than a product with a set of plans to be implemented. The implementation of the GCM aligns with notions of fluid curriculum development, in which sustainability curricula design is considered as "*an active process in which planning, acting and evaluating are all reciprocally related and integrated into*

*the process*" (Makrakis, 2011, p.11; Grundy, 1987, p.115). In this regard, the Green Curriculum Model is presented as a conceptual-design framework that can be used as a guide in informing educators on what should be integrated within a sustainability-infused curriculum in higher education. It is a process of interactions that involves: teacher-to-learner, learner-to-learner interactions and interactions with the learning environment in the process of knowledge co-creation.

The green curriculum design is a cyclical intertwining process that mimics systemic patterns in nature and can be used as a guide on how to foster the creation of resilient and sustainable ecological, cultural, economic and social systems in teaching sustainability (Burns, 2011, Holmgren, 2004). The activation of the Green Curriculum Model has been inspired by the five phases of ecological course design (as articulated in goal five of Burns 2011's Model of Sustainability Pedagogy): observation, visioning, planning, development and implementation.

#### **5.4.1 Observation**

Observation is an important phase in the green curriculum design. It is the first step that the educator should carry out in the sustainability infused course design process. During this phase, the educator seeks to evaluate the available resources at his/her disposal for developing the sustainability thematic areas, fostering the sustainability principles and what pedagogic approaches to use and what anticipated competencies the students are expected to acquire. During observation, the educator assesses the opportunities and challenges inherent in gathering and crafting the necessary green curriculum tools. During this stage, the educator considers what are the available inputs to work with, what are the constraints that will help or hinder the process of putting together the sustainability themes, principles, appropriate pedagogies and the crafting of the desired sustainability competencies and indicators. Burns (2009, 2011) explains that during this stage, the educator considers what sustainability themes to incorporate in the course, what resources are available at his/her disposal and in implementing the course components. The process of observation provides opportunities for the educator to identify patterns and relationships among the components of the curriculum and understand the details (Burns, 2011; Holmgren, 2004). Through the observation process the educator assesses the academic and institutional ethos and culture in relation to the required sustainability course resources. The educator assesses what resources are available both internally and

externally that can support the efficient delivery of the course content. For example, are there available reading materials in the library? Is there sufficient funding for providing the reading list? Have external partners like sustainability organizations been contacted for any student field trips? Have these organizations sent approval to accept participation in the implementation of the course components? Considering the transdisciplinary nature of a sustainability infused course, are there colleagues from other disciplines willing to collaborate in developing and delivering the course? Is there support from the university administration vis-a-vis the needs of such a course curriculum re-orientation? Has the educator knowledge of who are the students that will be taking the course? Do they have prior knowledge of sustainability issues? What are the minimum requirements for undertaking the course, what is the nature (weight) of the course within the programme context? (Is the course a major within that programme or an optional module?). It is during the observation stage that the educator maps out all the needs for redesigning the course.

#### **5.4.2 Visioning**

During the visioning phase, the educator envisions the how and what of the course design. The educator is concerned with identifying what the curriculum design should be and should do? How it should look and feel like? What does it intend to accomplish? (What outcomes does the course design intend to deliver?). During this phase of the course design, the educator envisions which course themes are linked with which sustainability principles (as articulated within GCM) and what pedagogic approaches are best suited for delivering the themes and principles. How would the educator weave together the themes, principles and pedagogic approaches to deliver the necessary sustainability outcomes?

During the visioning stage, the educator seeks to identify his/ her strengths in relation to the course design and delivery and what areas of the course need external assistance.

During this stage, the educator envisions opportunities for relationship between the themes, principles and pedagogic approaches; relationships between learners and educators, between learners themselves as well as the interactions of both the educator and the learners with the learning environment during the learning and teaching process. As Burns (2011) argues, at this stage of the curriculum design, the educator envisions how and what kind of transformative learning will take place. The course design is envisioned in a systemic frame whereby the different components of the curriculum relate

with each other and are woven together to create a complex whole such that the curriculum design "*grows naturally from bottom up*"(Burns, 2011, n. p.).

### **5.4.3 Planning**

During the planning stage, the educator decides on what is needed in implementing the ideas for the curriculum, how would the different components or ideas be brought together. During this stage, the educator considers what resources (for example texts, available community resources, field visits if necessary, guest speakers, what classroom activities, what ICT resources and what assignments) would be incorporated into the course to effectively teach the chosen sustainability themes and foster the chosen sustainability principles embedded within those themes (as illustrated within levels one and two of the GCM). Burns (2011) argues that this stage is a good place to begin [the] "*detailed consideration of how to incorporate diverse perspectives, critical questioning of dominant paradigms and power relations*" (n.p.). It is also the stage to incorporate learner-centred pedagogic approaches that enhance active participation, values orientations, direct experience and place-based learning (Burns, 2011, 2009). During this stage, the educator plans on how to develop an integrated course in which the different elements are brought together with each playing a function(s) towards the attainment of the overall course goals. Different elements within the course could be used to perform multiple functions. Burns argues that "*creating relationships between all aspects of the course mimics the synergistic relationships in nature and provides [learning] opportunities that are meaningful and potentially transformative*"(Burns, 2011, n.p.).

### **5.4.4 Development**

This stage of the curriculum design focuses on reconceptualising ways in which the design will be implemented. It involves developing and writing out all the elements of the course: the syllabus, themes, principles, the necessary pedagogic approaches, outcomes, the plan of the course delivery. At this stage, the educator plans the course. Will there be weekly themes or lessons? How will the learning activities be organized? What types of learning activities and assignments will be given? Are the learning activities project-based or active participation in the classroom? What other pedagogic tools will be used- what types of information and communication technology (ICT) tools will be used? What types of projects and assignments will be involved in the teaching and learning process? How will the teaching and learning be structured? It is at this point



that the educator should consider levels three and four of the Green Curriculum Model, for guidance on the pedagogies and competencies necessary for quality ESD learning experiences. All these elements are woven together to provide optimal yield in the learners through the learning process.

#### **5.4.5 Implementation**

This is the stage where the educator undertakes the actual teaching of the course. During this stage, the educator makes adjustments where necessary and continuously assesses the teaching and learning process through continuous feedback. These assessments provide clues for further development of the course and making necessary adjustments to the design. The course design is cyclical and nested, and with continuous assessments and feedback, adjustments are made within the different components of the green curriculum as shown in figures 3 and 4 below. At this point, it would be useful for the educator to refer to level five of the GCM for guidance on indicators in ESD, by considering whether the DAB instrument might yield important insights into the dispositions, abilities and behaviours of learners at certain points within the delivery.

#### **5.5 Conclusions**

The Green Curriculum Model presents the educator with a conceptual-design framework to guide the integration of sustainability in higher education courses and programmes. The design and development of any sustainability education infused curriculum should involve the identification of the necessary sustainability principles that are embedded within the sustainability content as well as the use of pedagogic approaches that are appropriate for sustainability education and which reflect the identified sustainability principles and foster the intended learning outcomes.

The proper application of the sustainability infused curriculum in the learning and teaching process empowers and motivates learners to become problem solvers and change agents whose actions will ultimately lead to the development of sustainable communities. Although such transformational processes focus on the individual its actions will eventually trickle down to other members of the community, culminating

into the process of collective transformation for sustainability. The Green Curriculum Model is designed to act as a guiding tool to help educators navigate the process of reorienting higher education programmes and courses in addressing sustainability. Education for sustainable development remains a complex concept and “*can be an all-encompassing approach that permeates all aspects of education*” (CMEC, 2010, p.16). While there is the urgent need to address or embed sustainability in educational courses, it should be accepted that not all applications of ESD embrace all ESD’s components within a given programme or course curricula. Some courses may warrant the integration of more elements of the Green Curriculum Model than others. However, what is important is to ensure that the principles of sustainability and sustainability related pedagogic approaches are used in the learning and teaching process to enhance learners’ sustainability competencies. The following chapter explains what informed the decisions to frame the GCM as illustrated, and thus, what validated its formation.

## **Chapter Six: Operationalisation of DAB Instrument: The Pilot Study**

### **6.1 Introduction**

The concepts of sustainability and sustainability competence are controversial, complex, and difficult to define and measure, and have varied meanings for different people and practices. Given the complex nature of sustainability, there is limited availability of paradigmatic frameworks to guide educators in assessing sustainability competencies. This chapter introduces the Dispositions, Abilities and Behaviours (DAB) framework and the pilot study which explored its operation, and the findings of which subsequently influenced the design of an intervention in 2013-2014 that profiled sustainability competencies among final year undergraduate students in a higher education institution. The results of the initial piloting of the mixed methods study indicate that the DAB framework has good potential as a guide to educators or researchers in understanding and profiling sustainability-related abilities, attitudes and actions (areas of performance) of cohorts of students within higher education settings.

### **6.2 Profiling Sustainability Competencies**

The framework for DAB emerged from the Indicator level of the Green Curriculum Model. The DAB tool provides a snapshot in time (profiling) of learners' sustainability related competencies. The DAB tool was piloted across a cohort of students in a higher education context. It is important to note that the remit of this study did not extend to uncovering reasons as to why certain dispositions, abilities or behaviours towards sustainability were present or absent among learners. The premise was that if such a tool could be developed, then it could be utilized in future studies to identify the extent to which the sustainability-profiles of cohorts of students change over time in particular programmes of study in higher education. This could be used by future researchers to identify courses successfully fostering education for sustainable development, and thus, explore in detail the types of pedagogic processes and practices needed to improve sustainability competencies across cohorts of students.

The data collection and analysis of this pilot study sat within phase two of the exploratory sequential mixed methods approach of the overall study. The questions that framed the pilot study are outlined in table 5:

What sustainability competencies can or should be assessed in higher education; and how should these competencies be framed?
Can students' development of these sustainability competencies (knowledge, skills, attitudes, and/ or behaviours) be effectively measured within higher education?

Table 5. Framing Questions of DAB Pilot Study

The first phase of this section of the study involved the conceptualisation and design of the Dispositions, Abilities and Behaviours framework, which is the indicator element of the GCM, and this qualitative data emerged from a critical review of sustainability practices in higher education in Ireland, extant literature and discussions with researchers and experts in sustainability education. In this regard, the qualitative data from both the literature review and conversations with experts were coded and emergent themes informed the data analysis process, which eventually resulted in the framing of sustainability competencies in terms of learners' dispositions, abilities and behaviours in sustainability (DAB framework).

The second phase made use of a quantitative instrument (an online survey designed using elements of the DAB framework) that allowed learners to record their own perceived levels of sustainability competencies. In terms of the quantitative dimension of this pilot study, thirty-seven students (out of a total of 95) in final year of an undergraduate education programme in teacher education participated in an online survey modelled on the DAB framework. Most of the participants enrolled on the targeted degree course intended to qualify as primary-school teachers. There was a very high level of female participants within the course (circa 90% female), which was representative of the high proportion of females (85%) engaged in initial primary teacher education more generally in Ireland (Central Statistics Office, 2012).

The third phase involved analysis of the data results and discussion of key findings from the pilot study and implications for future research.

According to Joppe (2000), as cited in Golafshani (2003), reliability (the extent to which an instrument's measurement results are consistent over time) and validity (the extent to which an instrument's results consistently measure the construct of interest) remain an important aspect of any research undertaking. Reliability and validity for this study were obtained through the use of the exploratory mixed methods approach. In this regard, the literature review on sustainability and sustainability competencies initially resulted in the authors' conceptualisation and design of the DAB framework. The DAB framework was then subjected to critical reviews at many seminars and conferences by experts and researchers within the field of sustainability, which helped inform revisions to its design and establish its validity as a possible guide to designing a tool for assessing learners' sustainability competencies in higher education. Secondly, based on a critical examination of the elements of the DAB instrument and themes generated from literature on sustainability and sustainability competencies, a survey instrument of 49 statements/questions was designed to measure students' sustainability competencies. The data generated from participants' responses on the survey questionnaire were analysed to better understand the extent to which the survey could be used to effectively profile higher education learners' sustainability competencies. The survey data were thus statistically analysed using the Statistical Package for Social Sciences (SPSS), Version 21, using statistical frequencies and internal consistency tests to ascertain construct validity.

Finally, the results of the pilot survey were corroborated with the qualitative review of sustainability practices in higher education in Ireland and extant literature on sustainability, to give a rich picture (through research results 'mixing' of the qualitative and quantitative components of the study at this stage) of the design strength and applicability of the DAB instrument in profiling the sustainability competencies of cohorts of higher education learners in Ireland.

### **6.3 Measuring Sustainability Competencies**

An important aspect of sustainability education is to identify the types of competencies necessary for educating learners in sustainability. However, there are difficulties in evaluating or measuring learners' abilities and manifestations of acquired sustainability

competencies and this issue is the centerpiece of this study. Within existing literature in sustainability competencies, there are limited paradigmatic frameworks to guide educators in the process of evaluating the actual performances and/or manifestations of learners' sustainability competencies (Burns, 2011). Therefore, this study involved the conceptualisation, design and use of a sustainability competencies framework called the Dispositions, Abilities and Behaviours (DAB) framework, as a guide in the development of a tool to profile learners' sustainability competencies in higher education. The development of this framework is needed to fill the paradigmatic vacuum that is, the absence of a framework to guide educators in profiling learners' sustainability competencies in the learning and teaching process. The discussion now moves to describe the DAB framework.

#### **6.4 Dispositions, Abilities and Behaviours (DAB) Framework**

As outlined earlier, this study examined two questions, the first of which is responded to here: *What sustainability competencies can or should be assessed in higher education; and how should these competencies be framed?* In this regard, the DAB framework of competencies emerged from the qualitative dimension of this pilot study.

The DAB framework is thus a guide towards understanding the key areas to profile learners' sustainability competencies which include:

- Assessing learners' dispositions vis-a-vis sustainability (which involves the process of assessing whether learners' values, attitudes and beliefs are oriented towards promoting sustainability values like promoting environmental health, social inclusion and justice, intercultural communication, acceptance and preservation of indigenous knowledge).
- Assessing learners' abilities to foster sustainability (which includes assessing whether learners have acquired the requisite cognitive skills in systemic thinking, strategic planning, critical reflection, values thinking and futures thinking as well as skills, aptitudes and knowledge in sustainability).
- Assessing learners' behaviours vis-a-vis sustainability (which includes assessing the actual actions carried out by learners to act as change agents for promoting sustainability) as shown in figure 11.



Figure 11. Dispositions, Abilities and Behaviours (DAB) Framework

## 6.5 Assessing DAB Competencies in Sustainability

The second part of this pilot study focused on exploring the question:

*Can students' development of these sustainability competencies (knowledge, skills, attitudes, and/ or behaviours) be effectively measured within higher education?* In this regard, the profiling of students' sustainability competencies was considered through the lens of the DAB framework, sustainability competencies (Learning to Know, Do, Be, Live Together and Transform Oneself and Society), and key sustainability thematic areas.

The DAB framework informed the design of an online survey, which took the form of a set of 49 context specific sustainability-related statements or questions used to ascertain learners' dispositions, abilities and behaviours (actions) in fostering sustainability. This online survey was designed in such a way that it addressed the four cornerstones of sustainability (Culture, Economy, Environment and Society), as well as the five clusters of sustainability competencies (Learning to Know, Do, Be, Live Together and Transform

Oneself and Society). The set of questions and statements were used by learners to record their perceived levels of sustainability competencies, and the data gathered were analysed in a process that involved mapping the cumulative attitudes, aptitudes (including skills and knowledge) and behaviours identified within the DAB framework. Thus, the following criteria were considered within the mapping process:

1. The level of learners' agreements with, and willingness to engage with sustainability issues/ actions (mapping out learners' dispositions - attitudes, beliefs and value orientations - in relation to sustainability).
2. The level of learners' abilities to engage with sustainability issues/ actions (mapping out learners' aptitudes, skills and knowledge in sustainability).
3. The frequency of learners' engagements in actions for sustainability (mapping out actual actions carried out by learners to promote sustainability - by acting as champions or agents of change for sustainability).

The pilot survey was tested initially in November 2013 with a small sample of 9 students to ascertain any issues with phrasing of statements or questions, and/ or examine whether it could be completed within an appropriate time-frame. Considering this, some of the statements/questions were re-phrased and a number of questions deleted. The final version of the online survey of forty-nine questions was designed and structured into four areas examining the participants' profiles, dispositions in relation to sustainability, abilities in sustainability and behaviours. The online survey was deployed in March 2014 (using the online software tool - SurveyMonkey) to 95 final year higher education students in a higher education institution. A sample of 37 students in total responded to the survey (response rate of 39%), their responses were collated using SurveyMonkey, and the resultant data were then analysed using SPSS, version 21.

The participants varied in gender, age, and types of study programmes. The gender breakdown of the 37 respondents was 84% (n=34) female and 16% (n=3) male. In terms of age, 70% were between 16 to 24 years and 30% were over 25 years. In relation to the study programmes, 16% of the participants were studying part time and 84% were studying full time. In post-survey discussions, students cited the following reasons for non-participation with survey: Conflict between the survey deadline and assignment deadlines, lack of knowledge about the purpose of survey (which was in part due to low



attendance at scheduled informational sessions on research study), pressures associated with being in their final year of study in university, and a lack of interest for some students in the thematic area of this study.

As the response rate in this study was relatively small, few statistical methods could be applied to analyse the survey data. Consequently, there were limited statistical tests that could be carried out to test the statistical significance of the various sustainability items examined. In this case, Cronbach’s alpha test was used to validate the question scales and a Cronbach’s alpha coefficient of .83 was obtained, indicating good internal consistency of most of the statements.

Data gathered from the pilot online survey were analysed using the following scales: Gender, Age, Study Programme, Course Years, Agreement with sustainability Issues, Ability to engage with sustainability, Willingness to engage with sustainability issues and Frequency of actions taken to promote sustainability, as shown in table 6.

<p><b>Gender</b> was coded on a two-point scale (female = 1, male = 0), with predominately female respondents (92%, n =34) and males (8%, n=3).</p>
<p><b>Age</b> was coded on a two-point scale (16-24=1, &gt;25=0) a majority of the participants were between the ages of 16-24 (70%, n=26) and 11 participants were 25 years and over accounting for 30%.</p>
<p><b>Course Year</b> was coded on a two-point scale using the following categories (Years 1&amp;2=0, Years 3&amp;4=1). 37 participants from third year undergraduate studies (100%) responded to the pilot survey with a mean of .89 and Standard Deviation SD of .315</p>
<p><b>Study Programme</b> was coded on a two-point scale, based on category of (1= full time, 0= flexible mode). There were 6 participants studying part time (16%) and 31 participants studying full time (84%).</p>

Table 6. Coding of Scales in DAB Pilot Study

In terms of the key focus of this study on sustainability, a number of key scales for assessing levels of sustainability competencies were created based on combining some question items, as discussed below:

**Willingness:** Summary statistics from 7 questions were used to evaluate learners' dispositions-willingness to engage with sustainability. Willingness or learners' dispositions were coded as follows: 1= willing, 0=not willing. The cumulative mean (.78 and SD = .307), with a higher mean statistic, indicating a greater dispersion in pattern for those willing to engage with sustainability and those who were not willing to engage with sustainability issues.

**Abilities:** Twenty-one questions were used to ascertain learners' abilities to engage with sustainability actions/ issues. Ability was coded as follows: 1= able, 0=not able. The survey results produced a cumulative mean of (.63 and SD = .454) with a Cronbach's alpha coefficient of (.83) indicating good internal consistency of scale for the 16 items used.

**Frequency of action to promote sustainability:** The summary statistics for the 7 questions that evaluated the frequency of actions taken by learners as manifestations of competencies in change agency for sustainability were used to ascertain the frequency of action to promote sustainability. The responses were coded as follows: 1=at least once, 0=Not at all. The cumulative mean =.54; SD=.498, indicating that a moderate SD of almost .50, shows a slightly even dispersion in the pattern of learners' frequency of actions taken or not taken to promote sustainability. The results for the 7 question items examined also produced a Cronbach's Alpha coefficient of .81 indicating good internal consistency of the scale used.

**Agreement with sustainability issues:** Respondents recorded their levels of agreement/ disagreement with 13 statements on sustainability issues and these responses were coded as follows: 0= agreement, 1= disagreement. The initial premise was that agreement with

a statement indicated a negative disposition towards sustainability, and disagreement with the statement indicated a positive disposition towards sustainability. These 13 items were summed, with a cumulative mean of .86 and SD of .334 with a low SD indicating less dispersion in the response patterns for this competence and this is in line with the fact that a majority of respondents disagreed with most of the statements stated, thus indicating a high level of sustainability competencies on the 13 issues examined. A Cronbach's alpha of .70 suggests that the scale for these 13 items has good internal consistency. However, it is important to note here that because of a lack of sufficient statistical evidence to test statistical significance; this result is to be viewed cautiously.

## **6.6 Key Findings on Sustainability Competencies**

The results of the pilot survey show that cumulatively a high percentage of learners exhibited competencies in the areas of sustainability that were examined.

An important dimension of 'Dispositions' towards sustainability can be examined in learners' willingness to engage in sustainability behaviours and/or actions. Figure 12 illustrates respondents' willingness/unwillingness to engage in specific inclusive, participatory and authentic actions for sustainability. As far as willingness to engage with sustainability is concerned, the survey results show that on average 87% of respondents were willing to engage with sustainability and thus positively disposed for sustainability while 13 % on average of the respondents were not willing to engage with sustainability and thus were not positively disposed for sustainability.

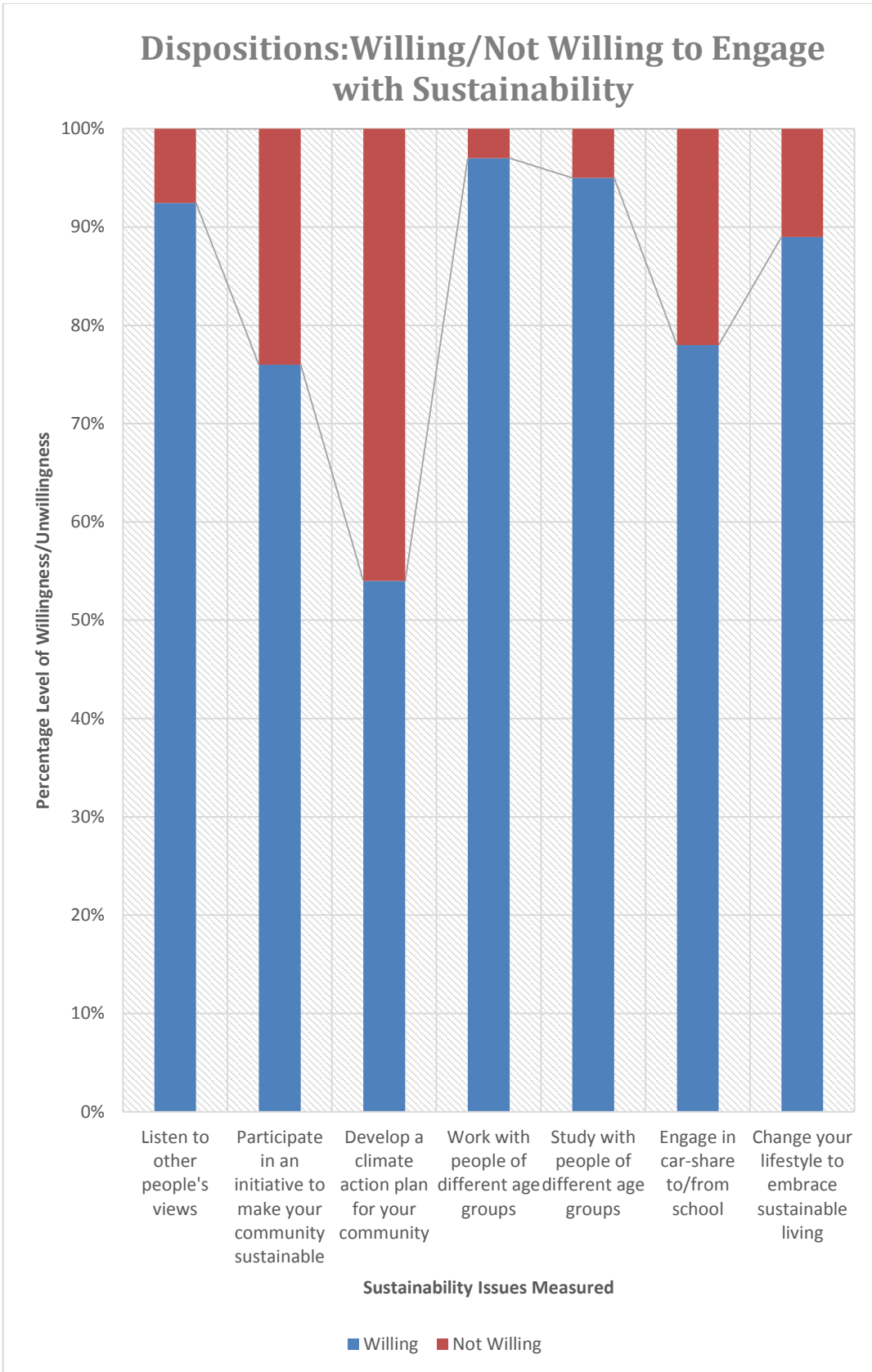


Figure 12. Dispositions: Willing/ Not Willing to Engage with Sustainability

The participants were also asked to rate their ‘Abilities’ to perform sustainability-related activities. Figure 13 illustrates respondents’ perceived levels of ability to engage in various sustainability actions. In relation to this, results from the survey show that cumulatively 45% of the learners on average perceived themselves as having low abilities to engage with sustainability while 55% on average perceived themselves as having good abilities to engage with sustainability.

In relation to actions for sustainability – ‘Behaviours’, the respondents indicated on a frequency scale their level of engagement in sustainability actions. Figure 14 illustrates the frequency with which respondents engaged in sustainability actions. As far as the frequency in which learners take actions to promote sustainability, the survey results show that on average 49% of the respondents have taken actions at least once in a week, month or year to promote sustainability, thus acting as change agents and manifesting some level of sustainability competencies for change agency; while 51% of learners on average have not taken any actions to promote sustainability which could be suggestive of a negative disposition or low level of ability in the competence of change agency.

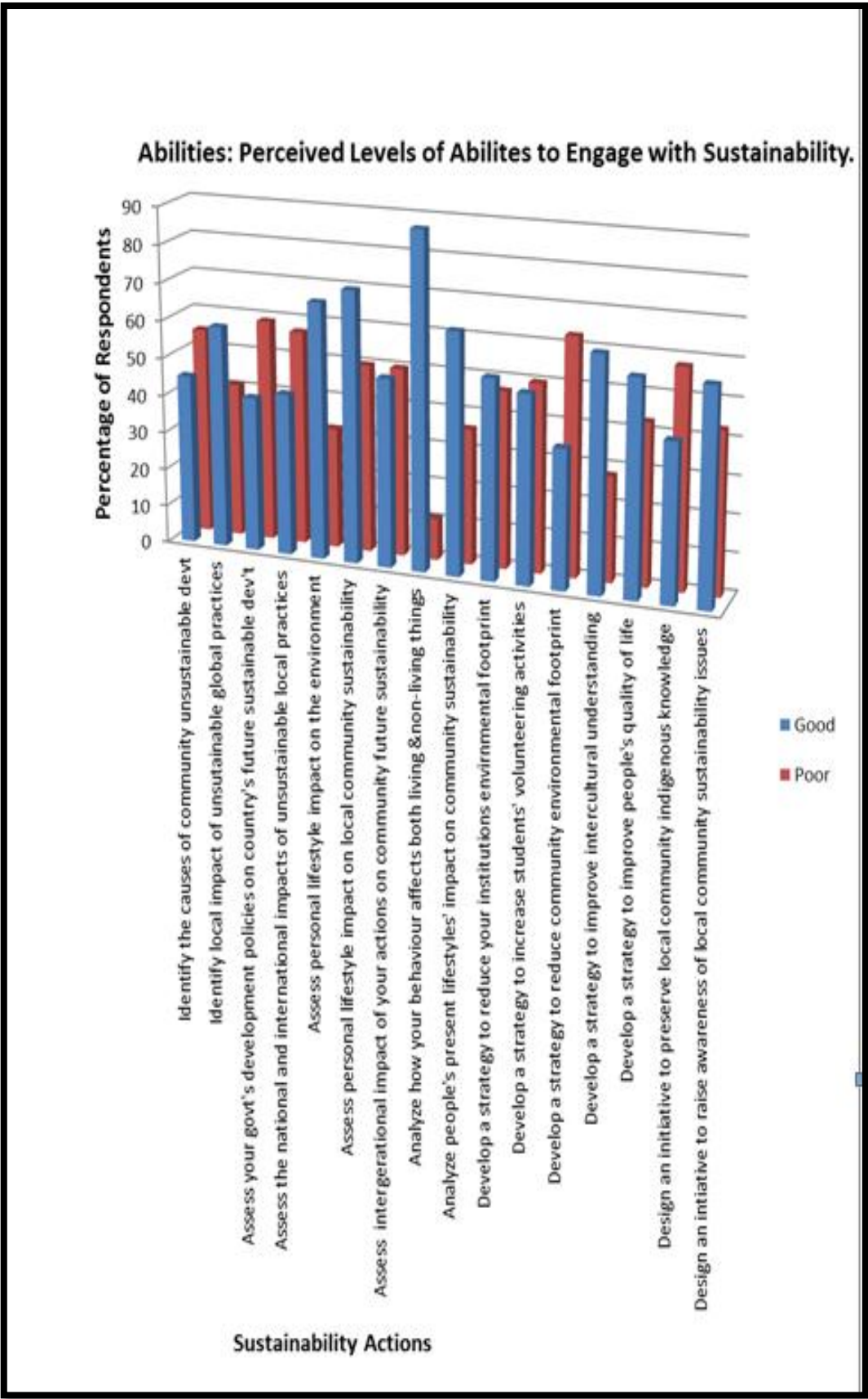


Figure 13. Abilities: Perceived Levels of Abilities to Engage with Sustainability

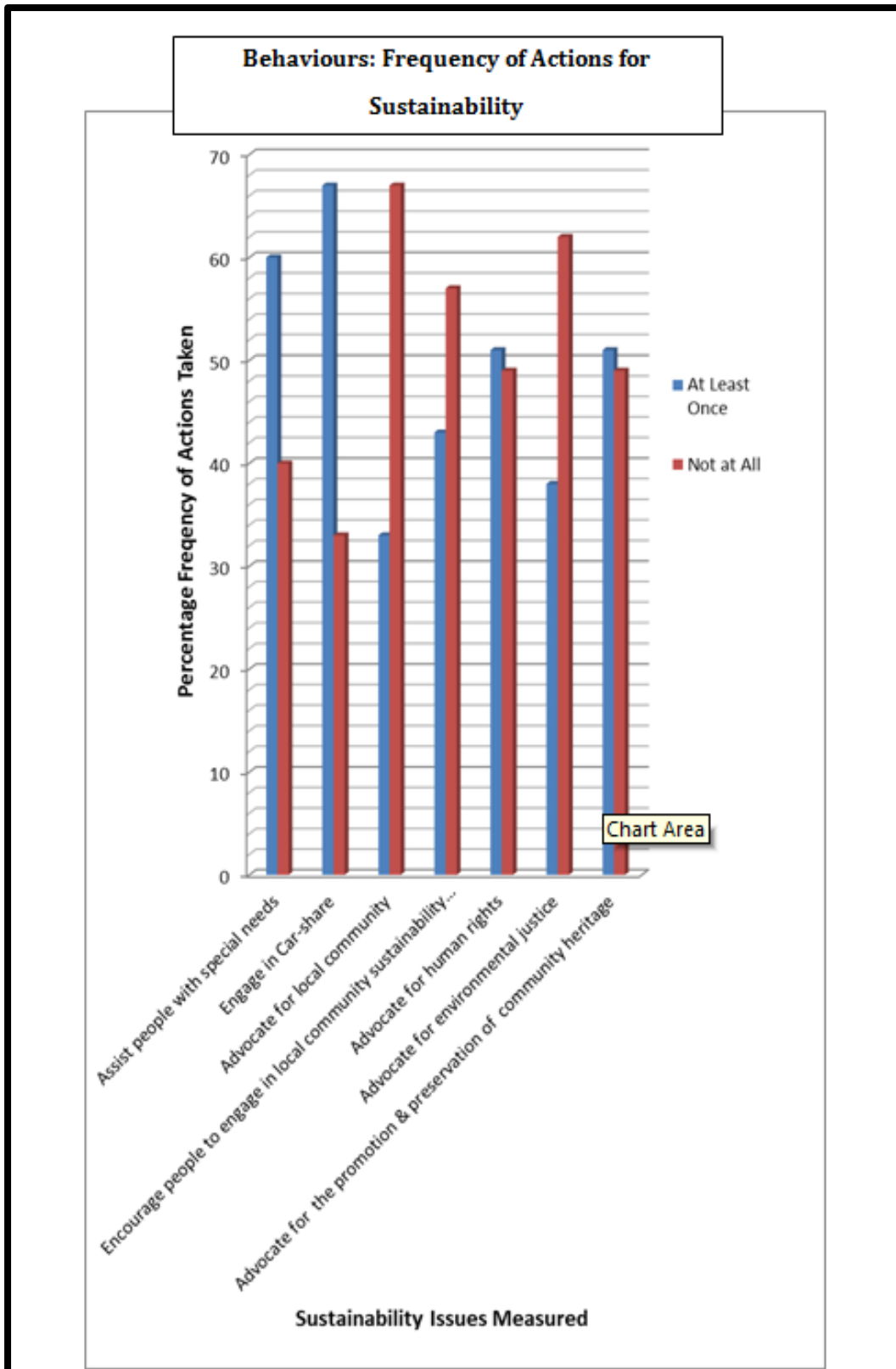


Figure 14. Behaviours: Frequency of Actions for Sustainability

Thus, when the results of the pilot study are viewed through the lens of the DAB framework we can conclude that overall this sample group were very positively disposed towards sustainability (Dispositions), almost half of them felt they lacked skills/ abilities to perform particular sustainability actions (Abilities), and that there existed very close to a 50-50 split in students engaged/ not engaged in sustainability actions (Behaviours). Further research would be required to investigate the disjoint between the very high degree of willingness to engage in sustainability (87% on average across this cohort of students) and the lower levels of action for sustainability (circa 50% on average).

Finally, the initial intention was that the dimension of *Dispositions in sustainability* would also be examined or informed by learners' considerations of a set of statements on key sustainability issues; their responses were ranked on a scale from 1 to 5, indicating their level of agreement or disagreement. For example: Dumping waste in the seas and oceans is acceptable. Figure 15 illustrates the respondents' level of agreement/ disagreement with specific perspectives or stances with respect to sustainability.



