FUTURE GRADUATE SKILLS: A SCOPING STUDY

Change Agents UK

EAUC

Dr Isabel Cook

October 2020

Change Agents UK

eauc
The Alliance for Sustainability Leadership in Education

Abstract

New skills are needed in the workforce to address the challenges posed by climate change and the drive for sustainable development. However, there is a lack of clarity about what exactly is required of employees in terms of sustainability skills across all sectors, and what so-called 'sustainability skills' (also referred to as competencies, attributes, literacy) might entail. This scoping study, by Change Agents UK and the EAUC, examines perspectives from three key stakeholder groups: university leaders, business leaders, and recent graduates. It interrogates their opinions on what 'sustainability skills' are, which skills are important for employability and/or sustainability, and how they could be best instilled in students and young people.

Results indicate that there are varying levels of agreement across several issues, but there is a clear consensus on the need for active collaboration and co-operation between universities and businesses in developing training and/or course material relating to sustainability, employability and workplace readiness. Extra-curricular activities and work placements/internships were also considered as particularly important by business leaders, but seemingly undervalued by graduates.

Executive Summary

Research Context

National and international carbon emission reduction targets, and the increased recognition of the importance of sustainable business practices, is driving the 'greening' of the UK economy. To meet the requirements of the shift towards a low-carbon economy there will need to be a significant change in the knowledge-base and skills of workers and employees across every sector of business. However, research by the Department for Business Innovation and Skills (BIS 2012) indicated that there is currently a lack of business managers and leaders who are 'sustainability literate'. Further, businesses report that they are struggling to find candidates with the right sustainability skills to fit graduate positions, indicating a mismatch between the skills training available at university and the changing requirements of employers (e.g. Arum and Roksa 2014; Calonge and Shah 2016).

The economic impacts of the Covid-19 pandemic have created further unknowns in terms of opportunities for young people, and the skills that will be needed in the job market going forward. It is now even more important that graduates are agile in terms of their skills base, and equipped with the right skill sets for addressing future challenges.

Research partners

The EAUC is the alliance for sustainability leadership in education. It exists to lead and empower the post-16 education sector to make sustainability 'just good business'. With over 200 universities, colleges and learning and skills organisations as members, EAUC is leading the way in bringing sustainability to the business management and curriculum of institutions across the UK and Ireland, and further afield. This report was commissioned by the EAUC's Future Business Council. The Council comprises executives from leading employers and universities with the aim of addressing the graduate sustainability skills gap.

Change Agents UK is a charity and not-for-profit organisation who provide work placements in sustainability and deliver training and online learning to graduates and young people in a range of the topics including project management, presentation skills and communicating sustainability. Change Agents UK work with partner organisations across many sectors, providing help and resource with research and practical projects delivering change for a sustainable future.

Purpose of this scoping study

This scoping study aims to bring further understanding to the area of changing graduate requirements, graduate skills gaps, and sustainability skills. The results generated will be used by the research partners to make recommendations on actions for current students, employers, university and government. It will also inform the approach to training graduates at CAUK and the strategic approach taken by EAUC.

Structure

This scoping study was based on questionnaires and interviews with a range of key actors from different stakeholder groups: recent graduates, business leaders, and university leaders. This provided a wide scope of viewpoints, and the ability to compare ideas and insights into similar issues from different perspectives.

Results

- There should be greater communication and collaboration between universities and businesses, in terms of module design, teaching real-world problems, and organising work placements and internships

- While technical skills are important for certain specific roles, soft skills (such as communication, presentation, influencing behaviour change, analytical and critical thinking, and team working) are valuable in all areas of business, and should be taught in all degree courses.

- The most effective way to impart new sustainability knowledge and skills would be to embed them within university course curricula. This would allow students to understand how sustainability relates to their sector/discipline rather than seeing it as a separate issue.

- Both business leaders and graduates identified workplace skills as the main skills gap (e.g. negotiation, telephone skills, confidence working with superiors, and professionalism)

- Business leaders consider volunteering, placements, and internships as valuable ways for students to improve and demonstrate their skillset, but graduates seemed less aware of the value of these extra-curricular activities for their future employment

- The findings of this research (primarily the call for cross-sectoral cooperation and co-creation of course material) mirror those of research undertaken 15 years ago (Martin and Jucker 2005; Gumley 2006; Stieg 2006). The consistency of the message regarding the best 'next steps' for creating a curriculum for ESD indicates that, although research over the past decade may have increased our understanding of which specific competencies or skills are most desirable, or the state of those skills among different student populations, there remains a lack of significant, measurable action.

Recommendations by Audience

The recommendations from this study are organised by audience: Students, Businesses, Universities, and Government.

Students

- Undertake extra-curricular activities during your time at university, and make a note of the projects this involves, the responsibilities you take on, and the skills you have learned, as this will be valuable when you come to apply for work.
- Be proactive in seeking out opportunities for real-world work experience alongside academic study

Universities

- All degree courses should involve at least 2 weeks (or 1 day per week for 1 semester) of work experience or a placement of some kind to enable students to develop real-world understanding of the professional or business workplace. This does not have to be in the sector related to their degree discipline, as the focus is on developing students' experience of practical realities alongside academic theory.

- All courses must equip students with the cross-cutting skills necessary for addressing sustainability challenges, such as critical thinking, lateral thinking, and systems thinking. Interdisciplinary or cross-disciplinary learning and problem solving are valuable ways to get students out of their disciplinary silos and to start understanding the interconnectivity of systems.

- Universities as businesses have a responsibility to provide their staff (both office staff and teaching staff) with training on sustainability. This includes sustainability theory, practical applications of sustainability to different sectors, how it relates to their discipline, and how sustainability can be incorporated into their modules and teaching material

Business

- Businesses should be more proactive in contacting universities to offer work placement opportunities, guest lectures, and information on what exactly they are looking for in the graduates that they hire.

- Businesses also have a responsibility to train their existing staff in the sustainability skills and knowledge that are becoming more important. For businesses to become sustainable, it is not enough to wait until current graduates with sustainability knowledge are in a position high enough to make significant change. Training on sustainability theory, and its application, should be made available for all staff. This will make the business more able to address the future challenges that emerge, both during and after the Covid-19 pandemic.

Government

- In order to ensure that the changes recommended here are followed through, and to facilitate the process, the government must establish a body or commission that both enforces the necessary changes, and also facilitates and co-ordinates the process, through communication of best-practice approaches and provision of resources for universities. We support the call from Aldersgate Group for a National Skills Commission – it is crucial that this is a cross-cutting group, with representation from young people, education institutions, education sector bodies and organisations, business and Government.

- There is a significant opportunity and need for these findings to be considered at all stages of education – whilst this study has concentrated on university education and graduate skills, this issue is universal. The Teach the Future campaign calls for education at all levels to reflect the severity of the climate crisis; we support this and we would like to see sustainability in its broadest forms being incorporated into learning across subjects and disciplines. Skills for the future will be needed by all young people entering the workforce and changes to the National Curriculum to upskill students will be required. Ofsted and QAA must take a proactive role in fulfilling these requirements.

Future Graduate Skills: A Scoping Study

Introduction

National and international carbon emission reduction targets, and the increased recognition of the importance of sustainable business practices, is driving the 'greening' of the UK economy. The UK government has pledged to reach net zero emissions by 2050, and there is growing consumer and legislative pressure for businesses to increase their sustainability (Foerstl et al. 2014; UK Government 2019). Adapting current business and manufacturing practices will result in the redefinition of existing jobs, and the creation of new jobs and sectors (GHK 2009). The United Nations Environment Programme (UNEP 2008) has warned that a shortage of skills and labour required for 'green' jobs could impede the growth of the green economy (UNEP 2008; Martinez-Fernandez *et al.* 2010).

To meet the requirements of the shift towards a low-carbon economy, it is thought there will need to be a significant change in the knowledge-base and skills of workers and employees across every sector of business. This includes hard skills (such as renewable engineering, emission reduction from production lines, carbon footprinting), and soft skills (such as systems thinking, reflexivity, and cross-sectoral working) (GHK 2009; Sandri et al. 2018). However, research by the Department for Business Innovation and Skills (BIS 2012) indicated that there is currently a lack of business managers and leaders who are 'sustainability literate'. Further, businesses report that they are struggling to find candidates with the right sustainability skills to fit graduate positions, indicating a mismatch between the skills training available at university and the changing requirements of employers (e.g. Barton 2012; Arum and Roksa 2014; Calonge and Shah 2016).

In order to successfully achieve a net-zero economy, and also meet other sustainability goals such as pollution and waste reduction, reducing resource consumption, and fair wages and employment conditions, it is essential that businesses gain the sustainability knowledge and skills to enact the required changes. Addressing the 'gap' between graduate skills and employer demands is an important step in improving the sustainability of businesses across sectors. However, it is first necessary to define this skills gap by clarifying what 'sustainability skills' entail, which skills are in demand by employers, and what training is available to students or recent graduates.

Therefore, the purpose of this scoping study is to bring further understanding to the area of changing graduate requirements, graduate skills gaps, and sustainability skills. The results of this exploratory project will identify key areas for further research, and inform the development of future training frameworks. These results were informed by questionnaires and interviews with a range of key actors from different stakeholder groups, providing a wide scope of perspectives. The approach taken in the interviews was influenced by a review of academic and grey literature on the subject of sustainability skills, education for sustainable development, and skills gaps.

Literature Review

This review includes academic literature on the subject of 'sustainability skills' (also referred to as 'green skills', 'sustainability competencies', and 'sustainability literacy'. It also reviews grey literature such as reports, policy statements and web pages from university websites. As well as academic and grey literature, job descriptions and requirements were also included in the identification of 'sustainability skills'. On two UK-based environmental job advertisement websites (Environmental Jobs 2019 and Environment Jobs 2019), a search was made for graduate or entry level jobs with the search term 'sustainability'. Eight roles that met these criteria were available on the former, and three on the latter. The job requirements listed for each role will also be used to inform this review.

What are sustainability skills?

Sustainability skills are referred to using a variety of terms across the literature studied, including 'green skills', 'sustainability competencies', 'sustainability literacy' (see Martinez-Fernandez et al. 2010; Macdonald and Shriberg 2016; Sayce et al. 2008). To avoid confusion, this review will use the term 'sustainability skill' to refer to any of the above. Another key difference is that some literature refers specifically to 'hard' skills or technical knowledge, while others focus mainly on 'soft' skills. This section will first focus on the range of hard skills that have been suggested as being important for sustainability, followed by a review of the soft skills frequently cited as the most important.

Hard Skills

In guidance for UK Higher Education providers, the Quality Assurance Agency for Higher Education (QAA) and the Higher Education Academy (HEA) list several elements of technical knowledge and skills for sustainability that they consider important for graduates (QAA/HEA 2014). For instance, a critical understanding of the concept of sustainable development, and the value of interconnectedness and interdisciplinarity for its achievement. It also promotes the importance of understanding the drivers of unsustainable development such as global power structures and inequalities, and applying knowledge of historical actions and outcomes to envision how future scenarios may be shaped. These types of skills are rooted in a deep understanding of the theoretical concepts behind sustainability, and a knowledge of the methods and models that could be used to reach it. This idea is supported by the EAUC, who consider an understanding of sustainable development to be a key skill missing from the average graduate (Sustainability Exchange 2017; see also Stieg 2006). Furthermore, in five of the 11 graduate sustainability jobs advertised, an interest, knowledge and/or experience in sustainability, sustainable development or sustainability assessments was required.

Other technical sustainability skills that are mentioned across the literature and job requirements are those that are newly emerging as a result of the growing green economy and sustainability requirements placed on organisations, like carbon footprinting, Environmental Impact Assessment, environmental auditing, knowledge of sustainable materials, energy tariffs, sustainable waste management, and renewable energy engineering (Gumley 2006; Stieg 2006; GHK 2009; Martinez-Fernandez et al. 2010).

The hard skills and technical knowledge discussed here range from having a working knowledge of sustainability theory and application, to having a technical understanding of the methods and processes associated with meeting environmental standards.

Soft Skills

Soft skills are attributes that aren't necessarily specific to a job or industry, but influence the way that people work and address the issues that are presented to them. Examples of soft skills include

communication skills, team working, and flexibility. Much of the literature studied focussed on the soft skills deemed necessary for sustainability. For instance, Sandri et al. (2018) consider systems thinking, critical thinking, reflexivity, and foresight, as crucial for attaining 'sustainability literacy'. This is supported by Gumley (2006), Rowe (2007) and Rieckman (2012). A focus on changing the way that graduates are thinking, as well as changing their technical knowledge base, is important as sustainability poses emerging and complex issues that can only be addressed through innovation and an understanding of diverse systems and their interactions (Farrell et al. 2013).

Across the literature and job descriptions that discuss soft skills, one of the most frequently mentioned is the ability to work across disciplines, across sectors and across many stakeholders (Drayson et al. 2014; Rowe 2007; Macdonland and Shriberg 2016; Sandri et al. 2018; Environment Jobs 2019; Environmental Jobs 2019). This is referred to in different ways, including working 'in collaboration with' other parties, working in a 'multi-agency' environment, 'building relationships' with a range of stakeholders, 'coalition-building', 'multi-disciplinarity', and 'problem solving using many subjects'. The importance of this cross-sectoral working is stressed partly because the achievement of sustainability demands a consideration of, and balance between, economic, environmental, and social factors (Fuertes-Camacho et al. 2018). No discipline, sector, or stakeholder is able to solely address every element of a complex system in a way that meets the requirements of sustainable development. Consultation, collaboration and partnership is therefore a necessary and central element to the actualisation of sustainability. Therefore, organisations looking to improve the sustainability of their operations, or new organisations developing in the green sector, require graduates and employees who are able to work cross-sectorally and in effective partnerships with a range of stakeholders.

Summary

The type of sustainability skill required in any job depends on the sector and type of job. Martinez-Fernandez et al. (2010) argue that all roles need to have a grasp of sustainability as a whole, and the complexities associated with it, even though the job-specific skills or additional qualifications depend on the position. Different types of sustainability skill cited across the literature (job-specific technical skills, understanding of sustainability, and new ways of thinking and working) suggests that there is no single, agreed definition of 'sustainability skill'. Alternatively, it indicates that sustainability skills include competencies and knowledge that graduates would have to gain over a range of different placements, training workshops, courses and/or classes.

It is noteworthy that the vast majority of literature on the subject refers primarily to environmental sustainability, environmental assessment and auditing, and a knowledge of environmental issues. This mirrors a concern of the EAUC, who state that one of the problems with graduates understanding of sustainable development is that they assume it relates only to environmental practices, rather than considering the social and economic elements of sustainability (Sustainability Exchange 2017).

Who is talking about, or addressing, the skills gap?

