INTERNATIONAL CONFERENCE ON ENGINEERING AND PRODUCT DESIGN EDUCATION
6 & 7 SEPTEMBER 2018, DYSON SCHOOL OF DESIGN ENGINEERING, IMPERIAL COLLEGE, LONDON, UNITED KINGDOM

NORWAY-UK COMPARATIVE ANALYSIS OF SUSTAINABILITY IN DESIGN EDUCATION

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ABSTRACT
Education for sustainability seeks to educate students in a manner that promotes sustainable development, acknowledging upcoming societal, economic, and technological changes and equipping learners to adapt to these developments. This preliminary exploratory study investigates British and Norwegian government strategies and visions that address these changes and compares them to curricula for design education. This study uses a hermeneutical approach to textual interpretation based on emerging topics from the strategies, and analyzes the curricula in light of sustainable education and transformative theory. The findings show the similarities between the two countries; both favor technical skills, whereas issues of an aging society and practicing critical reflection are rarely addressed. Therefore, this paper calls for discussion on the formulation of design education curricula and the skills it prioritizes.

Keywords: Sustainable design education, design education curriculum, transformative learning

1 INTRODUCTION

There is ongoing discussion in post-secondary education about creating curricula for adopting technology in schools and preparing students for future uncertainties caused by automation and a global workforce [1]. The critics of current practice argue that theory and practice should be brought closer together, combining academic and vocational studies and making them more accessible [1], that situated or contextualized participatory learning and cross-disciplinarily approaches should be more present [2], and that continual learning throughout one's professional life is vital [3]. To meet the needs of the changing society, it has been suggested that these three concepts of should be integrated into post/secondary curricula: *education for sustainability* [4], *resilient learner* [5], and *transformative learning* [6]. Education for sustainability addresses the kind of knowledge that will be needed to enable *sustainable development*, as well as how is this knowledge thought so that learners can cope with disruptions and uncertainties. *Resilient learner* refers to an individual who is capable of adapting his or her expertise by adopting new skills, knowledge, and perspective [5]. *Transformative learning* replaces transmissive learning, such as learning by listening. Transformative learning occurs through consciously directed processes of self-examination of one's unconscious set of beliefs, values, and attitudes, and critical reflection on their underlying premises [6]. The three concepts highlight needs beyond the scope of traditional teaching methods.

Design education, which is transdisciplinary and taught through the studio practice of trial and error, could be a leader in sustainable education, as it fosters the ability to adapt and think creatively and requires the learner to confront problems and uncertainties. However, in general, the vision, mission, and objectives in design higher education do not address the needs of the changing society from a sustainable perspective. This article discusses certain challenges in design education in the United Kingdom and Norway, considering its compatibility with the changes of our societies. The comparison between Norway and the UK will highlight planned changes in design education, allowing for reflection on their mission, objectives, and implementation. The overall objective is to determine how design skills can address the challenges of education for sustainability, and which changes in curricula can be made to enhance this.

2 METHOD

The goal of this exploratory study is to present sustainability topics and initiate discussion of education for sustainability in design education. It compares Norway and the United Kingdom by outlining issues that education for sustainability should address, which in turn will shape two case studies on curriculum formation for sustainable design education [7]. As this is an initial exploratory study, we choose countries that will allow us to examine variety of the sustainable policy topics. We choose two countries that focus on sustainability, already have positive results [8], and are from one region, but differ in size and economy. This is in order to find the variation in the government focus of sustainability issues. The school curricula were chosen randomly—using the 2018 *Guardian* University guide to design courses [9]—because the concept of education for sustainability is considered an educational format with content that can benefit any type of education. Thus, we have chosen general product design education, though education in the UK can be specially tailored for design for sustainability. Norway on the other hand has three master product design programs, which are included in this study. The prerequisite, however, was that curricula are product design or product design engineering educations.

2.1 Theoretical Perspectives

Education for sustainability focuses on learners' autonomy, critical reflection, and ability to shift perspective and overcome constraints in order to develop resilience. Mezirow [6] explains that humans make meaning of information through "sets of immediate specific expectations, beliefs, feelings, attitudes, and judgments," which he terms "habits of mind." Individuals change their habits of mind when confronted with "disorienting dilemmas" and do so through rational discourse and critical reflection. From the perspective of education for sustainability, transformative theory is critical to how the knowledge or sustainable development is taught. It is therefore of interest to study how and where these metacognitive approaches to learning occur in the design curriculum.