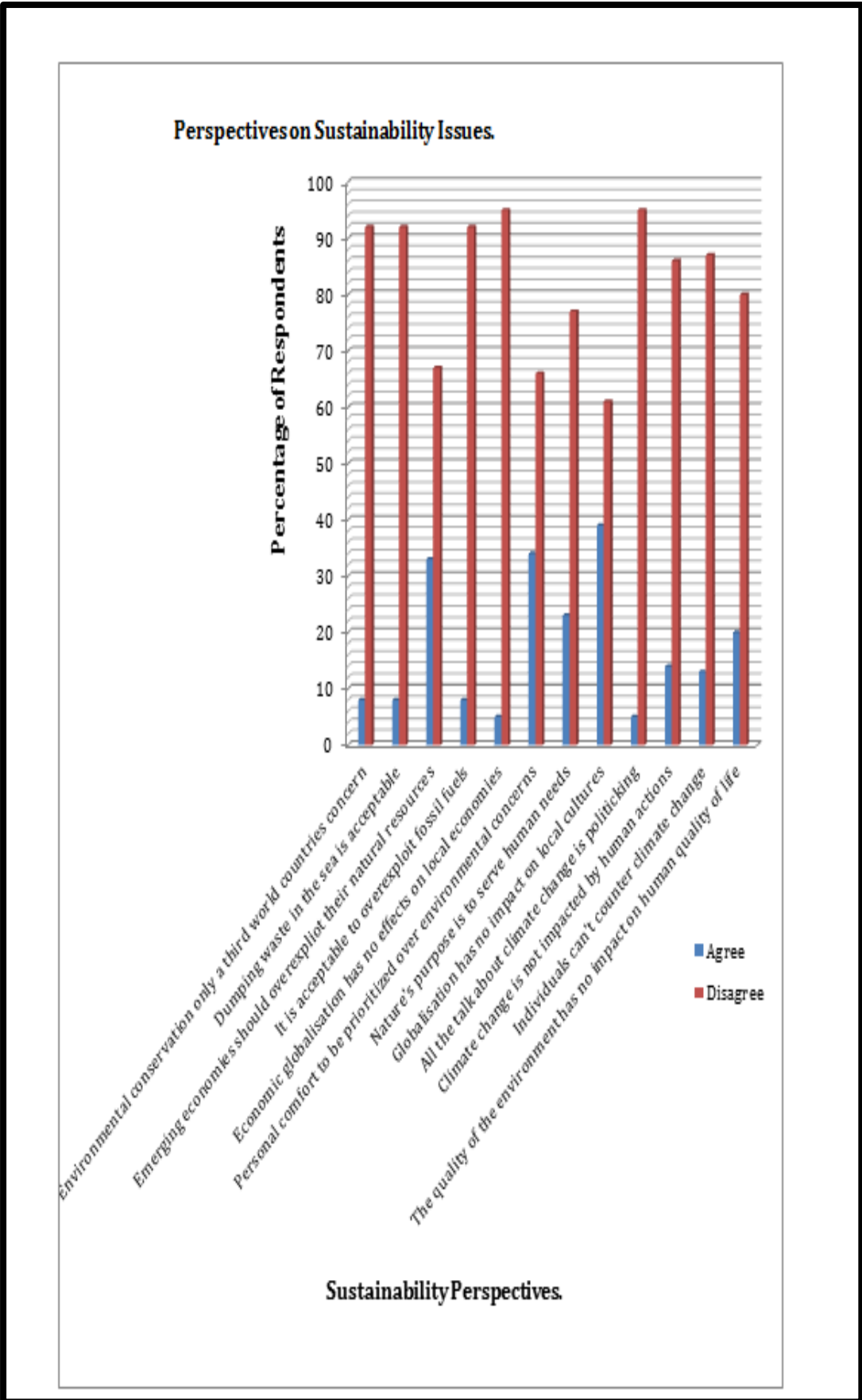


Figure 15. Perspectives on Sustainability Issues

The data analysed from this section of the survey indicated that a majority of the learners, with a cumulative average response of 83% disagreeing with the statements, displayed critical awareness of the sustainability issues examined; while the minority of learners, 17% of the respondents on average agreeing with the sustainability statements, displayed a lack of knowledge of or appreciation for sustainability issues. However, it cannot be concluded that there is a direct correlation between levels of agreement or disagreement to statements on this survey, and negative or positive dispositions towards sustainability, as this would involve making presumptions about levels of, and relationships between, knowledge and dispositions of learners. As a result of this ambiguity in analyzing responses to these statements, it has been decided that future manifestations of the online survey will not include this section.

## **6.7 Discussion of the Pilot Survey Findings**

The overall findings of this pilot study present a good snapshot of higher education learners' sustainability competencies and how these students' sustainability competencies can be profiled at a given point in time. Despite the limitations in the number of learners who responded to the pilot survey, the findings of this study present us with important lessons to learn with regards to higher education learners' dispositions, abilities and behavior (actions) in terms of engaging with sustainability related challenges.

The pilot study findings show that despite the provisions of extensive information and awareness campaigns on environmental matters (for example through campus greening initiatives), many higher education learners (46%) as shown in figure 11, are not willing to develop climate actions plans for their communities. Also, over 63% of the learners self-reported that they do not have the abilities to develop a strategy to reduce the future environmental footprints of their local communities as shown in figure 13. The same situation is exhibited in the fact that well over 68% of the learners did not take actions to advocate for their local community sustainability, and over 62% of them did not take any actions to advocate for environmental justice as shown in figure 14.

These findings clearly indicate that despite general awareness on environmental matters learners do not take adequate actions on environmentally related issues. There is the need to promote the infusion of sustainability in higher education curricula so as to provide learners with the knowledge, skills and competencies to carry out actions that promote environmental health and other aspects like strategic planning for climate change actions and natural disaster mitigation to make their communities more resilient and sustainable.

Another important aspect of sustainability which the pilot study findings present is the issue of learners' value orientations vis-à-vis sustainability. The pilot study findings show that with regards to sustainability values like car-sharing when travelling to work or to school, a majority of higher education learners surveyed (78%) as shown in figure 13, are willing to engage in car-share to school or work. This finding is a good pointer to the fact that present-day higher education learners are beginning to realize the need to reduce the volume of carbon dioxide emitted into the atmosphere through the increased volumes of automobiles on our roads. These students' values orientations suggest alignment with some key sustainability values; in this case, their willingness to engage in car-sharing when travelling to school or work. However, a small percentage of the students surveyed (22%) still nurture the values of prosperity, viewed in terms of wealth and property accumulation. Thus, these learners cherish the comfort of enjoying single occupancy of their cars to travel to school or work if they have the means to do so, instead of engaging in car-share, even if they are aware of the benefits to the atmosphere of reduced carbon emissions through the reduction in the volume of automobiles on our roads.

Furthermore, a majority of the learners (95%) disagreed with the statement that 'all the talk about climate change is politicking and there is no real need to take action'. Despite vigorous campaigns by contrarians (especially multinational oil corporations which consider corporate profiteering to be of prime importance over environmental concerns), there is enormous scientific evidence that increasing global temperatures are a threat not only to the environment but also to human societies (Pachauri & Meyer, 2014). These learners' responses suggest recognition of the fact that climate change is a serious issue that needs to be addressed.

As outlined earlier, there are currently limited paradigmatic instruments to guide educators in profiling higher education learners' sustainability competencies, although there is growing interest and calls for integrating sustainability across higher education

curricula (Makrakis & Kostoulas-Makrakis 2013a; Hopkinson and James, 2010; Benn and Dunphy, 2009). In terms of assessing sustainability-related knowledge, skills, dispositions and behaviours, there have been many attempts to develop scales, mainly within the context of environmental education. The most well-known of these is the Dunlap and Van Liere's (1978) New Ecological Paradigm Scale (original NEP), a 12-item scale for ascertaining whether populations have more environmentally conscious (pro-ecological) worldviews, which was subsequently reviewed, revised and renamed by Dunlap and his colleagues to become a 15-item Revised New Ecological Paradigm Scale (Dunlap, Van Liere, Merteg & Jones, 2000). Other scales include the Ecocentric and Anthropocentric Attitudes Towards Sustainable Development (EAATSD) scale, used to evaluate students' perceptions of the relationship between environmental and social issues (Kopnina, 2013), and the Sustainability Tracking and Rating System (STARS), a tool developed by the Association for the Assessment of Sustainability in Higher Education (AASHE, 2012) for assessing both learners and staff sustainability knowledge and activities. However, the STARS and similar tools are principally designed to assess higher education campus greening activities and are thus not appropriate tools for undertaking a holistic assessment, or profiling, of learners' sustainability competencies.

More recently, Zwickle, Koontz, Slagle, & Bruskotter, (2014) designed a multiple-choice survey as a tool for assessing higher education students' sustainability knowledge and used statistical analysis to present the results of their survey. However, in the absence of articulation of what was understood as sustainability knowledge and what sustainability criteria underpinned the design of the tool, it is difficult to critically engage in an analysis of their findings. Interestingly, Zwickle et al.'s (2014) study also highlights the difficulties of engaging higher education learners in responding to online surveys on sustainability education in general, and assessment of learners' sustainability knowledge and competencies. The authors explain that their university-wide survey to assess students' sustainability knowledge with a sample of more than 40000 undergraduate students enrolled in Ohio State University in the United States of America had a response rate of only 1389 students (13.3% of their sample). In comparison to their limited response rate, the response rate in the pilot DAB study of 38% looks very healthy, although the overall target group for the DAB pilot study was very small when compared to their study.

## 6.8 Conclusions

Changes in human behaviours to embrace sustainability can be activated through formal, non-formal and informal educational processes. Higher education institutions have an important role to play as drivers of education, training and policy enhancement for sustainability. As advocated in the University Charter for Sustainable Development (Copernicus, 1994), the Talloires Declaration (2005), the UN Decade of Education for Sustainable 2005-2014 (UNESCO, 2007) and the Council of the European Union's (2011) strategic framework for European cooperation in education and training 2020, universities and other higher education institutions are called upon to play a critical role in mobilising and fostering learners' acquisition of sustainability competences. Higher education institutions have the expertise to foster the knowledge and skills necessary to enable students devise preventative strategies and/ or solutions to sustainability related issues now and in the future. In this regard, the DAB framework emergent from this study comes at an important juncture for higher education. It offers higher education institutions, educators and/or researchers opportunities to better understand the nature and extent of competencies development (with respect to sustainability-related abilities, attitudes and actions) within higher education. The findings of this pilot study show that the online survey tool can be used by educators to profile learners' sustainability competencies in higher education, and provides a useful snapshot of their self-reported perceived competencies with respect to sustainability at particular point/s in time. Finally, as outlined previously, the results of this pilot study need to be cautiously considered because of the small size of the sample. This pilot study mainly intended to inform the reader on the reliability and internal construct consistency of the DAB-informed sustainability competencies survey tool, ahead of its deployment on a university-wide basis.

## **Chapter Seven: University-Wide Deployment of DAB Tool**

### **7.1 Introduction**

This chapter presents the findings from the application of the Dispositions, Abilities and Behaviour, DAB, framework in profiling higher education learners' sustainability competencies through the deployment of the DAB university-wide students' survey. The initial part of the chapter presents the findings from the large-scale testing of the DAB framework. The latter section presents a summary of the key findings, conclusions and recommendations from this study.

### **7.2 DAB Framework – Large-Scale Testing**

In terms of encouraging participation, the large-scale deployment of DAB survey tool (and corresponding informational events about the research study) was time-tabled to ensure that there are no conflicts with assignment deadlines. Furthermore, more emphasis was placed on communicating the benefits of engagement in the survey (such as: opportunities to inform sustainability education) in the informational events with students. The data gathered from the university-wide survey in 2015 was subjected to a thorough and rigorous statistical analysis, since the survey was deployed with a much larger sample of students, with the expectation of much higher participation levels of students, and thus more types of statistical analysis of data-sets could be undertaken. The extended DAB testing thus examined whether the DAB-informed survey tool could be used as an instrument to effectively profile sustainability competencies across cohorts of students in a range of disciplinary and trans-disciplinary contexts at a particular point in time in higher education. The discussion that ensues thus explains the adaptations to the survey (on foot of findings from piloy study), how the various scales were determined, and the correlations and other tests carried out to examine relationships between the dispositions, abilities and behaviours of participants in this study. The final section summarises the key findings, conclusions and recommendations from this study.

### 7.3 Methods in Large-scale DAB Testing

This section outlines the research tools, and methods used in developing the scales for the survey analysis. The online survey was designed and deployed to gather data to answer two main questions to help validate the tool:

1. *Do university undergraduate learners' profile attributes (gender, age, current year of study and study programmes), affect their willingness, abilities and behaviours to engage with and/or promote sustainability?*

To better examine the issues under investigation in the first question, the following sub-questions were explored:

- a. *Do university undergraduate students' ages affect their willingness, abilities and behaviours in relation to promoting sustainability?*
- b. *Do university undergraduate students' genders affect their willingness, abilities and behaviours in promoting sustainability?*
- c. *Do the course years in which university undergraduate students are registered; affect their willingness, abilities and behaviours in promoting sustainability?*
- d. *Do the types of study programmes that university undergraduate students are undertaking affect their willingness, abilities and behaviours to engage with and/or promote sustainability?*

The second main question in validating the DAB tool examined in this section of the study is:

2. *Do correlations exist between participants' dispositions, abilities and/or behaviours to engage with and/or promote sustainability?*

The survey was designed in four sections, as illustrated in table 7.

<b>Section one</b> of the survey examined learners' profile information (age, gender, current year of study and programme of study).
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<b>Section two</b> of the survey examined statements related to learners' willingness (dispositions) to engage with sustainability issues, with Likert scale item responses which included: (Extremely willing, Very willing, Not very willing, Definitely not willing, Don't know).
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**Section three** of the survey examined statements related to learners' abilities (skills, aptitudes and knowledge) to engage with sustainability issues, with Likert scale item responses which included: (Very good, Good, Poor, Very poor, Don't know).

**Section four** of the survey examined statements related to actions taken by learners (behaviours) to promote sustainability, with Likert scale item responses which included: (Once a day, Once a week, Once a month, Once a year), with learners required to make some comments about the survey in general.

Table 7: Structure of DAB Survey tool

The survey design was informed by the results of the pilot of the DAB tool that was designed and deployed in November 2014. The revised version of the online survey that was deployed in April 2015 was made up of forty-four questions designed and structured into four main sections (thus five questions were removed from original DAB framework). The first section was made up of five questions that examined learners' profiles: gender, age, their current year of study and the types of study programmes for which they were registered. The second section was made up of eleven statements that examined the level of students' willingness to engage with sustainability. The third section was made up of twelve statements that examined the level of students' abilities (their aptitudes, skills and knowledge) to engage with sustainability issues. The fourth section was, made up of fifteen statements that examined the frequency of actions carried out by students to promote sustainability. The final question allowed respondents to add comments about the survey. (See Appendix F to view DAB Survey Tool)

## 7.4 Sampling Approach

The survey was deployed to a simple random sample of an email list of 1000 undergraduate students of Dublin City University (DCU Glasnevin campus), to gather data and examine whether the results obtained could provide any meaningful evidence to make inferences about DCU undergraduate students' willingness/abilities to engage with



sustainability issues as well as their behaviours (actions taken), with regards to promoting sustainability.

As shown in figure 16, the target population of the study was the entire population of DCU registered undergraduate students of 9155 for the academic year 2014-2015 (HEA, 2014). Because of the constraints of time and the inherent difficulties of obtaining large responses from students through a census type sampling approach, a sample frame of 1000 students was randomly selected from an email list of undergraduate students in clusters of all the four faculties of the university (Faculties of Engineering and Computing, Science and Health, Humanities and Social Sciences, DCU Business School, including Business and Languages and Distance Education-Oscail). Access to the email lists was obtained from the DCU students' union with inherent administrative bureaucratic hurdles involved in the process. The randomly selected students were invited to participate in the survey by email and the survey was deployed in April 2015, with controlled access such that the same student could not participate in the survey more than once. Numerous follow up reminder emails were sent to the students and finally, 132 students responded to the survey giving a 13.2% response rate.

The simple random email list approach was used because of the practical difficulties of obtaining huge levels of response from all undergraduate students using a census approach whereby all the students would have been invited to participate in the survey. The low response rate of 13.2 % obtained in this survey is indicative of the problems of high rates of respondents' non-response associated with online students' surveys like this one, as identified in earlier studies (Couper, 2000; Couper, Traugott & Lamias, 1999; Zwickle et al., 2014). A simple random sample (obtained from clusters of students in the various faculties) was thus used in this study in an attempt to reduce the margin of sampling error associated with greater percentages of participants' non-responses that are common in high coverage list-based web surveys such as students' surveys (Couper, 2000).

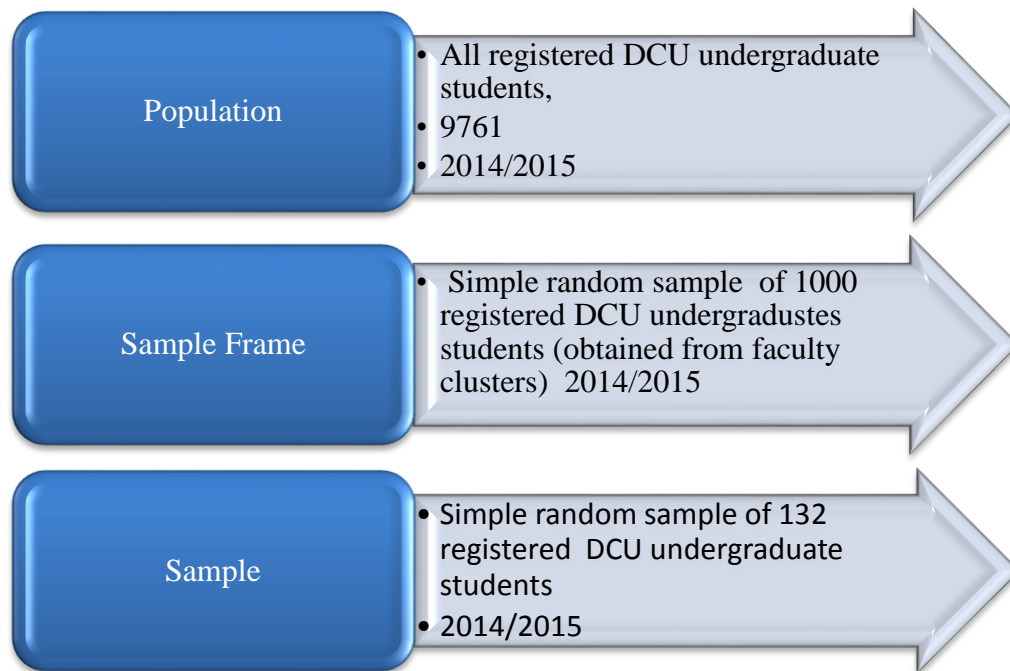


Figure 15. Sample population of students surveyed

Also, the simple random sampling via email list was appropriate for this study's target population because all registered undergraduate students of DCU are provided with an email by the institution and all students have access to these emails via their private electronic gadgets (phones, computers) as well as through computers located in computer laboratories in the university and the library. Students also have ready access and assistance from ISS information services which help students in case of problems with accessing their emails both on and off campus.

## 7.5 Analysis Process

The online survey was deployed in DCU using the online survey tool *surveymonkey* to collate and output data that could be readily interpreted using the Statistics Package for Social Sciences (SPSS) version 21 software. The types of questions posed comprised predominantly of closed statements/questions, using likert scaled options with few open-ended sections that required respondents to elaborate or make comments.

The data collected from the online survey comprised learners' demographic information such as their gender, ages, current year of study and the type of study programmes the

learners were registered in during the academic year 2014/2015, as well as statements examining learners' willingness and their abilities to engage with sustainability issues and statements testing the frequency of actions they carried out to promote sustainability.

The data was analysed at a number of stages. The first stage of data analysis involved data coding and running of the Cronbach's alpha tests to determine the reliability and validity of the questions scales. The second stage involved the running of descriptive statistics of the identified variables. The third stage involved the running of nonparametric statistical tests: the Spearman Rank-Order (alternative nonparametric Pearson correlations) test, to examine the effects of learners' profile attributes age, on their sustainability related dispositions, abilities and behaviours as well as the effects of learners' dispositions and abilities on the actions they have taken (behaviours) to promote sustainability; the Mann Whitney/Wilcoxon Rank-Sum tests (alternative nonparametric independent samples tests) to examine the effects of learners' gender on their dispositions, abilities and behaviours; and, the Kruskal Wallis (alternative nonparametric Analysis of Variance -ANOVA) test, to examine the effects of learners' current year of study and study programmes on their sustainability related dispositions, abilities and behaviours. The fourth stage of analysis involved the discussion of the findings, conclusion and recommendations.

### **7.5.1 Stage 1: Data Analysis (Online Survey Data Coding and Reliability Testing)**

Data analysed from the online survey yielded the following scales: gender, age, current year of study, study programme. This section details each of these scales in relation to the online survey participants. The following scales were created based on combining a number of question items. The data was coded using the scales highlighted in Table 8:

<b>Respondents' Profiles</b> (included participants' gender, age, current year of study and study programmes).
<b>Gender:</b> was coded on a three points scale: 1(Male), 2(Female), 3 (Other), with predominantly female participants (N=87, 65.9 %), males (N=44, 33.3%) and other (N=1, .8%).
<b>Age:</b> was coded on a two-points scale based on the categories, 1(16-22 years, Young learners), 2 (23- 59 years, Mature learners), with a (Mean = 22.52, median = 20.00, SD = 7.073). The majority of participants (80.9%, N= 106) were between the ages of 16 and 22 (young students)

and the rest of the participants (19.1%, N=25) were between the ages of 23 to 59 years (mature students).
<b>Current year of study:</b> was coded on a four points scale, 1(Year 1, Year 1 second semester), 2 (Year 2), 3(Year 3), 4(Year 4, Year 4 in my home country, Year 4 exchange year programme) with (Median = 2 SD = 1.106, Maximum=4, minimum=1).
<b>Study programmes:</b> was coded on 50 points scale as shown in table 11.
<b>Willingness to engage with sustainability issues:</b> was coded on a five points scale.1(Extremely willing), 2(Very willing), 3(Not very willing), 4(definitely not willing), 5(Don't know).
<b>Abilities to engage with sustainability issues:</b> was coded on a five points scale.1 (Very Good), 2(Good), 3(Poor), 4(Very Poor), 5 (Don't know).
<b>Actions taken to promote sustainability:</b> was coded on a five points scale, 1(At least once a day), 2(At least once a week), 3(At least once a month), 4(At least once a year), 5 (Not at all).

Table 8. Scales in Online Survey Coding

The students' responses were collated using Survey Monkey, and the output data was analysed using SPSS version 21, to ascertain whether correlations existed between learners' profiles/their willingness and abilities to engage with sustainability and their behaviours (actions taken actions) to promote sustainability.

A range of correlations tests were used to determine whether or not there exist relationships between the identified dependent and independent variables of interests. The analysis began with the identification of the variables of interests. The following variables of interests were identified:

- **Dependent variables of interest:** 1(Learners' willingness to engage with sustainability issues); 2 (Learners' abilities to engage with sustainability issues) and 3 (Learners' behaviours - actions taken to promote sustainability).
- **Independent variables of interest:** Learners' 1(gender), 2(age), 3(current year of study) and 4(programme of study).

Data for this study is generated from rank-ordered Likert-scale scores of students' responses from a survey questionnaire. Such data are generally not normally distributed and thus do not hold the assumptions of normality of data distribution. For these reasons,

the survey analysis of this study will involve the use of alternative non-parametric statistical test that are appropriate for testing the determined research hypotheses. In this light, the different nonparametric statistics, correlations and validity tests are explained in Appendix G, giving their assumptions, characteristics, contexts and use in this study, while the different nonparametric statistical tests run in this study are explained in Appendix H.

### 7.5.1.1 Reliability Testing

In this first stage of the data analysis process, the Cronbach Alpha reliability test was run to determine the reliability and validity of the question scales. In the majority of cases, for the thirty-eight sustainability related survey statements that examined learners' dispositions, abilities and behaviours in relation to promoting sustainability, the test produced a Cronbach Alpha reliability test coefficient of .902 indicating good internal consistency. Further Cronbach Alpha reliability tests produced the following test statistics: .748 for the eleven statements in the survey that examined learners' dispositions (willingness or unwillingness to engage with sustainability issues); .875 for the twelve survey statements that examined learners' abilities to engage with sustainability issues; .790 for the fifteen survey statements that examined learners' behaviours (frequency of actions taken to promote sustainability), indicating good internal consistency for all the survey statements as shown in the reliability statistics summary table 9.

Scale	Number of questions	Cronbach's Alpha
All sustainability related statements	38	.902
Willingness to engage with sustainability statements	11	.748
Ability to engage with sustainability statements	12	.875
Behaviours to promote sustainability related statements	15	.790

Table 9. Reliability statistics summary.

### 7.5.2 Stage 2: Data Analysis (Descriptive Statistics)

The second stage of data analysis process involved identifying descriptive statistics (frequencies, means, median, mode, standard deviations) for the complete data-set for learners (N=132 cases).

**Gender:** The gender breakdown of the 132 respondents was as follows: Females (65.9%, N=87), Males (33.3%, N=44) and other (gender neutral) (.8%, N=1) as shown in figure 16.

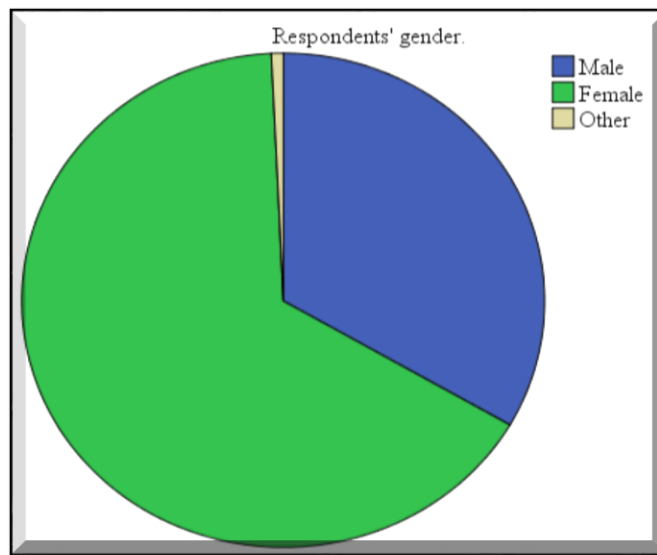


Figure 16. Distribution of respondents by gender.

**Age:** In terms of the age distribution of students' participation in the survey, the descriptive statistics produced the results, (Mean=22.52, Mode= 20, SD= 7.049), with the minimum age of respondents being 16 years and the maximum age was 59 years, as shown in table 10.

Respondent's age.

	Frequency	Percent	Valid Percent	Cumulative Percent
16	1	.8	.8	.8
17	1	.8	.8	1.5
18	12	9.1	9.1	10.6
19	23	17.4	17.4	28.0
20	31	23.5	23.5	51.5
21	21	15.9	15.9	67.4
22	18	13.6	13.6	81.1
23	4	3.0	3.0	84.1
24	6	4.5	4.5	88.6
25	1	.8	.8	89.4
29	1	.8	.8	90.2
30	1	.8	.8	90.9
31	2	1.5	1.5	92.4
36	1	.8	.8	93.2
38	1	.8	.8	93.9
39	1	.8	.8	94.7
41	3	2.3	2.3	97.0
48	1	.8	.8	97.7
49	1	.8	.8	98.5
54	1	.8	.8	99.2
59	1	.8	.8	100.0
Total	132	100.0	100.0	

Table 10. Percentage distribution of respondents by age

In terms of frequency percentages per age of students who participated in the survey, 81.1 percent (N=102) of the respondents were between the ages of 16 to 22 years (Young students) and 18.9 percent (N=30) of the respondents were between the ages of 23 to 59 years (Mature students). Students between the ages of 18 to 24 years had the highest levels of participation in the survey. In this group, 31 students aged 20 years participated in the survey with a percentage participation rate of 23.5%; 23 students aged 19 years participated in the survey giving a participation rate of 17.4%; 21 students aged 21 years participated in the survey with a percentage participation rate of 15.9%; 18 students aged 22 years participated giving a participation rate of 13.6%; 12 students aged 18 years

participated in the survey with a percentage participation rate of 9.1%; 6 students aged 24 years participated in the survey with a percentage participation rate of 4.5%; and 4 students aged 23 years participated in the survey with a percentage participation rate of 3.0%. In addition, 3 students aged 41 years participated in the survey, giving a participation rate of 2.3% and 3 students aged 31 years participated in the survey giving a participation rate of 1.5%. For the rest of the age groups (16, 17, 25, 29, 30, 36, 38, 39, 48, 49, 54, 59 years old), only one student participated from each of these age groups with a percentage participation rate of 0.8% each as shown in figure 17.

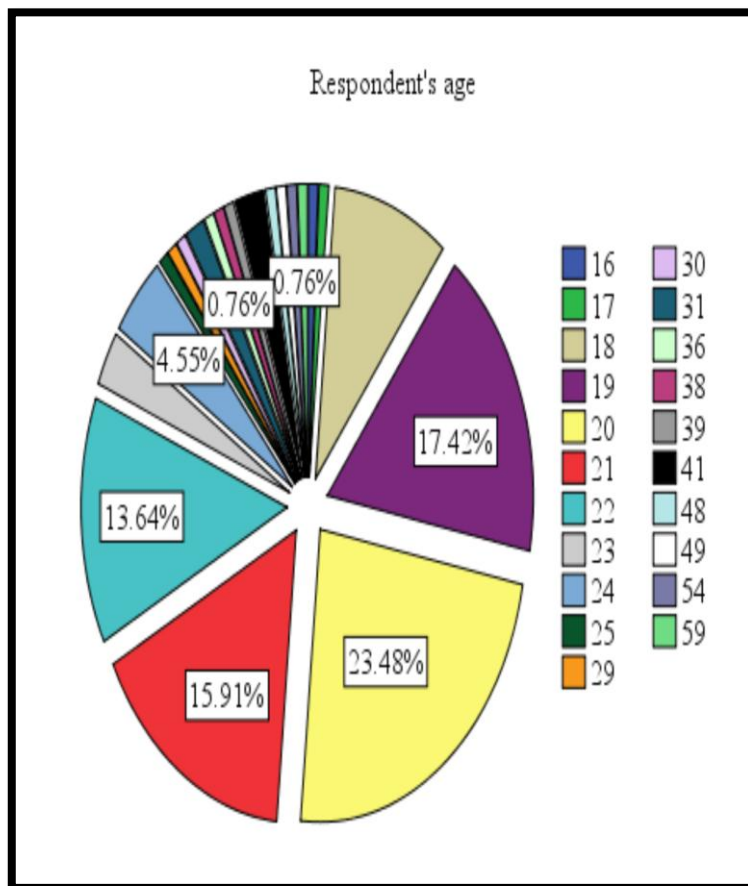


Figure 17. Percentage frequency distribution of respondents by age



**Current Year of Study:** As far as the respondents' current years of study are concerned, 42 respondents were in their first year in higher education accounting for 31.8% of the respondents, 34 were in the second year (25.8%), 32 were in the third year (24.2%) and 24 of the respondents were in the fourth year of their undergraduate studies accounting for (18.2%) as shown in figure 18.

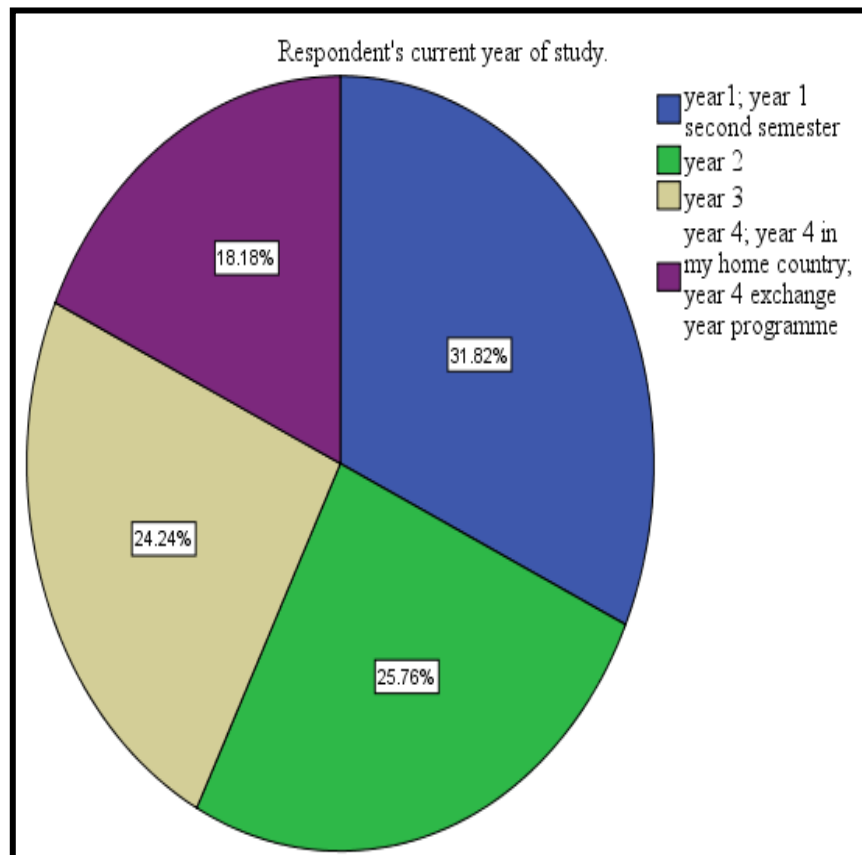


Figure 18. Percentage frequency distribution of respondents by current year of study

In relation to the study programmes covered, students who participated in the survey were registered across a range of undergraduate study programmes grouped by faculty as shown in table 11.

BUSINESS STUDIES	ENGINEERING STUDIES	SCIENCE AND HEALTH STUDIES	HUMANITIES AND SOCIAL SCIENCES
BA. in Accounting and Finance	B.Eng. in Biomedical Sciences	B.Sc. in Computer Applications	BA. in Applied Languages and Intercultural Studies
BA. in Business Studies	B.Eng. in Electronic Engineering	B.Sc. in Actuarial Mathematics	BA. in Applied Language and Translation Studies
BA. in Business Studies Study, Abroad (BSSA00, ECSA00)	B.Sc. in Information and Communications Engineering	B.Sc. in Analytical Sciences	BA. in communication studies
BA. in European Business-French	B. Eng. in Manufacturing Engineering with Business Studies	B.Sc. in Applied Physics	B.Sc. in Computer and Communication Sciences (CCS3)
BA. in International Business	B. Eng. in Mechanical and Manufacturing Engineering	B.Sc. in Athletic Therapy and Training	B.Sc. in Media and Chinese (Joint Honours)
BA. in International business and languages (English, French, German, Spanish)	B. Eng. in Mechatronic Engineering	B.Sc. in Biotechnology	B.Sc. in Media and French
BA. in Global Business		B.Sc. in Chemical and Pharmaceutical Sciences	B.Sc. in Multimedia
BA. in Global Business (Canada)		B.Sc. in Environmental Science and Health	BA. In Journalism
BA. in Global Business (France)		B.Sc. in Genetic and Cell Biology	Bachelor of Civil Law/Law and Society (BCL)
BA. in Global Business (Germany)		B.Sc. in Health and Society	Bachelor of Law and Politics/ International Relations (Joint Honours-HLIL)
BA. in Global Business (USA)		B.Sc. in Physical Education	Bachelor of Law and Spanish (Joint Honours)
B.Sc. in Aviation Management		B.Sc. in Physics	B.Sc. in Education and Training
B.Sc. in Marketing, Innovation and Technology		B.Sc. in Physics with Biomedical Sciences	B.Sc. in Science Education*
		B.Sc. in Sports Science and Health	
		B.Sc. in General Nursing	
		B.Sc. in Intellectual Disability Nursing	
		B.Sc. in Psychiatric Nursing	
		B.Sc. in Psychology	*Programme located in Science & Health but Education strand offered though FHSS

Table 11. Study Programmes

The descriptive statistics for learners' study programmes show that students undertaking studies in global business USA studies (N=8) formed the largest group of study programmes, accounting for 6.1% of all the study programmes represented in the survey, followed by students undertaking studies in civil law, law and society and education and counseling study abroad, (N=7) with each group accounting for 5.3% of all the study programmes represented in the survey, and students in Business studies (N=6) accounting for 4.5% of all the study programmes represented in the survey. In all the other programmes represented the percentage coverage per programme ranged from (3% to less than 1%).

In general 39 students were studying business, accounting for 29.5% of all the study programmes represented in the survey; 11 students were studying engineering and computer sciences accounting for 8.4% of the study programmes; 42 students were undertaking studies in science and health studies, accounting for 32% of the programmes covered and 40 students were undertaking studies in the humanities and social sciences, accounting for 30.1% of all the programmes covered in the survey responses (See Appendix T).

For effective analytical purposes, one case (an influential outlier) with gender (other) was subsequently excluded from further analysis, with the adjusted data producing the results (Mean= 2.60, Median =3.00, SD =1.201) with 30.5% of learners doing Business studies, 7.6% Engineering studies, 32.8% Science and Health studies and 29% Humanities and social sciences, as shown in table 12 and figure 19. While the excluded data was important, it had a significant effect that could have resulted in false interpretations of the results. Thus, all subsequent analysis was done with the exclusion of the outlier case.

Respondents' study programmes grouped by faculty.