Business

The existence of a barrier to employability due to a graduate skills gap is undesirable to both industry and academia, who are each invested in the employability of graduates. Research by Cade (2008 – cited in Sayce et al. 2008) found that over half of employers in the UK built environment sector valued the environmental and social responsibility knowledge of candidates in their graduate selection. The Apollo Alliance, a coalition of labour, business, environmental and community leaders working towards a clean energy revolution in the USA, has identified that there are labour shortages

in the sustainable manufacturing, construction and installation sectors, which will hinder progress towards the expansion of clean energy (Martinez-Fernandez et al. 2010). A survey of the German renewable industry sector in 2007 also showed that there were a lack of qualified employees for knowledge-intensive positions (Martinez-Fernandez et al. 2010). This indicates that the graduate skills gap discussed here is not limited to the UK, and may be a global phenomenon.

There is some conflicting data around what types of skills are most valued by business; Sayce et al. (2008) found that although organisations in the built environment sector value 'sustainability literacy' in graduates, this is not always prioritised over technical knowledge or experience. In contrast, other research (see Branine 2008; Association of Graduate recruiters 1995; Sayce et al. 2008; Drayson 2015a) showed that employers valued soft skills or transferable skills over grades and technical skills. This further demonstrates the importance of both hard and soft skills, and the sector- or role-specific nature of the required sustainability skills.

Research by NUS, Change Agents UK and HEA into students' skills for sustainability and employability indicated that senior leaders in business valued sustainability skills in graduates, but that the most important sustainability skill was the ability to 'use resources efficiently', with fewer valuing an 'understanding of peoples relationship to nature' (Drayson 2015a). Drayson (2015a) argue that this indicates "a systematic alienation of humans and nature" by business leaders, within businesses, and within society as a whole. This mirrors the focus of students and graduates on the environmental aspect of sustainability, to the detriment of the social and economic aspects of sustainability, as identified by the EAUC (Sustainability Exchange 2017).

Universities

There is much less available literature published by universities and HEIs on the research gap, but the provision of training and education for students on sustainability and sustainable development indicates the recognition of this knowledge requirement.

Integration of sustainability within degrees

Research into student attitudes in 2013 indicated that most students interested in sustainable development wanted to learn about it through their syllabus, rather than studying it separately (Drayson et al. 2014). This is referred to as Education for Sustainable Development (ESD) (Cani 2014). Sustainability policies and frameworks, such as the UNESCO Decade of Education for Sustainable Development (2005-2014) and the Higher Education Funding Council for England (HEFCE 2009) Sustainable Development in Higher Education plan, have provided frameworks to assist universities in the integration of sustainability into all aspects of higher education (Cani 2014). However, Nejati and Nejati (2013) state that, although HEIs have changed their visions towards increasing sustainability, the provision of ESD has been uneven across universities and across subjects.

Several universities offer the integration of sustainability education into traditional degrees. Most commonly, undergraduate business degrees offer modules on Corporate Social Responsibility, business ethics, and sustainable business management (for instance Glasgow Caledonian University; University of Southampton 2019; University of Kent 2019; University of Nottingham; University of Sussex). Undergraduate geography and environmental science degrees also often incorporate sustainability and sustainable development in their core or optional modules (see University of Leeds 2019a; University of Newcastle 2019; University of Exeter 2019). In addition, some universities are developing courses specifically designed for addressing sustainability and cross-disciplinary studies (see University of St Andrews 2019; University of Leeds 2019b; University of Warwick 2019). This indicates that these universities recognise the growing need for graduates who are confident in matters of sustainability. The inclusion of sustainability into degree courses is much less common in

subjects such as languages, literature, history, and classics, although the Media Studies BA degree at University of Brighton offers a module in Sustainability and Innovation in Digital Culture (University of Brighton 2019).

To facilitate the incorporation of sustainability into more traditional subjects, several universities offer training courses to their staff. For instance, the University of Plymouth offers lecturers a masters-level module in sustainability education, which covers the concept and history of sustainability, and ways to incorporate it into their teaching (University of Plymouth 2019; see also University of Bedford 2019; University of Leeds 2019c; Keele University 2019). Other universities also offer sustainability training to university staff, but with a focus on how staff can reduce their own environmental impact, rather than a deeper understanding of sustainability or enabling staff to incorporate sustainability skills into their curriculum (see University of Reading 2019; University of Edinburgh 2019; Swansea University 2019)

This review has not included consideration of training provision for post-graduate or research students in institutes such as the Grantham Centre in Sheffield (Grantham Centre for Sustainable Futures 2019), as this only accounts for a small subset of graduates, and could be considered unreasonable for additional degrees to be the only way for graduates to gain the necessary employability skills.

Extracurricular training

As well as in-course learning, many universities have also started to offer extra-curricular training or experience in sustainability and sustainable development projects. Macdonald and Shriberg (2016) state that many universities have sustainability leadership programmes which are designed to provide students with the skills and knowledge required for working in the environmental sector or in 'green jobs'.

Green Impact is another national programme run by the National Union of Students that promotes sustainable practices within organisations, and engages both staff and students in the running of sustainability activities (Green Impact 2019). Many students' unions also arrange or facilitate their own sustainability training programmes for students. For instance, Sheffield University Students Union has several ongoing sustainability campaigns, including Sustainability Step Up, an online information tool to educate students about how they can become more sustainable (Sheffield Students Union 2019). University of West England Students Union has a sustainability committee made up of students who organise events, volunteering and campaigning to improve the sustainability of the university and of Bristol (UWE Students Union 2019). Finally, some universities organise free workshops on ethical and sustainability subjects, such as foraging, waste-free homes and natural cosmetics making (see Cardiff Metropolitan University 2019; Manchester Students' Union 2019; University of Stirling Students Union 2019; Sheffield Hallam Students Union 2019).

Summary

The available literature and online resources studied have revealed that many universities are incorporating sustainability and related skills into the curriculum of some degree subjects, such as business and some sciences. Other disciplines have made less progress in the integration of sustainability into the curriculum, such as history, art, and languages. This may be because is it easier to relate sustainability issues to subjects already studied in business (economics, corporate social responsibility) and environmental sciences/geography (environmental degradation and management).

Sustainability events, workshops and training were commonplace across the students' unions researched online. This may give the opportunity to learn about sustainability to students who do not have access to it through their course material. However, learning about sustainability in the context of a degree course and partaking in openly available workshops may yield very different results in the type of sustainability skills and knowledge that they impart. Further research should be done on the strengths and weaknesses of different types of sustainability training for different purposes.

Although the sustainability skills gap is recognised in business and industry, it is much more difficult to identify the training available in different roles or provided by different companies. Interviews with recent graduates working in sustainability roles in various sectors will be used to give insight into the type of training that has been made available to them through their organisations.

Who is responsible for addressing the skills gap?

This section focuses on who is responsible for addressing the skills gap, and providing the training required for students and graduates to meet employer requirements.

Universities

Many stakeholders view it as the responsibility of HEIs to prepare students for the graduate job market through training and education in sustainable development. According to a survey of third-year students across universities and degrees, 80% consider universities as the key actors for delivering sustainability skills, in particular through embedding it into existing course content (QAA/HEA 2014). In another survey, 32% of people in senior leadership roles 'strongly agreed' that the development of students social and environmental skills was the responsibility of HEIs (compared to 14% disagree/strongly disagree, and 48% don't know/neither agree nor disagree) (Drayson 2015b). This indicates that many employers expect graduates to have received training in social and environmental skills (which have a significant overlap with sustainability skills) prior to being employed.

Research has found that knowledge and skills for sustainability were well served through an integrated approach of teaching sustainability within degree subjects (Fuertes-Camacho et al. 2018). Some scholars (Cani 2014; Cortese 2003) argue that there needs to be a transformation in education at all levels to create the next generation of sustainable professionals and workforce. Cortese (2003) states that interdisciplinarity and co-operation between disciplines, rather than just the inclusion of ESD within disciplinary silos, is what is required to give graduates the critical perspectives and knowledge necessary to support green growth.

Employers

Some literature implies that industry or employers should take some responsibility for the provision of training: 60-70% of students who took part in an NUS survey agreed or strongly agreed that it was the responsibility of their future employer to prepare them for their future role (Drayson 2015a). Martinez-Fernandez et al (2010) argue that businesses should provide training to their existing workforce in order to make the necessary shift towards sustainability, as relying only on new graduate employees to have sustainability skills will make any change too slow. Furthermore, sustainability knowledge and skills are continually growing and evolving, so businesses will have to provide ongoing training for their employees in order for their practice to keep up with required standards (see also Stieg 2006). Some sustainability skills are industry specific, so some scholars argue that industry should work with HEIs to inform them of the necessary skills for their sector, as well as providing or funding some of the training through internships, apprenticeships, and workshops (Ali et al. 2017; Gumley 2006; Stieg 2006). GHK (2009) suggest that financial or tax

incentives should be offered to companies who provide sustainability skills training to their employees, indicating that they consider the onus of providing ESD lies (at least partly) on the shoulders of the employers.

Summary

A common theme across much of the literature studied is that collaboration between business and HEIs may be the best way to provide the necessary training. Industry must inform HEIs what they will require from graduates, so that universities can arrange tailored skills and knowledge provision (Ali et al. 2017; Stieg 2006; Maslin et al. 2019; Drayson 2015a). Furthermore, greater partnership between universities and businesses will facilitate the creation of internship and placement opportunities, which will equip students with a range of employability skills extending beyond sustainability (Drayson et al. 2014; Gumley 2006; Maslin et al. 2019).

Conclusion

The purpose of this literature review was to identify themes across academic and grey literature regarding the graduate sustainability skills gap. This covered the various definitions of 'sustainability skills' by different stakeholders, including soft skills and technical knowledge. It also identified that, although businesses appear to discuss or diagnose the 'skills gap' more frequently than HEIs, many universities provide both intra- and extra-curricular sustainability skills training and workshops. There was, however, an inequality or disparity in the incorporation of ESD across different disciplines.

Of the literature cited, 19 references are five or more years old, while 10 of these are at least a decade old. In contrast, only 15 references discussing the skills gap have been published in the last five years (although this does not include the university and students' union websites referenced). This indicates that the graduate skills gap in relation to sustainability was identified over a decade ago, and has been discussed by various groups and stakeholders since. Some progress has been made towards equipping graduates with the skills required for sustainability roles and the green growth of the UK economy, for instance through ESD incorporated into course material by some universities. However, there remains a gap in the skillset of graduates, both in terms of sustainability knowledge and skills, and general employability and workplace skills.

Collaboration between education and industry in the provision of training, creation of internships, and the development of ESD curricula, was frequently cited as an important and necessary step to close the graduate sustainability skills gap. Both HEIs and employers can separately provide training on sustainable development. However, industry-supported workshops in universities can reach greater numbers of students than those hosted by businesses, and industry input into intra-curricula ESD can ensure that courses are designed with employability in mind.

Greater research is needed into the effectiveness of different types of sustainability training for students, whether embedded in course material, as additional optional modules, or in extra-curricular workshops. It is important that sustainability skills are imparted efficiently as well as effectively, as students also have to complete their degree course, and are unlikely to elect to several additional extra-curricular hours a week of training. This is addressed in the interviews undertaken as part of this scoping study. Further research is also needed into the current training made available to recent graduates or employees at certain businesses, and whether this directed, role-specific approach to sustainability training is more or less effective than general sustainable development knowledge gained through university learning.

Methodology

This scoping study used two different data collection methods, a questionnaire and telephone interviews. Both methods were qualitative, as the aim was to allow respondents to propose their own ideas and gain an insight into different perspectives on sustainability skills and graduate requirements, rather than circumscribing answers and predicting themes. The overall aim of this study is to identify initial themes, ideas and insights that could inform further study and research, so it was important to avoid leading questions.

The questionnaire consisted of mainly open questions, and the interviews were semi-structured to make sure that the same type of information was collected from each participant, while allowing the interviewee to lead the discussion.

This methodology will first explain the methods used in the creation, data collection and data analysis of the questionnaire. This is followed by an explanation of the methods, data collection and data analysis of the telephone interviews.

Questionnaires

The questionnaire was created, carried out and analysed prior to any telephone conversations. The initial aim was to identify any main themes, ideas or concerns around the idea of sustainability skills and graduate employment. The target audience of this questionnaire was recent graduates who are currently working in in sustainability-related roles. They were identified and contacted during a CAUK training day, during which they filled out the questionnaire. Sixteen respondents completed the questionnaire in total.

The full questionnaire can be found in the appendices. It is divided into six sections: Demographics, Graduate Employability Skills; Sustainability Skills; Education; Extra-curricular; Current Employment. The Demographic section aimed to get an overview of each respondent in terms of their age, time since graduating, highest qualification, and discipline studied at university. This is to give some understanding of the range of participants.

The Graduate Employability Skills section focussed on general employability for graduates. It asked questions about what skills are important for graduate employability, what skills their current role required them to have, whether they felt like they had any skills gaps when they graduated, and whether they received any general employability skills training at university. Although this scoping study focuses on sustainability skills, general employability or workplace skills are also still important for employment in sustainability-focussed roles.

The Sustainability Skills section mainly aimed to find out what the respondents considered to be ‘sustainability skills’, and who they thought should have responsibility for developing the sustainability skills of graduates. Often, literature about ‘sustainability skills’ is written by researchers, so this would give a perspective on what ‘sustainability skills’ are perceived to be from a graduate or early career point of view.

The Education section aimed to find out what types of sustainability skills the respondents gained as part of their higher education (if any). This included whether any of their modules included information on sustainability, and what skills they felt they gained from those that did. This included modules on the specific topic of sustainability, as well as modules or courses that embedded sustainability ideas and teaching throughout.

The Extra-curricular section asked respondents about whether they had taken part in any sustainability-related extra-curricular activities, such as optional workshops, seminars, guest lectures

or volunteering opportunities. The aim was to determine what sustainability skills respondents may have gained through these different channels, and how this may compare with the sustainability skills gained through traditional educational means.

The final section, Current Employment, asked respondents specifically about the sustainability skills that their current role requires. This is similar to some questions in the Graduate Employability skills section, but the focus there was on general skills, while the focus here is on sustainability skills. It also inquires into whether they had any skills gaps related to sustainability, and whether or not their employer has organised any training for sustainability skills to address this gap. This can be compared to the Education section, to identify whether it is universities or employers who currently offer sustainability-specific training to students and graduates.

Data Analysis

Content analysis was undertaken on the questionnaire responses. The answers given by respondents were grouped into themes so that the frequency of each theme being mentioned could be noted, and broader themes identified. For instance, the skills 'data analysis', 'data management' and 'data handling' were all included in the 'data analysis and management' theme.

Limitations

A potential limitation of this section of the research is the number of respondents. The results would be more robust if a greater number of graduates had been involved. However, the purpose of the questionnaires was just to identify initial themes to inform the in-depth interviews. Another potential limitation could be that all participants were employed in a sustainability-related role. This means that they may have had more insight into sustainability skills have undertaken more sustainability-related extra-curricular activities compared to 'average' graduates. This may have somewhat influenced their responses.