2.2 Curricula and government strategies analysis

The curricula of three higher design education programs in Norway and the UK were used to examine how learning outcomes are defined. In parallel, four political strategies for future challenges were studied in order to determine the governments' perspective on sustainability. The hermeneutical approach to textual analyses [10] was chosen as the goal is to study policies and their possible influence on curriculum development. The hermeneutical approach [11] recommends iterative phases of analysis in which the researchers reexamine their prior understanding of the topic and of the text. The emerged topics were compared to one another within the perspective of education for sustainability, which is the theoretical concept and the starting point of this research.

2.3 Coding Procedures

First, the government strategies and visions were coded using Nvivo software to discover emerging topics and approaches to sustainable development. Second, these topics were used as a starting point for curriculum investigation by coding themes associated with these topics. Finally, the verbs used in the curriculum to describe learning outcomes, which indicate how the selected design curriculums envision the type of knowledge students should gain through their programs, were coded indirectly. This approach reflects the pedagogical concept of sustainable education. The coding process was first conducted by automated word search, and later manually examined to ensure that every topic was included or correctly assigned.

3 FUTURE CHALLENGES IDENTIFIED BY GOVERNMENT STRATEGIES AND VISIONS

The two main ideas behind education for sustainability are the type of knowledge and how it is obtained, enabling it for students in the foreseen contexts of the future. Thus, documents related to government strategy and design education were analyzed and categorized according to sustainable education issues such as adaptive expertise. The intention is to connect the formulation and structure of design education strategies to the socio-political context of sustainability. Therefore, this section analyzes the future challenges highlighted by the UK and Norwegian governments as well as organizations such as Innovate UK, the National Endowment for Science-Technology and the Arts (Nesta), the Organisation for Economic Cooperation and Development (OECD), and Innovation Norway.

Four recent documents that address future societal challenges and contribute to or are part of Norwegian or British government strategy were selected: "Industrial Strategy: Building a Britain Fit for the Future," a British government document published in December 2017 [12]; "The Future of Skills," a foresight exercise of the skills necessary for the British workforce in 2030 [13]; "Digital Government Review of Norway" (OECD, 2017) [14], which provides recommendations on upgrading the Norwegian government digital services to the digital level of the nation (European Commission, 2017); and "The Dream Commitment," a document based on "reports on the needed transformation of the Norwegian economy"[15]. All documents are available to the public online.

3.1 Future challenges for sustainability by the UK

The UK's "Industrial Strategy" [12] aims to fund the private sector and R&D to put the "United Kingdom at the forefront of the industries of the future." Working with Innovate UK, the government identified four major areas of investment, which are "**artificial intelligence and data-driven** economy, **clean growth**, the **future of mobility** and our **aging society**." According to the document, these are "major global trends that are significant not just for our economy, markets and people, but for societies cross the world." "The Future of Skills" [13], a forecast report conducted by Nesta, identified key technology trends and contrasted them with global challenges. The report considers the rise of the internet of things, 3D printing, and biotechnology the top three technologic trends. Meanwhile, it highlights significant global changes:

1. **Growing global middle class** that will prompt a significant increase in global consumption.
2. **Aging population**, to whom job automation will be more a solution than a threat, as the workforce will shrink in developed countries; the elderly are the largest consumers of healthcare, thus healthcare innovation will expand; the needs of the elderly will also prompt changes in the housing sector as it accommodates this population.
3. **Climate changes** will lead to other sources of energy, introducing low carbon economy.
4. **Urbanization** will require cities to review urban design to accommodate the needs of the aging population as well as waste and recycling policies; smart cities will call for "digital infrastructure technology."
5. **Increasing inequality** will increase demand of social and healthcare services.

3.2 Future challenges by Norway

The Norwegian government also identified several of the above technological trends and challenges. The Digital Government Review [14] finds the **digital data driven society** and the **need for inclusion across age groups, migrants, refugees, and other sectors** to be areas of investment. It highlights the "need to use digital technologies to modernise, simplify and improve public sector processes and external outputs. To make the lives of citizens and businesses easier and enhance their productivity, Innovation Norway [15] recognizes the following six areas of investment:

1. **Ocean space**: investment in new technology that captures the ocean's biological raw material and contributes to clean energy production, among other benefits.
2. **Clean energy**: new technology to cover **future transportation needs** on land and at sea, with the goal of a complete transition to renewable energy.
3. **Bio-economy**: The use of renewable bio-based products to reduce the impact of three significant global challenges—resource scarcity, climate change, and population growth and urbanization.
4. **Health and welfare**: "[An] **aging population** and new, large patient groups provide growth in public health tasks. The comprehensive needs make a potentially powerful driver for innovation in health industry."
5. **Smart societies**: Making Norwegian industry part of the "global solution" for future urban and technology changes.
6. **Creative businesses and tourism**: The development of art, culture, nature, and leisure activities. It includes industries such as film, music, design, literature, architecture, and computer games.