	Frequency	Percent	Valid Percent	Cumulative Percent
Business studies	40	30.5	30.5	30.5
Engineering studies	10	7.6	7.6	38.2
Science and health studies	43	32.8	32.8	71.0
Humanities and social sciences	38	29.0	29.0	100.0
Total	131	100.0	100.0	

Table 12. Percentage frequency distribution of respondents' study Programmes grouped by faculty

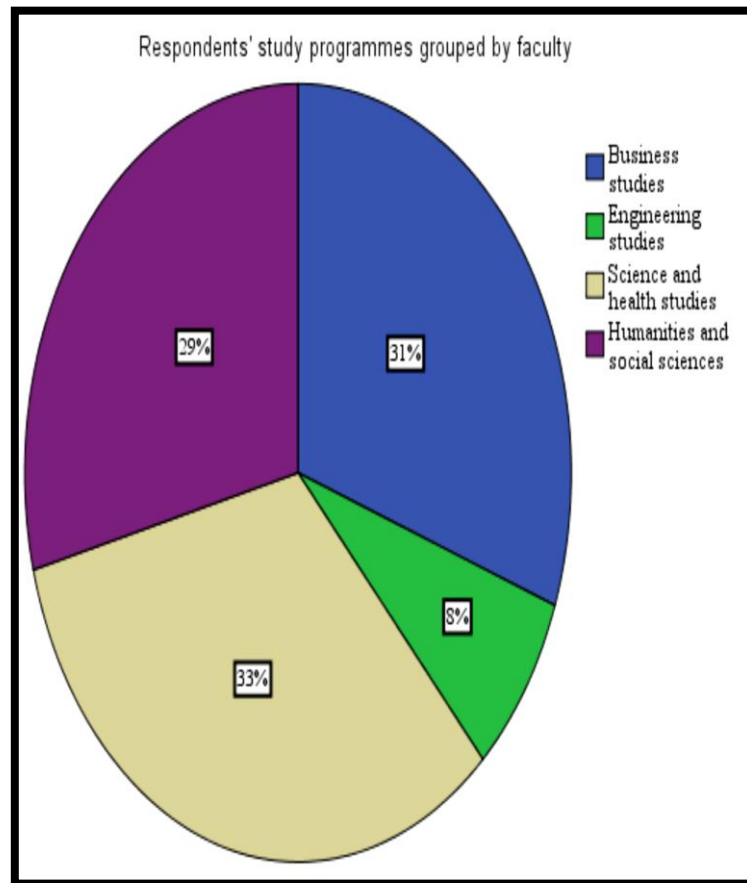


Figure 19. Percentage distribution of respondents' study programmes grouped by faculty

In terms of the overall summary of the frequency responses for all the 38 statements which students were asked to rate their willingness/abilities to engage with sustainability issues, and the frequency of actions they have taken to promote sustainability, the data produced the following results:

- In terms of respondents' willingness to engage with sustainability issues, on average 70.1% were willing to engage with sustainability issues. Respondents

were most likely to rate high levels of willingness to engage in the following: water conservation (95%); activities that improve his/her own well-being (86%); collaborate with people from different ethnic and cultural backgrounds to address sustainability challenges (80%).

- In the same light, on average 24.9% of respondents were not willing to engage with sustainability issues. Respondents were more likely to rate unwillingness to do the following: buy environmentally friendly products (60%); seek other people's perspectives on sustainability challenges (regardless of their age, gender, culture or socio-economic status), (36%); participate in environmental clean-up campaigns (such as Tidy Towns), in his/her local area (31%).
- On average 3.8% of the respondents didn't know whether or not they were willing (positively/negatively disposed) to engage with sustainability issues. The highest percentage of respondents who were undecided on their level of willingness to engage with sustainability issues was reflected in statements that required them to rate their willingness to: seek other people's perspectives on sustainability challenges (regardless of their age, gender, culture or socio-economic status) (10%); collaborate with people from different ethnic and cultural backgrounds to address sustainability challenges (6%) as reflected in table 13 and figure 20.

*Willingness to engage with sustainability issues	Don't know	Not willing	Willing
Respondent's willingness to engage in energy conservation.	4%	21%	75%
Respondent's willingness to engage in water conservation.	1%	4%	95%
Respondent's willingness to purchase locally produced goods (such as foodstuff, arts and crafts).	1%	27%	72%
Respondent's willingness to participate in environmental clean-up campaigns (such as Tidy Towns), in his/her local area.	3%	31%	64%
Respondent's willingness to buy environmentally friendly products.	2%	60%	38%
Respondent's willingness to engage in activities that improve his/her own well-being	2%	12%	86%
Respondent's willingness to collaborate with people from different ethnic and cultural backgrounds to address sustainability challenges.	5%	15%	80%
Respondent's willingness to choose environmentally friendly options (such as car-share, bus or cycling) to travel, to and from college/work/social events.	2%	21%	77%
Respondent's willingness to change his/her lifestyle to embrace more sustainable living.	5%	23%	72%
Respondent's willingness to seek other people's perspectives on sustainability challenges (regardless of their age, gender, culture or socio-economic status).	10%	36%	44%
Respondent's willingness to participate in community initiatives (such as waste recycling), aimed at making his/her community more sustainable in the future.	4%	28%	68%

Table 13. Cumulative Percentage distribution of respondents' willingness/unwillingness to engage with sustainability issues

*\* Aggregated percentages of scores of respondents' willingness/unwillingness to engage with sustainability.*

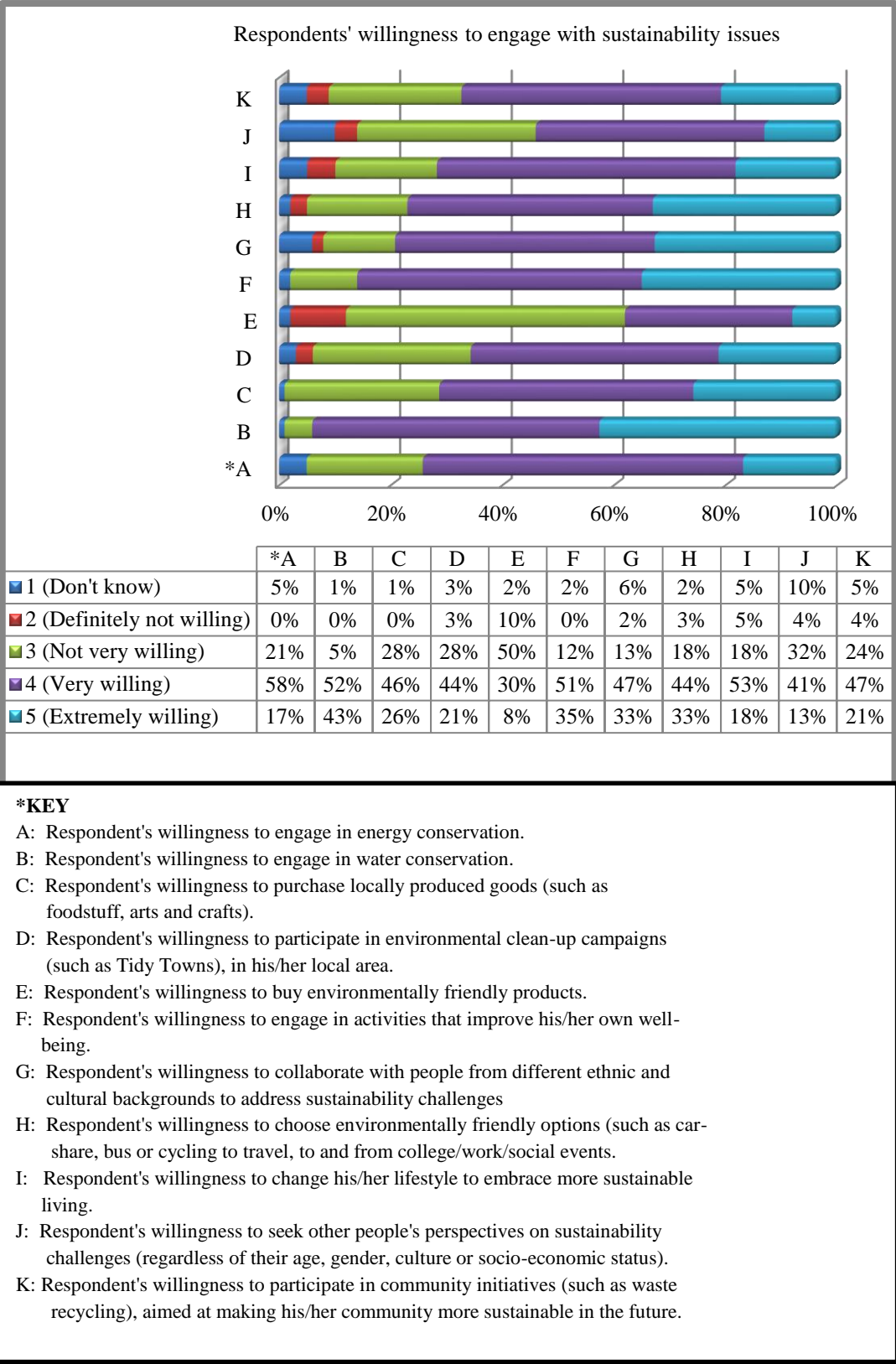


Figure 20. Percentage distribution of respondents' willingness/unwillingness to engage with sustainability issues.

In terms of university undergraduate learners' abilities to engage with sustainability issues, on average (54%) of them self-rated as having abilities to engage with sustainability issues. The highest percentage of respondents' abilities to engage with sustainability issues was reflected in the statements that asked learners to rate their abilities to: analyse the impacts of his/her personal lifestyle on the environment (76%); assess the intergenerational impact of unsustainable actions (such as the current culture of 'throwing away items rather than recycling' on future generations (73%); analyse how his/her behaviour affects both living and non-living things (71%); analyse the impacts of his/her personal lifestyle on the local community (61%) and develop a plan to help older people have better quality of life (61%). For the rest of the statements on learners' abilities to engage with sustainability issues, the level of respondents' good abilities ranged from 34% to 54%. In the same light, on average, 40.4% of respondents had poor abilities to engage with sustainability issues. The highest percentages of learners with poor abilities to engage with sustainability issues were reflected in the statements that required learners to rate the level of their abilities to: develop a plan to reduce the environmental foot print of his/her local community (60%); design an initiative to preserve indigenous knowledge from his/her local community (52%); develop a plan to improve inter-cultural understanding and communication within his/her community or work place (49%). The rest of the respondents' levels of poor abilities to engage with sustainability issues ranged from 21% to 42%. On average (8.4%) of the respondents did not know whether they had good or poor abilities to engage with sustainability issues. The highest percentages of respondents who were did not know the levels of their abilities to engage with sustainability issues were reflected in statements that required them to rate their abilities to: develop a plan to improve inter-cultural understanding and communication within his/her community or work place (14%); analyse the impacts of the present lifestyles of people in his/her community on the community's future sustainability (13%). For the rest of the statements the levels of respondents not knowing their abilities to engage with sustainability issues ranged from (5% to 11%) as shown in table 14 and figure 21.



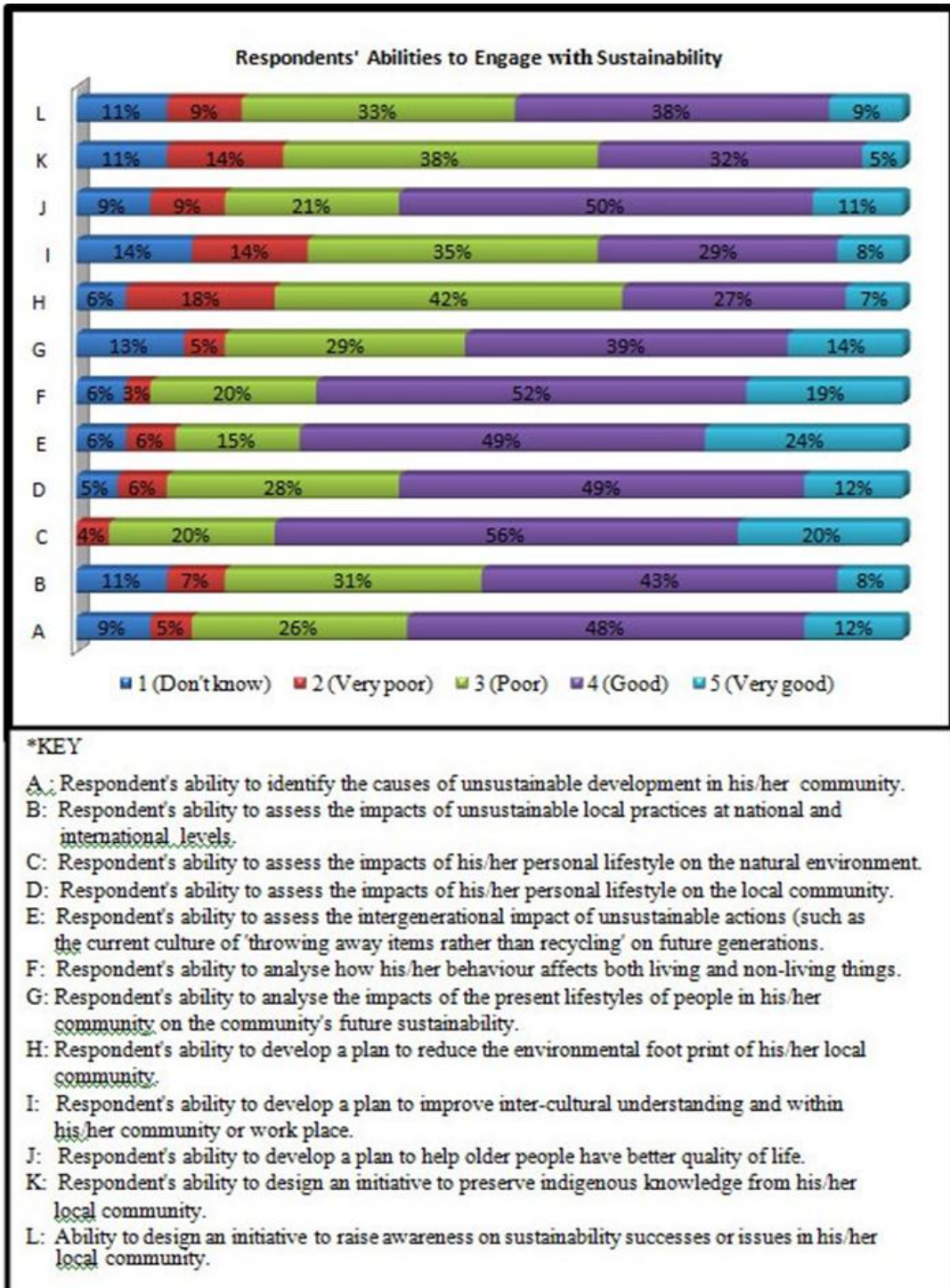


Figure 21. Percentage distribution of learners' abilities to engage with issues

<b>*Ability to engage with sustainability issues</b>	<b>Don't know</b>	<b>Poor</b>	<b>good</b>
Respondent's ability to identify the causes of unsustainable development in his/her community.	9%	31%	60%
Respondent's ability to assess the impacts of unsustainable local practices at national and international levels.	11%	38%	51%
Respondent's ability to analyse the impacts of his/her personal lifestyle on the environment.	0%	24%	76%
Respondent's ability to analyse the impacts of his/her personal lifestyle on the local community.	5%	34%	61%
Respondent's ability to assess the intergenerational impact of unsustainable actions (such as the current culture of 'throwing away items rather than recycling' on future generations.	6%	21%	73%
Respondent's ability to analyse how his/her behaviour affects both living and non-living things	6%	23%	71%
Respondent's ability to analyse the impacts of the present lifestyles of people in his/her community on the community's future sustainability.	13%	34%	53%
Respondent's ability to develop a plan to reduce the environmental foot print of his/her local community.	6%	60%	34%
Respondent's ability to develop a plan to improve inter-cultural understanding and communication within his/her community or work place.	14%	49%	37%
Respondent's ability to develop a plan to help older people have better quality of life.	9%	30%	61%
Respondent's ability to design an initiative to preserve indigenous knowledge from his/her local community.	11%	52%	37%
Respondent's ability to design an initiative to raise awareness on sustainability successes or issues in his/her local community.	11%	42%	47%

Table 14. Cumulative Percentage distribution of respondents' abilities to engage with sustainability

*\*Aggregated scores of learners' responses on abilities to engage with sustainability.*

In relation to taking actions to promote sustainability, on average 16% of sustainability related actions were carried out by learners throughout the year (whether it was on a yearly, monthly, weekly or daily basis). Results from the data show that on average 19% of actions were carried out on a daily basis to promote sustainability. The areas in which respondents recorded the highest levels of sustainability related actions taken on a daily basis were in: conserving energy at home or elsewhere (78% of actions taken); travelling to and from college/work/social events using environmentally friendly options (such as car-share, bus or cycling) (64% of actions taken); reducing food wastage at home or elsewhere (52% of actions taken). However, the lowest levels of respondents' recorded daily actions to promote sustainability were reflected in the areas of : participating in a

group to promote sustainability in his/her local community (0%); participations in intercultural events (0%); advocating (speak out, take action) for sustainability in his/her local community (1%); advocating (speak out, take action) for environmental justice(1%); advocating for the promotion and preservation of his/her local community's cultural heritage (1%); participating in environmental cleaning up campaigns (such as Tidy Town initiatives) in his/her local area (1%) and purchasing locally produced goods (such as foodstuff, arts and crafts) (2%) of actions taken by respondents on a daily basis.

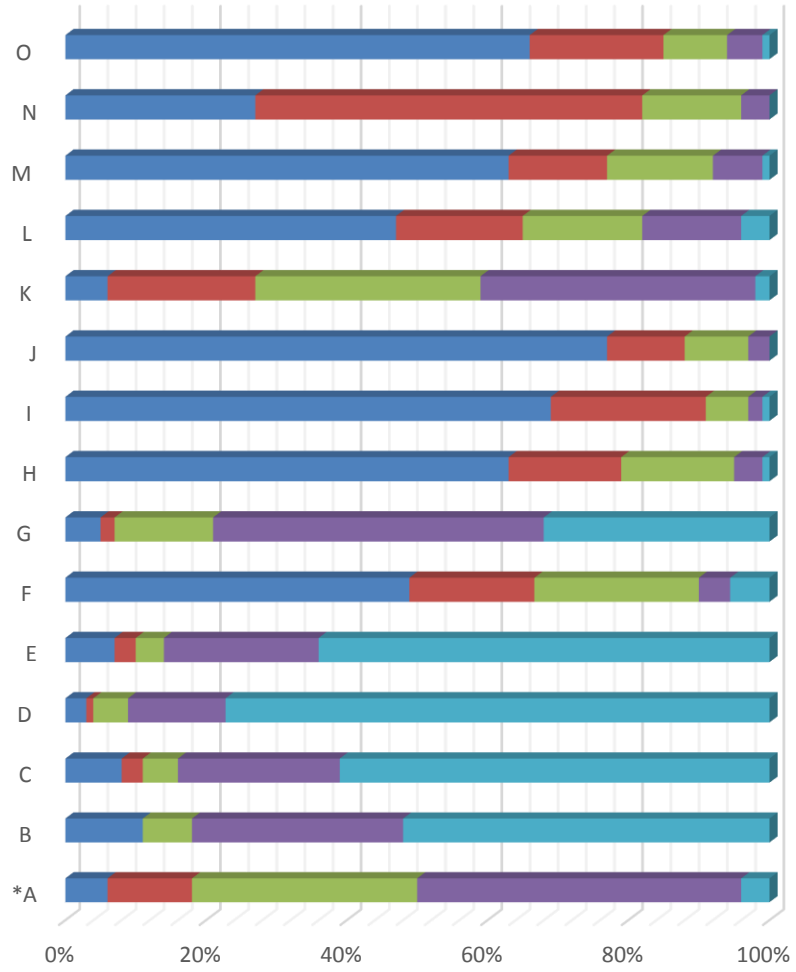
On a weekly basis, respondents recorded on average 18% of actions taken to promote sustainability. The highest levels of weekly actions taken to promote sustainability were recorded in the areas of: improving his/her own well-being (mental, social and physical) (47%); purchasing environmentally friendly products (46%); purchasing locally produced goods (such as foodstuff, arts and crafts) (39%). The lowest levels of respondents' weekly actions taken to promote sustainability were recorded in the areas of: participating in environmental cleaning up campaigns (such as Tidy Town initiatives) in his/her local area (2%); participating in a group to promote sustainability in his/her local community (3%); participations in intercultural events (4%). For the rest of the areas in which actions were taken on a weekly basis, the levels of actions range from (5% to 30%).

On a monthly basis, respondents recorded on average 14% of actions taken to promote sustainability. The highest levels of actions taken monthly to promote sustainability were recorded in the areas of: purchasing environmentally friendly products (32%); purchasing locally produced goods (such as foodstuff, arts and crafts) (32%). Although the data showed that on a monthly basis learners took very low actions to promote sustainability in areas such as: reducing water usage at home or elsewhere (5%); conserving energy at home or elsewhere (5%); travelling to and from college/work/social events using environmentally friendly options (such as car-share, bus or cycling) (5%). These monthly percentages of actions taken are low because learners did engage in these activities more frequently on a daily and weekly basis as discussed earlier. The rest of the levels of actions taken to promote sustainability by respondents for the areas examined ranged from (6% to 21%) on a monthly basis.

On a yearly basis on average respondents recorded 13% of actions taken to promote sustainability. The highest levels of actions taken were reflected in the areas of: participating in inter-cultural events (55%); participating in environmental cleaning up campaigns (such as Tidy Town initiatives) in his/her local area (22%). The rest of the levels of actions taken to promote sustainability by respondents for the areas examined ranged from 1% to 22% on a yearly basis.

Where actions were required for the sustainability issues examined in the survey, the results show that overall on average 33.5% of the times no actions were taken to promote sustainability on a yearly, monthly, weekly or daily basis. The highest percentage levels of inactions were reflected in areas of: participating in a group to promote sustainability in his/her local community (77%); participating in environmental cleaning up campaigns (such as Tidy Town initiatives) in his/her local area (69%); advocate for the promotion and preservation of his/her local community's cultural heritage (66%); advocating (speak out, take action) for sustainability in his/her local community (63%). The lowest levels of inaction were reflected in areas of: conserving energy at home or elsewhere (3%); improving his/her own well-being (mental, social and physical) (5%). The rest of the levels of inactions to promote sustainability by respondents for the areas examined ranged from 6% to 47% of the times as shown in figure 22.

### Actions taken by respondents to promote sustainability



	*A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
■ 1 (Not at all)	6%	11%	8%	3%	7%	44%	5%	63%	69%	77%	6%	47%	63%	27%	66%
■ 2 (At least once a year)	12%	0%	3%	1%	3%	16%	2%	16%	22%	11%	21%	18%	14%	55%	19%
■ 3 (At least once a month)	32%	7%	5%	5%	4%	21%	14%	16%	6%	9%	32%	17%	15%	14%	9%
■ 4 (At least once a week)	46%	30%	23%	14%	22%	4%	47%	4%	2%	3%	39%	14%	7%	4%	5%
■ 5 (At least once a day)	4%	52%	61%	78%	64%	5%	32%	1%	1%	0%	2%	4%	1%	0%	1%

\*KEY to Actions taken by respondents to promote sustainability

- A: How often does the respondent purchase environmentally friendly products?
- B: How often does the respondent take action to reduce food wastage at home or elsewhere?
- C: How often does the respondent take action to reduce water usage at home or elsewhere?
- D: How often does the respondent take action to conserve energy at home or elsewhere?
- E: How often does the respondent travel to and from college/work/social events using environmentally friendly options (such as car-share, bus or cycling)?
- F: How often does the respondent seek advice on any matter from elders in the community?
- G: How often does the respondent take action to improve his/her own well-being (mental, social and physical)?
- H: How often does the respondent advocate (speak out, take action) for sustainability in his/her local community?
- I: How often does the respondent participate in environmental cleaning up campaigns (such as Tidy Town initiatives) in his/her local area?
- J: How often does the respondent participate in a group to promote sustainability in his/her local community?
- K: How often does respondent purchase locally produced goods (such as foodstuff, arts and crafts)?
- L: How often does the respondent advocate (speak out, take action) for human rights?
- M: How often does the respondent advocate (speak out, take action) for environmental justice?
- N: How often does the respondent participate in inter-cultural events?
- O: How often does the respondent advocate for the promotion and preservation of his/her local community's cultural heritage?

Figure 22. Percentage distribution of actions taken by respondents to promote sustainability.

### **7.5.3 Stage 3: Data Analysis – Correlations across data-sets**

The third stage of the analysis process involves an attempt to answer the main question/sub-questions in validating the DAB tool through the identification of correlations between participants' characteristics (age, gender), their chosen programme and year of study, with participants' dispositions, abilities and behaviours in sustainability.

***1a) Do undergraduate university students' ages affect their willingness, abilities and behaviours in relation to promoting sustainability?***

**Correlations between respondents' age(s) and their willingness to engage with sustainability issues.**

To examine the correlations between respondents' age(s) and respondents' willingness to engage with sustainability, the Spearman rank correlation test was

run and produced the result ( $N=131$ ,  $\rho = -.049$ ,  $P = .579$ )<sup>1</sup>, indicating that there exists no statistically significant correlation between undergraduate university learners' age(s) and their willingness to engage with sustainability issues.

### **Correlations between respondents' age(s) and their abilities to engage with sustainability issues**

To examine the correlations between respondents' age(s) and their abilities to engage with sustainability issues, the Spearman rank correlations test was run and produced the results ( $N=112$ ,  $\rho = -.127$ ,  $P = .182$ ). The result shows that there exists no statistically significant correlation between respondents' ages and their abilities to engage with sustainability issues.

### **Correlations between respondents' age(s) and their behaviours to promote sustainability**

To examine the correlations between respondents' age(s) and their behaviours (actions taken) to promote sustainability, the Spearman rank correlations test was run and produced the results ( $N=131$ ,  $\rho = -.134$ ,  $P = .160$ ). The results show that there exists no statistically significant correlation between respondents' ages and the actions they have taken to promote sustainability.

### ***1b) Does undergraduate university students' gender affect their willingness, abilities and behaviours in promoting sustainability?***

In this section, the data analysis centred on examining the relationships between university undergraduate learners' gender and their willingness, abilities and behaviours to engage with and /or promote sustainability.

### **Association among learners' gender, and their willingness to engage with sustainability**

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<sup>1</sup> P value is set at 0.05; only age groups with a minimum count of 5 accounted for in the tests.

To examine whether university undergraduate learners' gender has effects on their willingness to engage with sustainability issues. The Mann Whitney-Wilcoxon Rank Sum test was run which produced the results ( $N=131$ ,  $U=2249$ ,  $p=.102$ ) \*\*. Indicating that there is no statistically significant correlation between undergraduate learners' gender and their willingness to engage with sustainability as shown in (Appendix I).

**Relationship between learners' gender and their abilities to engage with sustainability.**

To examine whether university undergraduate learners' gender has effects on their abilities to engage with sustainability issues. The Mann Whitney-Wilcoxon Rank Sum was run which produced the results ( $N=112$ ,  $U=1435.5$ ,  $p=.766$ ). The results show that, learners' gender has no statistically significant effects on their abilities to engage with sustainability issues, thus retaining the null hypothesis that the distribution of respondent's abilities to engage with sustainability is the same across categories of respondent's gender (See Appendix J).

**Relationship between learners' gender and their behaviours (actions taken) to promote sustainability.**

To examine whether university undergraduate learners' gender has effects on their behaviours to promote sustainability. The independent samples Median Mann Whitney U was run which produced the results ( $N=111$ ,  $U=1080$ ,  $p=.060$ ). The results show that learners' gender has no statistically significant effects on their behaviours to engage with sustainability issues (See Appendix K).

*1c) Do the current course year in which university undergraduate students are registered, have effects on their willingness, abilities and behaviours to engage with and/or promote sustainability?*

**Association among learners' current year of study and learners' willingness to engage with sustainability issues,**



To examine the association among learners' current years of studies and their willingness to engage with sustainability issues. The independent samples median Kruskal Wallis test was run and produced the results  $df(=3, N=131, H=2.430, P=.448)$ . The results show that, learners' current year of study has no statistically significant effects on their willingness to engage with sustainability issues (see Appendix L).

**Association among learners' current years of studies and their behaviours to promote sustainability.**

To examine the association among learners' current years of studies and the actions they have taken to promote sustainability. The independent samples median kruskal Wallis test was run and produced the results  $df(=3, N=111, H=5.025, P=.170)$ . The results show that learners' current year of study has no statistically significant effects on respondents' behaviours (actions taken) to promote sustainability (See Appendix M).

**Association among learners' current years of studies and their abilities to engage with sustainability issues.**

To examine the association among learners' current years of studies and their abilities to engage with sustainability issues, the independent samples median Kruskal Wallis test was run producing the results  $df(=3, N=112, H= 9.554, P=.023)$ . The results show that learners' current year of study has statistically significant effects on respondents' perceived abilities to engage with sustainability issues. The result rejects the null hypothesis that the distribution of respondents' abilities to engage with sustainability issues is the same across categories of respondent's current year of study, as shown in figure 24. The Kruskal Wallis test results are further confirmed by the results of the descriptive statistics and frequency distributions of respondents' abilities as shown in Tables 15 and 15A. The results show that the median level of abilities for first year, second year, third year and fourth year undergraduate students is (41). Based on respondents' self-rating of their abilities, the results show that third year

undergraduate students of higher education have the greatest levels of abilities to engage with sustainability, when compared with students of first year, second year and fourth year undergraduates. The data sum counts show that third year students exhibited more ability levels (20) above the median level than students of all the other classes as shown in table 15a. Also, comparatively first year undergraduate learners presented higher counts of ability levels (19) below the median for all the four classes (year1, year 2, year 3, year 4) as shown in Table 15b and figure 23.

\*\* *P* value is set at 0.05 for Appendices: *F, G, H, I, J, K, L, M, N, O, P.*

#### Descriptive Statistics

	N	Mean	Std. Deviation	Min	Max	Percentiles		
						25th	50th (Median)	75th
Abilities_SUMF	116	41.03	8.058	18	60	36.00	41.00	46.00
Learner's current year of study	132	2.29	1.102	1	4	1.00	2.00	3.00

Table 15a. Descriptive statistics for learners' abilities responses and current year of studies

#### Frequencies

	Learner's current year of study				
	Year1; Year 1 second semester	Year 2	Year 3	Year 4, Year 4 in my home country; Year 4 exchange year programme	
Abilities_SUMF	>Median	15	15	20	4
	<=Median	19	13	10	17

Table 15b. Learners' frequency results for abilities greater than and/or less than the median per year of study.

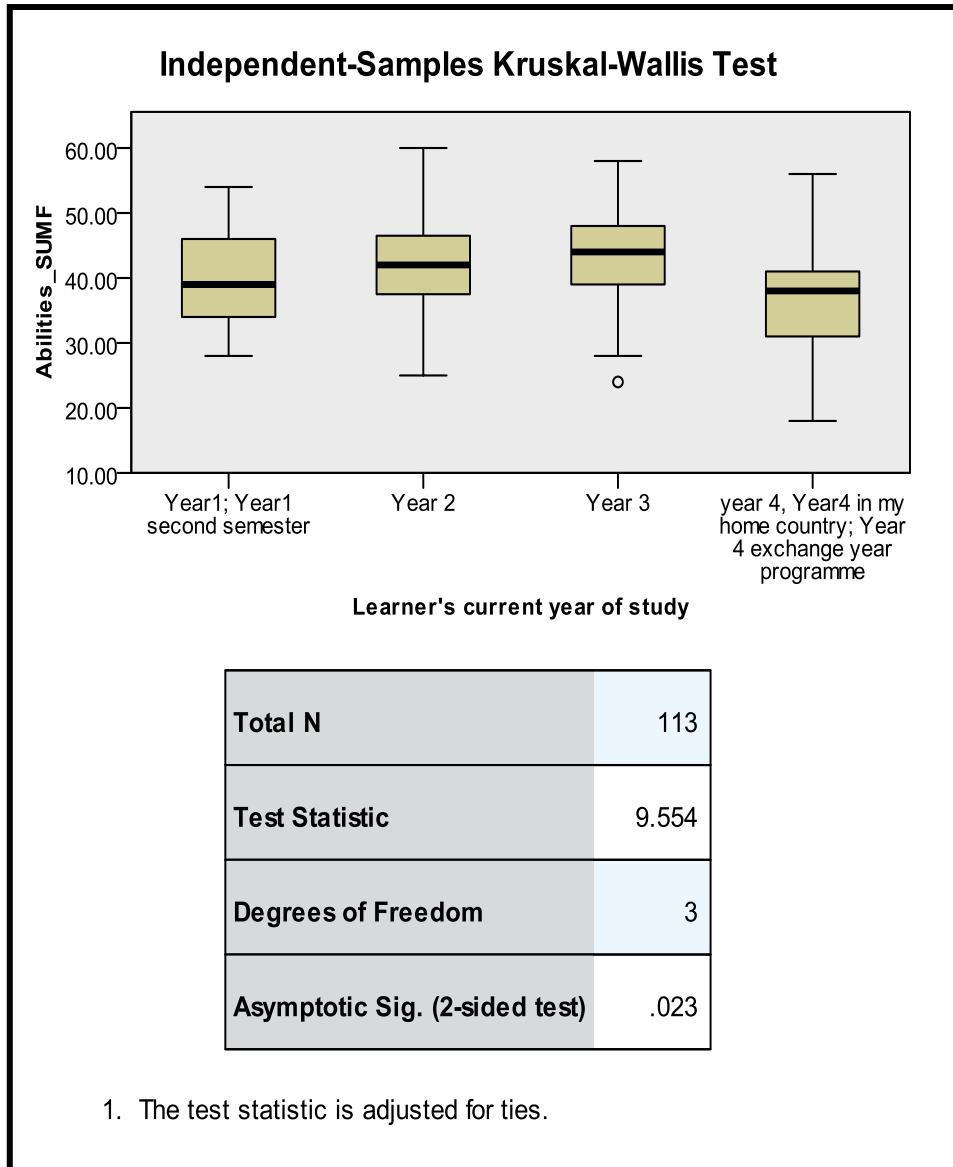


Figure 23. Association among learners' current year of study and their abilities to engage with sustainability

*Id) Are there relationships between the types of study programmes for which university undergraduate students are registered and their willingness, abilities and behaviours to engage with and/or promote sustainability?*

**Association among learners' study programmes and their willingness to engage with sustainability**

To examine the association among learners' study programmes and their willingness to engage with sustainability, the independent samples median Kruskal Wallis test was run producing the results  $df(47, N=131, H=59.706, P=.101)$ . The results show that learners' study programmes have no statistically significant effects on their willingness to engage with sustainability (See Appendix N). Further analysis of the data was done to examine whether or not there existed relationships between learners' study programmes grouped by faculty and their willingness to engage with sustainability issues. The independent samples median Kruskal Wallis test was run and produced the results  $df(3, N=131, H=1.613, P=.657)$ . The results show that learners' study programmes grouped by faculties have no statistically significant effects on their willingness to engage with sustainability (See Appendix O).

#### **Association among learners' study programmes and their abilities to engage with sustainability**

To examine the association among learners' study programmes and their abilities to engage with sustainability, the independent samples median Kruskal Wallis test was run producing the results  $df(45, N=112, H=52.409, P=.209)$ . The results show that learners' study programme has no statistically significant effects on respondents' abilities to engage with sustainability issues, thus retaining the null hypothesis that the distribution of respondents' abilities is the same across categories of study programmes (See Appendix P). Further statistical tests were carried out to examine the association among learners' study programmes (grouped by faculty) and their abilities to engage with sustainability. The independent samples median Kruskal Wallis test was run and produced the results,  $df(3, N=112, H=3.654, P=.309)$ . The results show that learners' study programme has no statistically significant effects on respondents' abilities to engage with sustainability issues, thus retaining the null hypothesis that the distribution of respondents' abilities is the same across categories of study programmes (See Appendix Q).

### **Association among learners' study programmes and their behaviours (actions taken) to promote sustainability**

To examine the association among learners' study programmes and their behaviours (actions taken) to promote sustainability, the independent samples median Kruskal Wallis test was run producing the results  $df (45, N=111, H=51.728, P=.228)$ . The results show that learners' study programme has no statistically significant effects on respondents' behaviours (actions taken) to promote sustainability, thus retaining the null hypothesis that the distribution of respondents' behaviours to promote sustainability is the same across categories of study programmes (See Appendix R). Further statistical tests were run to examine the association among learners' study programmes (grouped by faculty) and their behaviours (actions taken) to promote sustainability. The independent samples median Kruskal Wallis test was run and produced the result,  $df (3, N=111, H=4.240, P=.237)$ . The results show that learners' study programmes when grouped by faculty have no statistically significant effects on their behaviours (actions taken) to promote sustainability. The results retain the null hypothesis that the distribution of respondents' behaviours to promote sustainability is the same across categories of study programmes when grouped by faculty (See Appendix S).