Telephone Interviews

The second part of the data collection was conducted as telephone interviews. Three different demographics were targeted for telephone interviews, in order to get different perspectives on graduate sustainability skills. The three groups were: recent graduates, higher education leaders (such as leading professors and heads of department), and business leaders (such as heads of sustainability and managing directors at large organisations. University leaders was chosen as a category as they are closely involved with the incorporation of ESD in the curriculum at a higher level, as well as being involved with educating students. Business leaders were also chosen because a lot of the literature relating to sustainability skills and training is written by academics from the perspective of academia. This literature rarely incorporates the perspectives of the stakeholders who are the 'end users' of the graduates and their skills, namely the employers. Finally, graduates were chosen because both business leaders and university leaders may have quite a 'high-level' perspective on skills and requirements for sustainability. In contrast, recent graduates who are in their first sustainability-related roles have first-hand experience of the specific skills that they need for their jobs and the skills gaps that they personally have.

Recent graduates were identified through the CAUK database. An email was sent to all CAUK current and recent graduates requesting that they get in touch if they were interested in taking part in a short telephone conversation. University leaders and business leaders were contacted through a member of the CAUK board of trustees who is also involved with the EAUC and therefore has close relationships with the sustainability departments of many universities and large organisations. For all telephone interviews, the responses were not recorded using audio technology, but extensive notes were taken throughout the interviews.

Graduate telephone interviews

The template used as a guide for the graduate telephone interviews can be found in the appendices. It follows a similar structure to the graduate questionnaire, and contained many similar questions, but allowed the respondents to give more detailed and expansive answers than they did in the questionnaire. There were six participants in total, and each telephone interview took around 20 minutes.

University leader telephone interviews

The template used as a guide for the university leader telephone interviews can be found in the appendices. Several of the questions focus on the idea of sustainability skills, how they can be defined, and what type of sustainability skills should be prioritised. It also looks at whether they have perceived any change in requirements placed on graduates by the job market, and how any skills gap would best be addressed. Six university leaders were interviewed, all of whom hold senior positions in either sustainability related departments, or whose research was strongly related to some element of sustainability. Each interview lasted approximately 30 minutes in total.

Business leader telephone interviews

The template used as a guide for the business leader telephone interviews can be found in the appendices. The focus of the questions was on the competencies and skills prioritised by their business, how these relate to sustainability skills, and whether they have perceived any particular skills gap in the graduates that they hire. Six business leaders took part in these interviews, all of whom hold senior positions in businesses related to sustainability, such as environmental institutes or sustainable waste management, or senior roles in sustainability departments of large corporations. Each interview lasted approximately 30 minutes.

Data Analysis

For each group of interviews, answers were compiled into single documents organised by question or type of question. Content analysis was undertaken separately for each of the groups of interviews, to identify themes, agreements, and disagreements in the answers given. This was used to generate an understanding of the general perspective of each group on the concept of sustainability skills, the presence of a skills gap, and the most effective methods for teaching sustainability skills. Comparisons could then be drawn to identify areas of accord or discord between the groups.

Limitations

A potential limitation of the telephone interview data collection could be that there were not many respondents in each group. However, there were the same number of respondents in each group, so each got the same amount of representation and potential variation. As mentioned previously, this research is being undertaken for a scoping study, to identify the main themes and ideas that emerge around these subjects, in order to inform further research or action, rather than to draw firm conclusions. Therefore, the number of participants does not pose an insurmountable limitation.

Being unable to record and transcribe interviews may have led to some information being left out. However, very detailed notes were taken during the interviews, to make sure that all ideas and themes were captured even if the specific wording was not.

Results

Graduate Skills Questionnaire

Sixteen participants completed the graduate skills questionnaire, although not all questions were filled out by each participant. The sections of the questionnaire are as follows: Demographics; Graduate Employability Skills; Sustainability Skills; Education; Extra-curricular; Current Employment. Other than the Yes/No answer questions, all questions were open and respondents were given space to write as much as they wanted. This means that for the skills questions, for instance, several respondents put more than one skill in their response. The tables of results for each question can be found in the appendices.

Demographics

The majority of respondents (n=10, 62.5%) were between the ages of 23 and 26, with three aged 18-22 and three aged 27-30. The years most common to have graduated from university were 2017 (n=5), 2018 (n=4) and 2019 (n=5). This indicates that most respondents are very recent graduates, and have been out of university a few years at most. The highest qualification of most respondents is undergraduate degree (n=11, 68.8%), with five (31.2%) having a Masters-level qualification.

The respondents were from a wide range of degree subject, with Geography the most popular (n=6) followed by Environmental Science (n=3). In total, 12 respondents had degree disciplines relevant to geography, environmental science or management, or sustainability.

Graduate Employability Skills

The most frequently mentioned skills important for graduate employability were associated with working with others: communication skills (n=13), teamwork (n=3), people skills (n=2), collaboration (n=1) and networking or relationship building (n=1). Other general workplace skills considered important by respondents were organisation (n=5), time management (n=5), presentation skills (n=7), and project management (n=8). The full range of general employability skills mentioned by respondents are listed in Table 1.

The trends shown above are reflected in the specific skills required for respondents' current positions in sustainability roles. The most common responses were again related to working with others: communication skills (n=9), client management and rapport (n=6), relationship building (n=3) people skills (n=2), Collaboration (n=1) and Team-working (n=1). General workplace skills mentioned again were: project management (n=8), presentation skills (n=6), time management (n=5), organisation (n=3). There were also several skills mentioned relating to hard skills/technical skills, such as: IT skills (n=5), specific sustainability knowledge (n=5), data analysis and management (n=2), budgeting experience (n=1), forecasting experience (n=1), sales experience (n=1). All skills mentioned by respondents in relation to their current role are listed in Table 2.

Respondents were also asked whether they felt they had any skills gaps when they graduated or before they were offered their current position. Presentation skills were the most frequently mentioned skills gap (n=5), followed by experience using Microsoft Excel (n=4). Other skills gaps mentioned covered a range of skills such as sector-specific knowledge (n=2), creativity (n=1), and pace of work (n=1). Four respondents stated that they had no skills gap. Table 3 lists the skills gaps mentioned and associated frequencies.

The respondents were then asked about training in employability skills that they received at university and in the workplace. The most frequently cited ways that universities offered employability skills training was through employability modules embedded within their course (n=4),

organisation of a work experience placement or year in industry (n=4), and provision of a careers service (n=4). Other training was provided through extra-curricular employability skills modules (n=3) and job application workshops (n=3) (see Table 4). In terms of in-role training, four respondents (25%) stated that their employer offers regular training courses, both internal and external workshops. Three respondents (19%) stated that the only training offered by their employer thus far was the Change Agents UK project management and presentation skills training day. Other types of training mentioned included role-specific inductions (n=2) and internal or in-role/on-the-job training (n=2) (See Table 5).

Sustainability Skills

Respondents were asked what skills or knowledge are needed to deliver sustainability, or work in a sustainability-related role. Hard skills were the most frequently mentioned, including technical knowledge of specific sustainability processes such as energy efficiency and environmental management (n=9), and a theoretical understanding of sustainability (n=6). In addition to skills already mentioned in the General Employability' section, other soft-skills considered important by respondents were public engagement (n=3), scientific research skills (n=2) systems thinking (n=1), and a commitment to sustainability (n=1) (See Table 6).

Respondents were also asked who they think has a responsibility to develop the sustainability skills of students and graduates (See Table 7). Nine respondents (56%) considered it the responsibility of the students or graduates themselves to improve their skill-set, and nine also said that it is the responsibility of universities to build sustainability skills into the curriculum. Six respondents (37.5%) stated that the employer should develop the sustainability skills of their recent employees. Others thought that there should be support for developing skills from education at all levels through school, university and in the workplace (n=6), while three respondents (19%) stated that it was the responsibility of the government to make sure that sustainability education was compulsory at some level.

Education

Eleven of the sixteen participants (69%) stated that their course offered modules on sustainability, although two stated that they did not elect to take the available modules. The main skills gained from these modules were a technical knowledge of sustainability and environmental solutions (n=4), and a change in thinking and learning styles towards critical or systems thinking for problem solving (n=4) (see Table 8).

Ten respondents (62.5%) stated that sustainability was incorporated into the syllabus of other modules, although four did not answer the question. Sustainability was incorporated in a variety of ways, most commonly through modules on climate change (n=4), as well as through relating the subject to the UN Sustainable Development Goals (n=1) or by discussing sustainable laboratory practices such as plastic use (n=1) (see Table 9). The skills that graduates felt they had gained from these modules included an understanding of sustainability theories (n=3), an awareness of environmental issues (n=2), and a knowledge of how to use research to justify arguments or choices (n=2) (see Table 10).

Extracurricular

Nine of the respondents said that there were extra-curricular activities or training related to sustainability available at their university (56%), and seven of the respondents stated that they partook in said training or activities. This took the form of additional modules, public or guest lectures, interactive workshops, and volunteering opportunities, among other things (see Table 11). The skills that participants stated that they gained from this extra-curricular training varied, but the

most commonly cited were an understanding of sustainability in general (n=3) and an understanding of sustainable behaviours and attitudes (2). See Table 12 for a comprehensive list of skills mentioned.

Respondents who stated that their university *did not* offer extracurricular training for sustainability were asked what (if any) extra-curricular sustainability skills training they would have liked to have access to. Answers covered a range of themes, including the opportunity to volunteer or undertake work experience in order to apply their knowledge in practice, and access to workshops on sustainability and workshops on sustainable job roles (see Table 13). This indicates that some respondents had desire to further their theoretical knowledge about sustainability, while others want to increase their practical experience and apply the knowledge they already have.

Current Employment

The first question in this section was: '*What sector do you work in?.'* However, the question was not sufficiently clear to generate useful results. For instance, some respondents interpreted it to mean the *type* of organisation they work for (e.g. not-for-profit, higher education), whereas others interpreted it to mean the focus of the work of their organisation, both specifically (e.g. energy efficiency, housing, waste management) and generally (e.g. sustainability, environmental), and others interpreted to mean the specific work that their organisation undertakes (e.g. Environmental Financing).

Respondents were also asked what specific sustainability skills their current role requires. The most common skill mentioned was specific technical sustainability knowledge, for instance about how to undertake certain processes (n=11), while a further two respondents stated the importance of sector-specific knowledge. Experience influencing behaviour change (n=3) and communication skills (n=3) were the joint-second most frequently cited sustainability skills, with team management (n=2) and volunteer engagement (n=1) also mentioned. This indicates the importance of inter-personal and persuasive skills in order to enact change. Table 14 provides a full list of the sustainability skills required for respondents' current roles.

The next question asked respondents about whether they felt that they had any gaps in their sustainability skills when they started their current role. Six respondents (37%) stated that they felt that they had a specific technical knowledge gap when they first started in their current role, and one (6%) felt they had a lack of sector-specific knowledge. Other skills gaps mentioned were more related to general workplace skills such as Microsoft excel skills (n=2) and presentation skills (n=1) (see Table 15).

In order to determine whether employers were attempting to address the skills gaps of their recent employees, respondents were asked whether their employer had organised any training in sustainability skills. The most common answer (n=4) was that the Change Agents UK training day on presentation skills and project management was the only form of training provided, although there were many other examples of types of training, such as technical skills workshops (n=2) and in-role/on-the-job training (n=2). See Table 16 for a full list of training provided to respondents.

The final question of the questionnaire asked whether respondents had pursued any sustainability skills training external to that offered as part of their employment or degree. Twelve respondents (75%) said no, or did not answer the question. Of the four that said yes, two stated that they did volunteering for organisations such as a sustainable farm. One stated that they undertook courses on FutureLearn, a digital education platform that offers Massive Open Online Courses (MOOCs). Finally, one respondent pursued training in energy efficiency technology. The low numbers of

respondents pursuing external training to improve their sustainability skills contrasts with the higher numbers of respondents stating that students and graduates themselves have a responsibility to develop their own sustainability skills.

Graduate Interviews

This section synthesises the results of the telephone interviews with graduates. There were six participants in total, who will be referred to by their initials to maintain anonymity. Each theme or question will be explored in turn. Interviews were not recorded and transcribed, but detailed notes were taken during each interview.

General employability

Perceived weaknesses

Interviewees were first asked about what they perceived to be their weaknesses in terms of their employability when they were students. A common answer was that they felt they were lacking the necessary industry experience demanded by many job descriptions (Interviewees SP, JD, HB). General workplace skills such as writing professional emails and having a professional telephone manner were also mentioned as key weaknesses (HB, MR). Interestingly, three interviewees (JD, HB, SP) stated that it was hard to prove their achievements or skills in their job applications, even if they felt proficient, as often one forgets to note down the achievements and impacts of extra-curricular activities. Furthermore, interviewee MR stated that job application and CV writing skills were a weakness. This suggests that many graduates feel as though they are unsure how best to demonstrate the skills that they gain in university when applying or interviewing for roles. Finally, presentation skills and public speaking were mentioned as weaknesses despite gaining some experience during university, as standards are expected to be higher or different in a professional setting (AP, MR).

Transition into the workplace

The second question asked was about what graduates wished they had known or been taught in university that would have helped their transition into the working world. A common theme was that some experience working with professionals in an external environment would have improved their confidence when working with clients and senior members of staff (AP, SP, OS). Two interviewees (JD, HB) stated that specific knowledge on energy efficiency or sustainability technology would have been useful. Experience of using Microsoft Excel was also mentioned by two interviewees (OS, HB), who stated that it is used extensively in business, but that there was no opportunity to use it as a student, and many were not aware that it was a skill that they should cultivate.

Sustainability Skills

What are important sustainability skills?

The first question of this section aimed to get an idea of what skills the interviewees consider to be important for delivering sustainability, or working in a sustainability-related role. Some graduates stated that having a theoretical understanding of sustainability was important (AP, OS), but more mentioned the importance of understanding how sustainability theory can be implemented and applied to different sectors, including the logistics and bureaucracy of different workplaces (SP, OS, HB). An awareness of sustainability policy and developments in the field was also considered important (AP, JD). Communication skills and interpersonal skills were also frequently mentioned, due to the complexity of communicating sustainability with different demographics and

stakeholders (AP, OS, MR). Finally, interviewees JD and MR cited several general soft skills such as adaptability, research skills, and analytical thinking as being crucial when working in relation to sustainability.

What is the gap between sustainability as it is taught in university, and sustainability as it is enacted in the workplace/by businesses?

This question aimed to determine whether there were elements of sustainability that were being taught at university but that were not being enacted in business, or alternatively whether there were elements of sustainability being implemented in their workplace that they had not learnt about at university. One of the interviewees (OS) stated that some of what is taught in university about sustainability is more theoretical, hypothetical or even radical, than can readily be applied in most workplaces. For instance, a steady-state or circular economy, or degrowth, is not necessarily easy to implement in a single business, although they stated that it was still important to learn about. Alternatively, interviewee MR stated that they have learnt things about sustainability in her business that wasn't covered in the relevant module at university. Finally, interviewee JD stated that they did not learn much about sustainability in their course, but what they did learn (about the three pillars of sustainability and the Sustainable Development Goals) they can see in her businesses approach. The answers here clearly vary depending on the exposure of each graduate to sustainability theories, and also on the business in which they currently work.

How could their employers improve understanding of sustainability?