In both the UK and Norway, challenges and investment opportunities can be clearly linked to design. These include:

1. **Green alternatives** (referred to as low-carbon, renewable, or clean growth)
2. **Automation** (automated vehicles, automated jobs, smart cities)
3. **Inclusion** (aging population and ethnic minorities)
4. **Healthcare and welfare**

5. **Increased consumption** (clean growth, alternative materials, resource scarcity, and bio-economy). These five terms are the type of knowledge needed for sustainable development which might appear in the curricula of design schools in the UK and Norway.

4 CURRICULA ANALYSIS

It is argued that design skills are essential for the global future economy [13]. This section evaluates six curricula from design schools in the UK and Norway. The three Norwegian design schools are included in the study as well as three British design schools randomly selected from the 2018 *Guardian* university guide [9]. All six design curricula are publically available online. They are contrasted with the five common future challenges identified by both countries. The section aims to start discussion about whether the training offered by design schools aligns with the challenges soon to be faced by society, including technology trends, environmental disruptions, and population growth [13]. The findings from the curriculum textual analysis are presented in the form of topic frequency percentages.

4.1 Curricula for sustainable development

Figure 1 reveals how the frequent topics in the design curricula correspond to challenges identified in the government strategies and visions. It shows the coding categories correspond to many of the skills necessary to understand and address the five future challenges. Our findings show that technical skills are present in the UK design curricula more frequently than in Norwegian curricula. On the other hand, ethical perspectives, which include reflection about consumption and the role of design in waste production, are more common in Norway. Environmental awareness and inclusivity issues appear in roughly equal measure in the UK and Norway curricula. However, both sets of curricula neglect reflection on welfare and healthcare future challenges.

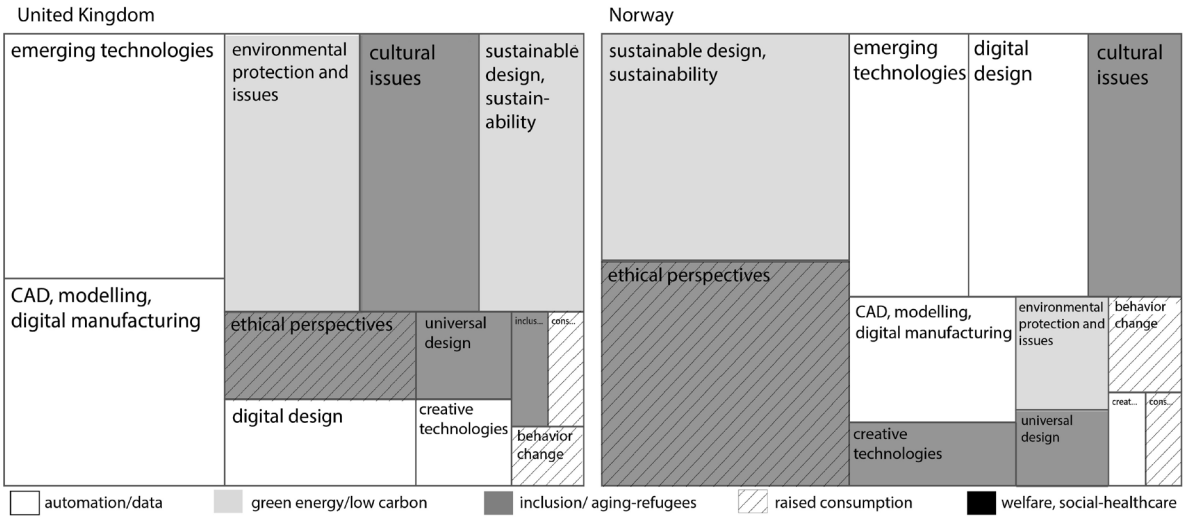

Figure 1. Frequent sustainability topics in the curricula of the selected design schools

4.2 Curricula for sustainable education

Figure 2 shows the frequency of verbs used to describe intended learning outcomes in the Norwegian and British design curricula. The verbs are sorted by the types of knowledge they promote. When describing knowledge or skills, British and Norwegian design curricula samples often use phrases that contain verbs such as “obtain,” “acquire,” and “have,” suggesting an essentialist approach to the curriculum. Procedural knowledge is quite pronounced in both sets of curricula. The British curricula use more verbs that emphasize the meta-cognitive abilities of learners, while the Norwegian curricula are richer in verbs that emphasize declarative knowledge.