#### **7.5.4 Stage 4: Data Analysis: Associations across DAB dimensions**

The fourth stage of the data analysis involved the running of further statistical tests to answer the question:

*Do correlations exist between participants' dispositions, abilities and behaviours to engage with and/or promote sustainability?*

In this light, the Spearman Rank Correlations tests were run:

1. To examine if participants' willingness to engage with sustainability had effects on their abilities to engage with sustainability.
2. To examine if participants' willingness to engage with sustainability had effects on their behaviours to promote sustainability.

3. To examine if participants' abilities to engage with sustainability issues had effects on their behaviours to promote sustainability.

**Correlations between respondents' willingness to engage with sustainability, and their abilities to do same**

To examine the correlations between respondents' willingness to engage with sustainability and their abilities to engage with sustainability issues, the Spearman rank correlations test was run and produced the results, ( $N=131$ ,  $\rho = .510$ ,  $P = .001$ ). The results show that there exists a statistically significant positive correlation between respondents' willingness and their abilities to engage with sustainability issues as shown in table 16.

Correlations

Respondent's willingness to engage with sustainability issues		Respondent's abilities to engage with sustainability issues		
Spearman's rho	Respondent's willingness to engage with sustainability issues	Correlation Coefficient	1.000	.515**
		Sig. (2-tailed)	.	.000
		N	131	112
		Correlation Coefficient	.515**	1.000
	Respondent's abilities to engage with sustainability issues	Sig. (2-tailed)	.000	.
		N	112	112

Table 16. Correlation between respondents' willingness and respondents' abilities to engage with sustainability.

\*\* Correlation is significant at 0.01 level (2- tailed).

**Correlations between respondents' willingness to engage with sustainability and their behaviours (actions taken) to promote sustainability.**

To examine the correlations between respondents' willingness to engage with sustainability and their behaviours (actions taken) to promote sustainability, the Spearman rank correlations test was run and produced the results ( $N=131$ ,  $\rho = .442$ ,  $P = .000$ ). The result shows that there exists a statistically significant positive correlation

between respondents' willingness to engage with sustainability and the actions they have taken to promote sustainability as shown in table 17.

### Correlations

Respondent's willingness to engage with sustainability issues		Actions taken by respondents to engage with sustainability issues		
Spearman's rho	Respondent's willingness to engage with sustainability issues	Correlation Coefficient	1.000	.420**
		Sig. (2-tailed)	.	.000
		N	131	111
	Respondent's abilities to engage with sustainability issues	Correlation Coefficient	.420**	1.000
		Sig. (2-tailed)	.000	.
		N		111

Table 17. Correlation between respondents' willingness and respondents' abilities to engage with sustainability. \*\* Correlation is significant at 0.01 level (2- tailed).

### Correlations between respondents' abilities to engage with sustainability issues, and the actions they have taken to promote sustainability

To examine the correlations between respondents' abilities to engage with sustainability and their behaviours (actions taken) to promote sustainability, the Spearman rank correlations test was run and produced the results ( $N=111$ ,  $\rho = .565$ ,  $P = .000$ ). The result shows that there exist statistically significant positive correlations between respondents' abilities to engage with sustainability and their behaviours to promote sustainability as shown in table 18.

### Correlations

Respondent's abilities to engage with sustainability issues			Actions taken by respondent to promote sustainability	
Spearman's rho	Respondent's abilities to engage with sustainability issues	Correlation Coefficient	1.000	.551**
		Sig. (2-tailed)		.000
		N	112	110
		Correlation Coefficient	.551**	1.000

	Actions taken by respondent to promote sustainability	Sig. (2-tailed)	.000	.
		N	110	111

Table 18. Correlations between respondents' abilities and their behaviours to engage with and/or promote sustainability.

*\*\* Correlation is significant at the 0.01 level (2-tailed).*

## 7.6 Discussion

Data from the DAB survey produced interesting findings. The survey results showed that higher education learners' ages and their gender do not have significant impacts on their dispositions, abilities and behaviours with regards to engaging with and/or promoting sustainability. Contrarily the results showed that higher education learners' current year of study correlates with their abilities to engage with sustainability. Interestingly among undergraduate students of higher education, third year students rated themselves with the highest levels of abilities to engage with sustainability compared with students of first year, second year and fourth year. The results could be justified by the fact that while most undergraduate degree courses and programmes run for four years, by the third-year learners have acquired sufficient knowledge, skills and aptitudes to engage more with sustainability related issue and actions. However, in the fourth year, while the students may have acquired higher levels of academic skills and abilities, the students are more engaged with their disciplinary study work (Examinations, assignments, projects/practice, internships) to enable them to complete their degree programmes and are thus, less inclined to fully engaging with issues and studies that are not directly related to their study programmes and courses. The data results also showed that first year undergraduate learners of higher education have self-declared lower levels of abilities to engage with sustainability when compared with students of second year, third year and fourth year.

The overall results of the survey showed that higher education learners: overwhelmingly have positive dispositions towards sustainability; have self-proclaimed high levels of abilities to engage with sustainability and manifest their dispositions and abilities for sustainability through increasing levels of actions (behaviours) taken to promote



sustainability. However, these results have limitations as they present a snapshot in time of higher education learners' dispositions, abilities and behaviours in relation to engaging with and/or promoting sustainability.

The survey results also showed that learners' willingness correlates positively with their abilities to engage with sustainability while their abilities correlate positively with their behaviours to promote sustainability.

As far as the DAB instrument itself is concerned, the result of the survey has proven that the DAB tool can effectively be used in profiling higher education learners' sustainability related dispositions, abilities and behaviours at a given point in time.

Also, the DAB instrument has proven to be a useful tool for identifying elements of higher education learners' profile attributes that impact negatively or positively on their dispositions, abilities and behaviours to engage with and/or promote sustainability.

However, there are limitations with the DAB tool about the statements used. The statements used in the survey were limited to the type and environment of the learners. The statements do not represent a standardized sustainability related statement bank. Statements or questions for the DAB instrument could be adapted and amended to suit the learning environment and situation of the learners to profile their sustainability related dispositions, abilities and behaviours at a given point in time.

## **7.7 Conclusions**

The DAB survey was designed and deployed to university undergraduate learners. The survey instrument was designed with forty-four statements, thirty-eight of which were sustainability related statements, which covered issues relating to learners' dispositions, abilities and behaviours. Eleven statements were used which examined issues about learners' dispositions (willingness/unwillingness) for sustainability; twelve statements examined learners' sustainability related abilities (knowledge, skills and aptitudes) and fifteen statements examined the actions learners have taken to promote sustainability.

The findings from this part of the study showed that higher education learners overwhelmingly had positive dispositions for sustainability; self-recorded high levels of abilities to engage with sustainability and had manifested this through increasing levels

of actions taken to promote sustainability. Interestingly, higher education learners' ages, gender or the types of study programmes for which they are registered (be it the course or faculty programmes), have little or no effects on their dispositions, abilities and behaviours to engage with and/or promote sustainability.

The results also showed that the DAB tool can effectively be used in identifying learners' profile attributes that impact on their sustainability related dispositions, abilities and behaviours. Thus, the DAB tool can be used to profile higher education learners' sustainability related dispositions, abilities and behaviours at a given point in time.

## **Chapter Eight: Comparative Analysis of DAB and NEP Tools**

### **8.1 Introduction**

This chapter reports on a comparative analysis of the DAB instrument vis-à-vis the standardized New Ecological Paradigm (NEP) tool in profiling higher education learners' sustainability competencies. The focus in this section is to examine the relationship between learners' sustainability worldviews and their behaviours in promoting environmental sustainability. The NEP tool profiles learners' worldviews (i.e. whether they are proecological or not) and provides an indication as to their disposition (anthropocentrism, etc.). The focus in this section thus was on exploring associations between: 1) the environmental perspectives of the DAB and corresponding worldviews in NEP (because both instruments-DAB and NEP have measures related to environmental sustainability), and secondly, whether there was any connection between the behaviour aspect of the DAB (the actions they take to promote sustainability) and learners' worldviews.

### **8.2 Focus and Context for Comparative Analysis**

The focusing question to answer for this section of the study in validating the DAB was: *Do higher education learners' worldviews influence their behaviours (actions) in promoting sustainability?* To answer this question, a purposefully selected sample case study of a group of first year higher education learners who were undertaking a course in sustainability was chosen to profile their sustainability related worldviews and behaviours in promoting environmental sustainability upon entering higher education.

The DAB and NEP surveys were deployed by email to a case group of 54 in-coming first year education and training (full time and part time) students of Dublin City University (DCU Glasnevin Campus), who were undertaking a course in sustainability. The DAB survey set-out to profile learners' behaviours in relation to environmental sustainability on entering university, while the NEP survey profiled their worldview with respect to sustainability (whether they had pro-ecological worldviews, or not). A sample of 38 learners responded to the surveys, giving a percentage response rate of 70.4%

Due to the limited number of the case group, the statistical analysis in this section will focus only on descriptive statistics (statistical frequency distributions of learners' responses for both the DAB and NEP surveys) to make comparisons of learners' worldviews and behaviours in promoting sustainability.

The analysis was carried out in four stages. The first stage involved the analysis of descriptive statistics for the DAB and an identification of learners' behaviours in relation to perspectives on environmental sustainability. The second stage involved the analysis of the descriptive statistics of the NEP, identifying learners' sustainability related worldviews, taking into consideration the five sub-themes of the NEP tool. The third stage involved investigating if there were associations between learners' NEP profiled worldviews and their DAB measured sustainability behaviours. The fourth stage involved a discussion of the combined DAB and NEP case group survey findings.

### **8.3 Stage 1: Analysis of DAB Case Group**

The Dispositions, Abilities and Behaviours framework is created to give an indication of learners' dispositions, abilities and behaviours vis-à-vis sustainability at a point in time. The 'behaviours' component of the DAB framework as explained earlier provides a snapshot of learners' actions for sustainability. The behavior subscale of the DAB is made up of 15 items and rated on a 5-point Likert scale ranging including: 1(Once a day), 2(Once a Week), 3(Once a Month), 4(Once a Year) and 5(Not at all). The focus in this section was to examine the eight behavior items that examined learners' actions in relation to promoting environmental sustainability.

The focus of the analysis in this section thus, was to **examine learners' behaviours in promoting environmental sustainability**. The intent was to explore the relationships between the behaviour dimension of DAB and students existing worldviews as revealed through the NEP scale, with a view to revealing whether there was a correlation between learners' worldviews and their behaviours in promoting environmental sustainability.

#### **8.3.1. Learners' Behaviours in Environmental Sustainability**

The descriptive statistics in table 19 show that for the range of activities that promote environmental sustainability examined in the survey, this cohort of students engaged

more in purchasing environmentally friendly product (84% of the times); participating in environmental cleaning up campaign/ (such as: Tidy Towns initiatives) in your local area (65%) of the times and taking actions to reduce water usage at home or elsewhere (59%) of the times. However, given the increasing information campaigns and awareness raising over the effects of climate change and the emphasis on environmental sustainability by schools and colleges through the green flag programmes in Ireland one would have expected the learners to register higher levels of actions in the areas such as conserving energy. Ironically, the case study results showed that this cohort of students took the least actions in the area of conserving energy at home where 76% of the times no actions were taken to conserve energy. A similar trend was exhibited in their actions in relation to using environmentally friendly options (such as: car-share, bus or cycling) to travel to and from college/work/social events, as shown in table 19 and figure 24.

An interesting nuance in the findings of this section of the study is the fact that this cohort of students recorded very high levels of purchasing environmentally friendly products which one would have expected not to be the case because most often environmentally friendly products (be them organic foodstuff or recycled products) are much more expensive than non-environmentally friendly ones. Two reasons might justify this students' self-reported results: First, just coming from second level where the emphasis on sustainability was on the environmental perspective, their responses could represent a desire to show their concern for environmental protection. Secondly, the students may not have understood the question. This was a good opportunity to carry out interviews with some of the students in the case-group to corroborate the students' survey responses with some explanations from them. However, despite many attempts made to engage the learners in an interview process and despite accepting to participate in the interviews initially, the learners who initially accepted declined to engage in interviews, although the researcher made repeated requests through emails. This is one of the setbacks of this research. This would have been an opportunity to make the respondents' (students') voices much stronger in the findings of this study. However, this has not been the case in this instance as the students did not accept to engage in the interviews.

<b>Percentage distribution of learners' behaviours (actions taken) to promote environmental sustainability</b>	<b>Not at All</b>	<b>Once a Year</b>	<b>Once a Month</b>	<b>Once a Week</b>	<b>Once a Day</b>
How often you purchase environmentally friendly products.	0	3	3	10	84
How often you take action to reduce your food wastage at home or elsewhere	16	0	8	30	46
How often you take action to reduce water usage at home or elsewhere.	3	0	22	59	16
How often you take action to conserve energy at home or elsewhere.	76	14	5	5	0
How often you travel to and from college/work/social events using environmentally friendly options (such as: car-share, bus or cycling).	73	22	5	0	0
How often you participate in environmental cleaning up campaign/s (such as: Tidy Towns initiatives) in your local area.	3	0	19	65	13
How often you purchase locally produced goods (foodstuffs, arts and/ crafts).	8	11	27	38	16
How often you advocate (speak out/take action) for environmental justice.	62	24	28	6	0

Table 19. Percentage Frequency Distribution of Learners' Actions to promote Environmental Sustainability

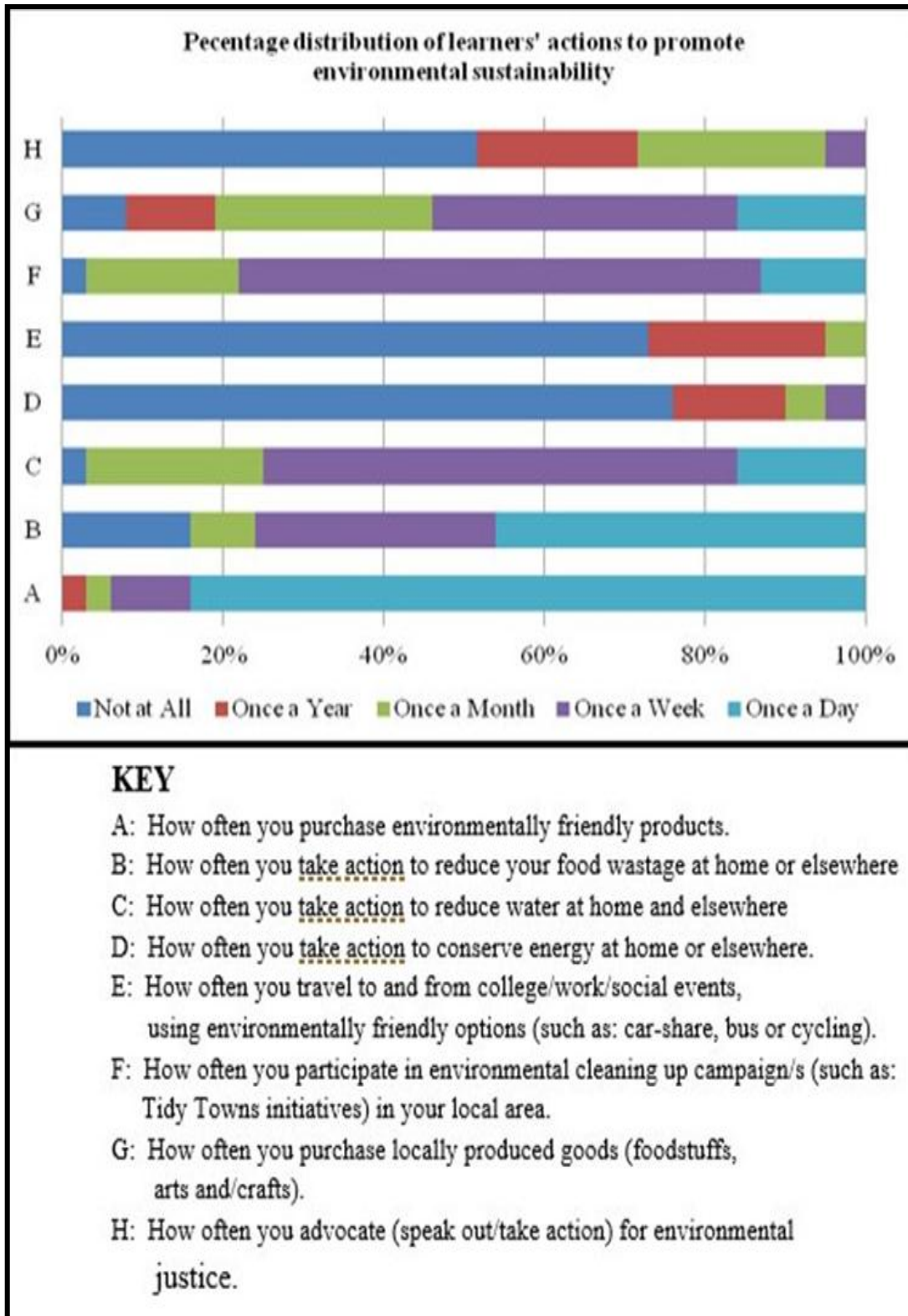


Figure 24. Percentage distribution of learners' actions to promote environmental sustainability

### **8.3.2 Discussion of DAB Case Study**

In general, the DAB case survey results showed that this group of higher education learners upon entry into higher education studies, had engaged in promoting some aspects of environmental sustainability especially in purchasing environmentally friendly products; participating in environmental cleaning up campaign/ (such as: Tidy Towns initiatives) in their local areas and reducing water usage at home or elsewhere. However, ironically while this cohort of learners self-reported frequently purchasing environmentally friendly products, they made lower levels of actions to promote other important aspects of environmental sustainability especially in the areas of energy conservation and the use of environmental friendly modes of transport.

### **8.4 Stage 2: Analysis of New Ecological Paradigm (NEP) Case Study**

The revised version of Dunlap & Van Liere's (1978) New Ecological Paradigm (NEP) was created to measure the degree to which people view humans as a part of nature rather than separate from nature (ecological worldview). This scale is made up of 15 items, rated on a 5-point Likert scale, ranging from 1 (strongly disagree) to 5 (strongly agree). For analytical purposes the NEP has been re-coded into a binary scale 1 (Agree) and 2 (Disagree) for the 15 statements of the NEP. Agreements with the eight odd numbered items indicate a pro-ecological worldview and disagreement with these statements indicate an anthropocentric (human-centred) worldview. Likewise, disagreements with the seven even numbered items indicate a pro-ecological worldview and agreements with these statements indicate an anthropocentric worldview as shown in tables 20 and 21.



1. We are approaching the limit of the number of people the Earth can support.
2. Humans have the right to modify the natural environment to suit their needs.
3. When humans interfere with nature it often produces disastrous consequences.
4. Human ingenuity will insure that we do not make the Earth unlivable.
5. Humans are seriously abusing the environment.
6. The Earth has plenty of natural resources if we just learn how to develop them.
7. Plants and animals have as much right as humans to exist.
8. The balance of nature is strong enough to cope with the impacts of modern industrial nations.
9. Despite our special abilities, humans are still subject to the laws of nature.
10. The so-called “ecological crisis” facing humankind has been greatly exaggerated.
11. The Earth is like a spaceship with very limited room and resources.
12. Humans were meant to rule over the rest of nature.
13. The balance of nature is very delicate and easily upset.
14. Humans will eventually learn enough about how nature works to be able to control it.
15. If things continue on their present course, we will soon experience a major ecological catastrophe.

Table 20. The Revised New Ecological Paradigm (NEP) Statements

Agreement (Pro-ecological worldview)	Agreement (Anthropocentric -human centric worldviews)
<ol style="list-style-type: none"> <li>1. We are approaching the limit of the number of people the Earth can support.</li> <li>3. When humans interfere with nature it often produces disastrous consequences.</li> <li>6. Humans are seriously abusing the environment.</li> <li>7. Plants and animals have as much right as humans to exist.</li> <li>8. Despite our special abilities, humans are still subject to the laws of nature.</li> <li>11. The Earth is like a spaceship with very limited room and resources.</li> <li>13. The balance of nature is very delicate and easily upset.</li> <li>15. If things continue on their present course, we will soon experience a major ecological catastrophe.</li> </ol>	<ol style="list-style-type: none"> <li>2. Humans have the right to modify the natural environment to suit their needs.</li> <li>4. Human ingenuity will ensure that we do not make the Earth unlivable.</li> <li>6. The Earth has plenty of natural resources if we just learn how to develop them.</li> <li>8. The balance of nature is strong enough to cope with the impacts of modern industrial nations.</li> <li>10. The so-called “ecological crisis” facing humankind has been greatly exaggerated.</li> <li>12. Humans were meant to rule over the rest of nature.</li> <li>14. Humans will eventually learn enough about how nature works to be able to control it.</li> </ol>

Table 21 New Ecological Paradigm Scale Explanations

There are five subscales of NEP measure, consisting of three items per subscale and six themes. The subscales and their corresponding item numbers are:

- *The Reality of Limits to Growth (items: 1, 6, 11);*

- *Antianthropocentrism (items: 2, 7, 12);*
- *The Fragility of Nature's Balance (items: 3, 8, 13);*
- *The Rejection of Exemptionalism (items: 4, 9, 14); and*
- *The Possibility of Eco-crisis (items: 5, 10 15),*

as shown in table 22a and the explanations of the NEP themes in table 22b.

<b>The Five Sub-Scales of the New Ecological Paradigm</b>	
<i>Reality of the Limits to Growth (The degree to which people understand the limits of the earth's resources).</i>	1. We are approaching the limit of the number of people the Earth can support. 6. The Earth has plenty of natural resources if we just Learn how to develop them. 11. The Earth is like a spaceship with very limited room and resources.
<i>Anti-anthropocentrism (the degree to which people understand the need to move beyond human centric views of the world).</i>	2. Humans have the right to modify the natural environment to suit their needs. 7. Plants and animals have as much right as humans to exist. 12. Humans were meant to rule over e rest of nature.
<i>The Fragility of Nature's Balance (the degree to which people understand the fragility of nature).</i>	3. When humans interfere with nature it often produces disastrous consequences. 9. The balance of nature is strong enough to cope with the impacts of modern industrial nations. 13. The balance of nature is very delicate and easily upset.
<i>The Rejection of Exemptionalism (the degree to which people understand the dangers of relying on humans to solve crises).</i>	4. Human ingenuity will insure that we do not make the Earth unlivable. 9. Despite our special abilities, humans are still subject to The laws of nature. 14. Humans will eventually learn enough about how nature works to be able to control it.
<i>The Possibility of Eco-crisis (the degree to which people understand that we are facing an ecological crisis).</i>	5. Humans are seriously abusing the environment. 10. The so-called "ecological crisis" facing humankind has been greatly exaggerated 15. If things continue on their present course, we will soon experience a major ecological catastrophe.

Table 22a. Five sub-scales of NEP measure.

<b>Pro-Ecological</b>	<b>The degree to which people view humans as part of nature rather than separate from it.</b>
<b>Reality of the limits to growth</b>	The degree to which people understand that the Earth resources are limited
<b>Anti-anthropocentrism</b>	The degree to which people understand the need to move beyond human centric views of the world.
<b>The fragility of nature's balance</b>	The degree to which people understand the fragility of nature.

<b>Rejection of exemptionalism:</b>	The degree to which people understand the dangers of relying on humans to solve crises.
<b>The possibilities of eco-crisis</b>	The degree to which people understand that we are facing an ecological crisis.

Table 22b. Explanations of the NEP Themes.

In terms of the overall results of the NEP case group survey, the statistical percentage frequency distribution of learners' responses show that a majority of the learners (66.4%) expressed pro-ecological worldviews with regards to the 15 NEP statements and (33.6%) of them had anthropocentric worldviews. In this light, for the 8 odd numbered statements in which agreements with the statements indicated pro-ecological worldviews which included: *We are approaching the limit of the number of people the Earth can support; When humans interfere with nature it often produces disastrous consequences; Humans are seriously abusing the environment; Plants and animals have as much right as humans to exist; Despite our special abilities, humans are still subject to the laws of nature; The Earth is like a spaceship with very limited room and resources; The balance of nature is very delicate and can easily upset and If things continue on their present course, we will soon experience a major ecological catastrophe*, 75% of the learners expressed pro-ecological worldviews by agreeing with the statements.

For the 7 even numbered statements for which disagreements with the statements also indicated pro-ecological world views which included: *Humans have the right to modify the natural environment to suit their needs; Human ingenuity will ensure that we do not make the Earth unlivable; The Earth has plenty of natural resources if we just learn how to develop them; The balance of nature is strong enough to cope with the impacts of modern industrial nations; The so-called "ecological crisis" facing humankind has been greatly exaggerated; Humans were meant to rule over the rest of nature; Humans will eventually learn enough about how nature works to be able to control it*, 57% of the learners expressed pro-ecological worldviews by disagreeing with the statements.

Meanwhile for the 8 odd numbered statements for which disagreement with the statements indicated human centric world views, on average, 25% of the learners expressed human centric worldviews by disagreeing with the statements and for the 7 even numbered statements that agreement with them indicated human centric worldviews, on average, 43% of the learners expressed human centric worldviews by

agreeing with the statements. Generally, a majority of the learners view humans as part of nature rather than separate from it as shown in table 23.

Agreement (Pro-ecological worldview)	% Agree	% Disagree	Agreement (Anthropocentric -human centric worldview)	% Agree	% Disagree
<b>1. We are approaching the limit of the number of people the Earth can support.</b>	43	57	<b>2. Humans have the right to modify the natural environment to suit their needs.</b>	46	54
<b>3. When humans interfere with nature it often produces disastrous consequences.</b>	83	17	<b>4. Human ingenuity will insure that we do not make the Earth unlivable.</b>	27	73
<b>5. Humans are seriously abusing the environment.</b>	97	3	<b>6. The Earth has plenty of natural resources if we just learn how to develop them.</b>	6	94
<b>7. Plants and animals have as much right as humans to exist.</b>	100	0	<b>8. The balance of nature is strong enough to cope with the impacts of modern industrial nations.</b>	62	38
<b>9. Despite our special abilities, humans are still subject to the laws of nature.</b>	84	16	<b>10. The so-called “ecological crisis” facing humankind has been greatly exaggerated.</b>	57	43
<b>11. The Earth is like a spaceship with very limited room and resources.</b>	41	59	<b>12. Humans were meant to rule over the rest of nature.</b>	69	31
<b>13. The balance of nature is very delicate and easily upset</b>	70	30	<b>14. Humans will eventually learn enough about how nature works to be able to control it.</b>	36	64
<b>15. If things continue on their present course, we will soon experience major ecological catastrophe.</b>	81	19			

Table 23. Percentage frequency distribution of learners’ agreements/disagreements with sustainability related statements

As far as the theme on the ‘*reality of the limits to growth*’ is concerned, a majority of the learners ( $\frac{2}{3}$ ) expressed human centric worldviews while a minority ( $\frac{1}{3}$ ) of them expressed pro-ecological worldviews. Here 57% of the learners expressed human centric worldviews by disagreeing with the statement that ‘*we are approaching the limit of the number of people the Earth can support*’, while 43% of them expressed pro-ecological worldviews by agreeing with the statement. Also, an overwhelming majority of the learners (94%) expressed pro-ecological worldviews by disagreeing with the statement that ‘*the Earth has plenty of natural resources if we just learn how to develop them*’, while 6% of the learners expressed human centric worldviews by agreeing with the

statement. In the same light, a majority of the learners (59%) expressed human centric worldviews by disagreeing with the statement that ‘*the Earth is like a spaceship with very limited room and resources*’, while 41% of the learners expressed pro-ecological worldviews by agreeing with the statement. Thus, although learners overwhelmingly acknowledge the fact that the earth’s resources are limited, ironically, a majority of them generally do not see the need to limit population growth and the unsustainable use of resources. Thus, these learners’ do not think in terms of the sustainable use the earth resources so that future generations could benefit same from earth’s bounty, as shown in table 24.

<b>Reality of the limits to growth</b>	<b>Agree</b>	<b>Disagree</b>	<b>Pro-Ecological</b>	<b>Anthropocentric</b>
1. We are Approaching the limit of the number of people the Earth can support.	43	57		x
6. The Earth has plenty of natural resources if we just learn how to develop them.	6	94	x	
The Earth is like a spaceship with very limited room and resources	41	59		x

Table 24. Frequency distribution of learners’ agreements/ disagreements with issues related to the realities of the limits to growth.

In relation to the theme on *anti-anthropocentrism* a majority of the learners ( $\frac{2}{3}$ ) expressed pro-ecological worldviews while one third of them expressed anthropocentric worldviews. Here 54% of the learners expressed pro-ecological worldviews by disagreeing with the statement that ‘*humans have the right to modify the natural environment to suit their needs*’, while 46% of them expressed anthropocentric worldviews by agreeing with the statement. Also, all the learners (100%) overwhelmingly expressed pro-ecological worldviews by agreeing with the statement that ‘*plants and animals have as much right as humans to exist*’. In the same light, a majority of the learners (69%) expressed anthropocentric worldviews by agreeing with the statement that *humans were meant to rule over the rest of nature*, while only 31% of them expressed pro-ecological worldviews by disagreeing with the statement as shown in table 25.

Anti-anthropocentrism	Agree	Disagree	Ecological	Anthropocentric
2. Humans have the right to modify the natural environment to suit their needs.	46	54	x	
7. Plants and animals have as much right as humans to exist.	100	0	x	
12. Humans were meant to rule over the rest of nature.	69	31		x

Table 25. Frequency distribution of learners' agreements/ disagreements with issues related to anti-anthropocentrism.

As far as the theme on the *fragility of nature* is concerned a majority of the learners ( $\frac{2}{3}$ ) expressed pro-ecological worldviews while one third of them expressed human centric worldviews. Here 83% of the learners expressed pro-ecological worldviews by agreeing with the statement that when '*humans interfere with nature it often produces disastrous consequences*', while 17% of the learners expressed human centric worldviews by disagreeing with the statement. Also, 62% of the learners expressed human centric worldviews by agreeing with the statement that '*the balance of nature is strong enough to cope with the impacts of modern industrial nations*', while 38% of the learners expressed pro-ecological worldviews by disagreeing with the statement. In the same light 70% of the learners expressed pro-ecological worldviews by agreeing with the statement that '*the balance of nature is very delicate and can easily upset*', while 30% of the learners expressed human centric worldviews by disagreeing with the statement. In general, a majority of learners understand that nature's balance is fragile and the earth has limited carrying capacity to withstand all of human industrialization and other unsustainable practices, as shown in table 26.

The fragility of nature's balance	Agree	Disagree	Ecological	Anthropocentric
3. When humans interfere with nature it often produces disastrous consequences.	83	17	x	
8. The balance of nature is strong enough to cope with the impacts of modern industrial nations.	62	38		x
13. The balance of nature is very delicate and easily upset	70	30	x	

Table 26. Frequency distribution of learners' agreements/ disagreements with issues related to the fragility of nature's balance.

Overall, as far as the theme of the rejection of exemptionalism is concerned, the learners overwhelmingly expressed pro-ecological worldviews. In this case, 73% of the learners expressed pro-ecological worldviews by disagreeing with the statement that *'human ingenuity will ensure that we do not make the Earth unlivable'*, while 27% agreed with the statement thus expressing human centric worldviews. 84% of the learners expressed pro-ecological worldviews by agreeing with the statement that despite our special abilities, *'humans are still subject to the laws of nature'*, while 16% of learners expressed human centric views with regards to this statement. Also 64% of learners expressed pro-ecological worldviews by disagreeing with the statement that *'humans will eventually learn enough about how nature works to be able to control it'*, while 36% of learners agreed with the statement, expressing human centric worldviews. Thus, learners understand the dangers of relying on humans to solve crises as shown in table 27.

The rejection of exemptionalism	Agree	Disagree	Pro-ecological	Anthropocentric
4. Human ingenuity will ensure that we do not make the Earth unlivable.	27	73	x	
9. Despite our special abilities, humans are still subject to the laws of nature.	84	16	x	
14. Humans will eventually learn enough about how nature works to be able to control it.	36	64	x	

Table 27. Frequency distribution of learners' agreements/disagreements with issues related to the rejection of exemptionalism.

In relation to the theme on *the possibilities of eco-crisis*, a majority of the learners ( $\frac{2}{3}$ ) expressed pro-ecological worldviews while a minority ( $\frac{1}{3}$ ) of them expressed human centric worldviews. Here 97% of the learners expressed pro-ecological worldviews by agreeing with the statement that *humans are seriously abusing the environment*, while 3% of them expressed human centric worldviews by disagreeing with the statement. Also, 57% of the learners expressed human centric worldviews by agreeing with the statement that *the so-called "ecological crisis" facing humankind has been greatly exaggerated*, while 43% of them expressed pro-ecological worldviews by disagreeing with the statement. In the same light, a majority of the learners (81%) expressed pro-ecological worldviews by agreeing with the statement that *if things continue on their present course, we will soon experience a major ecological catastrophe*, while 19% of them expressed human centric worldviews by disagreeing with the statement. Overall, a majority of the learners understand that the world is facing an ecological crisis, as shown in table 28.

The possibilities of eco-crisis	Agree	Disagree	Ecological	Anthropocentric
5. Humans are seriously abusing the environment.	97	3	x	
10. The so-called "ecological crisis" facing humankind has been greatly exaggerated.	57	43		x
15. If things continue on their present course, we will soon experience a major ecological catastrophe.	81	19	x	

Table 28. Frequency distribution of learners' agreements/disagreements with issues related to the possibilities of eco-crisis.



#### **8.4.1 Discussion of NEP Case Study**

The NEP survey responses reveal that overall this cohort of higher education learners upon entering the university have pro-ecological worldviews with regards to the sustainability issues examined. However for some statements in the survey which examined issues related the earth's carrying capacity, the finite nature of planetary resources and the possibility of an ecological crisis and the role of humans in the ecological system (*We are approaching the limit of the number of people the Earth can support; The Earth is like a spaceship with very limited room and resources; The balance of nature is strong enough to cope with the impacts of modern industrial nations; The so-called "ecological crisis" facing humankind has been greatly exaggerated; Humans were meant to rule over the rest of nature*), these learners generally expressed human centric views as far as these sustainability issues are concerned.

#### **8.5 DAB/NEP Comparative Analysis Discussion**

The findings for the NEP case survey show that generally, two-thirds of the learners expressed proecological worldviews and one third of them had anthropocentric worldviews with regards to the sustainability perspectives examined. However, when we investigate further into the sub-categories of the NEP scale, we see some incongruencies with pro-ecological worldviews. In relation to the 'reality of the limits to growth', two thirds of the learners didn't understand the planetary limits of growth while one third of them did understand that earth reseaources are finite and there is a limit to growth. Also in relation to anti-anthropocentrism, two-thirds of the learners had proecological worldviews while one third of them had anthropocentric worldviews. In the same light in relation to the fragility of natures' balance, a majority of the learners ( $\frac{2}{3}$ ) had proecological worldviews. Interestingly, in relation to issues of exemptionalism, an overwhelming majority of the learners expressed proecological worldviews. Also, a majority of the learners ( $\frac{2}{3}$ ) expressed proecological worldviews with regards to issues related to the possibility of eco-crisis.

In comparison with their behaviours as recorded from the DAB survey results, the DAB survey results showed that the learners had engaged highly in some activities that promote environmental sustainability in areas like purchasing environmentally friendly

products, participating in environmental clean-up and reducing water wastage at home and elsewhere but recorded low levels of actions in key environmental sustainability areas like energy conservation and using environmentally friendly transport.