Interviewees were asked how they thought their business could improve their workforce's understanding of sustainability. Interviewee SP stated that the team in their business is very diverse, and so they have not all had the same background education in sustainability, which can cause issues when discussing certain topics or ideas. They stated that it would be good if the business provided training for all members of staff so that everyone has a baseline level of understanding. Interviewee AP stated that their business was already attempting to improve its sustainability by publishing a five-year sustainability action plan, however they did not mention how this related to the workforce understanding of sustainability. Instead, they suggest that businesses should get involved with projects like the Carbon Literacy project run by Manchester Metropolitan University, which aims to educate people and businesses so that they have a better understanding of climate change, and also provides accreditations to organisations that become carbon literate. Finally, interviewee JD stated that staff in their business are given the resources to enhance their own knowledge through the business intranet, but that it would be more effective if the business could give them some direction regarding the most relevant research and information to read for their roles. The other interviewees discussed ways in which their business could become more sustainable, through allowing working from home or other emission-reduction measures, rather than discussing the sustainability skills of the workforce.

What is the best way of imparting sustainability information and skills?

This question asked interviewees what they thought the best way to impart information, skills, or understanding about sustainability to students and graduates would be. Most of the interviewees stated that embedding sustainability into all university course curricula would be the most effective way (AP, SP, JD, MR). Students could be asked to identify how different topics relate to the sustainable development goals or the sustainability agenda (AP, JD). This would help people understand how sustainability relates to their sector rather than seeing it as an optional extra (AP, SP, MR). Interviewee OS said that workplace inductions are useful for sustainability education, as they make sure that everyone in the team or in the business has the same level of understanding and understand how their work relates to sustainability (see also JD). Interviewee AP also stated that

businesses should provide elearning modules for staff, and give reminders of the changes that they could be making in terms of sustainability in their own life.

University Interviews

This section synthesises the results of the telephone interviews with university leaders. There were six participants in total, who will be referred to by their initials. Each theme or question will be explored in turn. Interviews were not recorded and transcribed, but detailed notes were taken during each interview.

Sustainability Skills

Changing requirements of job markets

Interviewees were first asked about whether they have perceived any changes in what the job market expects of graduates, both generally and in terms of sustainability. Some of the respondents stated that there has not yet been a significant change in business requirements of graduates in response to recent sustainability and net-zero targets, even though some of the rhetoric has changed (JL, WP, ML). Some go on to say that they expect a large shift in demand in the next 5-10 years, both for graduates with technical skills and knowledge to design sustainable infrastructure, and for the labour force to carry out the necessary work (JL, WP). In contrast, interviewees JHF and SM state that they have seen a change in the competencies required, such as critical thinking, challenging norms, and the ability to deal with wicked problems. However, they have not noticed a change in the specific qualifications or technical skills required (JHF, SM). Finally, interviewee WM suggests that there has been a change in requirements, but only from some sectors and companies who have begun to have a longer-term perspective about their business requirements. Other sectors and companies have done little or nothing in terms of changing the requirements they place on graduates in response to the SDGs or net-zero targets (WM). This suggests that the response of business to the climate crisis, the SDGs and government targets is variable, and in no way unified or uniform across businesses.

What are Sustainability skills?

Four of the six interviewees (JL, WP, ML, WM) stated that there were two kinds of sustainability skills: soft skills (referred to as ‘sustainability literacy’ by JL), and hard skills (referred to as ‘technical competencies’ by JL and ML).

In terms of soft skills, the most often mentioned were systems thinking, future-forward thinking, and critical analysis (JHF, ML, SM, WM). Interviewee WP also mentions soft skills, but uses the term to refer to more general workplace skills such as communication, presentation, people handling and business management. In contrast, interviewee JL states that sustainability literacy covers ideas such as ‘being a global citizen’ and ‘environmental stewardship’. This suggests that, while many perceive soft sustainability skills as referring to the way that one works or thinks, they may also be used to refer to the way in which one acts.

When discussing hard skills, many of the interviewees gave less detail than when discussing soft skills. Interviewees JL and ML mention hard skills only by stating that there are some technical competencies related to sustainability, without expanding further. Interviewees WP and WM state that hard skills are often more related to specific subjects such as geography, environmental science, and chemical engineering. They state that different hard skills can be unique to certain subjects or disciplines, and allow people to become specialists in certain fields.

Which sustainability skills are the most valuable?

All six respondents stated that they valued soft skills over hard skills. Interviewee WP stated that soft skills are most important for sustainability because people with good soft skills are able to bring together those with hard skills and manage them to get the best outcome for sustainability. They also have greater influence over behaviour change through soft skills such as empathy, communication, and persuasion. Further, interviewee JHF stated that students and graduates with soft skills are more desirable because hard skills, such as technical knowledge or processes, can easily be taught. In contrast, they state that many soft skills are intangible and less to do with what one is taught, so can be present in graduates from any discipline. Interviewee WP states that soft skills are also important from the graduates perspective, as having strong soft skills will benefit employment prospects and career mobility for the individual.

Both interviewees WM and WP state that hard skills are also important. WM goes further to state that all graduates should have a mixture of both, but that the types of skills and the necessary balance of soft and hard skills depends on the discipline or job of a graduate. More technical roles will specifically demand certain hard skills and technical understanding, but this does not reduce the importance of having some soft skills too.

Skills Gaps

Gaps in student skill sets

There is significant variation in the opinions of university leaders on student and graduates skills gaps. Three of the interviewees (JHF, ML, SM) stated that sustainability-specific ways of thinking (systems thinking, lateral thinking, trans-disciplinary skills) are the main gap that they see in students. Interviewee JL states that any future skills gap is not yet certain, as they predict a radical change in business (and a resulting change in skill requirements) in the next decade. However, they project that the skills gap will be in soft skills such as being future-facing. In contrast, Interviewee WP states that the biggest gap for students and graduates is in technical skills and even simple literacy and numeracy, which they consider lacking in most students.

Finally, interviewee WM stated that they had not noticed any particular gap in the skillsets of students. They state that throughout their career, employers have been stating that there is a skills gap, but that this gap has never been articulated in a way that would help universities to understand and address it.

Addressing gaps in sustainability skills

Interviewees were asked about what they considered the best way to impart sustainability skills to students. Interviewee ML stated that disciplines need to recognise the way that they fit into larger narratives, and teach cross-cutting skills rather than being isolated in disciplinary silos. Four of the interviewees (JHF, JL, WP, WM) state that both the concept of sustainability and the skills necessary for it, should be embedded into all university curricula. This was considered more effective than creating additional modules that deal with sustainability and sustainability skills separately, because this would give the impression that sustainability is separate from the rest of the subject, rather than an integral part (JHF, WM). Interviewee WM stated that incorporating sustainability into course curricula would allow students to analyse the problems of sustainability through the frames of analysis that their discipline uses, to foster better understanding and engagement. To make this possible, interviewee JL stated that there needs to be a programme of education for university staff, to ensure that they have sufficient understanding of sustainability and how it relates to their discipline, otherwise they would not be able to effectively incorporate it. This would require significant high-level support and investment (JL). Interviewees JHF and WP did concede, however,

that additional or 'bolt-on' modules about sustainability would still be better than not including sustainability at all.

Two interviewees (WP, SM) suggested that graduates should undertake additional qualifications like masters degrees, for instance in systems thinking or in sustainability and business, in order to improve their employability and sustainability skills.

Interviewee SM went further when discussing how the education system should change to incorporate sustainability and impart sustainability skills. They state that teaching in schools should move away from fixed disciplines, and instead should be done in themes (such as flooding, climate change, housing). They state that, as these are all interdisciplinary, wicked problems, they should be examined from all disciplinary angles. SM states that this would give students a more holistic approach to problem solving even before they arrive at university.

Finally, Interviewees JHF and WM argue that greater communication and collaboration between businesses and universities can help shape the curriculum in a way that produces students with the skills that are actually required by businesses. It also helps general graduate employability when there are already firm links between a university and a business. Interviewee WM states that businesses or employers should be more explicit in explaining the skills gap that they perceive, in order for universities to attempt to address it.

Who is responsible for improving sustainability skills?

The final question of these interviews asked the interviewees whose responsibility they think it is to improve the employability and sustainability skills of students and graduates. Most interviewees (JL, WP, ML, SM, WM) state that universities have a responsibility to make sure that the education that they are providing is up-to-date and relevant for improving the knowledge and skills of the students. However, many (JHF, JL, WM) argue that universities are not machines for training students for specific jobs, and that there are purposes to academia other than job skilling. These interviewees state that the onus cannot rest entirely on universities. JHF and WM suggest that businesses need to help universities embed certain skills into degree courses, either by providing expertise or by explaining the necessity of each skill. Interviewees JL and WP state that employers also have a responsibility to upskill their workforce and offer CPD through in-role training, online training or adult education.

None of the interviewees stated that students and graduates themselves have a responsibility to improve their employability or sustainability skills.

Business interviews

This section records the results of telephone interviews with business leaders. The results are grouped by question or theme of question. There were six participants in total, referred to by their initial.

General Employability

What degree disciplines are valued over others?

The first question asked whether they, as an individual or business, consider any degree disciplines more favourable or valuable for working in sustainability-related roles sector. Two of the interviewees (KH, DS) favour engineering graduates in particular, but stated that they did not mind what form of engineering. The other four interviewees (AD, MR, MS, GS) stated that they did not mind what degree subject a graduate had as long as they could demonstrate that they had the skills to do the job, and could demonstrate an aptitude for learning and a commitment to sustainability.

Interviewee MS states that this is because many degrees now offer modules in sustainability, many graduates now have an understanding of sustainability regardless of their degree course. In contrast, interviewee GS stated that a lot of knowledge, for instance around environmental issues, can be picked up on the job, so they would rather that applicants had other skills that were less easily taught. Finally, Interviewee AD stated that graduates with degrees in specialist subjects such as Environmental Management, might not be the most desirable because the courses focus on processes and regulations. Interviewee AD argued that this makes students only see the environmental issue through the lens of EIA, rather than being encouraged to think creatively about other ways to address the issue. Therefore, they state that too great a focus on the job process in university courses can create less creative graduates.

General employability skills

Interviewees were then asked what general skills and competencies they prioritised when looking for new employees. Interviewee MS was the only one who listed specific hard skills such as data analysis and manipulation, although interviewee DS mentioned that technical skills were important alongside soft skills. Interviewee MS also asserted that a key skill was an understanding of how businesses work, and how to deliver change within a business. All other interviewees focused on soft-skills, with social skills such as communication, the ability to work collaboratively, humour, personality, and team fit being mentioned by all interviewees. In addition, interviewees GS and DS stated that being inquisitive and having keen intellect were very important.

Sustainability Skills

What skills to they require from graduates coming into sustainability roles?

The following question inquired into whether the interviewees look for any specific skills when hiring people into sustainability-focused roles. Most interviewees (DS, AD, KH, MS) suggested that they would just look for the same skills and competencies that they mentioned above, although DS did state that it was important for graduates to have an understanding of how sustainability applied to their sector. Interviewee GS stated that policy knowledge on environmental issues is almost critical for the industry in which they work, but as long as graduates can demonstrate an ability to gain and master knowledge quickly, even this is not wholly essential. Finally, interviewee MR expressed the importance of personal values when hiring new employees for sustainability roles. They expect that the graduates purpose in life and personal values should align with the concept of sustainability, as they must believe in the concept in order to effectively enact it in the workplace.

What are sustainability skills?

To follow on from the question about skills required for sustainability roles, interviewees were then asked how they personally would define ‘sustainability skills’ in general. There was some disagreement between the interviewees answers. Interviewee KH stressed the importance of entrepreneurship and initiative, AD defined sustainability skills as things like charisma, communication skills, and the ability to influence behaviour change, while DS cited soft skills such as lateral thinking and creativity. In contrast, Interviewee GS lists specifically hard skills such as environmental auditing, environmental impact assessment, and an understanding of energy and material efficiency, as fundamental sustainability skills. Finally, Interviewee MS stated that they consider the term ‘sustainability skills’ to be unhelpful and potentially confusing, because there is such a great range of roles across a range of sectors related to sustainability. Therefore, they argue, there are different skills associated with developing sustainability policy compared with skills

required to deliver the policy or meet policy requirements. Therefore, they would argue there is no such thing as 'sustainability skills'.

What sustainability skills are the most valuable?

Interviewees were then asked whether they would prioritise hard skills and technical competencies or soft skills in graduates and new employees. Three interviewees (DS, MR, MS) stated that a mixture of both hard and soft skills is required, but that the specific types of skill would depend on the role that they are being hired for. Interviewee KH states that they value soft skills more because hard skills or technical knowledge are easier to teach to employees whereas soft skills, such as entrepreneurship or team fit, cannot always be so easily taught (see also interviewees MR and DS). In contrast, Interviewees AD and GS place greater value on hard skills and technical knowledge. AD states that this is because there is more focus on technical knowledge in their business. Furthermore, although interviewee MR states that they expect a mixture of hard and soft skills, and that soft skills are very important as they are less easy to teach, they say that a graduate would not get selected for interview at all if they did not have the necessary hard skills and technical understanding.

Are carbon reduction targets changing the profile of skills needed?

Interviewees were asked whether they think that the challenge of net-zero carbon emissions has changed, or will change, the profile of skills that their organisation will need. Interviewees GS, KH, and MS stated that they did not think their graduate skills requirements would change, as the function of the organisation is the same, it is just a different environmental issue to consider. In contrast, interviewee DS argued that the shift in the economy to one that burns no more fossil fuels will be an immense transition, which will require skills such as innovative thinking, creativity, and inquiring minds. He suggests that people and organisations will need to start to work in an outcome-focussed way, to ensure that they enact change. Interviewee AD also suggests that change is necessary, and they state that the requirements of the environmental job market are already changing. Environmental jobs used to focus on technical compliance and monitoring, and would happen in a silo. Now, as people doing environmental and sustainability jobs are embedded across businesses, they need more interchangeable business skills and the ability to effectively communicate. They argue that this is what is driving the need for graduates with soft skills.

Skills Gaps

What skills gaps have been identified in recently hired graduates?

In terms of skills gaps that the interviewees have noticed in graduates that they are hiring, there was some variation in the skills mentioned. Interviewee DS stated that they have noticed a significant gap in the soft skills required for sustainability, such as lateral thinking and creativity. Interviewee MR stated that there was a lack of understanding about how businesses should work, including their structure and processes, so even if graduates had a technical understanding of sustainability, they had little understanding of how it could be enacted or implemented in a business context. The skills gap mentioned by Interviewee KH focused mainly on workplace skills such as negotiation, presentation, networking, written skills, and the confidence necessary to work with clients and superiors. They also specifically stressed the importance, but lack, of entrepreneurship in graduates. Interviewee GS also mentioned a slight lack in professional workplace skills, such as knowing how to address ones seniors, while the only skills gap mentioned by Interviewee AD was in the telephone skills of graduates. Interviewee MS stated that they had not noticed any skills gap in the graduates they hired, but attributed this to their rigorous application process that attracted only a higher calibre of applicants.

What is the best way for students and graduates to improve their employability?