However, given the high levels of proecological worldviews recorded by this cohort of students, with regards to issues related to exemptionalism, the fragility of nature's balance, and the possibility of eco-crisis, one would have expected them to engage more in activities that promote environmental sustainability especially in key areas (such as energy conservation and using environmentally friendly transport). Instead, they recorded the lowest levels of actions in such key environmental sustainability issues. Thus, although generally, most of this cohort of students expressed proecological worldviews, they took very little actions to promote sustainability in key areas of environmental sustainability like energy conservation and using environmentally friendly transportation options. This indicates that despite increasing global awareness and information on sustainability issues related to climate change and the devastating global consequences of increasing atmospheric temperatures caused by carbon emissions from automobiles and other greenhouse gases into the atmosphere, these learners are still not taking adequate actions in the areas of mitigating climate change. In the same light, although this group of learners generally expressed pro-ecological views in many of the statements examined in the NEP survey, they generally expressed human centric views with regards to issues related to the Earth's carrying capacity, the finite nature of planetary resources, the possibility of an ecological crisis and the role of humans in the ecological system. For example, many of the learners viewed humans as part of nature rather than separate from it. Yet the same cohort of students think humans were meant to rule over the rest of nature from their recorded responses. Ironically again overwhelmingly this cohort of students express worldviews that despite our special abilities, humans are subject to the laws of nature. The students' responses to the sustainability issues raised in the surveys reflect their contextual understandings of sustainability. While they may express anthropocentric views like humans were meant to rule over the rest of nature, at the same time many of them agreed that despite our special abilities humans are still subject to the laws of nature. This position reflects the environmental sustainability issues the students were experiencing in the context of Ireland for example many of these students may have witnessed and/or heard through the media about the floods of December 2015 when the River Shannon overflowed its banks, inundating more than 470

homes, farms and other property in the Athlone and surrounding areas (Irish Times, 2015). The incongruity in this cohort of learners' worldviews and actions in relation to environmental sustainability issues is also a reflection of the complexity of the concept of sustainability, indicating that the relevance of the sustainability discourse should be contextualised to the realities of the learners.

Therefore, from a comparative analysis of the behavior element of DAB, and the worldview and its constituent elements from NEP, we realise that having a pro-ecological worldview does not necessarily imply that the participant will holistically engage in actions to promote sustainability in all its perspectives (be them environmental, social, economic or cultural). Also, even within a given area of sustainability like the case of environmental sustainability which has been the focus of this section of the study, learners' do not holistically engage with promoting sustainability. They might take actions to promote sustainability in some areas based on their personal interests and ignore other key areas where actions are necessary as revealed by the results of this case study.

## **8.6 Conclusions**

The findings from this case-group survey of first year university learners showed that upon entering the university, this group of higher education learners generally have pro-ecological worldviews and have engaged in some activities that promote environmental sustainability. However, although they carried out actions in some areas to promote environmental sustainability like reducing water wastage at home, purchasing environmental friendly products and engaging in environmental clean up campaigns in their local communities, this cohort of learners neglected the promotion of key areas of environmental sustainability like energy conservation and the use of environmentally friendly transport options. Thus, despite growing awareness and information on environmental challenges associated with climate change that the world is currently facing, this cohort of students is still lagging behind in terms of taking actions to promote sustainability in areas that could help in mitigating climate change. Thus, there is a disjoint between their sustainability related worldviews (highly proecological) and their behaviours in promoting some key aspects of environmental sustainability.

The findings of this case-group survey also confirm findings from literature (Eurobarometer, 2006), which hold the arguments that generally, people do not match their sustainability related attitudes (in this case worldviews), with their actions. This finding calls for the need to address sustainability in higher education courses and programmes so that learners are provided with knowledge that gives them holistic understandings of sustainability education. Educating learners in sustainability will thus equip them with skills, knowledge and competencies to engage with sustainability as change agents to take holistic actions to promote sustainability.

The findings of the case study also provide significant information to higher education academic programme chairs and staff interested in sustainability issues on learners' pre-university entry sustainability related knowledge, skills and actions. Such information could be helpful to academic programmes chairs and staff in determining the types of sustainability competencies to be fostered in programmes and courses, to prepare learners to become sustainability change agents in the course of their higher education learning and upon graduation.

In addition, the case study findings have proven that the NEP and DAB are important sustainability related assessment tools that could be used by educators to:

- Profile learners' sustainability worldviews (whether these are pro-ecological or human centric) using the NEP tool;
- Profile higher education learners' prior sustainability related knowledge, skills, competencies and behaviours using the DAB tool.

The case study findings also showed that the DAB instrument could be used as a complementary ESD competencies assessment tool that could be used with other standardized ESD competencies assessment tools (such as the NEP) to provide a holistic and richer snapshot of higher education learners' sustainability competencies at a given point in time.

However, on reading these findings one should be aware of the limitations of these sustainability related assessment tools. To begin with, although standardized, the New Ecological Paradigm (NEP) instrument assesses specifically the orientations of learners' worldviews whether they are pro-ecological or human centric. However, education for sustainable development goes beyond people's worldviews and incorporates learners'

knowledge, skills and actions (behaviours) beyond the environmental and ecological dimensions. The goal of education for sustainable development is to prepare learners to become change agents for sustainability who manifest their knowledge, skills and actions (behaviours) to promote sustainability. Thus, while the NEP is an important sustainability assessments tool, it needs to be associated with other sustainability related assessment tools and/or methods to present a holistic picture of learners' sustainability related worldviews, knowledge, skills and behaviours.

Also, the results of the case study have shown that the DAB is an important sustainability related assessment tool that can be used by educators to profile learners' sustainability knowledge, skills and behaviours at a given point in time and context. In addition, the DAB can be used to profile learners' sustainability competencies over time. In such cases the tool can be used at various stages of learners' sustainability studies to capture progressing and/or regressing trends in their sustainability related knowledge, skills and actions over time. In such circumstances, there will be repeated assessments of learners' sustainability knowledge, skills and actions during their studies.

However, the DAB tool has its limitations as it presents only a snapshot in time and context of learners' sustainability related profiles. Also, like the NEP tool, the DAB tool needs to be associated with other sustainability related assessment tools and/or methods to present a holistic picture of learners' sustainability related dispositions, knowledge, skills and behaviours in the long term.

## Chapter Nine: Conclusions & Recommendations

### 9.1 Introduction

This research study set out to examine how the curricula of higher education might be re-oriented to enable learners to become more critically aware of challenges in sustainability facing the world, and more proactive in seeking solutions to them, thus becoming agents of change to foster the development of more sustainable future communities. This chapter responds to the research questions posed at the outset of the study, reflects on researcher development in the process of implementing the research study, and summarises the conclusions and recommendations from this study.

### 9.2 Responding to Research Questions

This study centred on considering why, and how, sustainability should be infused within higher education curricula in an Irish context.

#### 9.2.1 Infusing Sustainability

So, *why should sustainability education be integrated in academic programmes and courses in higher education in Ireland?* There is an urgent need to address sustainability in higher education programmes and courses so that higher education can *produce* future graduates who are sustainability change agents vested with sustainability competencies and knowledge to take actions through behavior changes that promote sustainability. Education plays a key role in fostering more sustainable behaviours, and higher education is called upon to play a leading role in developing graduates who are ‘global citizens’ who understand better how the world works, and take their own responsibilities to build more sustainable future societies (Sterling, 2009). The dawn of the 21<sup>st</sup> century witnessed a global rallying call for higher education to play a more significant role in fostering ideals that promote change in and action for sustainable development (UNESCO, 1998). The review of literature in 2011 acknowledges that this has resulted in the formation of consortia of higher education institutions, and articulation of declarations such as the Talloires Declaration of 1990, that highlight the work to be undertaken in sustainability education and practices across the sector. However, it also revealed that there existed a

dearth of ESD models or frameworks as well to guide the infusion of sustainability in higher education (Leal Filho et al., 2017), especially in the context of higher education in Ireland. As Roorda (2000 cited in Shriberg, 2002) argued, although the declarations and consortium set up to address sustainability have important guidelines for integrating sustainability in policy and/ or practices in higher education, they did not expressly clarify at an operational level how and what higher education institutions should do to address sustainability in their programmes, courses and activities. This difficulty has been further compounded by the complexity and ambiguity of the concept of ESD, clouding its meaning and understanding among many, including some educators in higher education. This was evident in the emphasise on differing dimensions of the cornerstones of sustainability (environmental, social, economic and cultural) across programmes and courses revealed in the documentary review of the integration of sustainability in higher education institutions in Ireland at the outset of this research study in 2011.

This research offers a workable framework in the form of the Green Curriculum Model that can be used to guide educators towards trans/multi-disciplinary learning in ESD, resolving the micro level challenge identified at the outset causing lack of effective ESD infusion as a result of educators operating within disciplinary silos. Furthermore, this study offers a practical tool in the form of the DAB, which can be used at institutional and programmatic levels to inform educators and curricular planners of the degree of ESD competency among cohorts of learners.

### **9.2.2 Enabling Effective ESD in Higher Education**

Therefore, to effect change within higher education with respect to sustainability education, this research charted a path that explored the second dimension of this central research question: *How should sustainability education be integrated in academic programmes and courses in higher education in Ireland?*

The research study resulted in the articulation of a new conceptual-design framework in the form of the Green Curriculum Model that can be used by educators to guide the infusion of sustainability in higher education programmes and courses in Ireland, and the DAB tool to capture a snapshot of learner sustainability competencies at a point in time. The following section explains the key features of GCM and DAB, and how they can be

integrated in conjunction with NEP scale to further sustainability re-orientations within higher education.

### **9.2.2.1 Green Curriculum Model conceptual framework**

The GCM presents an overview of key considerations to be made in re-orienting higher education curricula to address sustainability in programmes and courses at five levels: the content, principles, pedagogic approaches, competencies and indicators, and can be used by educators in third level to stimulate discussion on, and re-orientation of, their curricula to address sustainability. The GCM can further be activated by applying Burns (2011) ecological design processes, which were inspired by the five phases of Hemenway (2000) Ecological Design, namely, observation, visioning, planning, development and implementation, as explained in chapter five.

The Green Curriculum Model brings together content (that is the sustainability thematic areas to be taught or the disciplinary themes that incorporate sustainability); sustainability principles (which include the ten key sustainability principles incorporated in the green curriculum framework); sustainability related pedagogies (which include socio-constructivist, values-based, transformational and experiential learning pedagogies); sustainability related competencies, which enable learners to acquire the necessary aptitudes, attitudes, skills and knowledge to become sustainability change agents within their communities and in working life and the sustainability indicators, and can be used as a conceptual guide in framing the sustainability related programme or course curriculum. The articulation of the Green Curriculum Model as a ‘conceptual design’ framework has been informed by the literature, key theorists, interviews with practitioners of sustainability educations, researcher’s experiences within the Tempus RUCAS project, and scholars and stakeholders from a wide range of disciplinary areas, and presents itself as a pragmatic guide to infusing sustainability at an operational level in higher education programmes and courses in Ireland. The goal of sustainability education is to imbue in learners, competencies for action to re-examine their values, belief systems, attitudes and behaviours to embrace pro-ecological values that enable them to become agents of change for sustainability. This lack of emphasis within existing ESD strategies on the criticality of ethical values in ESD learning and teaching, calls for the need for a guiding ESD instrument that places proecological ethical values learning as the central focus of ESD learning and teaching. In addition to ethical value-pedagogic approaches the GCM emphasises on the incorporation of other sustainability related



pedagogic approaches- Experiential, Constructivists and Transformative learning in sustainability learning and teaching. The recommendations for use of the GCM in higher education include the creation of a toolkit to help raise awareness of key dimensions of GCM and to develop capacity among higher education staff in activating the GRM conceptual framework within and across disciplines. Furthermore, it is incumbent on higher education management to ensure that an ethos compatible with ESD is fostered within their institutions.

#### **9.2.2.2 Dispositions, Abilities and Behaviours DAB tool**

This research study also resulted in the design, development and evaluation of the Dispositions, Abilities and Behaviours (DAB) competency framework, which is a tool for profiling higher education learners' sustainability related competencies, and in itself can be considered as a paradigmatic framework to guide the profiling of learners' sustainability competencies in higher education in Ireland. The descriptive statistics (emergent from analysis of the DAB) were useful in providing an overview of participants' dispositions, their self-declared levels of abilities and the nature of actions for sustainability of a particular cohort of higher education students. This information is very important in terms of identifying whether particular pedagogic approaches (such as: ethical values-based learning), activities or indeed content needs to be integrated to foster positive dispositions towards sustainability, or enhance specific abilities necessary for engagement in sustainability actions. Thus, the DAB tool can be used to effectively profile higher education learners' sustainability related dispositions, abilities and behaviours at a given point in time, and thus to inform educators on potential re-orientations necessary to address the needs of a specific cohort of learners.

The results show that the DAB tool can effectively be used in identifying learners' profile attributes (age, course, etc.) that impact on their sustainability related dispositions, abilities and behaviours. The analysis of correlational results from the DAB dimension of this study show that participants' gender, or indeed, study programme has no significant impact on their dispositions, abilities and/ or willingness to engage in sustainability. Interestingly, while the participants' year of study has no significant impact on their abilities and/ or willingness to engage in sustainability, the year of study does appear to have an impact on their dispositions to engage in sustainability. Furthermore, the results show that there exists a statistically significant positive

correlation between respondents' willingness and their abilities to engage with sustainability issues, and, similarly, with their actions for sustainability (behavior). Furthermore, the result shows that there exist statistically significant positive correlations between respondents' abilities to engage with sustainability and their behaviours to promote sustainability.

The recommendations for use of DAB tool in higher education is for educators to deploy DAB on entry to their programme and to utilize the findings to help identify broad dispositions of a cohort towards sustainability and to identify skills-set that may need to be integrated within the specific course to support action for sustainability.

### **9.2.2.3 New Ecological Paradigm NEP scale**

The NEP tool profiles learners' worldviews (i.e. whether they are proecological or not) and provides an indication as to their disposition (anthropocentrism, etc.). From the comparative analysis of associations between worldviews (as measured using the New Ecological Paradigm scale) and actions for sustainability (as measured from the Behaviour scale within the DAB tool), we realise that having a pro-ecological worldview does not necessarily correlate with actions for sustainability. This is a very interesting finding as it suggests that examining learners' dispositions towards sustainability (willingness to engage in sustainability actions) is more useful as an indicator or predictor of likely engagement in actions for sustainability, as opposed to using a scale such as NEP which reflects a particular frame of mind or worldview with respect to sustainability.

The recommendation for use of the NEP tool in higher education is that it is deployed at the outset of a course to ascertain learners' pro-ecological (or not) worldviews. This information provides the educators with an understanding of pre-orientations of learners's values vis-à-vis sustainability, and thus, allows the educator to target areas or values bases that conflict with, and/or need re-orienting towards, sustainability.

## **9.3 Researcher's Reflections on Research Journey**

The ontological assumptions of qualitative research, relate to issues of addressing the nature of reality. Reality is constructed and seen with different lenses by the multiple

actors engaged in a qualitative research. Consequently, there emerge multiple realities in the research situation. These include the realities of the investigator, those of the people being investigated and those of the reader(s) or audience(s) interpreting the research report (Creswell, 1998). In this situation, the qualitative researcher needs to report this nature of multiple realities relying on the *“voices and interpretations of informants through extensive quotes; present themes that reflect the voices of the informants and advance evidence of different perspectives on each theme”* ((Creswell, 1998, p.76).

As far as this study is concerned, being a qualitative oriented mixed methods design study that pragmatically used both the qualitative and quantitative assumptions, the qualitative ontological stance within this study afforded the researcher acknowledgment of the multiple realities, opportunities and challenges of infusing sustainability in higher education programmes and courses in Ireland. It entailed a consideration of multiple perspectives, taking into consideration, the perceptions and interpretations of higher education staff who were interviewed, the students’ perceptions of sustainability issues through survey responses as well as the researcher’s analysis (understandings, explanations and interpretations) of the data collected from informants and other secondary sources. At the epistemological level, this study looked at the relationship between the researcher and that which is being investigated. In the process of a qualitative related research inquiry, *“the researcher tries to minimise the ‘distance’ or ‘objective separateness between himself or herself and those being researched”* (Creswell, 1998, p.76). This epistemological perspective has implications for this study.

During this study, my (the investigator) research engagements with the informants in Dublin City University involved conducting interviews, with staff engaged in addressing sustainability in their respective courses and contributed in facilitating the Tempus RUCAS workshop on reorienting university curricula to address sustainability. These actions brought me closer to the informants. Such closeness in the research process helped me to engage in the research process not as an “outsider” (the Etic) but as the insider (Emic) in the process of acquiring knowledge. My engagements in the research process were those of a learner engaged in the process of acquiring knowledge from the participants who were not only viewed as participants but the actual holders of knowledge which I was seeking to acquire. As Mehra, (2002) observes, regardless of the degree of knowledge possessed by the researcher in the research process, the participant or insider’s knowledge or view points over the issues researched is more important and the researcher

should not approach the research with pre-determined goals or judgements. This epistemological position brings to the surface the tensions of my dual capacity within this study, as both an outsider and insider. As an outsider (etic), I am the investigator, seeking to acquire knowledge on the process of infusing sustainability in programmes and courses in Dublin City University. As an insider, in the course of this research I was a research assistant in the school of education studies in Dublin City University, working on research projects that dealt with issues related to addressing sustainability in higher education, including the Erasmus ICT-enabled ESD project, and the Tempus RUCAS project. Through these projects and my interactions with other researchers in the RCE (Regional Centre of Expertise for sustainability (RCE) Dublin, I contributed to the processes and actions to raise awareness on the need for Dublin City University to embrace sustainability; and as an investigator I was seeking knowledge to find out what educators in DCU were doing in relation to integrating sustainability in their programmes and courses. This dual capacity brought to light the tensions apparent in the context of the investigation wherein I was not only seeking knowledge from informants and respondents (some of whom were my colleagues and students) but also, I was witnessing some of the changes (processes and actions) that were taking place in Dublin City University in addressing sustainability both through campus greening activities and addressing sustainability in courses some of which I participated in like the new sustainability course that was launched in 2015/2016 academic year (Making the Post-Carbon World- MPCW16). This dual capacity (that of an eye witness and an investigator in the process of infusing sustainability in programmes and courses in Dublin City University) had significant implications in my perceptions and interpretations of the processes and actions of infusing sustainability in programmes and courses in the institution. However, despite my knowledge in sustainability education and my position as a member of the Dublin City University community, I had to approach the investigation with an open mind, willing to learn from the participants.

During this study, my informants' perspectives on issues of infusing sustainability in programmes and courses in DCU were of primordial importance. My role as an "insider" (a close learner in the research process) and the close distance between myself (the investigator) and my informants had implications for the axiological assumptions of this study. The axiological issues embody the role of beliefs and values in a study. In a qualitative related research, the researcher's beliefs and values have significant

implications in the study. Denzin (1989) argues that in research, the researcher's self, influences his or her research interests. The researcher's beliefs and values thus play a significant role both in his/her choice of research topics as well as the interpretations of the findings. Mehra (2002) corroborates this argument by holding the views that:

*A researcher's personal beliefs and values are reflected not only in the choice of methodology and interpretation of findings, but also in the choice of a research topic. In other words, what we believe in determines what we want to study...more often than not, [researchers have their] personal beliefs and views about a topic-either in support of one side of the argument, or on the social, cultural, political sub-texts that seem to guide the development of the argument (n.p.).*

Mehra (2002) and Scheurich (1994) argue that the historical position, class, race, gender, religion, and other life's orientations of the researcher, all have implications in the research process. In this light, my social, cultural and political position as the researcher has implications for this study at two levels:

Firstly, originating from a minority English speaking background in a predominantly French speaking Cameroon, I have witnessed first-hand the unsustainable socio-political practices of the Cameroon political elite that has promoted a culture of marginalisation of segments of the Cameroonian society especially the masses from the minority English speaking regions. This political culture of marginalisation has been perpetuated through poor intercultural communications and understanding, autocratic rule, political oppression of minorities, poor governance, financial mismanagement, lack of accountability and transparency, endemic corruption and human rights abuses. The result has been increased poverty levels among the masses, increased unemployment rates especially among the youths, lack of basic amenities like health infrastructure, lack of clean drinking water, intermittent shortages of electricity, poor transportation networks and above all poor-quality education at all levels (primary, secondary and tertiary). Consequently, the populations of the English-speaking regions of Cameroon have been pushed to the point where they can no longer stand the level of marginalisation and indifference from the political elite despite repeated calls for an end to the injustices promoted by the predominantly French speaking autocratic central administration. This has culminated into an uprising that has plunged the government into chaos, resulting in brutal repressive military responses that has seen many civil society activists as well as innocent citizens from the English-speaking regions of Cameroon killed and many

imprisoned with the country now facing a political crisis that it has found difficult to resolve. While many see the crisis as a language issue, in reality the crisis is a clash of worldviews, values and belief systems between the two groups with diametrically opposed values and belief systems- with the English speaking communities exhibiting Anglo-Saxon values inherited from their British colonial heritage wherein the people cherish values like (orderliness, transparency and accountability in office, justice, empathy and valorisation of the ‘other’) as Andrian Bloomfield (March, 2017) aptly describes the situation in the telegraph: “*the anglophone Cameroonians, who make up less than a fifth of the 23M people, remain stubbornly loyal to their colonial traditions, to the bewilderment and often derision of French speakers, they insist on forming orderly queues, referring to bars as off-licences and dressing up their judges and lawyers in powdered wigs... both British common law and GCE O-and A- level syllabuses remain deeply cherished*” (n.p.), as opposed to a ruthless culture of corruption, bribery, poor governance, a worldview that values autocracy inherited by the French speaking political elite from their French colonial master.

Coming from this socio-political background, influenced my decision to want to undertake research in the area of addressing sustainability in higher education especially with the interest of seeking ways to promote sustainability oriented values (social-cultural, political and environmental justice, transparency and accountability, economic equity, care and empathy) in higher education because higher education produces the future elite that play a huge role in society both in the business and political arenas. Yet it is this segment of society that promotes the greatest levels of unsustainable development practices both in terms of policy and practices and studies have shown that it is this segment of society, many of whom have passed through higher education studies that resist change to embrace sustainability. Thus, the research topic on infusing sustainability in higher education programmes and courses was chosen because I could see a personal connection from my historical background with the topic as an educationist from the minority English speaking region of Cameroon. In undertaking the study, I did strive to be the person I am, interested in seeking knowledge about addressing sustainability in higher education in Ireland.

Secondly, as a migrant from the global south studying in Ireland, I have had the opportunity to also witness the excesses of consumerism in the western context, values which are perpetuating the ‘throw away’ culture that leads to pollution of the

environment, overexploitation of the limited stock of natural resources and acceleration of climate change effects through increasing emissions of greenhouse gases into the atmosphere especially through increasing automobile use. These western consumerist values have implications both in the developed world and in the developing world. The world is witnessing increases in global temperatures which if not controlled will hasten the advance of desertification, induce poor rainfall patterns with severe drought and or flooding consequences especially in the developing southern countries which could result in crop failures, inducing hunger and poverty among rural populations in the global south

As an investigator, I admit the value-laden nature of this research. It is not uncommon that the report of a study like this incorporates the researcher's beliefs, values and biases, as well as those of the informants. All the same as the investigator, I took the responsibility to ensure that my values and beliefs do not overshadow the views and interpretations of my informants. Instead the research report reflects my informants' views and the multiple perspectives of reality embedded in the study. This notwithstanding, this study will have a greater socio-cultural, political, economic and environmental impact on both the Irish higher education as well as the Irish society. In this light therefore, who I am, as well as my beliefs and values are inherently reflected in the analysis and conclusions I have drawn in this research.

#### **9.4 Recommendations**

There already have been significant levels of interest in the Green Curriculum Model as a conceptual-design framework for infusing sustainability in curricula of higher education from the sustainability community of experts, higher education staff and other researchers and academic administrators within governmental departments in Ireland. Its acceptability within the sustainability education community provides sufficient grounding for its application in infusing sustainability in higher education programmes and courses.

While the DAB indicator tool of the GCM has been rigorously tested in profiling higher education learners' sustainability related competencies, the GCM itself has not been practically tested because of the time limitations of this research study. A key recommendation of this study is thus for future research on the implementation of the GCM, and on ascertaining its effectiveness in re-orienting curricula to address

sustainability across a range of higher education and disciplinary contexts. In this regard, the **first recommendation** is for post-doctoral study of the application of the GCM framework across other higher education institutions in Ireland, to ascertain its effectiveness in reorienting higher education course curricula and pedagogic practices towards sustainability.

The **second recommendation** is a corollary to the first, in that it involves the development of a toolkit that can be used to build capacity among staff in higher education in ESD. The principal resources of the toolkit will be the GCM framework and the DAB tool. The accompanying handbook will provide a step-by-step guide on the application and integration of the GCM framework, which will utilize Burns (2011) ecological course design processes to operationalize the process of infusing sustainability in higher education curricula.

The **third recommendation** is that the emergent GCM toolkit also be made accessible online for educators in other jurisdictions. In this regard, the naming of the conceptual framework will be changed from the Green Curriculum Model to Sustainability-infused Curriculum Model (SCM), to avoid negative associations with neoliberal agendas for greening the curriculum. [The title of Green Curriculum Model will be retained within Ireland, as the term Green is contextually associated with Sustainability in the Irish case.]

The **fourth recommendation** relates to the call for improved understanding and action for sustainability among institutional management, politicians and policy makers. The GCM framework and DAB tool can only be effective in processes of infusing sustainability in higher education if institutional policies and cultures promote cross-disciplinary collaboration among higher education staff and provide incentives and staff development opportunities in sustainability education. The growing interests in the GCM conceptual-design framework and DAB tool is perhaps indicative of the need for both higher education institutions and the Department of Education and Skills in the context of Ireland to provide the necessary inputs (through favourable policy orientations and funding), to boost the growing academic staff interests in embracing sustainability and encouraging the adoption of interdisciplinary, holistic approaches in addressing sustainability in higher education programmes and courses in Ireland. The fourth recommendation thus involves the development of a Policy Brief to be sent to government and university presidents, highlighting the potential for the GCM and DAB



tool in reorienting higher education towards sustainability, and calling for its dissemination across government departments and other higher education stakeholders. This Policy Brief will further request that the Department of Education and Skills, and the Higher Education Authority, support the integration of GCM framework through the allocation of funding for higher education staff development in the areas of integrating sustainability in line with the objectives of the National Strategy on Education for Sustainable Development.

Furthermore, despite its strengths in profiling higher education learners' sustainability competencies, the DAB tool has its limitations as it has been tested only as a single point in time. The **fifth recommendation** is to engage in longitudinal research to examine the effectiveness of the DAB tool in tracking learner progression over extended periods of time.

In addition, like the NEP tool, the DAB tool needs to be viewed as complementary to other sustainability related assessment tools and/or methods, and thus, as a contributor to a holistic picture of learners' sustainability related dispositions, knowledge, skills and behaviours. Therefore, additional research is required to ascertain exactly how the DAB offerings contribute to, or build upon, existing tools and methods for assessing the broad range of learners' competencies in sustainability. In this regard, the **sixth recommendation** is that a further study is undertaken exploring the complementarity of using the DAB, with NEP and similar tools.

There is also the need to encourage the publication and availability of research on integrating sustainability in higher education in Ireland and beyond and to ensure its availability to educators and other stakeholders interested in sustainability in higher education. In this regard, the **final recommendation** of this research is for government agencies and those within the sustainability education community to help facilitate the dissemination of this research through contribution to discussion and critiques and engagement in further research within this important field of study.

## 9.5 Conclusions

It is with some sadness that I write this final section of the thesis. My journey with respect to this research is almost at its end, and has been terrifying and empowering at various

points in time. I entered into this research as a learner and I am exiting filled with information and knowledge, which I have shared with the readership, information that has implications on the practice of infusing sustainability in higher education. In this respect, the Green Curriculum Model and the Dispositions, Abilities and Behaviours tool are two practical offerings to academic practitioners and researchers in sustainability education. This study centred on considering how sustainability could be infused within higher education curricula in an Irish context; and makes no claims as to the generalizability of the findings of this study within other contexts or countries. It is envisaged that the Green Curriculum Model will act as a conceptual-design framework for academics striving to re-orient curricula towards sustainability, and that the Dispositions, Abilities and Behaviours tool will be used by academics in Ireland to profile learners' sustainability competencies across higher education faculties, programmes and courses. With the availability of the Green Curriculum Model conceptual-design framework to guide educators of higher education in re-orienting curricula towards sustainability and the Dispositions, Abilities and Behaviours tool for profiling higher education students' sustainability competencies at a given point in time, this research study thus ends with a fervent call for the urgency of infusing sustainability in programmes and courses across higher education in Ireland especially at this juncture when the world is facing enormous challenges associated with climate change, which requires higher education to step onboard to bring in innovative ideas and transdisciplinary solutions to save humanity from the consequences of climatic changes.

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## **APPENDICES**

## **Appendix A: Review of Sustainability Education Activities**

# **A Critical Review of Sustainability Education Activities in Higher Education in Ireland**

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### **Abstract.**

This study sets out to identify and evaluate the integration of sustainability education activities in Higher Education Institutions in the Republic of Ireland. The study focuses on evaluating how these institutions are integrating elements of the four cornerstones of sustainability education (which include environmental wellbeing, economic equity, societal justice and cultural vitality and diversity), into their programmes, courses and related activities. Changes in human behaviours to embrace sustainability can only be achieved through awareness and education obtained through formal, non-formal and informal educational processes and Higher Education Institutions play a vital role to foster such education.

**Keywords:** Sustainability, Education, Development, Sustainable Development, Education for sustainable development.

### **Introduction.**

This study set out to examine the integration of sustainability in Higher Education institutions' courses, programmes and other sustainability practices in the Republic of Ireland. The study focused on examining how these institutions are integrating elements of the four cornerstones of sustainability (which include, societal justice; environmental viability, economic equity and cultural vitality and diversity) into their programmes, courses and related activities. A desktop research was thus carried out during which all programmes and courses offered in higher education institutions in Ireland were examined through the institutions' webpages and other secondary information, to find out whether the courses and programmes offered in these institutions included elements of addressing sustainability as well as examining other campus greening activities within the institutions.

The present global economic recession as well as the catastrophic impacts of climate change and other environmental hazards provide evidence of the unsustainable economic,

financial and ecological actions of humanity. The impacts of such unsustainable human actions call for the need to promote a shift in human mindsets to embrace more sustainable values, behaviours and lifestyles which can make the world safer, healthier and more prosperous for all, thus improving both the environmental and human quality of life. Changes in human behaviours to embrace sustainability could be possible through awareness and education obtained through formal, non-formal and informal educational processes. Higher Education Institutions just as other educational settings have an important role to play as drivers of information and training on sustainability education. To assess the integration of sustainability education in the Irish Higher Education sector, it is necessary to find out:

- What types of sustainability programmes, courses and related activities are carried out in the various institutions?
- Are all the four cornerstones of sustainability taken into consideration within programmes and courses in area of sustainability?
- What role should Irish Higher Education Institutions play in disseminating the ideas of sustainability education in Irish Society?

### **Methodology.**

This study entails a critical documentary analysis of sustainability programmes, courses and related activities in Higher Education Institutions (Universities, Institutes of Technology and other Higher Education Authority recognised colleges) in the Republic of Ireland. Documentary research methodology is a research investigation method by which the researcher systematically collects, explores and interprets research data, taking into consideration the categories and patterns that emerge from the data (Payne and Payne 2004; Mogalakwe, 2006). The authentication and reliability of information for this study has been ascertained through proper scrutiny of the document contents and the authenticity of the institutional websites to ensure that the information is valid. The data for the study has been collected from publicly available information on the websites of a large sample of Higher Education Institutions in the Republic of Ireland. The list of the institutions reviewed is presented in Table1 below. Information has also been collected from other secondary sources including books, journal articles, internet websites, government publications, magazines and newspapers. Documentary research methodology has been used in this study to identify and evaluate the integration of

sustainability activities in the institutions investigated, based on the information that these institutions have published on their websites and other sources. This study is intended to provide a baseline evidence to inform the framing of a large-scale research study focused on identifying ways to foster the infusion of sustainability education in the Higher Education sector in the Republic of Ireland. The documentary research methodology is appropriate for this baseline study because it is cost effective, provides easily available information to be used and eliminates problems associated with encouraging participants to engage in the research, as well as participant biases in the research findings. However, this research method has its own limitations in that all information on sustainability programmes, courses and related activities of these institutions may not be publicly available on the websites of the institutions. Also, since institutions are constantly updating their webpages, some institutions might update their information after the investigation has already been done. This notwithstanding, this study was not intended to provide a blueprint on the integration of sustainability within programmes, courses and related activities in Higher Education. Rather it was intended to provide baseline evidence from which the large-scale research project can be informed on actions necessary to foster the integration of sustainability education in the Irish Higher Education sector.

<b>Universities</b>
Dublin City University
National University of Ireland, Galway
National University of Ireland, Maynooth
Trinity College, Dublin
University College Cork, Cork
University College Dublin
University of Limerick
<b>Institutes of Technology</b>
Dublin Institute of Technology
Athlone Institute of Technology
Cork Institute of Technology
Dundalk Institute of Technology
Dun Laoghaire Institute of Art, Design and Technology
Dun Laoghaire Institute of Art, Design and Technology
Galway-Mayo Institute of Technology
Institute of Technology, Blanchardstown
Institute of Technology, Carlow
Institute of Technology, Sligo

Institute of Technology, Tallaght
Institute of Technology, Tralee
Letterkenny Institute of Technology
Limerick Institute of Technology
Waterford Institute of Technology
<b>Other Higher Education Institutions Recognised by the Higher Education Training and Award Council.</b>
Mary Immaculate College Limerick
Mater Dei Institute
Royal College of Surgeons Ireland
St Angela's College Sligo
St Patrick's College Drumcondra

Table 1. List of Higher Education Institutions Reviewed.

### **The Concept of Education for Sustainable Development.**

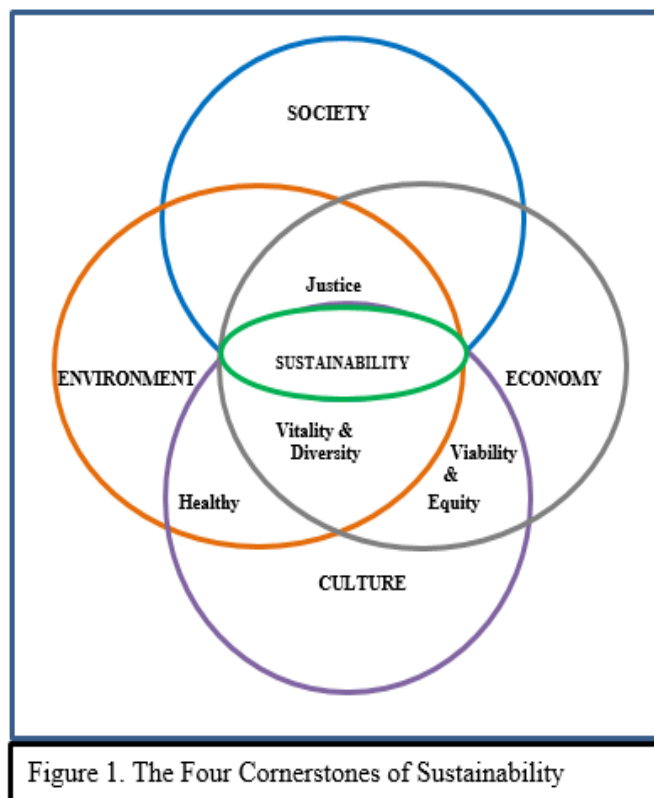
The Concept of sustainability remains controversial and there is no universally acceptable definition of sustainability. Generally, sustainability is considered as the ability to maintain something for a long time at a specific rate or level. It is an undefined set of ideals which allow people and other living and non- living things to have dignity and satisfaction, and for human actions to be geared towards protecting the environment, fostering societal justice, economic prosperity and equity, and promoting cultural vitality and diversity.

The Brundtland Report of the World Commission on Environment and Development (1987) defines Sustainable Development as “development that meets the needs of the present without compromising the ability of future generations to meet their needs”.

Education is crucial in fostering the ideals of sustainability. Education for sustainable development (ESD) is a process of learning how to make decisions that consider the long-term futures of the economy, ecology, and the equitable development of all communities as well as the promotion of their cultures. Education for sustainable development enables people to develop the knowledge, skills, values and competences that promote sustainable actions that will lead to improved quality of life now without destroying the environment for future generations. ESD provides individuals with the competence to make judgements and choices towards more sustainable behaviours. All over the world; people need the basic necessities of employment, health, education, food, shelter, sanitation and employment, which provides them with good quality of life. These necessities should be obtained while protecting and preserving the environment to ensure that future generations will also have the opportunity to enjoy same. The present global

economic recession as well as the catastrophic impacts of climate change and other environmental hazards provide evidence of the unsustainable economic, financial and ecological actions of humanity. The impacts of such unsustainable human actions call for the need to promote a shift in human mindsets to embrace more sustainable values, behaviours and lifestyles which can make the world safer, healthier and more prosperous for all, thus improving both the environmental and human quality of life.

Education for sustainable development is vital for human development. UNESCO's vision of sustainability centres on developing a "world where everyone has the opportunity to benefit from quality education and learn the values, behaviours and lifestyles required for a sustainable future and for positive societal transformation (UNESCO, 2006). Education for Sustainable Development is a process of learning how to make decisions that consider the long-term effects of human actions on the environment, promoting diversity in cultures, values and beliefs, equitable and green economic development as well as societal justice.



Sustainability is conceptualised as a holistic system with four interconnected and interdependent components. These components: the environment, economy, society and culture are important in attaining sustainability. Any actions in one area have consequences on the other components be they positive or negative. The goal is to attain a positive balance on all the four components, as shown in figure 1 (Shaeffer, 2007).

Human developmental actions should take into consideration the cost of such actions on the environment. Thus, human developmental endeavours should be undertaken while considering the environmental carrying capacity and strive to attain ecological balance so as to maintain environmental health. Such actions should also promote not only economic growth, but also equity in the distribution of global economic output for the prosperity of all for the present and future generations. Human developmental efforts should also engender social equity, resilience, inclusion, cohesion, welfare and justice, as well as promote cultural vitality, wellbeing, creativity, diversity and innovation (Yencken and Wilkinson, 2001).

### **The Importance of Education for Sustainable Development in Higher Education.**

The infusion of education for sustainable development principles and practices is of vital importance in Higher Education. The DAAD/UNU-VIE, (2009) report shows that infusing sustainability education in Higher Education Institutions helps the institutions to “foster the goals of attaining excellence in teaching and high quality research; improve resource use efficiency; promote social cohesion and projects the status of such institutions as sustainable institutions”. It is thus vital for Higher Education institutions to embrace sustainability education. Education for sustainable development can be fostered through educating the citizenry on the principles and practices of sustainability. Education for sustainable development is the driving force to promote citizens behavioural change to embrace sustainability. ESD entails educating the citizens on processes and practices that enable people to develop the knowledge, skills and competences that foster actions to promote a sustainable future for all. In this light, the UN declared the Decade for Education for Sustainable Development (2005-2014), during which the world is called upon to promote and foster education, awareness and actions on education for sustainable development (UNESCO, 2006). Through the integration of values, activities and principles of education for sustainable development into human behaviours and actions this will usher in a change in attitudes, behaviours and values to

ensure a more sustainable future in the world (UNESCO, 2006). Such education will promote behavioural changes to embrace sustainability and such changes in people's actions, values and beliefs to act sustainably, will improve the quality and health of the environment, promote sustainable economic growth and improve human quality of life (UNESCO, 2007).

In its education for sustainable development strategy (2010), the Council of the European Union called on member states to promote education and research on education for sustainable development in the Vocational and Higher Education sectors. The Council views education and training in sustainable development as the means by which European citizens will be equipped with the skills and competences needed to develop smart and innovative economies and enhance sustainable economic growth and inclusive societies in Europe ("Europe 2020").

### **The Role of Higher Education, in Fostering the Dissemination of the Principles and Practices of Sustainability Education in Irish Society.**

Changes in human behaviours to embrace sustainability could be possible through awareness and education obtained through formal, non-formal and informal educational processes. Higher Education Institutions just as other educational settings have an important role to play as drivers of information and training on sustainability education. As advocated in the University Charter for Sustainable Development (Copernicus, 1994), Universities and other Higher Education Institutions play a critical role in fostering the ideals of sustainability because these institutions "train the coming generations of citizens" (n.p.) and have the expertise in all fields of education and research, that will enable them to devise educational and other solutions to problems associated with unsustainable human actions and development.

The call on Higher Education's involvement to disseminate the knowledge on sustainability education has also been strengthened by the Talloires Declaration (2005), which was signed by twenty-nine university Presidents, Rectors and Vice Chancellors from different parts of the world. The Talloires Declaration urged University heads to "provide leadership and support to mobilize internal and external resources" (n.p.) for their institutions to engage in the provision of sustainability education to their learners and communities.



The objectives of the UN Decade of Education for sustainable (DESD, 2005-2014) are to “integrate values, activities and principles that are inherently linked to sustainable development into all forms of education and learning and help usher in a change in attitudes, behaviours and values to ensure a more sustainable future in social, environmental and economic terms” and Higher Education Institutions as well as other educational settings are called upon to engage in fostering the dissemination of information and training on the principles and practices of education for sustainable development (UNESCO, 2006, p.1).

In the same light the Council of the European Union’s strategic framework for European cooperation in education and training (‘ET 2020’) emphasises on the crucial role which education and training plays in “meeting the many socio-economic, demographic, environmental and technological challenges facing Europe and its citizens today and in the years ahead” and Higher Education should take centre stage in playing such a significant role in fostering the ideals and practices of Sustainability Education (Europa, 2011, n.p.).

At the national level in Ireland, the Irish Government’s national sustainable development strategy (Our Sustainable Future, 2012), provides a national policy framework which encourages and promotes national actions to transform Ireland into an innovative green economy with inclusive and resilient communities; fostering and respecting cultural diversity as well as promoting actions to safeguard environmental health. This policy framework among other issues calls for the integration of education for sustainable development at all levels of the formal, informal and non-formal education sectors in Ireland (Our Sustainable Future, 2012, p.77). In the Higher Education sector, the national sustainability framework emphasises on the need to embed education for sustainable development in Higher Education, and calls on Higher Education Institutions to: promote the integration of sustainability education across all disciplines; promote capacity building in support of sustainability education; promote, high standards of environmental protection and undertake innovative research and development in all aspects of sustainability education to build inclusive societies and move towards “a low-carbon and resource efficient economy” (Our Sustainable Future, 2012, p.78).

In spite of all the calls for policy shifts to embrace sustainability education in Higher Education, the integration of sustainability education in the Irish Higher Education sector

remains problematic. Among the many hindrances to infusing sustainability education is the fact that, in spite of the Irish government interests in sustainability education, no specific roadmap has been put in place by the Department of Education and skills to further the infusion of sustainability education in the Higher Education sector. Also, although the current Higher Education Authority strategic policy framework, “Towards a Future Higher Education Land Scape” (HEA Strategy, 2012) calls on Higher Education Institutions to play a significant role through education, training and research to contribute to the development of “a dynamic, fair, productive and creative society” (HEA, 2012, p.5), the strategic policy framework fails to come out with a roadmap for integrating the four cornerstones of sustainability education in a holistic manner, in the Irish Higher Education sector. The absence of such a framework means that Higher Education Institutions have no specific national higher education strategic policy framework for infusing sustainability education. Thus, the integration of sustainability education has remained a matter for the individual institutions to take actions on the sustainability education areas which are of interest to them. It is not surprising therefore that within the Irish Higher Education sector, only two institutions: University College Cork (2010) and the Galway-Mayo Institute of Technology (GMIT Castlebar, 2011), have obtained the Green Flag Awards<sup>2</sup>.

In the same light, although the University of Limerick has gained the status of the Irish Regional Centre of Expertise for Education for Sustainable Development (RCE, 2007)<sup>3</sup>, not all higher education institutions in Ireland are affiliated to the centre. The lack of a specific policy roadmap for integrating sustainability education in the Irish Higher

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<sup>2</sup> The Green Flag is an award of the Green-Campus Programme. The Green Campus Programme is an international environmental education and award scheme of the Foundation for Environmental Education. The Programme promotes long term, whole college action for the environment. It is run by An Taisce, in Ireland. Green Campus Ireland (2012). [Online] Available At: <http://www.greencampusireland.org/> [Accessed 08 August 2012].

<sup>3</sup> The United Nations University Institute of Advanced Studies (UNU-IAS) defines a Regional Centre of Expertise for Education for Sustainable Development (RCE) as a “network of existing formal, non-formal and informal education organisations, mobilised to deliver education for sustainable development (ESD) to local and regional communities”. UNU-IAS [Online]. Available At: [http://www.ias.unu.edu/sub\\_page.aspx?catID=108&ddIID=183](http://www.ias.unu.edu/sub_page.aspx?catID=108&ddIID=183) [Accessed, 08/08/201].

Education sector is a hindrance to advancing the fulfilment of the Irish national sustainable development objectives.

**Integrating Sustainability Education in Higher Education.**

The integration of sustainability activities in Higher Education Institutions should involve infusing aspects of all the four cornerstone of sustainability education. These include: the environmental perspectives; the economic perspectives; the social perspectives and the cultural perspectives (Shaeffer, 2007).

The integration of the environmental perspectives should involve educating the citizens on the need for values and behavioural changes towards issues of overconsumption, overpopulation, overproduction, environmental pollution, depletion of natural resources, and the switch to the use of renewable resources. The economic perspectives should involve educating citizens on issues and actions to promote economic justice, equity and advancing a knowledge society that promotes green economic advancements. The social perspectives should involve investments in human capital through education to foster societal cohesion, resilience and justice. The Cultural perspectives should involve educating citizens on policies and actions to promote cultural vitality and accommodating cultural diversity (van Nierop, 2008). These sustainability perspectives are interdependent and a holistic approach is necessary to effectively integrate all the sustainability perspectives within any given Higher education institution. The table below presents some of the thematic areas in which Higher education institutions could engage their sustainability education actions.

<b>Themes for the Four Cornerstones of Sustainability</b>
<b>Environmental Cornerstone</b>
Climate Change Issues:
Reduction of greenhouse gas emissions (i.e. understanding the impacts of human activity in particular the burning of fossil fuels on climate change).
Biodiversity (i.e. stopping biodiversity loss by addressing the changes in natural habitats).
Energy efficiency (i.e. actions to save energy and developing energy-saving technology).
Development of clean technology.
Conservation and management of natural resources.
Use of Renewable Energy
Waste management.

Pollution concerns (water, air, soil).
Sustainable transport.
<b>Economic Cornerstone.</b>
Sustainable consumption.
Sustainable production.
Corporate Social Responsibility practices.
Urban and local development.
Sustainable tourism.
Integration of environmental concerns in business decision-making (Green Business)
Sustainable/Fair Trade.
<b>Social Cornerstone.</b>
Health promotion
Community cohesion.
Social equity and justice.
Human Rights.
Gender Equality.
Demography.
Management of migration.
Social inclusion and Equal opportunities.
Development of human capital and skills.
<b>Cultural Cornerstone.</b>
Cultural Heritage/diversity.
Intercultural Understanding.
Indigenous knowledge.

Table 2. Themes for the Four Cornerstones of Sustainability.

Source: Adapted from van Nierop, P. (2008).

In line with the thematic areas identified above, a critical review of the sustainability programmes, courses and related activities of the various higher education institutions in Ireland shows that all the institutions reviewed are engaged in one way or the other in integrating elements of sustainability education in their respective activities. The data collected shows that a majority of the Higher Education Institutions’ programmes, courses and related activities are focused on promoting the environmental, economic and social pillars of sustainability. Empirical evidence from the data collected also shows that in most Irish Higher Education Institutions less emphasis has been placed on fostering the cultural perspectives of sustainability except in the case of the universities sector. Figure 2 below presents the coverage of sustainability activities in all the Higher Education Institutions reviewed.

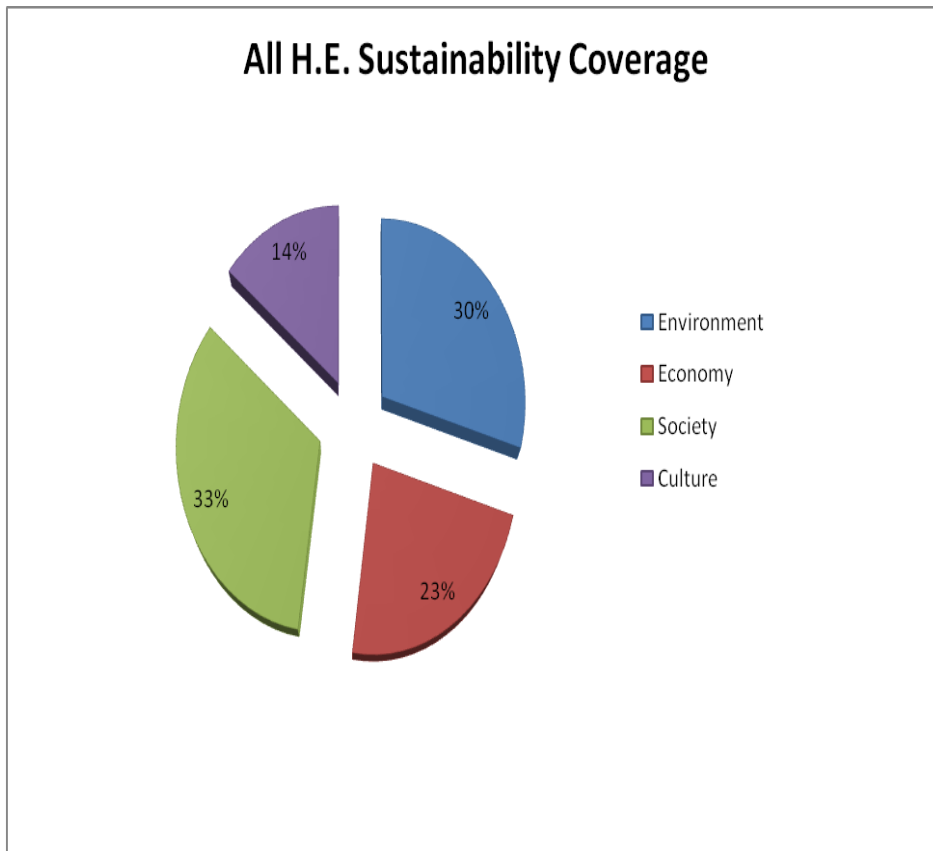


Figure 2. All Higher Education Sustainability.

Data from figure 4 above shows that within all of the Higher Education Institutions examined,

30 percents of their activities cover the environment pillar of sustainability.

33 percents cover the society cornerstone.

23 percents cover the economy cornerstone

14 percents cover the culture cornerstone.

Much needs to be done in all of the Higher Education Institutions in Ireland to promote activities which foster cultural diversity.

### **The Universities' Coverage of Sustainability Education.**

Contrary to the general picture presented when the entire Irish Higher Education sector is considered as a single unit of analysis, the University sector's coverage of the four cornerstones of sustainability as exemplified in figure 3 below, presents a slightly different picture. At the level of Universities, the reviewed data shows that more than a third of University programmes, courses and related activities focus on promoting cultural vitality and diversity. This finding is justified by the Higher Education strategic policy shift to foster internationalisation (DES, 2011), and this policy shift has been

strongly embraced by the university sector. The result has been the attraction of greater numbers of foreign students especially from South East Asia (China, India, Japan,) the Middle East, Brazil, the European Union and other parts of the world into Irish Universities and other Higher Education Institutions. The shift to embrace cultural diversity especially in Irish Universities has also been facilitated by the current Irish Higher Education strategic policy shift to foster institutional cooperation between the Irish Higher Education institutions as well as between these institutions and other Higher Education Institutions globally (HEA, 2012).

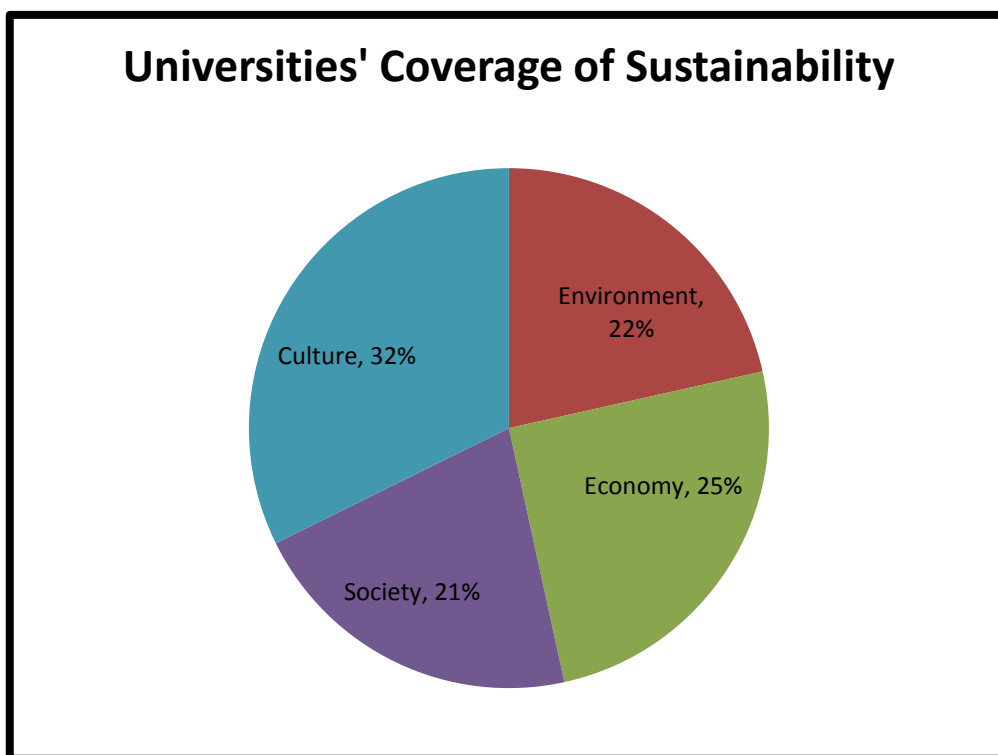


Figure 3. Universities' Coverage of Sustainability.

Data from the University sector shows that:

32 percents of all University Sustainability activities cover the culture cornerstone.

25 percents cover the economy cornerstone.

22 percents cover the environment cornerstone and

21 percents cover the society cornerstone.

While more than a third of all university sector sustainability programmes, courses and related activities foster cultural cornerstone, about one fifth of University activities are geared towards promoting environmental protection and a similar percentage (21%) or one fifth of the University activities are also geared towards fostering societal justice. However, the coverage of the economy cornerstone of sustainability presents a different

picture. The data studied shows that one quarter (25%) of all university sustainability programmes, courses and related activities address the economic pillar of sustainability.

Although many universities are engaged in campus greening activities, much still needs to be done for these Universities to actually attain the status of sustainable universities. This is exemplified by the fact within the Irish University sector only the University College Cork so far has received the Green Flag Award (UCC, 2010). The Green-Flag is an initiative of the Green Campus Programme, run by the department of Environment and Heritage. It is an international environmental education and award scheme which encourages colleges and schools to foster environmental sustainability activities within their campuses. Despite these shortcomings, there is growing interest in infusing sustainability activities in Irish Universities and the University of Limerick has attained the status of Regional Centre of Expertise in sustainability education (RCE, 2007) Also many other universities have established sustainability committees within their various institutions to oversee the implementation of sustainability activities within the institutions.

### **The Coverage of Sustainability within the Institutes of Technology**

Within the Institutes of Technology, a greater percentage of their programmes, courses and related activities are geared towards fostering environmental protection. The review findings show that 33% of their sustainability programmes, courses and related activities cover the environment cornerstone; 30% cover the society cornerstone; 20% cover the culture cornerstone and 17% cover the economy cornerstone as shown in figure 4. Although the data shows that one third of the sustainability programmes, courses and related activities of Institutes of Technology foster the environmental perspectives. Much still needs to be done nationally as so far just as in the university sector; only one Institution of Technology (GMIT Castlebar 2011) has obtained the green flag award. There is the need to increase the level of activities which foster both the economic, culture and societal perspectives of sustainability in programmes, courses and related activities of the institutions of technology sector.

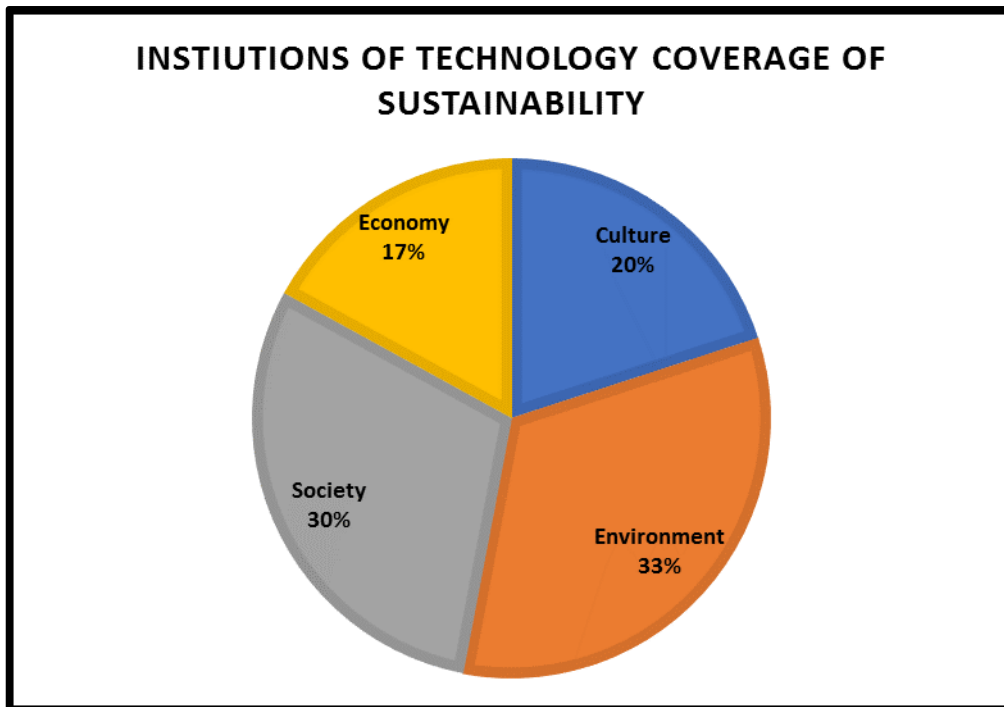


Figure 4. Institutions of Technology Coverage of Sustainability

### Conclusions.

Conclusively, the critical review of sustainability education programmes, courses and related activities in Irish higher education sector in 2011 indicated that infusing sustainability education in higher education activities in Ireland remains an important issue. All Irish higher education institutions are engaged in infusing sustainability education in one way or the other in their programmes and courses, and in addition through campus greening. However, the focus in their programmes and courses has been so much on promoting the environmental, and social pillars of sustainability (with differing emphasise on cultural and economic pillars of sustainability across the Institute of Technology sector and the University sector respectively) and it is not surprising that in most higher education institutions until about 2014 when a national policy on sustainability in education was published by the Irish government (National Strategy for ESD), sustainability was primarily viewed through the environmental lens and even where the other cornerstones of sustainability were considered as in the university sector, the different institutions took different approaches to engaging with sustainability education with limited focus on addressing sustainability in study programmes and courses. The integration of sustainability education in higher education requires a



systemic and holistic approach. The current approach in which individual or groups of institutions are taking different approaches to integrating some elements of sustainability education within their activities is unsustainable. The result is significant variation in approaches and the degree to which issues of sustainability education are considered important in institutional activities.

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## Appendix B: Interview Questionnaire (University Staff)

<b>Infusing Sustainability in Course Curricula: Interview Questionnaire (Staff).</b>
<b>1. The purpose of this interview questionnaire is to gather information from educators in higher education on issues of integrating sustainability in their respective course curricula.</b>
<b>Date:</b>
<b>Programme Chair/ Teaching Staff Name (s):</b>
<b>Faculty:</b>
<b>Discipline (Educational Sciences/ Social Sciences/ Natural Sciences, Engineering etc.):</b>
<b>Programme/Course Title:</b>

1. What is your understanding of sustainability education?
  - 1a). What is your disposition vis-à-vis sustainability education?
2. What themes do you think fall within sustainability education?
3. Which of these sustainability themes do you integrate in your course?
4. What principles do you think should be valued or prioritized in sustainability education? (for example, one of the principles that is valued in sustainability education is contextualisation which includes integrating in the course curriculum, context specific knowledge, indigenous knowledge as well as locally based knowledge, to connect the learners to their own contexts).
5. What teaching, learning and evaluation strategies do you typically use in the teaching and learning process in your course?
6. Are there particular teaching, learning and evaluation strategies that you think should be prioritized in sustainability education?
7. What competencies (knowledge, skills, and behaviours) do you think need to be developed in the process of teaching and learning in sustainability education?
8. How effectively can sustainability competencies be measured (taking into consideration an overall assessment procedure)?
9. What has the institution done to promote the integration of sustainability in your course curriculum?
10. What challenges do you face in integrating sustainability in your course curriculum? Thank you for participating in this interview.

### Appendix C: Codes for Staff Interviewees

LIST OF STAFF INTERVIEWEES	
Participant A	Lecturer, Institute of Education, DCU.
Participant B	Lecturer, Institute of Education, DCU
Participant C	Lecturer, Institute of Education, DCU
Participant D	Lecturer, School of Law and Government, DCU
Participant E	Lecturer, School of Languages and Intercultural Studies (SALIS), DCU
Participant F	Lecturer, School of Law and Government, DCU
Participant G	Lecturer, Institute of Education, DCU

Table C1. Staff Interviewee Codes

## Appendix D: Informed Consent



### DUBLIN CITY UNIVERSITY

#### Informed Consent Form

**Research Study Title:**

SUSTAINABILITY AND TRANSFORMATIONS IN HIGHER EDUCATION IN IRELAND: BARRIERS AND OPPORTUNITIES FOR INTEGRATING EDUCATION FOR SUSTAINABLE DEVELOPMENT IN DUBLIN CITY UNIVERSITY.

**Principal Investigator:** Ms Frida Agbor Besong, School of Education Studies, DCU

**Second Investigator:** Dr. Charlotte Holland, School of Education Studies, DCU

**Purpose of the research:**

The purpose of this research is to effect change through the integration of Education for Sustainable Development (ESD) principles in higher education in Ireland, using the case of Dublin City University (DCU). Such change will be enabled through the integration of ESD principles and practices into DCU policies, programmes and actions. To attain this aim, the study will be guided by the following objectives:

- To identify and examine national policies and practices that foster or inhibit the integration of ESD principles in universities in Ireland.
- To review and evaluate the impact of such policies and practices within the Irish higher education framework and what lessons could be learned.
- To identify and examine factors which favour or inhibit the integration of ESD principles in DCU, and what recommendations could be made.
- To examine how the lessons learned from the DCU experience could be used to inform policy nationally on how to foster the integration of ESD principles in higher education.

Confidentiality of participants in this research is assured. Should an extract from responses to the interview be used for research purposes, any information that would identify you personally will be removed and any work that is your ideas will be referenced and acknowledged.

*Participant – please complete the following (Circle Yes or No for each question)*

- |  |        |
|--|--------|
| Have you read or had read to you the Plain Language Statement?   | Yes/No |
| Do you understand the information provided?  | Yes/No |
| Have you had an opportunity to ask questions and discuss this study?   | Yes/No |
| Have you received satisfactory answers to all your questions?  | Yes/No |
| Are you aware that you will be interviewed & will complete a survey during the course of this research?      | Yes/No |
| Are you aware that your interview will be audio-taped?   | Yes/No |
| Are you aware that your responses to interviews/ survey, may be anonymously quoted in Research-based papers? | Yes/No |

**Confirmation that involvement in the Research Study is voluntary:**

Your involvement in this Research Study is entirely voluntary. You may withdraw from this research study at any point. There will be no penalty for withdrawing before all stages of the Research have been completed.

**Confidentiality of data, subject to legal limitations:**

Data will be securely held within the School of Education Studies, at Dublin City University, for two years after research is completed and accessed only by the named researchers within this study. The data will be securely disposed of after this. Confidentiality of participants in this research is assured. Confidentiality of information is subject to legal limitations. Should an extract from your response to interviews/ survey be used for research purposes, any information that would identify you will be removed.

**Signature:**

I have read and understood the information in this form. My questions and concerns have been answered by the researchers and I have a copy of this consent form. Therefore, I consent to take part in this research project

**Participants Signature:** \_\_\_\_\_

**Name in Block Capitals:** \_\_\_\_\_

**Date:** \_\_\_\_\_

## **Appendix E: Staff Interview Coding and Analysis**

### **Staff Interview Coding and Analysis: The Framework Method**

In this study, semi-structured interviews were used to collect data from 7 participants including university lecturers from the departments of education, Language and Intercultural studies and Law and government in a higher education institution. The university staff interviewees were anonymized and coded with alphabetical letters. The interviews were electronically recorded. At the end of the interview process, the interview responses were then transcribed.

The purpose of using interviews in this study is to authenticate and/ or validate the GCM (instrument building). Consequently, the focus of analysis is on content, identify patterns, themes and ideas within the interview response data rather than theory building and/ or making a discourse analysis of the structure and narratives of participant responses. Thus, the framework approach has been used in the analysis because it provides the researcher with opportunities for the development of themes both inductively from the accounts (experiences and views) of participants and deductively from extant literature (Gale et al., 2013). This involves a critical exploration of participant responses, identifying themes and emergent ideas.

#### **Section 1: Transcription**

Since the interest in this analysis was the content rather than the language structure or narratives, participants' responses, pauses, interruptions and exclamations were not taken into consideration except in instances where these narratives were contributing to clarifying meanings and interpretations by participants. The transcripts were re-checked for errors by re-listening to the audio recordings for any errors and familiarising with the transcript. The transcripts were supplemented with notes made during the interview for example information that was taken in conversation when the video had been powered off.

#### **Section 2: Coding**

The transcribed text was copied into a three Column table. The main transcript was coded through underlining interesting segments of text. The left column of the table was used to describe the content of each passage with a label or code, which ranged from a few



words, to parts of sentences or whole paragraphs. The right column of the table was used to record more detailed notes and ideas, such as questions to bear in mind as the analysis proceeded, and ideas for explanations or patterns in the data (See full coding excerpt in Table E1). The underlining, emphasises interesting parts of the data that the researcher felt were worth coding or taken note of.

Coding Label	Participant C		Notes and ideas
Longevity	1	<u>Ehm, sustainability is the ability to keep going and to sustain living really.</u>	Keep going= long-term
Dispositions for sustainability	2	<u>I didn't realise that I have an interest in sustainability until speaking to yourself and your lecture during the workshop, when you did link things together.... I am positively disposed for sustainability. I think when you appreciate that, the things that you've done and things that you are striving for is really to be more sustainable; is to be able to keep going in life, and not burn yourself out with stress, not run out of money, not, you know it's just to kind of evaluate things around you and to treat them with respect whether they are people, whether they are your students, whether the resources that you use; just appreciate them and do not waste them really.</u>	Capacity building ignites sustainability interest  Respect=sustainability values
Well-being as sustainability			
Sustainability values			
Collaborative learning	3	<u>Having all of my course content on moodle, so that makes the module sustainable, so if there was, anything to happen to me, my module can still go on because the notes are there and everything is there and sustainability in terms of the students learning.</u>	Student centred learning approaches/constructivism
Constructivist learning approaches	4	<u>I would like them to do some group work and figure things out themselves, I like them do individual work and work their way on things and I facilitate a work around the classroom and if they had any questions to ask me. I do some enquiry based learning with them, simulation of an experiment.</u>	
Inquiry learning	5	<u>Construct some kind of whether presentation or post or some kind of knowledge on the new concept and then to feed that back and present it back to the whole class and collaborate and then for the rest of the class and to evaluate what they have done and for the discussion to happen. So, to be really</u>	

Table E1. Interview Coding Excerpt

### Section 3: Developing a working analytical framework

After the open coding process, each coding section was examined identifying what is considered meaningful, what it is telling the researcher about the participants' views

about the sustainability issues examined in the interview questions such: the concept of sustainability, how ESD could be addressed in courses, the opportunities available for infusing ESD in courses, the types of pedagogic approaches used in sustainability education, the challenges associated with the process of embedding sustainability in courses etc. Once the ideas and themes were identified this formed the initial framework, taking note of any new codes that emerged that did not fit the identified a priori themes. The transcript was read through again to identify new codes and incorporate into the framework.

The next step involved regrouping codes that were conceptually related to the a priori themes and naming the category (for example, the understandings/definition of sustainability). The process of refining the codes continued until no new codes were generated. The final framework consisted of several codes, clustered into different categories, each with a brief explanatory description of their meaning and what ideas or elements were summarised under that code (As shown in table E2 excerpt for the a priori theme understandings/definition of sustainability

CODE	DESCRIPTION
<b>Understandings of Sustainability</b>	
Longevity	<i>Capacity to maintain something (idea, concept, resource); keep going so that we can enjoy the resources of the planet; continue on and on; longevity of the environment, ecology, fossil fuels</i>
Maintain environmental health/Greening	<i>Greening something (ecology, natural resources); healthy state of the environment; keeping the health of the environment</i>
Interconnectedness	<i>Interconnectedness, working together as a community</i>
The pillars of sustainability	<i>Sustaining the political, economic, social aspects of society; sustaining local cultures</i>
Timescale	<i>Looking at the past, present and future; long term in the future</i>

Table E2. Coding excerpt for the a priori theme understandings/definition of sustainability

#### **Section 4: Applying the analytical framework**

The final analytical framework was then applied to each transcript manually. The process was carried out for each case. Once all the data had been coded using the analytical

framework, the codes were summarized in a matrix for each theme in tabular form. As illustrated below, the matrix comprised of one row per case (participant) and one column per code. The coding matrix provided an easy structure into which the researcher could systematically reduce the data, in order to analyse it by case and by code (Gale et al., 2013). A separate sheet was used for each category. Data was then abstracted from the transcripts for each participant and code, summarised using verbatim words and inserted into the corresponding cell in the matrix. The codes and summaries were laboriously inserted manually and the references to interesting quotations were also highlighted within the cells of the matrix as shown in the sample sheet of the framework matrix of themes for the definition of sustainability in table E3 below.

Sustainability Definition	CODES (THEMES)					
	Cases	Longevity	Environmental health/ Greening	Inter-connectedness	Sustainability pillars	Timescale
<b>Participant A</b>	Ehm, my understanding of sustainability is ehm, regarding the capacity for humans, for us, for individuals to continue something, an idea, concept, ehm, a resource... You know sustainability usually means that something can continue on and on.			When I talk, or think about my understanding of sustainability, it is really the human capacity to maintain one, the planet, the ideas that we can share and develop ehm within the planet.		
<b>Participant B</b>		we have a responsibility to nature and the environment and to each other; to make sure that the resources and the environment that we live and work within is looked after and continues in a healthy state		... my understanding of sustainability would be that, ehm, it is about interconnectedness, how we work together as a community of people, how we are all part of the environment and this planet that we live on.		
<b>Participant C</b>	sustainability is the ability to keep going and to sustain living really.					
<b>Participant D</b>	You know sustainability usually means that something can continue on and on.					

<b>Participant E</b>				My understanding of sustainability is, on developing our society in a sustainable way, considering all aspects, political, economic, social...	my understanding of sustainability is, on developing our society in a sustainable way... and even, you know, looking at the past, the present and the future.
<b>Participant F</b>	So, it's that sense like will a project's benefits continue in the long term? Ehhm maybe the chances could also be understood as the process of self-sustaining in the future.				
<b>Participant G</b>				I see sustainability as the ability for a community to be self-reliant and I don't mean self-reliant in growing your own food but to be self-reliant on ideas and innovations. Not to become one global culture but to have a sustainable model where people can survive and provide themselves in their own communities.	

Table E3. Coding Framework Matrix

## Section 6: Interpreting the data

Themes were generated from the data set by reviewing the matrix and making connections within and between participant and categories. This process was influenced both by the original research objectives and by new concepts generated inductively from the data. During the interpretation stage, themes were developed which gave possible explanations to what was happening within the data. Ideas were generated, explored and fleshed out through the use of analytical memos and interpretations. Below is an example of a memo that was written about the category sustainability definition, to map out ideas related to university staff understandings and definitions of the concept of sustainability.

The same approach was taken to examine participants' perceptions, ideas and suggestions on the various aspects of addressing sustainability in higher education programmes and courses that were included in the interview questions. The memo is structured with sub-headings, including a definition of the category, specific codes that related to it, a summary of the raw data, discussion of points for consideration and emergent ideas. Bullet points, italic fonts and underlining were used to look for patterns within the data and also included illustrative quotations with references to the original transcripts.

## **MEMO: Understandings of Sustainability: Various Participants**

### **Definition**

**Longevity, environmental health, interconnectedness, sustainability pillars and timescale.** Sustainability was defined in relation to:

The capacity to maintain something for a long time, giving consideration to the past, present and future) as well as greening and maintaining environmental health, taking into consideration the interconnectedness between human communities and the environment and sustaining the political, economic, social and cultural aspects of society.