All interviewees stated that the most effective way for graduates to improve their employability would be to do activities beyond, or external to, their education, in order to create differentiation for themselves. This includes activities like volunteering and raising money, to demonstrate that they can translate their enthusiasm for sustainability into action (Interviewees KH, DS, GS). Interviewee MS states that undertaking relevant work experience, such as a year in industry, is the most valuable thing that students can do, as it gives businesses confidence that they would be able to add value to the business straight away. Interviewee GS also states that undertaking additional qualifications and becoming a member of societies or bodies like IEMA or Society for the Environment helps demonstrate a dedication to the environment.

How could universities work to improve the work readiness of students and graduates?

Interviewees were asked how they think universities could improve the work readiness of students and graduates. Four interviewees (KH, AD, DS, MS) state that there should be greater collaboration, or even partnership, between universities and industry or business. This could lead to business leaders providing guest lectures for both students and staff, greater work experience opportunities for students in a range of disciplines, and students having a chance to learn about and work on real-life projects. This would lead to graduates with a greater understanding of how businesses work, how sustainability theory relates to business, and with better workplace skills. The interviewees also stated that this would help university departments to have a better understanding of the knowledge and skills required for undertaking sustainability projects from a business perspective, and therefore a better understanding of what to include in their course content.

Interviewee DS states that there should be more training provided for lecturers and university staff on ESD, so that they feel more confident incorporating those ideas into their course content.

Interviewees DS and MR argue that sustainability and the concept of Environment, Social and Governance should be included in the curriculum, and that sustainability should be integrated across the curricula rather than taught in additional modules. Both interviewees KH and MR state that, although students often have a good understanding of the theory of sustainability, they are often lacking an understanding of how it can be applied in a business context. They argue, therefore, that universities should include business skills and information on how businesses operate, rather than just theoretical perspectives.

Interviewee AD argues, however, that the responsibility should not fall entirely on the university. They think that businesses also have a responsibility to train their own staff, rather than expecting universities to provide 'oven-ready' graduates.

How does their business improve sustainability skills or workplace skills?

The next question asked the interviewees whether their business offers training in sustainability skills, or more general workplace skills. Four of the interviewees (KH, MR, MS, GS) stated that their business does offer training, although the focus of the training offered is predominantly work-place skill focused. Several businesses have programmes that support their employees in undertaking additional qualifications, gaining leadership skills, or gaining skills specific to that workplace through webinars and formal training. These interviews did not inquire into the specific nature of the training available, as it is strongly related to the industry and function of the businesses in question, but it revealed that many businesses are open to the idea of offering training for the skills that they consider important.

Discussion

The main objective of this scoping study was to identify how graduate skills requirements might be changing in response to sustainability policies and carbon-neutral targets. For this aim, it was also necessary to identify what the important skills for sustainability were, and whether or not they were already being seen in graduate skills portfolios.

To achieve this objective, we interviewed participants from three different stakeholder groups, in order to obtain a range of different perspectives, and also carried out questionnaires with one of the groups. During these interviews, we inquired into both sustainability skills and general workplace skills. The information generated will be used to inform both future research and CAUKs approach to skills training sessions for their employees (right word?).

This discussion is organised thematically; the results from all groups of interviews will be compared and contrasted within each of the seven themes. Firstly, there will be a review of what the most important general skills for employability or the workplace are. The second theme explored is how different groups define sustainability skills, and whether soft skills or hard skills are more valued. The third theme is the different perspectives on the way that job requirements may be changing. The fourth theme is the way that the graduate skills gap is perceived by different groups of respondents. Next, there is a review of opinions on the best way to impart sustainability skills or improve the skills gap of graduates. The sixth theme discussed is the idea of who is considered to be responsible for improving the general and sustainability skills of students and graduates. Finally, there is an overview of the training currently offered by workplaces.

Essential Workplace Skills

Only the graduates (through both interviews and questionnaires) and business leaders were asked about what they consider to be important general workplace skills. Both the graduate questionnaires and the business interviews cited communication and teamworking skills as important. In addition, both the graduate interviews and the business interviews mentioned the importance of understanding the logistics and bureaucracy of different workplaces, in order to be able to effectively deliver change in a business context. Additional skills mentioned by graduates in both questionnaires and interviews were presentation skills, project management, organisation skills, the ability to work in a professional manner, and the confidence to work with clients and senior members of staff. Although these were not mentioned by business leaders when asked about important workplace skills, several of the business interviewees mentioned presentation skills, professionalism, and the confidence to work effectively with seniors as skills gaps that they had noticed in recent graduates. Skills gaps are discussed in greater detail later in this discussion, but this indicates that graduates may be identifying the skills they struggle most with as the most important, because their weaknesses have drawn their attention to these skills. Many of the issues raised here could be addressed through organised work experience in a professional setting. Placements or internships could address perceived weaknesses such as industry experience, general workplace skills, and experience working with professionals. The provision of placements and work experience could also help to address the skills gap perceived by businesses. It would be businesses who provide the placement, so they would be able to orchestrate it such that the training and experience provided students with the skills that the businesses most want in their employees. It could also improve graduates' confidence with working with clients and senior colleagues, and could give them experience working with commonly used systems and software.

Several of the business leader interviewees mentioned less tangible, more personality-based criteria as being essential in new employees. For instance team fit, personality, sense of humour,

inquisitiveness, and keen intellect, were all mentioned. No graduates mentioned any similar personality-based attributes as being important. This indicates that students and graduates may not fully understand the range of skills, competencies and traits that are desired by businesses, and therefore may not be able to demonstrate their suitability for a role to the best of their ability.

Sustainability Skills

This theme discusses the ways that 'sustainability skills' are perceived and defined by different groups. The interview results revealed that there was a significant difference in 'sustainability skills' as defined by different groups of stakeholders. A technical understanding of scientific processes like energy efficiency and environmental impact assessment was frequently cited in graduate questionnaires, but very infrequently in business and university interviews. Although this appears to indicate that businesses value soft skills over technical/hard skills, some business leaders stated that they would never consider someone for a role if they did not have the right technical capability. Several university interviewees mentioned that hard skills or technical competencies are often specific to different disciplines, and although they may be used in sustainability projects, many are not necessarily sustainability-specific. This indicates that both university and business participants consider hard skills to be role- or sector-specific, and essential within some positions but not others, while soft-skills are important in all roles.

An understanding of how the theory of sustainability can be applied in a business context to specific sectors was also considered important by graduates in both interviews and questionnaires, and to business leaders. These stakeholder groups also both mentioned the importance of skills such as engagement and the ability to influence behaviour change. This indicates that those currently working in a sustainability-focussed role value the ability to put theoretical knowledge into practice and work with other stakeholders to enact change very highly. This was not mentioned in university interviews. This suggests that both recent graduates and business leaders working in sustainability have experienced a need to translate theoretical knowledge into practice. This contrasts with the analytical and theoretical focus of the sustainability skills valued by university leaders. This appears to be a significant area of disagreement between the business sector and university sector, an may therefore be an important area to focus on for addressing any skills gap.

Graduate, business and university interviews all mentioned that sustainability requires soft skills related to ways of thinking and working, such as critical thinking, systems thinking, analytical thinking, lateral thinking, and adaptability. This indicates that all groups recognise the new and unique challenges that sustainability poses, and the need to develop different, innovative solutions.

Many business interviewees mentioned personality-based attributes such as entrepreneurship, initiative, and charisma, as important sustainability skills, but these were not mentioned in either graduate or university interviews. Interviewees from both the university and business groups mentioned the importance of a personal commitment to sustainability in the way graduates live their whole life, rather than just in the workplace. However, none of the graduate respondents mentioned that a personal commitment to sustainability or living in a sustainable way was an important skill or trait for being hired for sustainability-related positions. As with the lack of recognition of the importance of personality traits, this indicates that students and graduates may not consider that businesses value skills and attributes other than tangible, workplace-specific competencies. Drawing attention to the fact that businesses value these things may encourage universities to offer a wider range of extra-curricular opportunities, and encourage graduates to focus on personally investing in sustainability rather than emphasising only academic attainment.

All groups state that general workplace skills, such as communication, presentation skills, people management, and research skills, are all also important sustainability skills. This highlights that 'sustainability skills' may just be considered an extension of essential skills for the workplace, and that separating the two may not be a useful approach. One of the business interviewees expanded this idea further, and stated that there is no such thing as 'sustainability skills', as the skills required for different roles across different sectors, can vary greatly. They argue that skills are specific to different roles, and therefore cannot be classed as 'sustainability skills' or 'non-sustainability skills'.

Finally, in both Graduate questionnaires and interviews, respondents mentioned the importance of public engagement, volunteer engagement, persuasive skills, and the ability to communicate sustainability to different demographics. This demonstrates that, from graduates' experience in entry roles related to sustainability, an important element of their job has been outreach and engaging with people outside of their business or sector. The fact that business leaders did not mention these skills suggests that they may be out of touch with the day-to-day requirements of entry positions. Highlighting the importance of engagement and communication skills to both universities and businesses may encourage them to provide greater training and support for these skills, thus better equipping graduates to meet role requirements.

Which sustainability skills are the most valuable?

Only the university and business interviewees were asked about which sustainability skills were considered more valuable. Most participants across both categories stated that they considered soft skills such as engagement, communication, and critical, lateral and systems thinking as much more important for sustainability than hard skills. There were several reasons mentioned for this, one being that people with soft skills can lead to greater influence over behaviour change. Another reason was that people with soft skills, such as people management and the ability to see a broader picture, are able to bring together technical specialists and act as a mediator between projects to maximise the benefit and reach of sustainability outcomes. Finally, an oft-cited reason was that soft skills are often intangible, or related to a persons personality or the way that they think. Therefore, soft skills are much more difficult to teach than hard skills such as technical knowledge or processes. Graduates with strong soft skills portfolios can therefore be taught some technical knowledge or processes when in role, whereas it may be more difficult to teach graduates with strong technical knowledge how to better communicate, engage, or think analytically. One business interviewee went further, and stated that graduates with specialist degrees such as Environmental Management may have too narrow a perspective on environmental issues. They argue that the focus on process and regulations in these degrees means that the graduate may not have learnt to think creatively about new ways to address environmental issues, particularly wicked problems like sustainability and climate change.

However, several interviewees from both groups stated that, although soft-skills may be more valuable in general, the mix of hard and soft skills required will depend on the role in question. Furthermore, while businesses may value a graduate with soft skills over those without soft skills, graduates without the necessary technical knowledge would not be considered for some roles at all. Soft skills must be seen as an essential addition to specialist hard skills for certain roles, but cannot replace technical understanding in many cases. Therefore, it seems appropriate for technical skills and knowledge to be taught within relevant disciplines, so that students and graduates are properly equipped for their chosen sector. Soft skills, on the other hand, should be embedded across all degree courses, regardless of the discipline, to ensure that all graduates have the soft skill requirements for working in sustainability roles.

Graduate Skills Gaps

There was a large range of skills gaps identified by the different groups. Standard workplace skills gaps were mentioned in business interviews and by graduate interviews and questionnaires, such as negotiation, presentation skills, confidence in working with clients and superiors, telephone skills, and professionalism. Many graduates also mentioned Microsoft Excel as a particular skill that they found lacking in themselves, as they were unaware of how much it is used in business and did not feel as though they had had the opportunity to learn how to use it properly. Sector-specific knowledge on sustainability technology and policy was also mentioned by graduates in both interviews and questionnaires as a skill gap. However, as most graduates contacted were relatively new to their position, this may be something that they would learn on the job after a few more months in-role. This suggests that businesses may expect people to graduate university with general workplace skills, and that graduates may therefore start work feeling behind in many 'essential' skills. University interviewees did not mention general workplace skills as areas for improvement among students and graduates, indicating that they may not consider the expectations that businesses place on graduates coming into entry roles. Businesses having a greater understanding of the training and education that is actually available to students, and universities having a greater understanding of the requirements of recent graduates and adjusting training to match this, may help to narrow this gap.

Soft skills important for sustainability, such as lateral thinking, systems thinking, and creativity, were mentioned in both business and university interviews as particular gaps that they had noticed in student and graduate skill sets. As both universities and business notice this particular gap in sustainability skills, this could be an area of focus for developing training or course content that addresses these skills in a way that suits the needs of both academia and industry.

There was some disagreement within groups about the skills gaps noticed. One university leader stated that literacy, numeracy, and the ability to write cogently has been a major gap in skills in many students recently. However, other university leaders stated that they had not noticed any skills gap in the students that they teach. This indicates that the trends seen in skills gaps may depend on the discipline or university in question.

From a business perspective, several business interviewees stated that a gap they notice in recent graduates is a lack of understanding of how businesses work, and how to enact change or implement sustainability in a business context, despite generally strong theoretical understandings of sustainability. This indicates that businesses may be expecting universities to provide a more practical education in the implementation of sustainability projects and policies, whereas many academic institutions may be focussing on a theoretical, critical understanding of the concept. One university interviewee stated that, throughout their career, they have heard businesses state that universities are not providing graduates with adequate skills for a business context. They argue that this reveals a mismatch in the way that businesses perceive the purpose of universities, compared to how universities perceive their own mission.

Changing graduate skills requirements

Only university leaders and business leaders were asked about whether they had noticed any changes to graduate job requirements. This is because they have all been in their industry for a significant period of time, and will have therefore witnessed changes to the job market. In contrast, the graduates are all new to their field, and will not have any insight into the way their experience differs from those before them.

A few of the university and business interviewees stated that they had noticed a change in requirements for graduates, particularly in the soft skills demanded. Both groups mentioned skills such as critical thinking and challenging the norm as being in increasing demand, while business interviewees in particular mentioned more workplace-specific skills such as interpersonal and communication skills, and an understanding of how sustainability is embedded into a business.

Several interviewees from both groups stated that they do not think there has been a significant change in graduate requirements yet, but that there is big change to come in the next 5-10 years. Several state that, as the shift in the economy away from fossil fuels will be such a dramatic change, it is difficult or impossible to accurately predict the way that it will affect job requirements. Some mention general groups of technical skills that they think will become more important in the future, such as the ability to design sustainable infrastructure, and the technical ability to build and install it. In contrast, other business interviewees stated that they do not think graduate requirements will be affected at all, as the challenges posed are new, but many businesses will continue to operate in much the same way.

This indicates that any change in graduate requirements may be sector-specific or even role-specific, so it is difficult to predict major changes before they occur. However, skills such as critical thinking and systems thinking are mentioned as being in increasing demand, and were also mentioned as graduate skills gaps (see previous section). This may be an important area of focus for developing student and graduate training programmes that meet the changing needs of the job market.

Sustainability skills education and training

All interviewees and respondents were asked about how they thought sustainability skills, and also more general skills to improve employability, would be most effectively imparted to students and graduates.

The most commonly cited response was that the most effective way for students and graduates to learn about sustainability and gain the associated skills, would be for the concept and skills to be embedded into the course curriculum of all degrees. Several of the university interviewees stated that this is important because sustainability is a concept that applies to all disciplines, and therefore cannot be taught as an external idea. Both university and graduate interviewees also argue that embedding sustainability within course material would allow students to understand how it relates to their sector, and teach them how to analyse sustainability problems through the lens of their own discipline, thus improving understanding and engagement with the idea. One of the university interviewees argued that university course curricula should go even further by recognising the way that each discipline fits into larger narratives, and teach cross-cutting skills rather than being isolated in disciplinary silos. Some business interviewees also stated that embedding material into all curricula would be more effective than creating additional modules, although their focus was specifically on embedding business skills and the idea of how sustainability is applied in business contexts, rather than just the theory of sustainability. In order to facilitate the embedding of sustainability theory and practice into course curricula, several university and business interviewees suggested that there should be a programme of education and training for all university staff. This training would ensure that they understand sustainability theory and how best to relate it to their course content.

Graduate questionnaires revealed that graduates gained sustainability knowledge and skills from optional modules on sustainability as well as modules that embedded sustainability within the subject. Most graduate and university interviews stated that optional or additional modules on sustainability would be ‘better than nothing’. However, they also argued that optional modules

would be less effective at imparting either sustainability knowledge or skills than embedding these ideas across the curriculum.

The main focus of many of the business interviewees was on the importance of work experience through placements, internships, or years in industry. Most argued that this experience was the most effective way for students and graduates to gain an understanding of how sustainability and behaviour change can be enacted in a business context. In addition, many stated that evidence of work experience vastly improved the employability of graduates, as it made employers more confident that they would have general workplace skills such as communication, confidence working with clients and senior management, and professionalism. They argued that work placements should be available for students in all disciplines, rather than a select few (such as business studies). To facilitate this, many business leaders suggested that universities should foster better connections or partnerships with businesses, in order to establish a programme of work placements. This could allow students the opportunity to gain general workplace skills that businesses perceive as a skill gap, as well as gaining an understanding of how sustainability can be applied in business contexts. Some university leaders also stated that there should be greater collaboration between businesses and universities, so that curricula can be shaped to include the skills and knowledge desired by businesses.

Extra-curricular activities such as volunteering, external qualifications, internships were mentioned by several business interviewees as ways that students and graduates can demonstrate their commitment to sustainability. Partaking in extra-curricular activities is also a good way that students and graduates can improve their employability by creating differentiation between themselves and others, and demonstrating additional skills such as project management. In the graduate questionnaires, respondents mentioned that partaking in extra-curricular activities gave them skills such as an understanding of sustainable behaviours and attitudes, and an understanding of how sustainability can be implemented in different ways. This demonstrates that some sustainability skills and general employability skills can be gained outside the university classroom, and that students should be made aware of the importance of partaking in activities external to their academic courses.

Finally, some interviewees across each group stated that there should also be sustainability training in workplaces. University interviewees mainly mentioned the importance of adult education provision in university settings, while businesses focussed on in-role training. Business interviewees mentioned continuing professional development (CPD) as being crucial for a successful business and employee development. Several stated that their business offers training to employees or support for those undertaking additional qualifications. However, most of the training mentioned was in general workplace skills, with little or no mention of sustainability skills. Graduate respondents seemed less sure of the availability of training in their workplace. Of the questionnaire respondents, the majority stated that the CAUK training day on presentation skills, project management and the SDGs was the only sustainability skills training offered to them so far. Only two of the 16 questionnaire respondents had received other training such as technical skills workshops, and two had received in-role or on-the-job training. This contrasts with the responses from business interviewees. Only one of the graduate interviewees stated that they had access to training resources through their business intranet, but also stated that there was little direction from the business for helping to identify the courses that were most relevant for their role. This indicates that, while businesses provide the opportunity to undertake CPD, it may not be widely available to new employees, or there may be inadequate information about what is available. Improving accessibility

to in-role training or courses may help to address some of the general workplace skills gaps seen by businesses.

One graduate interviewee mentioned that in their workplace there is quite a disparity in the level of understanding of sustainability across the workforce. In order to make businesses more effective in addressing sustainability issues, they suggest that sustainability training should be offered so that all employees have an equal grounding. Improving only the sustainability education provided at university will not have any impact on the existing workforce. This indicates that the development of a larger-scale programme of training may be necessary should industry requirements change significantly in the future. Alternatively, businesses should make CPD courses in sustainability theory and/or practice available to the wider workforce alongside training in leadership or workplace skills.

Whose responsibility is it to improve graduate sustainability skills?

There is some disparity in the way that different respondents apportion responsibility for the upskilling of students and graduates, in particular with regards to sustainability skills. Of the graduate questionnaires, the majority considered multiple parties to have responsibility. Half of the respondents stated that they thought the students or graduates themselves had a responsibility to seek out training and improve their skill set. While none of the university interviewees mentioned that individual students had a responsibility to improve their own sustainability skills, several business interviewees thought that seeking out extra-curricular activities improves the employability of students. This indicates that some expect students and graduates to seek out external training or activities on their own, rather than relying on those offered by universities or businesses.

Half of the graduate questionnaires also stated that universities need to build sustainability skills into the curriculum. This is mirrored by university interviewees, most of whom state that universities have a responsibility to make sure they are providing up to date and relevant information. The majority of business interviewees also consider it mainly the job of universities; only one suggested that the responsibility should not fall entirely on the university.

Several university interviewees and one of the business interviewees argued, however, that universities are not machines for training students for certain jobs, as there are purposes to academia other than job skilling. They state that businesses have a responsibility to train their own workforce, and also to collaborate with universities and provide expertise to help them embed certain skills in their degree courses. A third of the graduate questionnaire respondents also mentioned the responsibility of employers to provide training to their workforce. This is another demonstration of the importance of collaboration between universities and businesses to develop the most effective and useful approaches to training students and graduates, rather than both working in isolation.

Finally, around one-third of the graduate questionnaire respondents also argued that sustainability skills training should be embedded throughout the education system, starting in school, rather than only being provided at university. One university interviewee also mentioned the importance of embedding new ways of thinking and addressing complex problems into the school system. This suggests that they would like students to arrive at university with some experience of thinking critically and working with wicked problems, to reduce the pressure on universities to provide all of those skills. This is also important for students who do not go to university after school, as they too would benefit from having learnt to think critically and understanding the basis of sustainability theory.

The results of the interviews indicate the continued importance of both a theoretical and a practical understanding of sustainability, and that training in these ideas should occur in the workplace as well as part of degree courses. There was a gap identified between sustainability as it is taught in university compared to sustainability as it is enacted by businesses, but this gap was not clearly defined, and varied depending on the business or sector, and depending on the degree course and university. It does highlight the need to teach students the practical and logistical elements of sustainability implementation, rather than only the theoretical background of the subject. This, too, may require businesses to provide inductions or training to their workforce in order to ensure that all have the same baseline understanding of how sustainability relates to their sector.

Summary

The results of this research displayed some areas of strong agreement between stakeholders, and also some areas of disagreement. There is clear consensus that greater communication and collaboration between universities and businesses would benefit all parties. It would allow businesses to be more explicit about what skills they require from graduates, and would enable businesses to support universities in delivering these skills, for instance through guest lectures, module design, and lending expertise. It would also facilitate the organisation of work placements and internships for students across a wider range of degree subjects, which would equip more students with the workplace skills so desired by businesses.

Another area of clear agreement across all stakeholders is that, while technical skills are important for certain specific roles, soft skills are valuable in all areas of business. All groups of stakeholders mentioned skills such as communication, presentation, influencing behaviour change, analytical and critical thinking, and team working, as valuable for both sustainability and in the workplace in general. In particular, all stakeholders mentioned that new ways of thinking, such as critical thinking, analytical thinking, lateral thinking, systems thinking, creative thinking, forward thinking, and innovative thinking, are important for being able to address new, complex, and wicked problems. Therefore, while certain degree disciplines may include training in technical skills, soft skills such as these should be taught in all course curricula to ensure that all graduates are adequately equipped to address new challenges.

Finally, the last main area of consensus between all stakeholders was that the most effective way to impart new sustainability knowledge and skills would be to embed them within university course curricula. It is thought that this would allow students to understand how sustainability relates to their sector rather than seeing it as a separate issue. However, stakeholders also mentioned that this would require a significant programme of training for university staff, to make sure they understand sustainability theory and how it relates to their subject.

As this report collected opinions from a range of different groups of stakeholders, there were also inevitably some areas of disagreement. Primarily, the main skills gap in students and graduates mentioned by both business leaders and recent graduates was in general skills such as negotiation, telephone skills, confidence working with superiors, and professionalism. These were not mentioned by university interviewees, probably because they are not skills traditionally required by students in university settings. Universities do tend to include some general skills training such as presentation and team working skills within degree courses. However, it appears as though businesses expect graduates to have a wider range of general workplace skills than universities are currently providing.

In terms of important sustainability skills and areas of skills gaps, graduates mentioned technical competencies much more frequently than the other groups of stakeholders, who more frequently mentioned soft skills. This may be because in their experience in the workplace, it is much easier to

identify a gap in ones own technical understanding or ability than to notice a shortcoming in soft skills like critical thinking. Graduates were also much less likely than business interviewees to mention the importance of extra-curricular activities such as volunteering, placements, internships, and additional qualifications. Business interviewees often mentioned these activities as some of the best ways to improve employability for graduates and demonstrate their commitment to sustainability. It may be that students and graduates are not aware of the value of extra-curricular activities and demonstrating their commitment to sustainability for their employment prospects. Greater communication between businesses and universities, as mentioned above, may provide a way for businesses to better inform students of the ways that they can improve their employability.

Although all stakeholders did state that soft skills were generally more valuable for sustainability than hard skills, the perception of what these soft skills are differed between university and business interviewees. For instance, university leaders focussed on skills relating to new ways of thinking and processing information, such as critical and systems thinking. In contrast, the soft skills mentioned most often by businesses were those relating to the practical application of sustainable systems and policies within a business context. Therefore, while both universities and businesses may value soft skills for sustainability, what exactly they mean by 'soft skills' and the level of practical versus theoretical knowledge that they expect from students needs to be clarified in order for sustainability education to be useful and effective.

Finally, there was a vast range of opinions on graduate skills requirements in relation to sustainability, including that they have already changed, that they are changing, that they will change in the future, that they have not and will not change. One university interviewee even stated that businesses have always complained of a graduate skills gap, and that while the skills they want may change, the situation remains the same. This highlights the lack of agreement on this issue and the different situations in different sectors. Future research may be more effective if it focusses on the changing requirements of certain specific sectors or job roles, or the emergence of new job roles and titles in certain industries.

Conclusion

There were several aims to this scoping study. Firstly, we aimed to find out how different groups of stakeholders perceive or define 'sustainability skills'. This is particularly important for clarifying what different stakeholders and literature are referring to when mentioning 'sustainability skills'. Secondly, to identify what essential workplace skills and sustainability skills employers are seeking in graduates that they employ. The third aim was to identify what skills gaps have been identified, and how graduate skills requirements may have changed or be changing. These two aims will help CAUK enhance the training available to employees and graduates, to make it more useful for both the recipients and the businesses they work for. Finally, we aimed to ascertain what the best method for imparting sustainability skills and knowledge would be, and who is considered to have responsibility for providing training in sustainability. This would facilitate the development of training courses, degree course content, or extra-curricular activities that best meet the need of students, graduates and businesses.

In terms of sustainability skills, skills gaps, and changing skills requirements, our findings indicate several areas of disagreement or disconnect between the perspectives of different groups of stakeholders. If this disconnect goes unquestioned or unexamined, it could lead to a lack of understanding, miscommunication, and the creation of training or education programmes that do not actually address the issues at hand. There were also areas of agreement, such as the importance of new ways of thinking and working required to address complex, wicked problems like sustainability.

In terms of training or education for sustainability skills, almost all stakeholders agreed that sustainability skills and knowledge should be embedded into university degree courses, and in particular that soft skills are required across all disciplines. Further, many identify a need to blur disciplinary boundaries in order to develop cross-sectoral skills among graduates. This confirms what was found in the literature review, that integrating sustainability within degree subjects, and an increased focus on inter-disciplinary and trans-disciplinary learning, would be a successful way to give graduates the critical perspectives and knowledge necessary to support green growth. A pioneering example of this approach is the London Interdisciplinary School, which takes a cross-disciplinary approach, and teaches students how to study and address real world problems by using theory and methods from across the arts, humanities and sciences. The success of this course is not yet tested, with the first cohort starting in 2021, but this could provide a template or model for the design of truly cross-cutting courses that provide more sustainability-ready graduates.

There was also strong agreement that there needs to be greater collaboration and communication between universities and businesses. This would allow universities and businesses to share the responsibility of providing training in new skills, and would also ensure that the skills requirements expected by businesses were fully understood. This also verifies the findings of the literature review, as several academic papers stated the importance of university-industry partnerships to improve the education and training available to students.

Extra-curricular activities were mentioned frequently by business leaders as useful ways to improve sustainability skills and employability, and to demonstrate a range of skills. However, graduates seemed much less aware of the value of undertaking extra-curricular activities, such as volunteering, for their future careers. It may be that many students and graduates are unaware of the value of undertaking these extra-curricular activities, leading them to focus too heavily on their academic study.

What Are Sustainability Skills?

Results from both this study and in relevant literature have revealed a discrepancy in the way that 'sustainability skills' are perceived and defined. Not only do the terms used (skill, competency, literacy) vary between sources, but the types of attribute considered to be desirable for the pursuit of sustainability also vary. Some mention practical skills such as environmental auditing, while others mention knowledge such as understanding sustainability theory, personal attributes such as adaptability and resilience, new ways of working and thinking such as systems thinking, personal mindsets such as acting as a global citizen, and general workplace skills such as presentation and communication skills. While all of the above may be important for the new ways of working that sustainability requires, trying to define them all under the same banner and identify a way to impart them into all graduates may be a gross oversimplification of the task. More clear definitions of the types of skill, competency, literacy, or attribute required, and the different ways that they may be instilled, will be necessary for the achievement of such ambitious change. However, the search for even more exacting definitions should not form a barrier for expeditious implementation of ESD

Future Research

Similar research is being undertaken, or planned, by the Skills Commission. 'The Workforce of the Future' is a new research inquiry, proposed by the Skills Commission in April 2020, into the transition into the workforce and the way that our education system can address skills gaps (Skills Commission 2020). Although The Workforce of the Future focuses specifically on those leaving Further Education, rather than Higher Education, the results and recommendations from this scoping study could be a valuable resource for the Skills Commission in the early stages of their research.

This scoping study revealed several areas of potential future research. This study only interviewed six stakeholders from each group, which was enough to identify some similarities and differences between groups. However, it was not enough to determine whether the trends, such as the sustainability skills valued or skills gaps perceived, were influenced by the discipline or university that the graduates or university leaders were from, or by the sector of the business leaders. To establish the influence of discipline, university, or sector, on the skills expected or missing, future research should undertake similar interviews with a much greater sample of participants, organised by their discipline or sector.

A key area of agreement was that there needed to be collaboration between universities and businesses. Research needs to be undertaken into current collaborations between universities and businesses, how these could be expanded across more departments, and which businesses or universities would be interested in being involved in such a partnership. This would help determine what form this type of partnership could take, how the collaboration or communication could be facilitated, and what the specific outcomes and benefits could be.