### **Codes**

Longevity, Maintain environmental health/Greening, The pillars of sustainability, Timescale.

### **Summary of data**

- **Longevity**

Participants understood sustainability in terms of the capacity to maintain something (ideas, concepts and resources) for the long-term in this light participant F explained,

*So, it's that sense like will a project's benefits continue in the long term? Ehm maybe the chances could also be understood as the process of self-sustaining in the future.*

While for participant C, *sustainability is the ability to keep going and to sustain living really.*

Participant A said, *Ehm, my understanding of sustainability is ehm, regarding the capacity for humans, for us, for individuals to continue something, an*

idea, concept, ehm, a resource... When I talk, or think about my understanding of sustainability, it is really the human capacity to maintain one, the planet, the ideas that we can share and develop ehm within the planet.

- **Environmental health**

The participants also defined sustainability in terms of greening and maintaining environmental health. In this light, participant A explained, So, one of the first assumptions on that is, sustainability first, has to address the greener issues because without them, we don't have a platform to sustain anything else, so straight away ... sustainability has to do with ecology, the world, our natural resources.

Participant B said, we have a responsibility to nature and the environment and to each other; to make sure that the resources and the environment that we live and work within is looked after and continues in a healthy state.

- **Interconnectedness**

Participants also defined sustainability in terms of the interconnectedness of human societies with nature. As participant B explained, ... my understanding of sustainability would be that, ehm, it is about interconnectedness, how we work together as a community of people, how we are all part of the environment and this planet that we live on.

- **Sustainability pillars**

Participants also defined sustainability in relation to the different pillars of sustainability\_(economy, society, culture), with an important emphasis on local cultural viability. In this light, participant E explained that My understanding of sustainability is, on developing our society in a sustainable way, considering all aspects, political, economic, social....

While participant G explained that, I see sustainability as the ability for a community to be self-reliant and I don't mean self-reliant in growing your own food but to be self-reliant on ideas and innovations. Not to become one global culture but to have a sustainable model where people can survive and provide themselves in their own communities.

- **Timescale**

Participants also defined sustainability in terms of timescale, explaining that sustainability involves developing society taking into consideration the past, the present and the future actions of society. As participant E explained, *my understanding of sustainability is, on developing our society in a sustainable way... and even, you know, looking at the past, the present and the future.*

These memos were incorporated into the themes for the overall analysis of the interview data to give a rich picture of university staff, understandings, ideas and suggestions on re-orienting their courses and programmes to address sustainability.

## Appendix F: DAB Tool (Students' Sustainability Survey Questionnaire)

### Students' Sustainability Survey April 2015

I am Frida Besong. I am undertaking PhD level studies in infusing sustainability in higher education curricula.

As part of my PhD studies, I am gathering data from staff and students on issues of infusing sustainability in the curricula. This survey is being deployed to test the level of higher education students' competencies in sustainability.

The survey should take 10-15 minutes to complete. It is structured into four sections:

The first section looks at students' academic profiles.

The second section seeks to find out the level of students' willingness to engage with or embrace sustainability.

The third section seeks to find out the level of students' abilities to engage with sustainability issues.

The fourth section seeks to find out the frequency with which students have taken actions to promote or foster sustainability.

The data and information generated from this survey is anonymous, and thus your individual contribution will not be identifiable.

Thank you for your participation in this survey.

**\*1. I have been fully informed of the purpose of this study, and agree to take part in this study.**

- Yes
- No

#### SECTION 1. Student profile

**\*2. Please indicate your gender below:**

- Male
- Female

Other preferred gender term, please specify.

**\*3. Please insert your age in space provided:**





**\*4. Programme of Study (Degree Course Title).**

- B.Sc in Education and Training (Full Time).
- B.Sc in Education and Training Flexible Mode).

**\*5. Please indicate what year of course you are presently on.**

- Year 1
- Year 2
- Year 3
- Year 4

**SECTION 2. Please rate your willingness to engage in each of the following:**

**6. Rate your willingness to buy environmentally friendly products**

- Extremely Willing
- Very Willing
- Note Very Willing
- Definitely Not Willing
- Don't Know

**7. Rate your willingness to engage in energy conservation (for example: switching off lights, using renewable forms of energy) in everyday life**

- Extremely Willing
- Very Willing
- Note Very Willing
- Definitely Not Willing
- Don't Know

**8. Rate your willingness to engage in water conservation in everyday life.**

- Extremely Willing
- Very Willing
- Note Very Willing
- Definitely Not Willing
- Don't Know

**9. Rate your willingness to purchase locally produced goods (foodstuff, arts and/or crafts).**

- Extremely Willing
- Very Willing
- Note Very Willing
- Definitely Not Willing
- Don't Know

**10. Rate your willingness to participate in environmental cleaning up campaigns (such as: Tidy Towns initiatives) in your local area.**

- Extremely Willing
- Very Willing
- Note Very Willing
- Definitely Not Willing
- Don't Know

**11. Rate your willingness to engage in activities that improve your own well-being (mental, physical and/ or social well-being).**

- Extremely Willing
- Very Willing
- Note Very Willing
- Definitely Not Willing
- Don't Know

**12. Rate your willingness to collaborate with people from different ethnic and/ or cultural backgrounds in addressing sustainability challenges**

- Extremely Willing
- Very Willing
- Note Very Willing
- Definitely Not Willing
- Don't Know

**13. Rate your willingness to choose environmentally friendly options (such as car-share, bus or cycling) to travel to and from college/work/ social events.**

- Extremely Willing
- Very Willing
- Note Very Willing
- Definitely Not Willing
- Don't Know

**14. Rate your willingness to change your own lifestyle to embrace more sustainable living.**

- Extremely Willing
- Very Willing
- Note Very Willing
- Definitely Not Willing
- Don't Know

**15. Rate your willingness to seek out other people's perspectives on sustainability challenges (regardless of their age, gender, culture, socio-economic status, etc.).**

- Extremely Willing
- Very Willing
- Note Very Willing
- Definitely Not Willing
- Don't Know

**16. Rate your willingness to participate in community initiatives (such as: waste recycling) aiming to make your community more sustainable in the future.**

- Extremely Willing
- Very Willing
- Note Very Willing
- Definitely Not Willing
- Don't Know

<p style="text-align: center;"><b>SECTION 3: For each of the statements below, please rate your ability on...</b></p>
---

**17. Rate your ability to identify the causes of unsustainable development in your community.**

- Very Good
- Good
- Poor
- Very Poor
- Don't Know

**18. Rate your ability to assess the impacts of unsustainable local practices at national and international levels.**

- Very Good
- Good
- Poor
- Very Poor
- Don't Know

**19. Rate your ability to assess the impact of your personal lifestyle on the natural environment.**

- Very Good
- Good
- Poor
- Very Poor
- Don't Know

**20. Rate your ability to assess the impact of your personal lifestyle on the sustainability of your local community**

- Very Good
- Good
- Poor
- Very Poor
- Don't Know

**21. Rate your ability to assess the intergenerational impact of unsustainable actions (eg. your ability to assess the impact of the current culture of 'throwing away' items rather than recycling on future generations).**

- Very Good
- Good
- Poor
- Very Poor
- Don't Know

**22. Rate your ability to analyse how your behaviour affects both living and non-living things.**

- Very Good
- Good
- Poor
- Very Poor
- Don't Know

**23. Rate your ability to analyse the impact of the present lifestyles of the people in your community on the future sustainability of your community.**

- Very Good
- Good
- Poor
- Very Poor
- Don't Know

**24. Rate your ability to develop a plan for your local community to reduce its environmental footprint.**

- Very Good
- Good
- Poor
- Very Poor
- Don't Know

**25. Rate your ability to develop a plan to improve intercultural understanding and communication within your community or workplace.**

- Very Good
- Good
- Poor
- Very Poor
- Don't Know

**26. Rate your ability to develop a plan that helps older people to have better quality of life.**

- Very Good
- Good
- Poor
- Very Poor
- Don't Know

**27. Rate your ability to design an initiative to preserve indigenous (native) knowledge from your local community.**

- Very Good
- Good
- Poor
- Very Poor
- Don't Know

**28. Rate your ability to design an initiative that raises awareness of sustainability successes and/ or issues in your local community.**

- Very Good
- Good
- Poor
- Very Poor

- Don't Know

**SECTION 4: For each of the statements below, please rate the frequency with...**

**29. Rate how often you purchase environmentally friendly products.**

- Once a Week
- Once a Month
- Once a Year
- Not at All
- Don't Know

**30. Rate how often you take action to reduce your food wastage at home or elsewhere.**

- Once a Week
- Once a Month
- Once a Year
- Not at All
- Don't Know

**31. Rate how often you take action to reduce water usage at home or elsewhere.**

- Once a Week
- Once a Month
- Once a Year
- Not at All
- Don't Know

**32. Rate how often you take action to conserve energy at home or elsewhere.**

- Once a Week
- Once a Month
- Once a Year
- Not at All
- Don't Know

**33. Rate how often you travel to and from college/work/social events using environmentally friendly options (such as car-share, bus or cycling).**

- Once a Week
- Once a Month
- Once a Year

- Not at All
- Don't Know

**34. Rate how often you seek advice on any matter from elders in your community.**

- Once a Week
- Once a Month
- Once a Year
- Not at All
- Don't Know

**35. Rate how often you take action to improve your own well-being (mental, social and/ or physical well-being).**

- Once a Week
- Once a Month
- Once a Year
- Not at All
- Don't Know

**36. Rate how often you advocate (speak out/ take action) for sustainability in your local community.**

- Once a Week
- Once a Month
- Once a Year
- Not at All
- Don't Know

**37. Rate how often you participate in environmental cleaning up campaign/s (such as: Tidy Towns initiatives) in your local area.**

- Once a Week
- Once a Month
- Once a Year
- Not at All
- Don't Know

**38. Rate how often you participate with a group promoting sustainability in your local community.**

- Once a Week
- Once a Month
- Once a Year

- Not at All
- Don't Know

**39. Rate how often you purchase locally produced goods (foodstuffs, arts and/ or crafts).**

- Once a Week
- Once a Month
- Once a Year
- Not at All
- Don't Know

**40. Rate how often you advocate (speak out/ take action) for human rights.**

- Once a Week
- Once a Month
- Once a Year
- Not at All
- Don't Know

**41. Rate how often you advocate (speak out/ take action) for environmental justice.**

- Once a Week
- Once a Month
- Once a Year
- Not at All
- Don't Know

**42. Rate how often you participate in intercultural events (festivals etc.).**

- Once a Week
- Once a Month
- Once a Year
- Not at All
- Don't Know

**43. Rate how often you advocate for the promotion and preservation of your local community's cultural heritage.**

- Once a Week
- Once a Month
- Once a Year
- Not at All
- Don't Know



**44. Please add any other comments you wish to make here.**

**Thank you for your participation.**

## Appendix G: DAB Correlations: Statistics/Correlations/Validity Tests

### Statistics/Correlations/Validity Tests

Statistics, Correlations/ Validity Tests	Purpose:	Context of use:	Statistics/ Correlations Tests Use in the Context of this Research
<p>Cronbach's <math>\alpha</math></p> <p><b>Definition:</b> The Cronbach's <math>\alpha</math> statistics is a standardised measure of the inter-correlations between variables that are used to make up a scale in research. The stronger the association between variables, the greater the consistency and the larger the Cronbach's <math>\alpha</math>.</p>	<p><b>Purpose:</b> The Cronbach's <math>\alpha</math> test is used to determine good internal consistency and reliability of the scales used in a study.</p>	<p><b>Context of use:</b> Used to provide information regarding the internal consistency of items that were used to construct the scales for this study (Range: .0 to 1.0)</p> <p><b>Meaning of Small/ Big Values:</b> small values indicate that the scale does not have strong internal consistency. A value of .7 or higher is usually used as a threshold to indicate that the scale is reliable.</p>	<p><b>Cronbach's <math>\alpha</math> Use in the Context of this Research:</b> In this study, Cronbach's <math>\alpha</math> was used as a measure of reliability for all the scales that were constructed from multiple respondents' responses which included: their attributes-age, gender, current year of study and study programmes as well as their willingness to engage with sustainability issue; their abilities to engage with sustainability issue; and actions they have taken to promote sustainability, which were scales that combined 38 different students' responses into three respondents' scales for willingness, abilities and behaviours).</p>
<p>The Mann-Whitney <math>U</math> test or the - Rank-Sum Test</p> <p><b>Definition:</b> This is a nonparametric statistics test that is used to compare the differences in medians between two independent groups when the dependent variable is either ordinal or continuous, but not normally distributed.</p>	<p><b>Purpose:</b> It is used to test whether two independent samples of observations are drawn from the same or identical distributions. It is also used to test whether medians between comparison groups are different,</p>	<p><b>Context of Use</b> Used to compare the medians of responses of two groups to see if the differences in groups are meaningful. (Range: 0 to Positive Integer)</p> <p><b>Meaning of Small/ Big Values:</b> The <math>U</math> statistic reflects the two groups' rank totals. The smaller the <math>U</math> statistic the less likely it is that the differences in rank medians occurred by chance. The bigger the <math>U</math> statistic, the more likely it is that difference in</p>	<p><b>Mann-Whitney <math>U</math> Test Use in the Context of this Research:</b> In this study, <math>U</math>-tests were conducted to test for independence of observations for respondents' attributes (gender, current year of study, study programmes) in relation to the latent constructs (willingness/abilities to engage with sustainability issue and actions taken to promote sustainability).</p>

	<p>under the assumption that the shapes of the underlying distributions are the same.</p> <p>The Mann-Whitney <math>U</math> is used to test hypothesis on equality of medians. The <math>U</math> statistic tests if two samples are drawn from identical populations, and hence whether their medians are equal</p>	<p>groups' rank medians occurred by chance. (the <math>U</math> statistic is unusual in this respect as normally the bigger the test statistic the less likely it is that it occurred by chance).</p> <p>A values table can tell you whether the <math>U</math> value derived from the analysis is significant at the <math>p &lt; .05</math> level</p>	
<p>Kruskal Wallis Test</p> <p><b>Definition:</b></p> <p><b>The Kruskal Wallis test is a nonparametric alternative test to the Analysis of Variance test.</b></p> <p><b>The test statistic compares the variance between groups to the variance within groups to determine if ranked medians derived from the group vary in a meaningful way from the ranked median of other groups</b></p>	<p><b>Purpose</b></p> <p>To compare ranked median differences when there are more than two groups to determine if the medians are statistically different from each other.</p>	<p><b>Context of Use</b></p> <p>Kruskal Wallis test is used for hypothesis testing, to test whether groups differ from one another. (Range: 0 to Positive Integers)</p> <p><b>Meaning of Small/ Big Values:</b></p> <p>The <math>H</math> value tells us if the differences between groups are large and its unlikely that they have occurred by chance</p> <p>A bigger <math>H</math> value indicates that it is unlikely that the difference in groups occurred by chance.</p> <p>A smaller <math>H</math> indicates that it is more likely that the difference in groups occurred by chance.</p> <p>A values table can give you the probability that the <math>H</math> value you have can happen by chance given the number of groups and participants in each</p>	<p><b>The Kruskal Wallis Test Use in the Context of this Research:</b></p> <p>In this study, the Kruskal Wallis test was used to examine whether respondent's current year of study had an effect on: (respondent's willingness/abilities to engage with sustainability; actions taken by respondent to promote sustainability).</p> <p>Whether respondent's study programmes influenced:(respondent's willingness/abilities to engage with sustainability issue; actions taken by respondent to promote sustainability).</p>

		group. A $p < .05$ value is used as an indicator of “statistical significance	
<p>Spearman Rank-Order Correlation Test.</p> <p><b>Definition:</b></p> <p><b>Spearman rank-order correlation test is a nonparametric statistical test alternative of the Pearson R correlation test. It measures the strength and direction of associations that exist between two variables measured at least on ordinal, interval or ratio, scale, where the data violates the assumptions of normality of data</b></p>	<p><b>Purpose</b></p> <p>The Spearman rank correlation test is used to ascertain the strength and direction of the link between two sets of data variables</p>	<p><b>Context of Use</b></p> <p>Spearman rank correlations are used to assess the magnitude by which two variables are related to one another (range: -1 to +1)</p> <p>The closer <i>rho</i> gets to either -1 or +1 the stronger the relationship between the variables being correlated.</p> <p><b>Meaning of Smaller/ Bigger Values.</b></p> <p>A small value indicates no relationship between the two Variables. 0 (is no relationship) and 1(a perfect linear relationship) or -1 (a perfect negative linear relationship). Positive coefficients indicate a direct relationship; as one variable increases, the other variable also increases. Negative coefficients indicate an indirect relationship; as one variable increases, the other variable decreases.</p>	<p><b>Spearman Rank-Order Correlation use in the Context of this Research</b></p> <p>The Spearman rank correlations tests were used to assess the relationships between: the levels of respondents’ willingness to engage with sustainability and their ability to engage with sustainability issues; the levels of respondents’ willingness to engage with sustainability issues and the actions they have taken to promote sustainability; the levels of respondents’ abilities to engage with sustainability issues and the actions they have taken to promote sustainability.</p>

Table G7. Statistics/Correlations/Validity Tests, Purposes and Contexts of Use in this study

## Appendix H: Non-parametric tests used assumptions and characteristics

### Non-Parametric Tests Used, Assumptions and Characteristics

Non-Parametric tests	Assumptions	Characteristics
The Mann- Whitney <i>U</i> test or the Wilcoxon-Rank-SumTest alternative test for 2 samples independent t-test	The test has two important assumptions: First the two samples under consideration are random, independent of each other, as well as the observations within each sample. Second data are not normally distributed, measured on ordinal scale and rank ordered	Test on rank medians. The two samples under consideration may not necessarily have the same number of observations.
Kruskal Wallis test (alternative test for One Way ANOVA).	There are three or more conditions or groups to compare, and each condition is performed by a different group. Data is not normally distributed, is measured on ordinal scale and rank ordered	Test on ranked medians based on $\chi^2$ Chi Square test
Spearman Rank Correlation test (is a nonparametric alternative test for the Pearson Correlation test)	It violates the assumptions of the Pearson correlation test of normality of data distribution and homoscedasticity. It assumes the existence of monotonic* relationships between variables	It is a nonparametric measure of correlations based on data ranks obtained by ranking the values of two variables and calculating the Pearson <i>r</i> on the resulting ranks, not the data itself.

Table H8. Non-parametric tests used assumptions and characteristics

\*Where there is a monotonic relationship between two variables, if the value of one variable increases, the value of the other variable will also increase and vice versa.

To answer the research questions in this section, a number of complex nonparametric correlations tests were run using SPSS version 21. Table H8 explains the different statistics and correlation tests run, their purposes and contexts of use in this study.

The following correlations tests were run to answer each of the given research questions and testing the determined research hypothesis.

- A. The Spearman rank-order correlations (nonparametric alternative Pearson correlation) tests were run to determine if there were any statistically significant associations between respondents' profile attribute age(s) and the latent constructs (respondents' willingness to engage with sustainability issues; abilities to engage with sustainability issues and actions taken by respondents to promote sustainability). Thus, Spearman rank tests were run:
1. To examine if participants' age(s) had effects on their willingness to engage with sustainability;
  2. To examine if participants' age(s) had effects on and their abilities to engage with sustainability;
  3. To examine if participants' age(s) had effects on actions taken by participants to promote sustainability.
- B. The Mann Whitney U/Wilcoxon Rank Sum Independent Samples tests (alternative parametric independent samples t-test) were run to determine if there is any statistically significant association between participant profile attributes (gender) and the latent constructs (willingness to engage with sustainability, abilities to engage with sustainability and (behaviours) actions taken to promote sustainability).
- C. The Kruskal Wallis test (alternative tests for Analysis of Variance ANOVA) were run to examine if there is any statistically significant associations between three or more groups of the independent variables (current year of study, and study programmes) and the latent constructs (willingness to engage with sustainability, abilities to engage with sustainability and actions taken to promote sustainability). Thus, the tests were run:
1. To examine if learners' current year of study had effects on their:
    - willingness to engage with sustainability issues;
    - abilities to engage with sustainability issues and
    - the actions they have taken to promote sustainability.
  2. To examine if learners' study programmes had effects on their:
    - willingness to engage with sustainability issues;
    - abilities to engage with sustainability issues and
    - the actions they have taken to promote sustainability.
- D. Spearman Rank tests were also run to examine whether correlations exist between participants' dispositions, abilities and/ or behaviours to engage with and/or promote sustainability:

- To examine if participants' willingness to engage with sustainability had effects on and participants' abilities to engage with sustainability;
- To examine if participants' willingness to engage with sustainability had effects on and participants' behaviours to promote sustainability;
- To examine if abilities to engage with sustainability issues had effects on participants behaviours to promote sustainability.

**Appendix I: DAB Correlations: Gender and Willingness**

**ASSOCIATION AMONG LEARNERS' GENDER, AND THEIR WILLINGNESS TO ENGAGE WITH SUSTAINABILITY.**

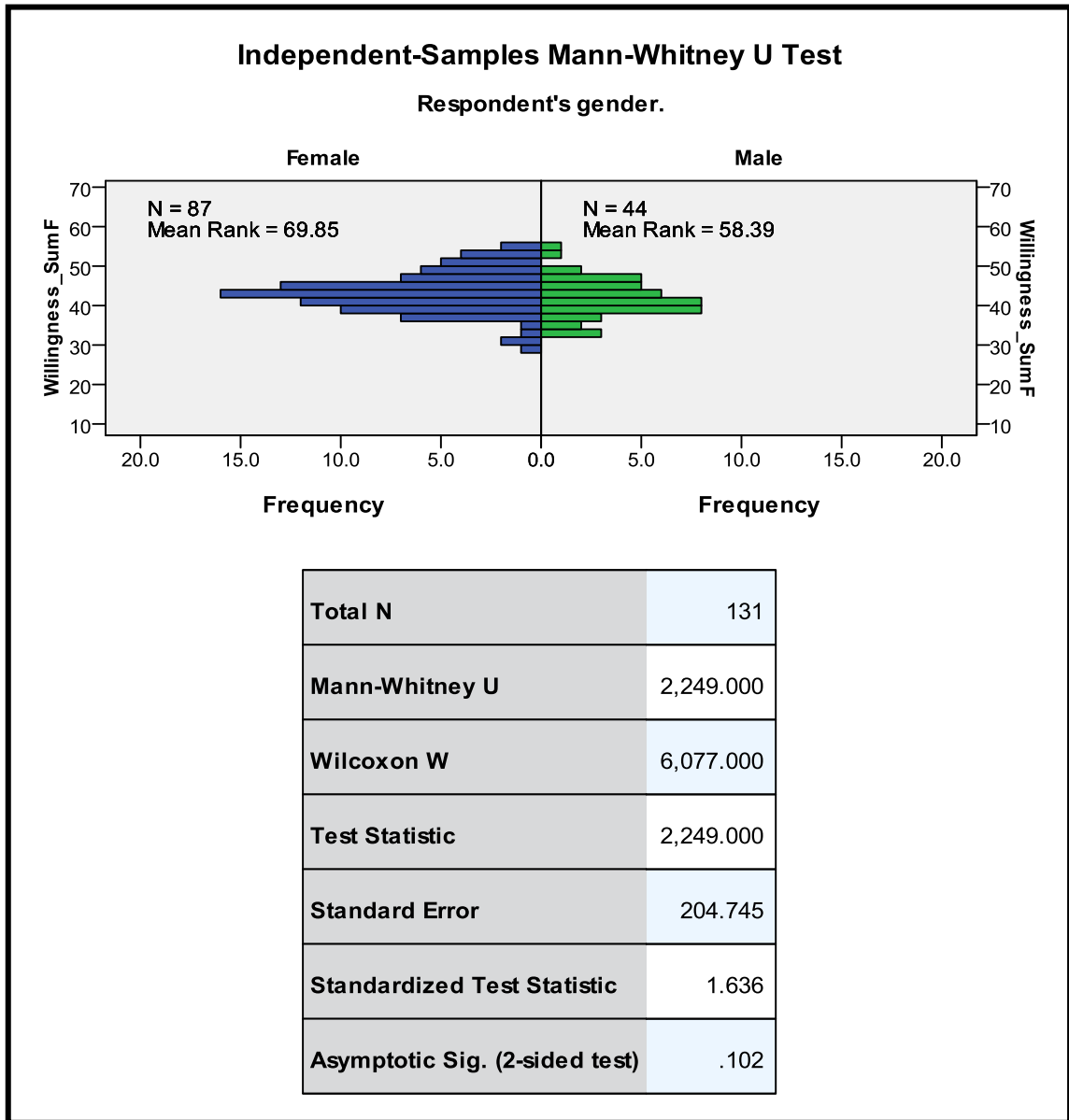


Figure I1. Association among learners' gender, and their willingness to engage with sustainability.



**Hypothesis:**

(H7): The distribution of respondents' willingness is not the same across the categories of gender.

(H0): The distribution of respondents' willingness is the same across categories of gender.

The results show that learners' gender has no statistically significant effects on their willingness to engage with sustainability issues, thus retaining the null hypothesis that, the distribution of respondents' willingness to engage with sustainability is the same across categories of respondents' gender.

## Appendix J: DAB Correlations: Gender and Abilities

### ASSOCIATION AMONG LEARNERS' GENDER AND THEIR ABILITIES TO ENGAGE WITH SUSTAINABILITY.

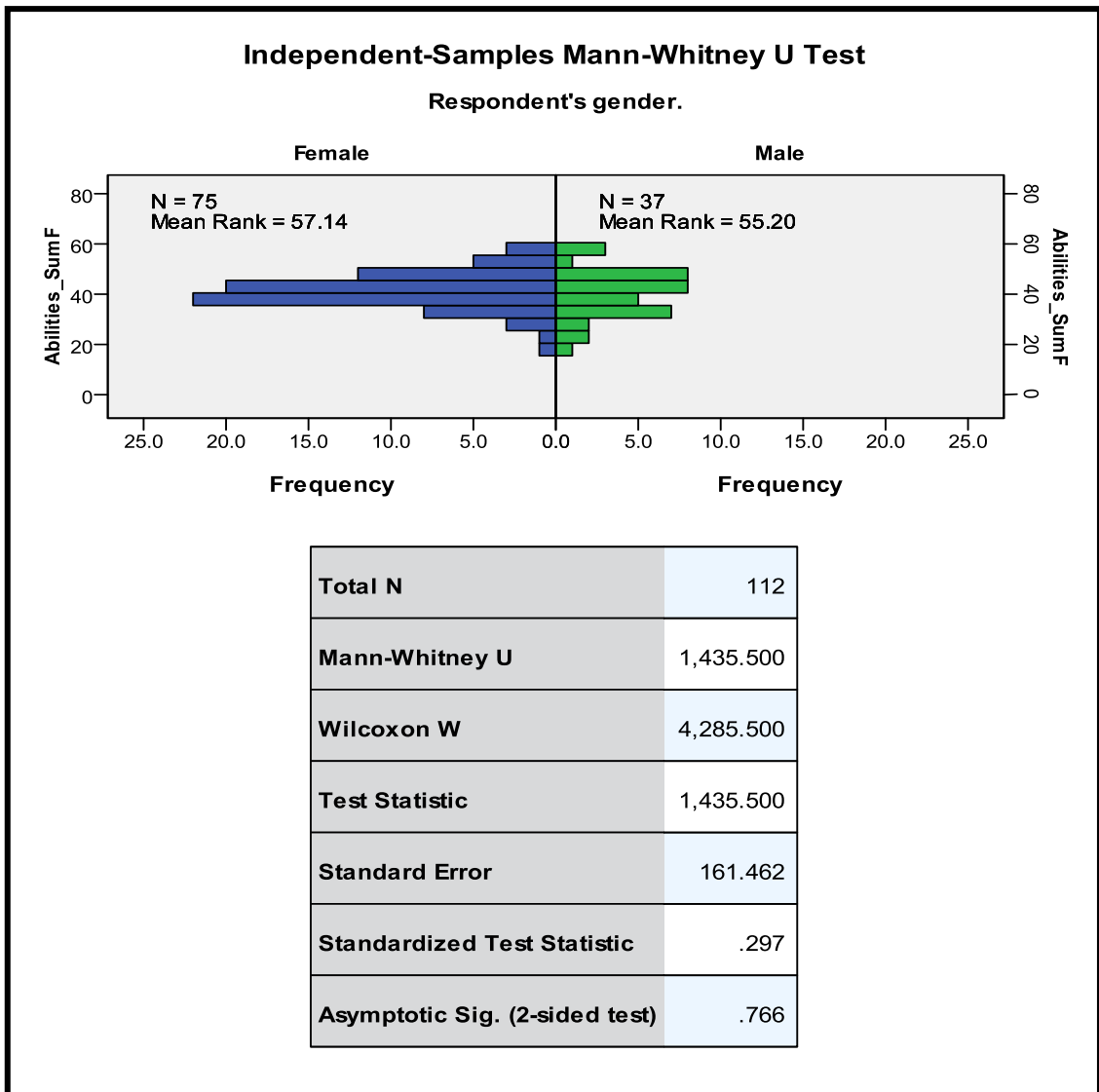


Figure J1. Association among learners' gender and their abilities to engage with sustainability.

#### **Association among learners' gender and their abilities to engage with sustainability.**

To examine whether university undergraduate learners' gender has effects on their abilities to engage with sustainability issues.

#### **Hypothesis:**

**(H8):** The distribution of respondents' abilities is not the same across the categories of gender.

**(H0):** The distribution of respondents' abilities is the same across categories of gender.

The Mann Whitney-Wilcoxon Rank Sum was run which produced the results ( $N=112$ ,  $U=1435.5$ ,  $p=.766$ ). The results show that, learners' gender has no statistically significant effects on their abilities to engage with sustainability issues, thus retaining the null hypothesis that the distribution of respondent's abilities to engage with sustainability is the same across categories of respondent's gender on figure J1.

## **Appendix K. DAB Correlations: Gender and Behaviour**

### **RELATIONSHIP BETWEEN LEARNERS' GENDER AND THEIR BEHAVIOURS (ACTIONS TAKEN) TO PROMOTE SUSTAINABILITY.**

To examine whether university undergraduate learners' gender has effects on their behaviours to promote sustainability.

#### **Hypothesis**

**(H9):** The distribution of respondents' behaviours (actions taken) to promote sustainability is not the same across the categories of gender.

**(H0):** The distribution of respondents' behaviours (actions taken) to promote sustainability is the same across categories of gender.

The independent samples Median Mann Whitney U was run which produced the results (N=111, U=1080, p=.060). The results show that learners' gender has no statistically significant effects on their behaviours to engage with sustainability issues. The result retains the null that the distribution of respondent's behaviours to promote sustainability is the same across categories of respondent's gender.

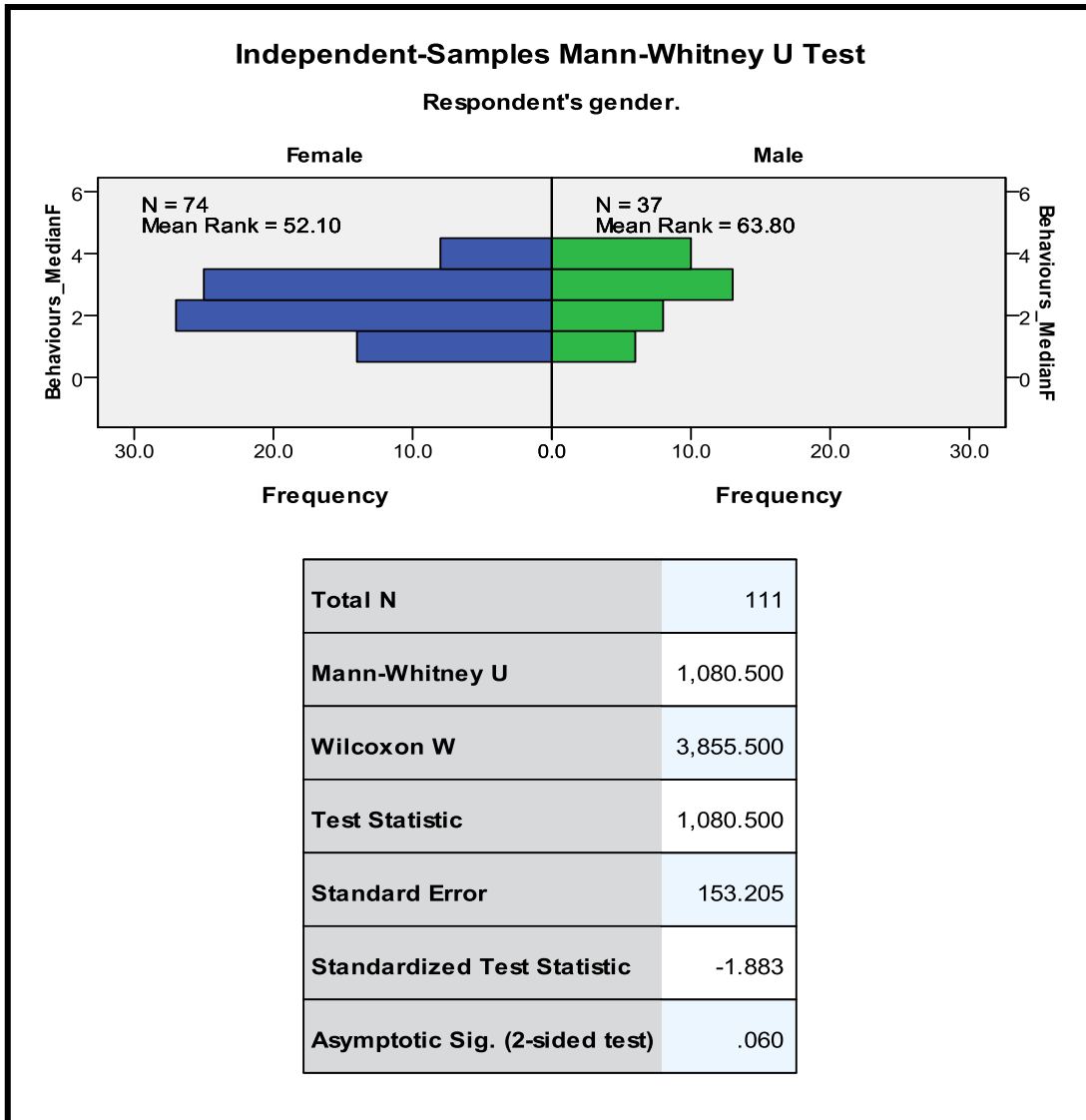


Figure K1. Association among learners' gender, and their behaviours to promote Sustainability.

**Appendix L: DAB Correlations: Year of Study and Willingness  
ASSOCIATION AMONG LEARNERS' CURRENT YEAR OF STUDY AND  
LEARNERS' WILLINGNESS TO ENGAGE WITH SUSTAINABILITY ISSUES.**

To examine the association among learners' current years of studies and their willingness to engage with sustainability issues.

**Hypothesis:**

**(H<sub>10</sub>):** The distribution of respondents' willingness to engage with sustainability issues is not the same across the categories of current year of study.

**(H<sub>0</sub>):** The distribution of respondents' willingness to engage with sustainability issues is the same across categories of current year of study.

The independent samples median Kruskal Wallis test was run and produced the results  $df(=3, N=131, H=2.430, P=.448)$ . The results show that, learners' current year of study has no statistically significant effects on their willingness to engage with sustainability issues. Thus, retaining the null hypothesis that the distribution of respondents' willingness to engage with sustainability issues is the same across categories of respondents' current year of study.