In terms of extra-curricular activities, it would be valuable to undertake research into the measurable, tangible impact of undertaking extra-curricular activities on perceived and actual skills, and on employability. If doing volunteering and other similar activities has a benefit for future employment and perceived skills, students may be either more likely to undertake extracurricular activities, or more likely to record the demonstrable benefit that their additional activities provided them. This could have a real impact on employability, so research into this topic could help students to be made more aware of the material benefit of undertaking extra-curricular activities on their potential future careers.

There was a consensus that the most effective way to impart sustainability skills and knowledge would be to embed them into degree curricula across all disciplines. This would require significant

investment in module creation and alteration, and the provision of training for all university teaching staff, to ensure they were confident in their own understanding of sustainability and how to apply it to their subject. A significant programme of research is needed to establish how this training would best be provided and the level of sustainability skills content expected within degree courses. UNESCO has defined ESD, or Education for Sustainable Development, as the inclusion of key sustainable development issues into teaching and learning, for example climate change, poverty reduction, and sustainable consumption. The Higher Education Council for England has developed a Sustainable Development in Higher Education Plan. Equally, some universities are using the guidance from UNESCO to inform the inclusion of ESD into their own degree courses. However, the uptake and application of these ideas and plans is not universal or consistent across HEIs. Could, or should, ESD become a requirement for UK universities? What are the barriers currently preventing or disincentivising the application of the HECFE Sustainable Development in Higher Education plan in more universities? Could ESD training for staff be provided by an external body in order to ensure equal provision to all UK university staff? Or should HEIs be able to maintain their autonomy in terms of the training provided to staff and content of their degree courses? These are all questions that could be addressed by future research, the results of which would be useful for the design and implementation of ESD in individual or many universities.

Finally, an important element of future research in this area, mentioned in questionnaires and by some interviewees, is the extension of the idea of ESD from HEIs to all levels of the educational system. The skills and competencies identified here and in other studies as important for addressing the challenges of sustainability are also valuable in all sectors and industries. Incorporating ESD into the school curriculum would equip all members of society with the skills and ways of working that will be valuable during the shift to a green economy, rather than focussing attention only on university graduates. In addition, a greater understanding of the importance of sustainability and how to live in a sustainable manner among the general population could lead to the adoption of more sustainable ways of life and modes of consumption across the country. Sustainability is not elitist; it is not a domain preserved for those lucky enough to have higher education qualifications. At its core, the essence of sustainability is about equitable distribution of resources (including knowledge and learning). Therefore, to achieve sustainability in general, as well as sustainability in education, the scope of those receiving this ESD must be widened.

How Does This Research Build On Previous Work?

Since at least 2005, attention has been drawn to the need for universities to create graduates that are able to address the challenges of sustainability. Research by Martin and Jucker (2005) identifies the importance of systemic curriculum change for effectively educating ‘Earth-literate’ graduates, and the barriers that prevent this change occurring. Their conclusions include the advisory that effective education for sustainability requires “cooperation and partnership, not only between universities but also with industry, local authorities and society at large” (p. 27). Therefore, while this scoping study has gone further in the aim to specifically define the competencies or skills required for sustainability, the recommendations for next-steps in implementing effective training in sustainability skills (i.e. cross-sectoral cooperation) remains as it did 15 years previous. Calls for cross-sectoral collaboration and co-creation of course material were seen in interviews with both university and business leaders during this scoping study, and also in literature studied (e.g. Ali et al. 2017; Gumley 2006; Stieg 2006). The consistency of the message regarding the best ‘next steps’ for creating a curriculum for ESD indicates that, although research over the past decade may have increased our understanding of which specific competencies or skills are most desirable, or the state

of those skills among different student populations, there remains a lack of significant, measurable action.

Recommendations for Action

Many of the ideas discussed in this scoping study and in contemporary research were identified over a decade ago, and recommendations for action have largely remained consistent: collaboration is needed between HEIs and businesses to develop course content that addresses industry demand and creates graduates that can address the changing challenges of the future. However, business and university interviewees in this scoping study once again highlighted the need for (and hence, the lack of) collaboration. This must inform our recommendations: the time has passed for meek calls for collaboration, and movement must be made forward into co-creation of a meaningful prospectus and action plan for change. Recommendations and frameworks on how to embed ESD into HEI scenarios already exist (see The Future Fit Framework by Stirling 2012), so a lack of understanding of how to implement ESD can no longer be cited as a barrier to action. Rather, a key barrier to action in the past appears to be ownership, both of the issue and of the solution. All stakeholders consulted agreed on the need for practical action, but all were surprised that another stakeholder group had not initiated it. In order for progress to be made, ownership needs to be taken by all groups of stakeholders, so that prompt and effective change can begin to occur on a large scale.

Living labs (Campuses and communities as test beds for applied research and learning) could be a useful way to trial ideas such as content co-creation and cross-disciplinary learning, to develop best practice approaches that could then be rolled-out to institutions on a wider scale. They also provide significant benefit to those that take part, in terms of workplace experience and cross-sectoral working. The EAUC Living Labs Research project provides more information on the benefits and logistics of this type of approach to training (EAUC 2020).

Research partner Change Agents UK deliver training in a range of the topics identified as skills gaps, including workplace skills, project management, and communicating sustainability. Greater access to this training would benefit students, recent graduates, and employees alike, but greater enrolment in CAUK training is limited by funding constraints. Greater investment in the CAUK academy from both businesses and HE institutions would go some way towards filling some of the skills gaps identified here, as the resources and structure already exists to address this issue (CAUK 2020).

Summary

The results of this scoping study confirmed what was found in the literature review; ‘sustainability skills’ have many different definitions or meanings for different stakeholders. Therefore, the term ‘sustainability skills’ is almost redundant if it is not defined, and confusion or misunderstandings are the likely outcome of using it. This scoping study also revealed differences in the way that graduate skills requirements, and changing requirements, are perceived by different stakeholders. Sustainability is a complex issue, and a wicked problem, so the tools for addressing it are also ill-defined and perceived differently by different actors. CAUK and the EAUC aim to equip the next generation of graduates with key skills for maximising their employment potential and addressing complex problems like sustainability. This research and future research into the issues raised will be invaluable for informing our approach to training, advising businesses, and facilitating sustainability actions.

Bibliography

Ali, A., Murphy, H.C. and Nadkarni, S., 2017. Sustainable development and hospitality education: employers' perspectives on the relevance for graduate employability. *Journal of Teaching in Travel & Tourism*, *17*(3), pp.159-172.

Arum, R., & Roksa, J., 2014. Aspiring adults adrift: Tentative transitions of college graduates. Chicago: University of Chicago Press.

Association of Graduate Recruiters, 1995. *Skills for Graduates in the 21st Century*. Cambridge: Association of Graduate Recruiters

Barton D. (2012). Young, gifted and slack: The skills gap must be bridged if the world is to avoid dire consequences. The Economist. Available at https://www.economist.com/news/2012/11/21/young-gifted-and-slack

BIS, 2012. Leadership & Management in the UK - the Key to Sustainable Growth: A Summary of the Evidence for the Value of Investing in Leadership and Management Development. Available at https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/32327/12-923-leadership-management-key-to-sustainable-growth-evidence.pdf

Branine, M., 2008. Graduate Recruitment and Selection in the UK. *Career Development International* 13(6), pp. 497-513

Calonge, D.S. and Shah, M.A., 2016. MOOCs, graduate skills gaps, and employability: A qualitative systematic review of the literature. *The International Review of Research in Open and Distributed Learning*, *17*(5), pp. 68-90

Cani, R., 2015. Sustainability literate graduates: Linking education for sustainable development within higher education with the 'skills gap' in the employment market. *Fields: journal of Huddersfield student research*, *1*(1), p.121.

Cardiff Metropolitan University, 2019. *Sustainability News and Events* [online]. Available at http://www.cardiffmet.ac.uk/about/sustainability/Pages/News-and-Events.aspx [Accessed 20 November 2019]

CAUK, 2020. *CAUK Academy* [online]. Available at https://www.changeagents.org.uk/cauk-academy [Accessed 25 August 2020]

Cortese, A. D. (2003). The Critical Role of Higher Education in Creating a Sustainable Future. Planning for Higher Education, 31(3), 15-22. Retrieved from http://www.aashe.org/resources/pdf/Cortese_PHE.pdf

Drayson, R., 2015a. *Student attitudes towards, and skills for, sustainable development Summary 4: Sustainability, skills and employability.* NUS, HEA and Change Agents UK. https://www.heacademy.ac.uk/system/files/summary4-sustainability-skills-and-employability.pdf

Drayson, R., 2015b. *Employer attitudes towards, and skills for, sustainable development Executive summary: Employers.* NUS, HEA and Change Agents UK. https://www.heacademy.ac.uk/system/files/executive-summary-employers.pdf

Drayson, R., Bone, E., Agombar, J. and Kemp, S., 2014. Student attitudes towards and skills for sustainable development. *York: Higher Education Academy*.

EAUC, 2020. *Launch of the EAUC's Living Lab Research* [online]. Available at https://www.eauc.org.uk/launch_of_eauc_living_lab_programme [Accessed 25 August 2020]

Environment Jobs, 2019. *Environment Jobs* [online]. Available at https://www.environmentjobs.co.uk/ [Accessed 13 November 2019]

Environmental Jobs, 2019. *Environmental Jobs* [online]. Available at www.environmentjob.co.uk/jobs [Accessed 13 November 2019]

Foerstl, K., Azadegan, A., Leppelt, T. and Hartmann, E., 2015. Drivers of supplier sustainability: Moving beyond compliance to commitment. *Journal of Supply Chain Management*, *51*(1), pp.67-92.

Fuertes-Camacho, M.T., Graell-Martín, M., Fuentes-Loss, M. and Balaguer-Fàbregas, M.C., 2019. Integrating Sustainability into Higher Education Curricula through the Project Method, a Global Learning Strategy. *Sustainability*, *11*(3), p.767-792

GHK, 2009. *The Impacts of Climate Change on European Employment and Skills in the Short to Medium-Term: Company Case Studies*, Final Report, Vol. 1, May 2009, London

Glasgow Caledonian University, 2019. *Corporate Sustainability* [online]. Available at https://www.gcu.ac.uk/study/modules/info/?Module=M3K421195 [Accessed 20 November 2019]

Grantham Centre for Sustainable Futures, 2019. *Training Tomorrow's Sustainability Leaders* [online]. Available at http://grantham.sheffield.ac.uk/training/ [Accessed 20 November 2019]

Green Impact, 2019. *About Green Impact* [online]. Available at http://greenimpact.nus.org.uk/about/ [Accessed 20 November 2019]

Gumley, W., 2006. Green steps for business: using sustainability skills to enhance industry placements for business graduates. In *Sharing wisdom for our future. Environmental education in action: Proceedings of the 2006 Conference of the Australian Association of Environmental Education* (pp. 192-202).

HEFCE, 2009. *Sustainable Development in Higher Education. 2008 Update to strategic statement and action plan* [online]. Available at http://efsandquality.glos.ac.uk/toolkit/HEFCE_SDAP_New09.pdf [Accessed 26 November 2019]

Keele University, 2019. *Education for Sustainability* [online]. Available at https://www.keele.ac.uk/greenkeele/educationforsustainability/ [Accessed 20 November 2019]

MacDonald, L. and Shriberg, M., 2016. Sustainability leadership programs in higher education: alumni outcomes and impacts. *Journal of Environmental Studies and Sciences*, *6*(2), pp.360-370.

Manchester Students' Union, 2019. *Sustainability Events* [online]. Available at https://manchesterstudentsunion.com/sustainability/sustainability-events [Accessed November 2019

Martin, S., and Jucker, R. 2005. Educating Earth-literate Leaders. *Journal of Geography in Higher Education* 29(1), pp.19-29

Martinez-Fernandez, C., Hinojosa, C., and Miranda, G., 2010. Greening Jobs and Skills. LABOUR MARKET IMPLICATIONS OF ADDRESSING CLIMATE CHANGE. OECD Local Economic and Employment Development (LEED) Working Paper Series

Maslin, M., et al. 2019. *Universities must act swiftly and independently on climate change*. Times Higher Education [online]. Available at https://www.timeshighereducation.com/opinion/universities-must-act-swiftly-and-independently-climate-change

Nejati, M. & Nejati, M. (2013) Assessment of Sustainable University Factors from the Perspective of University Students. Journal of Cleaner Production, 48(6), 101–107. http://dx.doi.org/10.1016/j.jclepro.2012.09.006

QAA/HEA 2014, Education for sustainable development: Guidance for UK higher education providers. Quality Assurance Agency for Higher Education and Higher Education Academy. Available at https://www.qaa.ac.uk/docs/qaa/quality-code/education-sustainable-development-guidance-june-14.pdf?sfvrsn=1c46f981_8

Rieckmann, M. 2012. Future-oriented higher education: which key competencies should be fostered through university teaching and learning? Futures 43, pp.127–135

Rowe, D., 2007. Education for a sustainable future. *Science* 317(5836), pp. 323–324

Sandri, O., Holdsworth, S. and Thomas, I., 2018. Assessing graduate sustainability capability post-degree completion: Why is it important and what are the challenges?. *International Journal of Sustainability in Higher Education*, *19*(1), pp.2-14.

Sayce, S., Clements, B., and Cowling, E., 2008. Are employers seeking sustainability literate graduates? Kingston University for HEA. https://s3.eu-west-2.amazonaws.com/assets.creode.advancehe-document-manager/documents/hea/private/kingston_sayce_full_1_1568037204.pdf

Sheffield Hallam Students' Union, 2019. *Sustainability* [online]. Available at https://www.hallamstudentsunion.com/sustainability/ [Accessed 20 November 2019]

Sheffield Students Union, 2019. *Sustainability* [online]. Available at https://su.sheffield.ac.uk/about/sustainability [Accessed 20 November 2019]

Skills Commission, 2020. *New Inquiry: The Workforce of the Future – 'Learning to earning' transitions and career development in a challenging labour market* [pdf]. Available at https://www.policyconnect.org.uk/sc/sites/site_sc/files/news/530/fieldnewsdownloads/projectoverview.pdf [Accessed 20 August 2020]

Stieg, C., 2006. The sustainability gap. *Journal of Interior Design*, *32*(1), pp.vii-xxi.