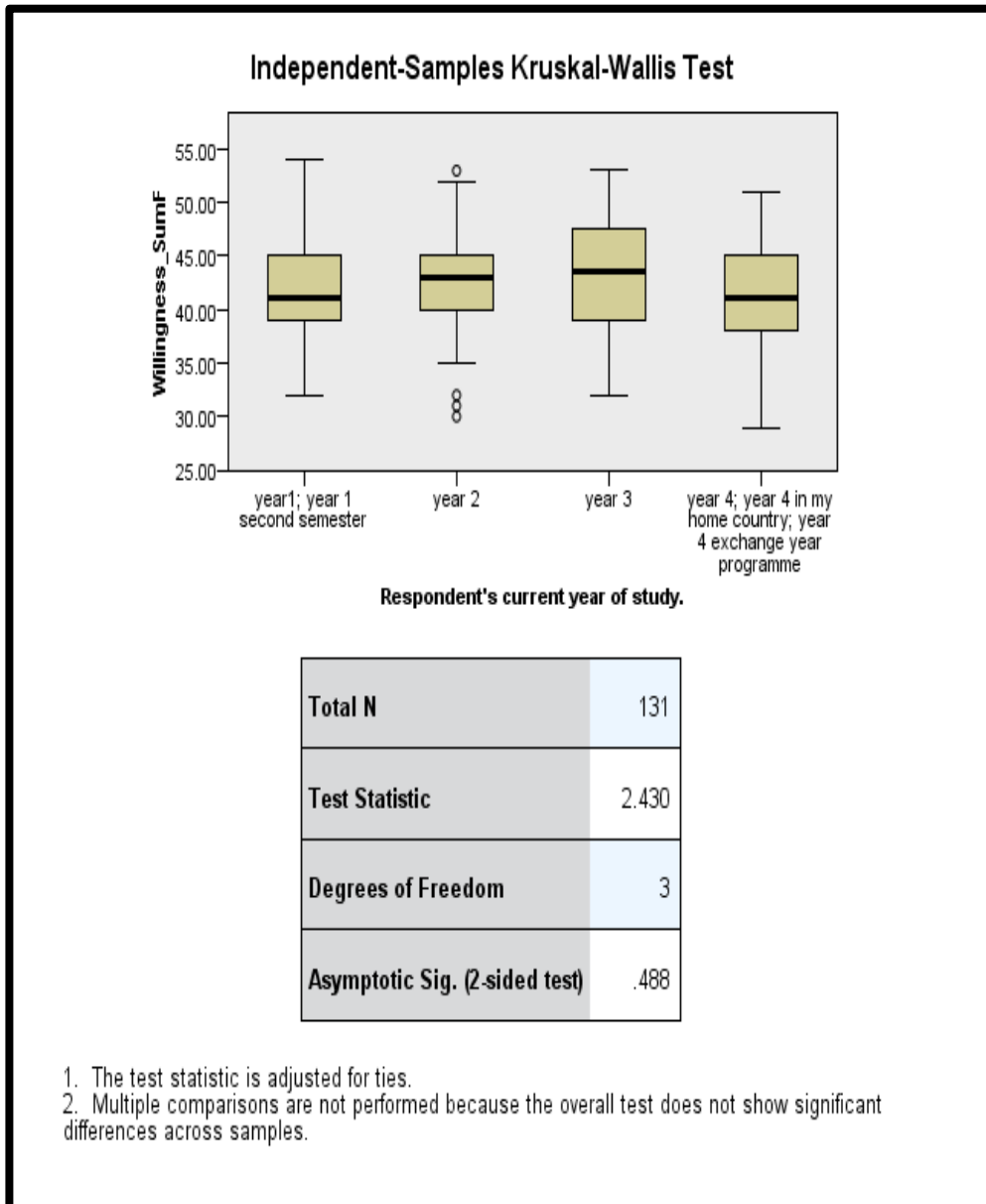


Figure L1. Association among learners' current year of study and their willingness to engage with sustainability issues.

**Appendix M: DAB Correlations: Year of Study and Behaviour**  
**ASSOCIATION AMONG LEARNERS' CURRENT YEAR OF STUDIES AND**  
**THEIR BEHAVIOURS TO PROMOTE SUSTAINABILITY.**

To examine the association among learners' current years of studies and the actions they have taken to promote sustainability.

**Hypothesis:**

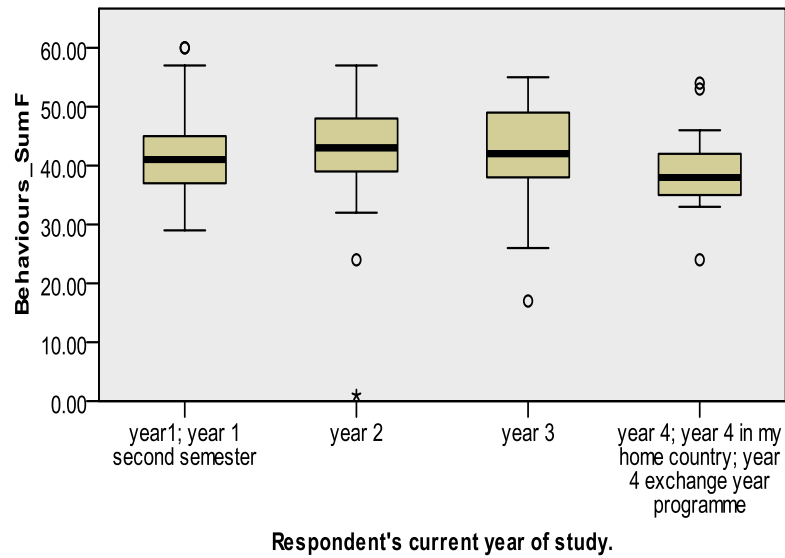
**(H12):** The distribution of respondents' behaviours to promote sustainability is not the same across the categories of current year of study.

**(H0):** The distribution of respondents' behaviours to promote sustainability is the same across categories of current year of study.

The independent samples median kruskal Wallis test was run and produced the results  $df(=3, N=111, H=5.025, P=.170)$ . The results show that learners' current year of study has no statistically significant effects on respondents' behaviours (actions taken) to promote sustainability. The result retains the null hypothesis that the distribution of respondents' behaviours (actions taken) to promote sustainability is the same across categories of respondents' current year of study on figure M1.



### Independent-Samples Kruskal-Wallis Test



<b>Total N</b>	111
<b>Test Statistic</b>	5.025
<b>Degrees of Freedom</b>	3
<b>Asymptotic Sig. (2-sided test)</b>	.170

1. The test statistic is adjusted for ties.
2. Multiple comparisons are not performed because the overall test does not show significant differences across samples.

Figure M1. Association among learners' current years of studies and their behaviours to promote sustainability.

## **Appendix N: DAB Correlations: Study Programmes and Willingness**

### **ASSOCIATION AMONG LEARNERS' STUDY PROGRAMMES AND THEIR WILLINGNESS TO ENGAGE WITH SUSTAINABILITY**

To examine the association among learners' study programmes and their willingness to engage with sustainability, the independent samples median Kruskal Wallis test was run producing the results  $df(47, N=131, H=59.706, P=.101)$ .

#### **Hypothesis:**

**(H13):** The distribution of respondents' willingness to engage with sustainability issues is not the same across the categories of respondents' study programmes.

**(H0):** The distribution of respondents' willingness to engage with sustainability issues is the same across categories of study programmes.

The independent samples median Kruskal Wallis test was run producing the results  $df(47, N=131, H=59.706, P=.101)$ . The results show that learners' study programmes have no statistically significant effects on their willingness to engage with sustainability, thus retaining the null hypothesis that the distribution of respondents' willingness is the same across categories of study programmes on figure N1.

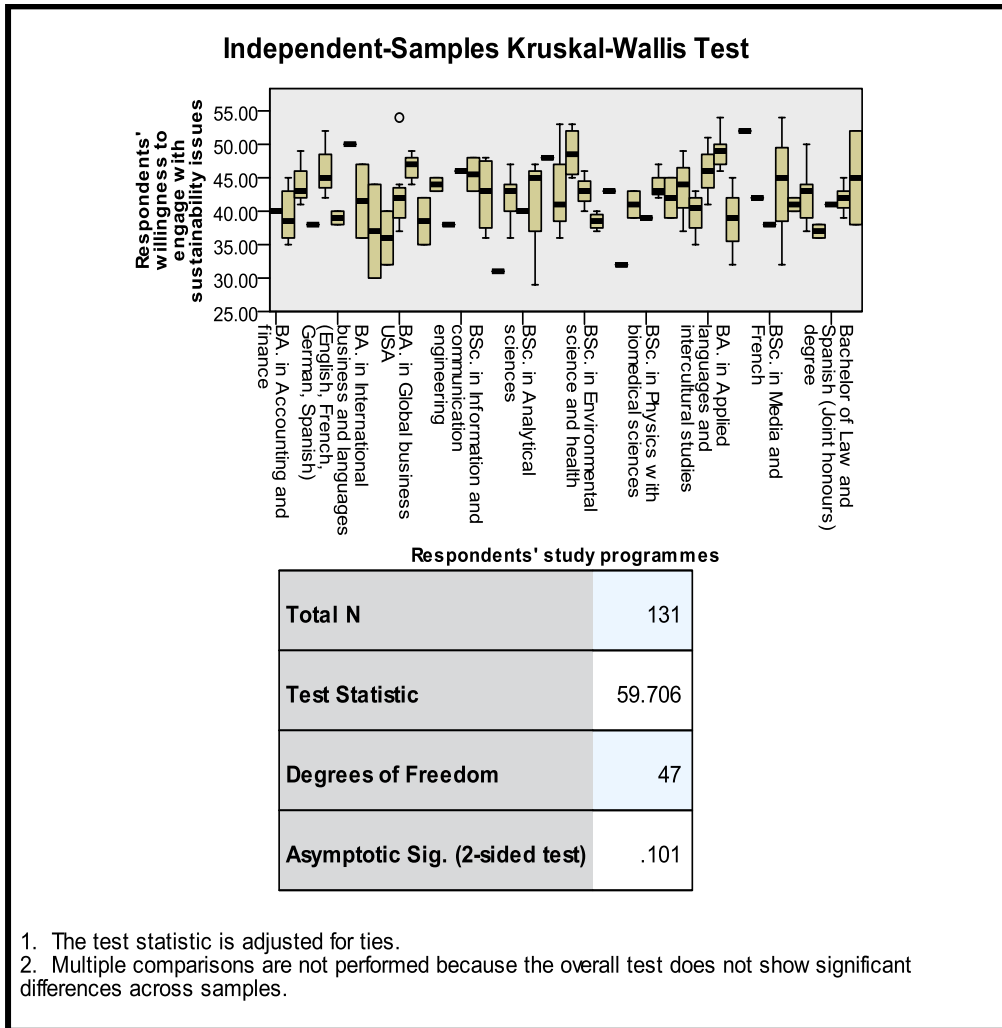


Figure N1. Association among learners' study programmes and their willingness to engage with sustainability issues.

Further analysis of the data was done to examine whether or not there exist relationships between learners' study programmes grouped by faculty and their willingness to engage with sustainability issues (See Appendix O).

## **Appendix O: DAB Correlations: Study Programmes (Faculty) and Willingness**

### **ASSOCIATION AMONG LEARNERS' STUDY PROGRAMMES (GROUPED BY FACULTY) AND THEIR WILLINGNESS TO ENGAGE WITH SUSTAINABILITY.**

The independent samples median Kruskal Wallis test was run and produced the results  $df(3, N=131, H=1.613, P=.657)$ .

#### **Hypothesis**

**(HI3A):** The distribution of respondents' willingness to engage with sustainability issues is not the same across the categories of respondents' study programmes grouped by faculty.

**(H0):** The distribution of respondents' willingness to engage with sustainability issues is the same across categories of study programmes grouped by faculty.

The independent samples median Kruskal Wallis test was run and produced the results  $df(3, N=131, H=1.613, P=.657)$ . The results show that learners' study programmes grouped by faculties have no statistically significant effects on their willingness to engage with sustainability. The results retain the null hypothesis that the distribution of respondents' willingness is the same across categories of study programmes grouped by faculty on figure O1.

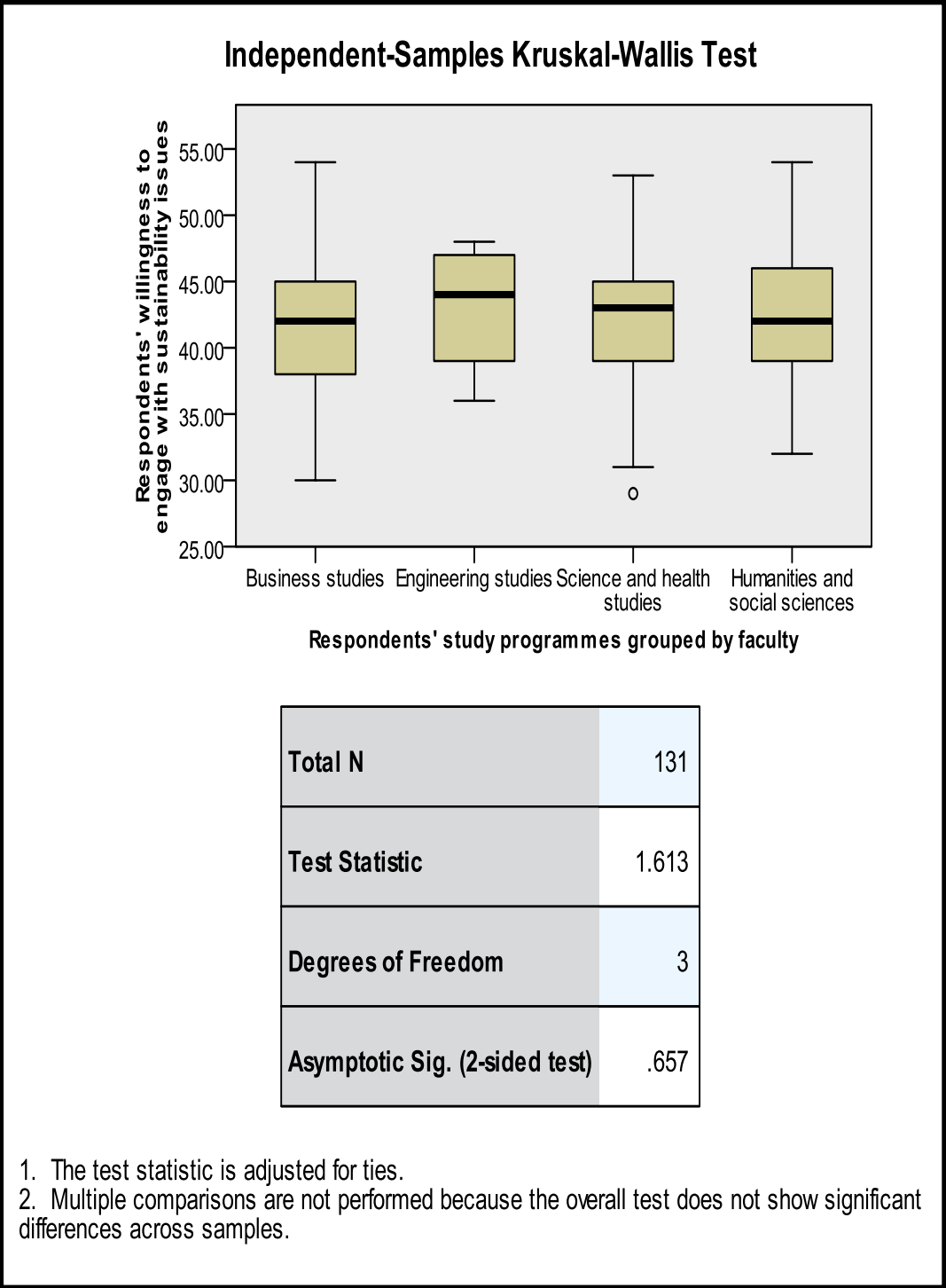


Figure O1. Association among learners' study programmes (grouped by faculty) and their willingness to engage with sustainability issues

## **Appendix P: DAB Correlations: Study Programmes and Abilities**

### **ASSOCIATION AMONG LEARNERS' STUDY PROGRAMMES AND THEIR ABILITIES TO ENGAGE WITH SUSTAINABILITY**

To examine the association among learners' study programmes and their abilities to engage with sustainability, the independent samples median Kruskal Wallis test was run producing the results  $df(45, N=112, H=52.409, P=.209)$ .

#### **Hypothesis:**

**(H14):** The distribution of respondents' abilities to engage with sustainability issues is not the same across the categories of study programmes.

**(H0):** The distribution of respondents' abilities to engage with sustainability issues is the same across categories of study programmes.

To examine the association among learners' study programmes and their abilities to engage with sustainability, the independent samples median Kruskal Wallis test was run producing the results  $df(45, N=112, H=52.409, P=.209)$ . The results show that learners' study programme has no statistically significant effects on respondents' abilities to engage with sustainability issues, thus retaining the null hypothesis that the distribution of respondents' abilities is the same across categories of study programmes, see figure P1.

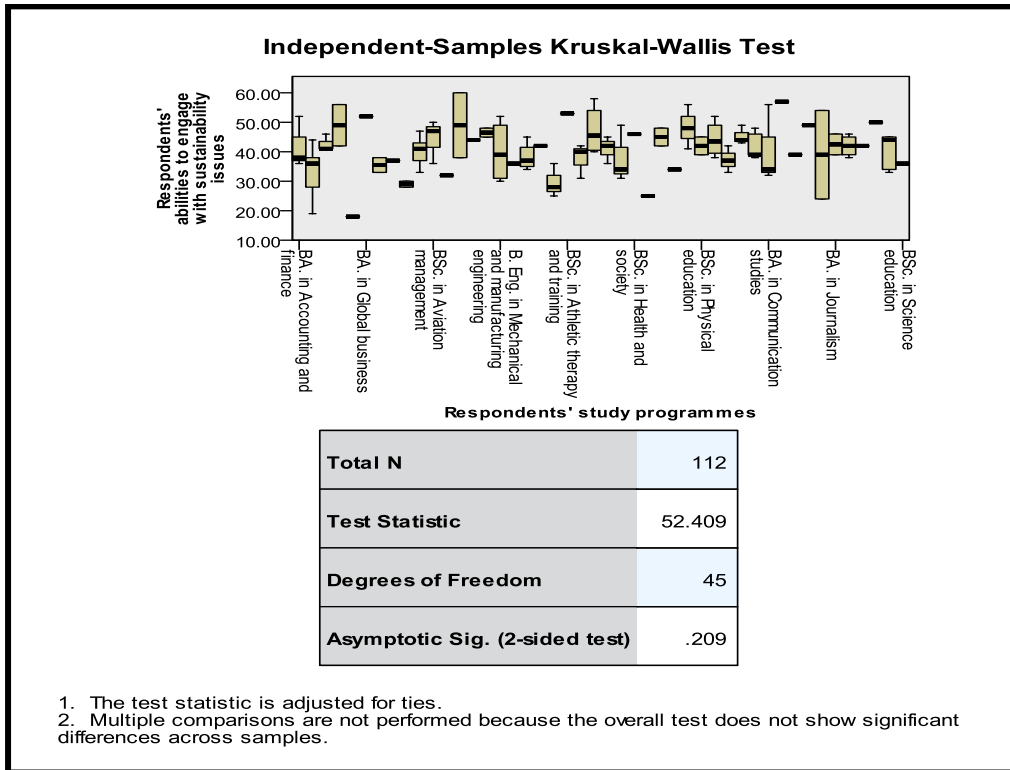


Figure P1. Association among learners' study programmes (grouped by faculty) and their abilities to engage with sustainability issues.

## Appendix Q: DAB Correlations: Study Programmes (Faculty) and Abilities

### ASSOCIATION AMONG LEARNERS' STUDY PROGRAMMES AND THEIR ABILITIES TO ENGAGE WITH SUSTAINABILITY ISSUES.

Further statistical tests were carried out to examine the association among learners' study programmes (grouped by faculty) and their abilities to engage with sustainability. The independent samples median Kruskal Wallis test was run and produced the results,  $df(3, N=112, H=3.654, P=.309)$ .

#### Hypothesis:

**(H14A):** The distribution of respondents' abilities to engage with sustainability issues is not the same across the categories of study programmes.

**(H0):** The distribution of respondents' abilities to engage with sustainability issues is the same across categories of study programmes (grouped by faculty).

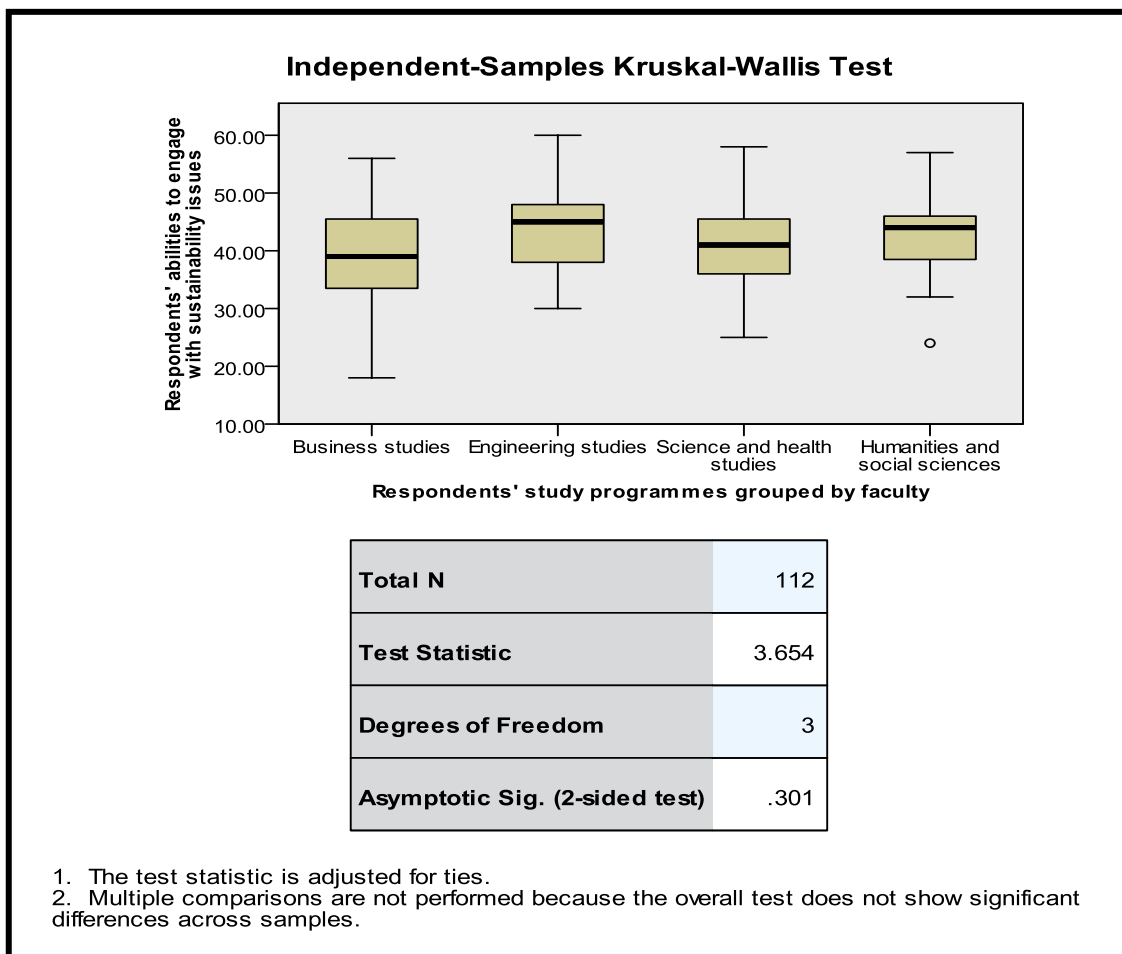


Figure Q1. Association among learners' study programmes and their abilities to engage with Sustainability issues.



The independent samples median Kruskal Wallis test was run and produced the results,  $df(3, N=112, H=3.654, P=.309)$ . The results show that learners' study programme has no statistically significant effects on respondents' abilities to engage with sustainability issues, thus retaining the null hypothesis that the distribution of respondents' abilities is the same across categories of study programmes as shown in figure Q1.

## **Appendix R: DAB Correlations: Study Programmes and Behaviours**

### **ASSOCIATION AMONG LEARNERS' STUDY PROGRAMMES AND THEIR BEHAVIOURS (ACTIONS TAKEN) TO PROMOTE SUSTAINABILITY**

To examine the association among learners' study programmes and their behaviours (actions taken) to promote sustainability, the independent samples median Kruskal Wallis test was run producing the results  $df(45, N=111, H=51.728, P=.228)$ .

#### **Hypothesis:**

**(H15):** The distribution of respondents' behaviours to promote sustainability is not the same across the categories of study programmes.

**(H0):** The distribution of respondents' behaviours to promote sustainability is the same across the categories of study programmes.

To examine the association among learners' study programmes and their behaviours (actions taken) to promote sustainability, the independent samples median Kruskal Wallis test was run producing the results  $df(45, N=111, H=51.728, P=.228)$ . The results show that learners' study programme has no statistically significant effects on respondents' behaviours (actions taken) to promote sustainability, thus retaining the null hypothesis that the distribution of respondents' behaviours to promote sustainability is the same across categories of study programmes.

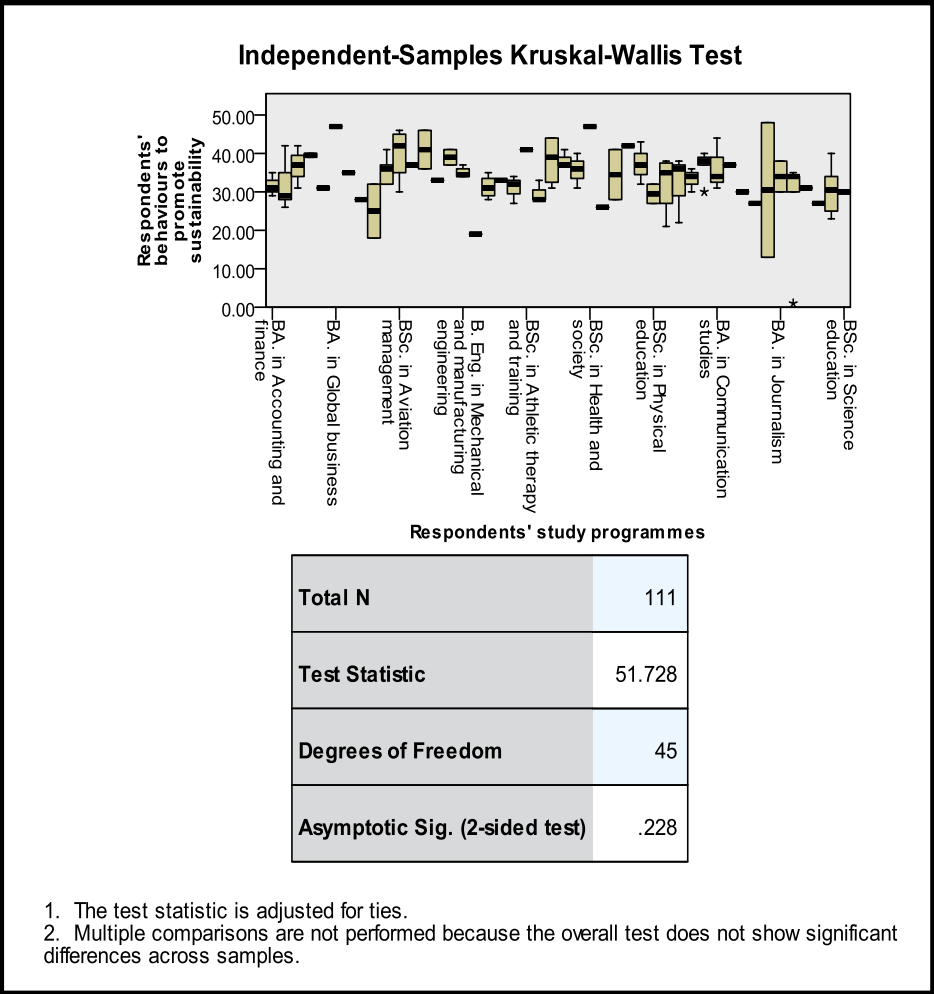


Figure R1. Association among learners' study programmes and their behaviours to promote sustainability

## **Appendix S: DAB Correlations: Study Programmes (Faculty) and Behaviours**

### **ASSOCIATION AMONG LEARNERS' STUDY PROGRAMMES (GROUPED BY FACULTY) AND THEIR BEHAVIOURS (ACTIONS TAKEN) TO PROMOTE SUSTAINABILITY**

Further statistical tests were run to examine the association among learners' study programmes (grouped by faculty) and their behaviours (actions taken) to promote sustainability. The independent samples median Kruskal Wallis test was run and produced the result,  $df(3, N=111, H=4.240, P=.237)$ .

#### **Hypothesis:**

**(H15A):** The distribution of respondents' behaviours to promote sustainability is not the same across the categories of study programmes (grouped by faculty).

**(H0):** The distribution of respondents' behaviours to promote sustainability is the same across the categories of study programmes (grouped by faculty).

Tests were run to examine the association among learners' study programmes (grouped by faculty) and their behaviours (actions taken) to promote sustainability. The independent samples median Kruskal Wallis test was run and produced the result,  $df(3, N=111, H=4.240, P=.237)$ . The results show that learners' study programmes when grouped by faculty have no statistically significant effects on their behaviours (actions taken) to promote sustainability. The results retain the null hypothesis that the distribution of respondents' behaviours to promote sustainability is the same across categories of study programmes when grouped by faculty figure S1.

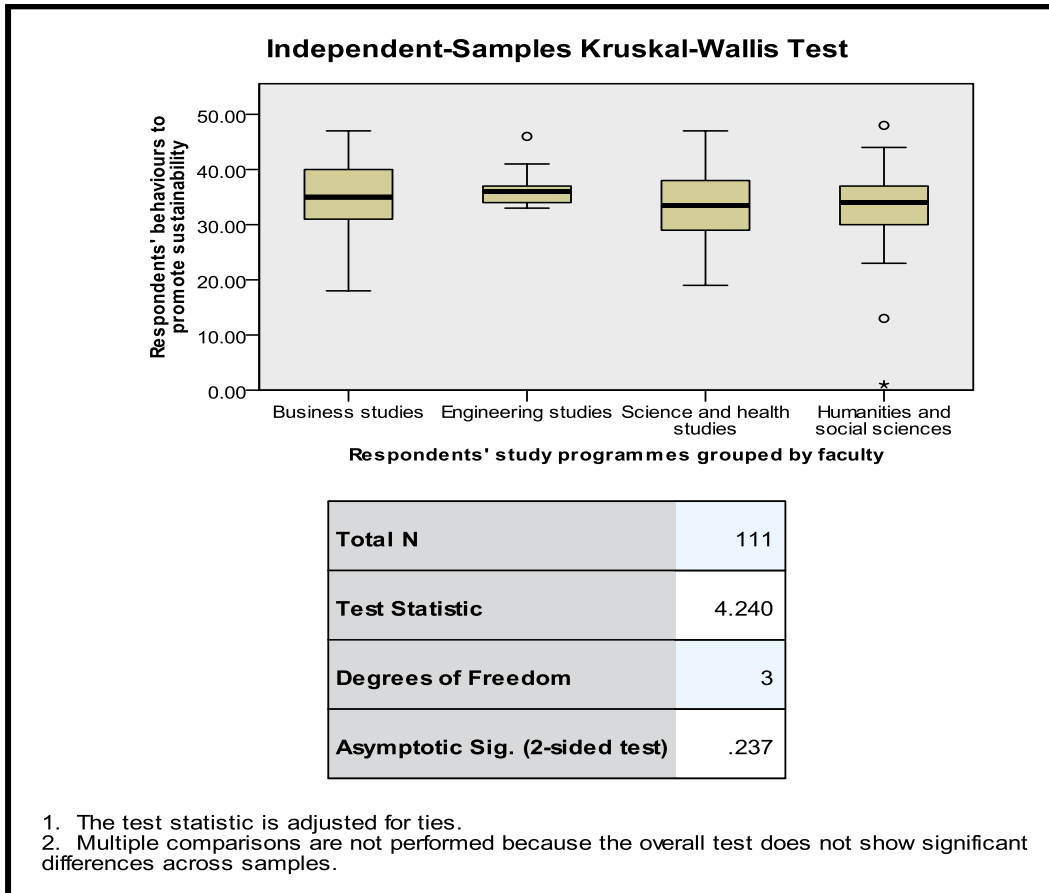


Figure S1. Association among learners' study programmes (grouped by faculty) and their behaviours to promote sustainability

## Appendix T: Percentage Frequency Distribution of Respondents' Study Programmes

Percentage frequency distribution of respondents' study programmes

Study Programmes	Frequency	Percent	Valid Percent	Cumulative Percent
BA. in Accounting and finance	3	2.3	2.3	2.3
BA. in Business studies	6	4.5	4.5	6.8
BA. in Business studies, study abroad	1	.8	.8	7.6
BA. In European business (French)	1	.8	.8	8.3
BA. in International business	4	3.0	3.0	11.4
BA. in International business and languages (English, French, German, Spanish)	2	1.5	1.5	12.9
BA. in Global business	1	.8	.8	13.6
BA. in Global business Canada	2	1.5	1.5	15.2
BA. in Global business France	2	1.5	1.5	16.7
BA. in Global business Germany	2	1.5	1.5	18.2
BA. in Global business USA	8	6.1	6.1	24.2
BSc. in Aviation management	5	3.8	3.8	28.0
BSc. in Marketing, innovation and technology	2	1.5	1.5	29.5
B.Eng. in Biomedical sciences	2	1.5	1.5	31.1
B.Eng. in Electronic engineering	1	.8	.8	31.8
BSc. in Information and communication engineering	1	.8	.8	32.6
B. Eng. in Manufacturing engineering with business studies	2	1.5	1.5	34.1
B. Eng. in Mechanical and manufacturing engineering	4	3.0	3.0	37.1
BSc. in Computer applications	1	.8	.8	37.9
BSc. in Acturial mathematics	5	3.8	3.8	41.7
BSc. in Analytical sciences	1	.8	.8	42.4
BSc. in Applied physics	3	2.3	2.3	44.7
BSc. in Athletic therapy and training	1	.8	.8	45.5
BSc. in Biotechnology	3	2.3	2.3	47.7
BSc. in Chemical and pharmaceutical sciences	4	3.0	3.0	50.8
BSc. in Environmental science and health	3	2.3	2.3	53.0
BSc. in Genetic and cell biology	4	3.0	3.0	56.1
BSc. in Health and society	1	.8	.8	56.8
BSc. in Physical education	1	.8	.8	57.6
BSc. in Physics	2	1.5	1.5	59.1
BSc. in Physics with biomedical sciences	1	.8	.8	59.8
BSc.in Sports science and health	3	2.3	2.3	62.1
BSc. in General nursing	2	1.5	1.5	63.6
BSc. in Intellectual Disability nursing	4	3.0	3.0	66.7
BSc. in Psychiatric nursing	4	3.0	3.0	69.7

BA. in Applied languages and intercultural studies	3	2.3	2.3	72.0
BA. in Applied languages and translation studies	5	3.8	3.8	75.8
BA. in Communication studies	3	2.3	2.3	78.0
BSc. in Computer and communication sciences	1	.8	.8	78.8
BSc. in Media and Chinese (Joint honours) degree	1	.8	.8	79.5
BSc. in Media and French	1	.8	.8	80.3
BSc. in Multimedia	3	2.3	2.3	82.6
BA. in Journalism	2	1.5	1.5	84.1
Bachelor of Civil law; Law and society (BCL)	7	5.3	5.3	89.4
BA. in European business (French)	2	1.5	1.5	90.9
Bachelor of Law and politics; International relations and law (Joint honours) degree	1	.8	.8	91.7
Bachelor of Law and Spanish (Joint honours) degree	2	1.5	1.5	93.2
BSc. in Education and Counselling study abroad	7	5.3	5.3	98.5
BSc. in Education and training	2	1.5	1.5	100.0
Total	132	100.0	100.0	

Table T1. Percentage frequency distribution of respondents' study programmes

**Study Programmes:** In relation to the study programmes covered, students who participated in the survey were registered in different undergraduate study programmes which included: Accounting and finance studies; Business studies (European business, international business, international business and languages, global business, marketing, innovation and technology and aviation management); Engineering studies (biomedical sciences, electronic engineering, information and communication engineering, manufacturing engineering with business studies, mechanical and manufacturing engineering, mechatronic engineering and computer applications); Sciences (acturial mathematics, analytical sciences, applied physics, athletic therapy and training, biotechnology, chemical and pharmaceutical sciences, environmental science and health, genetic and cell biology, health and society, physical education, physics, physics with biomedical sciences, sports science and health; Nursing and social studies (general nursing, intellectual disability nursing, psychiatric nursing, psychology); Languages, media, communications and journalism studies (applied languages and intercultural studies, applied languages and translation studies, communication studies, computer and communication sciences, media and Chinese, media and French, multimedia, journalism); Law, politics and international relations studies (civil law; law and society, law and politics; international relations and law, law and Spanish); Education studies (education and counselling, education and training), as shown in table T1.