Stirling, S. 2012. *The Future Fit Framework: An introductory guide to teaching and learning for sustainability in HE*. The Higher Education Academy

Sustainability Exchange, 2017. Ground-breaking new EAUC Future Business Council starts to bridge graduate skills gap. *Sustainability Exchange* [online]. Available at

Swansea University, 2019. *Embedding sustainability from the word 'go'* [online]. Available at https://www.swansea.ac.uk/sustainability/sustainability-knowledge-and-skills/training-and-skills/staff-student-induction/ [Accessed 20 November 2019]

UK Government, 2019. *UK becomes first major economy to pass net zero emissions law* [online]. Available at https://www.gov.uk/government/news/uk-becomes-first-major-economy-to-pass-net-zero-emissions-law

UNEP, 2008. *Green Jobs: Towards decent work in a sustainable, low-carbon world.* Report by Worldwatch Institute and Cornell University ILR School Global Labor Insitute. UNEP: Nairobi. http://wedocs.unep.org/bitstream/handle/20.500.11822/8825/UNEPGreenJobs_report08.pdf?sequence=3&isAllowed=y

University of Bedford, 2019. *Environmental sustainability training* [online]. Available at https://www.beds.ac.uk/sustainability/engagement/staff [Accessed 20 November 2019]

University of Birmingham, 2019. *Geography Degrees* [online]. Available at https://www.birmingham.ac.uk/schools/gees/courses/undergraduate/geography.aspx [Accessed 20 November 2019]

University of Brighton, 2019. *Media Studies BA (Hons)* [online]. Available at https://www.brighton.ac.uk/courses/study/media-studies-ba-hons.aspx [Accessed 20 November 2019]

University of Edinburgh, 2019. *Social Responsibility and Sustainability* [online]. Available at https://www.ed.ac.uk/sustainability/staff/training [Accessed 20 November 2019]

University of Exeter, 2019. *BA Geography* [online]. Available at https://www.exeter.ac.uk/undergraduate/degrees/geography/exegeogba/#Programme-structure [Accessed 20 November 2019]

University of Kent, 2019. *Business Ethics and Sustainable Management - CB733* [online]. Available at https://www.kent.ac.uk/courses/modules/module/CB733 [Accessed 20 November 2019]

University of Leeds, 2019a. *Sustainability and Environmental Management BSc* [online]. Available at https://courses.leeds.ac.uk/g004/sustainability-and-environmental-management-bsc [Accessed 20 November 2019]

University of Leeds, 2019b. *Geography BA* [online]. Available at https://environment.leeds.ac.uk/courses/0330/geography-ba [Accessed 20 November 2019]

University of Leeds, 2019c. *Staff Sustainability in Practice Training* [online]. Available at https://sustainability.leeds.ac.uk/sustainability-in-practice/ [Accessed 20 November 2019]

University of Newcastle, 2019. *Geography BA Honours* [online]. Available at https://www.ncl.ac.uk/undergraduate/degrees/l701/#courseoverview [Accessed 20 November 2019]

University of Nottingham, 2019. *Management BSc Hons* [online]. Available at https://www.nottingham.ac.uk/ugstudy/course/Management-BSc [Accessed 20 November 2019]

University of Plymouth, 2019. *Sustainability education: PGCAP module* [online]. Available at https://www.plymouth.ac.uk/about-us/teaching-and-learning/qualifications-and-recognition/sustainability-education [Accessed 20 November 2019]

University of Reading, 2019. *Sustainability Training* [online]. Available at https://sites.reading.ac.uk/sustainability/get-involved/sustainability-training/ [Accessed 20 November 2019]

University of Southampton, 2019. *MANG3029 Corporate Social Responsibility and Sustainable Business* [online]. Available at https://www.southampton.ac.uk/courses/modules/mang3029.page#aims_and_objectives [Accessed 20 November 2019]

University of St Andrews, 2019. *Sustainable Development (MSc) 2020* [online]. Available at https://www.st-andrews.ac.uk/subjects/sustainable-development/sustainable-development-msc/ [Accessed 20 November 2019]

University of Stirling Students' Union, 2019. *Environmental* [online]. Available at https://www.stirlingstudentsunion.com/sustainability/ [Accessed 20 November 2019]

University of Sussex, 2019. *Social Responsibility, Sustainability and Business Ethics (N1574)* [online]. Available at https://www.sussex.ac.uk/study/modules/undergraduate/2019/N1574-social-responsibility-sustainability-and-business-ethics [Accessed 20 November 2019]

University of Warwick, 2019. *School for Cross-Faculty Studies* [online]. Available at https://warwick.ac.uk/fac/arts/schoolforcross-facultystudies/ [Accessed 20 November 2019]

UWE Students Union, 2019. *The Sustainability Committee* [online]. Available at https://www.thestudentsunion.co.uk/community/green-team/sustainabilitycommittee/ [Accessed 20 November 2019]

Appendices

Graduate Skills Questionnaire

Demographics

1. Age Group

- 18-22
- 23-26
- 27-30
- 31+

2. Year Graduated (or expected) ……

3. Highest Qualification to date (or in progress)

- Undergraduate Degree
- Masters Degree
- PhD
- Other post-graduate qualification (please specify) ……..

4. Discipline of university degree(s)

……..

5. University attended

……..

Graduate Employability Skills

1. What skills do you think are important for graduate employability?

2. What specific skills did your current position require you to have?

3. Did you feel like you had any gaps in your skills base when you graduated/before you got your current position?

4. Did your university or degree course offer any training (either in-course or extra-curricular) to improve employability skills? Please expand

5. Has the organisation for whom you currently work offered any training on employability of general workplace skills?

Sustainability Skills

1. What skills or knowledge do you think you need to deliver sustainability, or work in the sustainability sector?
   (this can include technical knowledge and skills, as well as 'soft' skills)

2. Who do you think has the responsibility to develop the 'sustainability skills' of students and graduates?

Education

1. Were optional modules on Sustainability available as part of your degree? (if yes, continue to Q2, if no continue to Q4)
   Yes/No

2. Did you elect to take optional modules on Sustainability? If so, what skills, knowledge and/or understanding did they impart/cover?

3. What 'sustainability skills'(if any) do you feel you gained from the Sustainability module(s)?

4. Was Sustainability incorporated into the syllabus of any other modules? (if Yes, continue to Q5, if No, continue to the next section)
   Yes/No

5. In what way was sustainability incorporated into other modules? (i.e., what subject was it, how was sustainability applied to the subject?)

6. What sustainability skills (if any) do you feel you gained from the modules that incorporated sustainability within the subject?

Extra-curricular

1. Did your department or university offer any extra-curricular training on sustainability? (If Yes, continue to Q2, if No, continue to Q4)
   Yes/No

2. Did you partake in the extra-curricular training provided by your university? (If Yes, what form did it take (e.g. workshops, seminars); if No, why not?)
   Yes/No

3. What 'sustainability skills' do you feel you gained from the extra-curricular training?

4. If you answered No to Q1, what (if any) extra-curricular sustainability skills training would you like to have had access to at university?

Current Employment

1. What role to you currently hold?

……

2. What sector do you work in?

……

3. What 'sustainability skills' does your current role require?

4. When you first started your current role, were there any areas that you felt you had a skills or knowledge gap? How did you notice this skills gap? (If yes, please elaborate; if No, continue to Q6)
   Yes/No

5. Has your employer organised any training for sustainability skills to address this gap? If Yes, please elaborate; if No, continue to Q6)
   Yes/No

6. Have you pursued any sustainability skills training external to your employment? (If Yes, please elaborate)
   Yes/No

Graduate Interview Template

General Employability

1. When you were a student, what were your main areas of focus when trying to improve your employability skills? – or where did you feel you had weaknesses?

    a. *Were these general skills, or specific to the job or sector you wanted to go into?*

2. Now you have started in a job, are there any skills or knowledge that you wish you had been taught in university that would have helped your transition into the working world?

Sustainability skills

3. What do you think are important skills or knowledge for people working in the sustainability sector, or in a green job? Does your role require them?

    a. *Have you had the opportunity to gain these skills? How?*

4. Is there anything, in terms of sustainability, that you were taught or made aware of at university, that you do not see in your business, or that your current business does not seem aware of or invested in?

5. Are there any ways in which you think that your current business could become more sustainable/improve the understanding of sustainability and Sustainable Development among its workforce?

6. What do you think is the most effective way of imparting information, understanding or skills about sustainability and Sustainable Development to students or graduates?
(e.g.-embed into course material and relate to each degree? Separate modules on sustainability? Extra-curricular? Or in-role training?)

7. Is there anything else that hasn't been covered or mentioned here that you think is an important consideration when thinking about employability and workplace skills for achieving net-zero?

University Interview Template

1. Thinking about the challenge of net zero and carbon reduction, and the move towards sustainability, has this changed the requirements for graduates in the last few years, in terms of what the job market expects or demand?

2. A lot of the research I have done into the subject mentions things called 'sustainability skills' or 'green skills', which tend to include both soft-skills and hard skills. I was wondering what kinds of things you would consider to be 'sustainability skills'?

3. And would you say the hard skills and technical knowledge were prioritised, or the softer skills?

4. Have you, or your university, noticed any particular gaps in student skillsets?

5. What do you think is the best way for employability skills, especially those related to sustainability, to be imparted? For instance, incorporated into modules across all disciplines? Optional extra modules? Or extra-curricula activities?

6. And whose responsibility is it, do you think, to improve the workplace skills of students and graduates? Is the onus on the students themselves? Or perhaps should there be more focus on businesses offering in-role training?

Business Interview Template

1. Are there specific degree disciplines and/or universities that you recruit from in particular, or which are considered more favourable?

2. How many recent UK-based graduates do you hire each year?

3. What skills, competencies, or knowledge are often looked for or prioritised by your business in recent graduates?

4. Are there any other skills that you look for in people coming into sustainability roles?

5. In some of the literature we have been looking at, sustainability skills encompass both soft-skills and hard skills. Soft skills include things like the ability to work with various stakeholders, and critical thinking. Hard skills include sector-specific and technical knowledge, such as an understanding of the concept of sustainability, and environmental monitoring and reporting skills.

   What types of skills would your business prioritise over others for applicants, or which would you expect recent graduates to have?

6. Are any of these skills that you mention often lacking in applicants? In other words, do you notice any skills gap between what your business expects, and what applicants have?

7. In your opinion, what is the best way for students or graduates to improve their employability, especially with respect to the skills we have mentioned here?

8. And is there any way that you think universities could improve the work readiness of students and graduates?

9. To your knowledge, does your business offer training for sustainability skills, or indeed other workplace skills, to recent graduates or wider workforce?

10. Thinking about the challenge of net zero and carbon reduction, does this change the profile of skills you think you will need as an organisation?

Questionnaire Results

Table 1: Skills that are important for graduate employability	
Skill	Number of mentions
Communication skills	13
Project management	8
Presentation skills	7
Organisation	5
Time Management	5
Computer/IT skills	3
Data analysis and management	3
Team work	3
People skills	2
Professionalism	2
Problem solving	2
Networking/relationship building	1
Proactivity/initiative	1
Collaboration	1
Subject knowledge	1
Report writing skills	1
Research skills	1
Job application skills	1
Analytical skills	1
Adaptability	1
Enthusiasm	1

Table 2: Skills required for respondents current sustainability roles.	
Skill	Number of mentions
Communication skills	9
Project management	8
Presentation skills	6
Client management	6
IT/Microsoft skills	5
Time management	5
Specific sustainability knowledge	4
Relationship building	3
Organisation	3
Problem solving	2
Data analysis and management	2
Attention to detail	2
People skills	2
Teamworking	1
Collaboration	1
Self-motivation	1
Sales experience	1
Up to date understanding of issues	1

Budgeting experience	1
Forecasting experience	1

Table 3: Perceived skills gap at graduation.	
Skill	Number of mentions
Presentation Skills	5
Microsoft Excel	4
Sector-specific knowledge	2
Project management	2
Pace of work	1
Sales experience	1
Creativity	1
Time management	1
Relationship building	1
Data analysis	1
General IT skills	1
Client communication	1
No skills gap	4

Table 4: Type of employability skills training offered at university	
Training type	Number of mentions
Employability modules embedded in course	4
Organisation of work experience placement or year in industry	4
Careers service	4
Extra-curricular employability skills modules	3
Job application workshop	3
Project management training	1
Support for start-up businesses	1

Table 5: Type of employability skills training offered by employer	
Training type	Number of Mentions
Both internal and external training and workshops	4
Change Agents UK project management and presentation skills training day	3
Role-specific induction	2
In-role/on-the-job training	2

Table 6: Skills required for sustainability/in sustainability role	
Skill	Number of mentions
Technical knowledge of sustainability processes	9
Theoretical understanding of sustainability	6
Communication	4
Public engagement	3

Project management	3
Scientific research skills	2
Collaboration/teamwork	1
Knowledge of how to implement change	1
Systems thinking	1
Creative thinking	1
Commitment to sustainability	1
Analytical skills	1
Personality ('be inspiring, empathetic')	1

Table 7: Whose has responsibility for developing the sustainability skills of students and graduates	
Stakeholder	Number of mentions
Students or graduates themselves	9
University (by embedding it into the curriculum)	9
Employer/industry	6
Support from all levels of education and employers	6
Government through legislation	3

Table 8: Skills gained from sustainability modules	
Skills	Number of mentions
Technical knowledge of sustainability and environmental solutions	4
Project management	2
Problem solving	2
Analytical/critical thinking	1
Systems thinking	1
Presentation skills	1
Awareness of environmental issues	1

Table 9: How was sustainability incorporated into other modules?	
Module/method	frequency
Module on climate change or environmental issues	4
Environmental Law	1
Introduction to sustainability module	1
Related the module to SDGs	1
Sustainable scientific practices	1

Table 10: Sustainability skills gained from modules incorporating sustainability	
Skills	Frequency
Understanding sustainability theories	3
Awareness of environmental issues	2
How to use science and research to justify choices	2

How to influence behaviour change	1
Project management	1
Systems thinking	1
Creative problem solving	1

Table 11: Extracurricular training or activities about sustainability provided by university	
Activity	Frequency
Sustainability team volunteering	2
Additional modules	1
International fieldtrip	1
Public/guest lectures	1
Seminars	1
Model united nations interactive workshop	1

Table 12: Sustainability skills gained from extracurricular activities and training	
Skills	Frequency
Understanding of sustainability in general	3
Understanding sustainable behaviours and attitudes	2
Applying theoretical knowledge to the field	1
Understanding policies and technologies for environmental governance	1
Project management	1
Public engagement	1
Communication skills	1

Table 13: What extra-curricular training would you like to have had access to?	
Training	Frequency
Training or workshops in sustainable job roles and career progression	2
Experience applying theoretical knowledge by delivering sustainability projects	1
Sustainability workshops	1
Programmes such as Green League or Green Impact	1
Volunteering	1

Table 14: What sustainability skills does your current role require?	
Skills	Frequency
Specific technical sustainability knowledge	11
Experience influencing behaviour change	3
Communication	3
Specific sector knowledge	2
Team management	2

Knowledge of environmental policies and agenda	1
Problem solving	1
Project management	1
Volunteer engagement	1

Did you have a sustainability skills gap when you started your current role?	
Skills	Frequency
Specific technical knowledge	6
Microsoft Excel	2
Project Management	1
Communication	1
Sector specific knowledge	1
Presentation skills	1

Table 16: Training organised by employer to address sustainability skills gap	
Training	Frequency
Change Agents UK Presentation and Project Management skills training	4
In-role/On-the-job training	2
Technical skills workshops/training	2
Microsoft Excel training	1
Environmental Management training	1
External/guest lectures	1
Additional certificates or qualifications	1

Change Agents UK

www.changeagents.org.uk

www.eauc.org.uk

Future Graduate Skills:
A Scoping Study