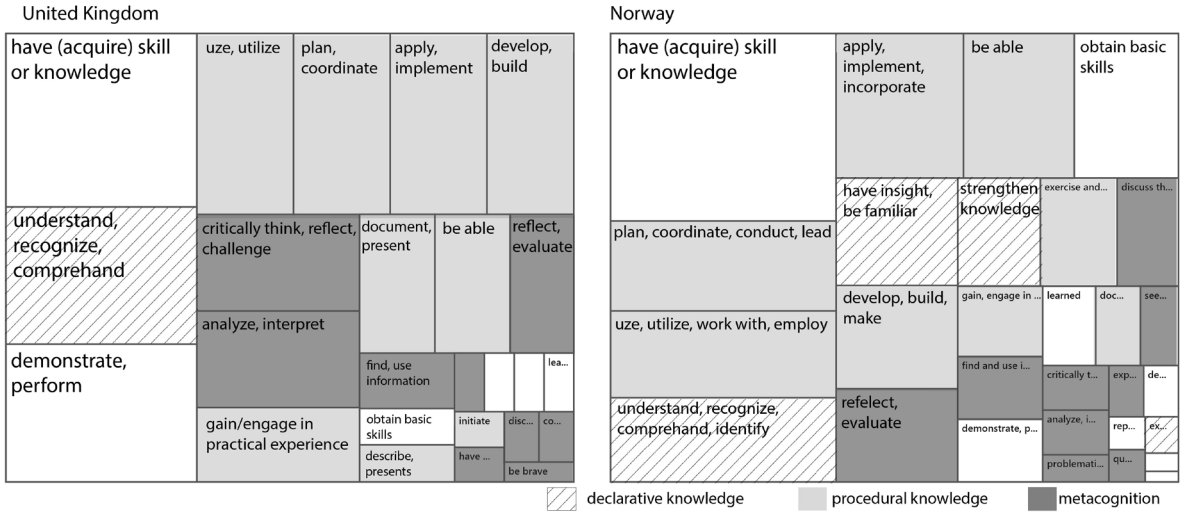

Figure 2. Frequently used verbs to describe intended learning outcomes in the curriculums of the selected design schools

5 DISCUSSION

Transformative theory advises that individuals change their "habits of mind" by learning through "experience, critical reflection, rational discourse and action" [16]. This suggests that meta-cognitive abilities and procedural knowledge are crucial elements in a curriculum devised to educate resilient learners. Declarative knowledge, though necessary for effortless processing of new information, does not necessarily enable significant shifts in the learner's perspective. This study shows that technical skills and procedural knowledge are predominant in the selected UK curricula, and represent a significant percentage of the Norwegian curricula. This is remarkable, as technology awareness and digital design will be essential in order to meet the future challenges highlighted by the governments. For instance, interactive interfaces, like apps and other digital resources, are tools that can inform users about consumption and green alternatives and can leverage environmental sustainability, welfare, and healthcare services. However, while technology can be used to address future challenges, it appears inclusive/universal design is rarely included in these curricula. The need to address the concerns of an aging society is noted in each of the analyzed documents and affects the welfare and healthcare systems of both countries. If this population is not taken into account, the production of new technology is likely to be underutilized by a large percentage of the population. Thus, future designers should be trained to consider how older adults perceive and use technology; they are the potential users of new interfaces in automated vehicles, smart cities' services, and healthcare products.

Although technology skills predominate in these curricula, they do not seem to be giving expected outcomes. We emphasize the need for a balanced curriculum where technical skills and ethical, sustainable, and inclusive perspectives should be pursued equally. However, the current curricula do not seem sufficient to encompass the current demand for technical skills, according to the British Design Council's skills report [17]. This report highlights the skills gaps between supply and demand, stating, "*Recruitment of design skills is challenging*"; due to the level of specialization the job requires, employees with design skills often have post-graduate degrees [17]. Among the design sectors that evidence skills shortages, the Design Digital group had the highest percentage of "hard to fill" vacancies in 2015, at 53%. More than 80% of employers were concerned that design workers lacked "*technical, practical or job specific*" skills.

5.1 Limitations

The data does not indicate the frequency of words that relate to education for sustainability in comparison to other relevant topics of the design curricula. This is because the purpose of this article is to study current and future approaches to education for sustainability, rather than the scope of implementation. Furthermore, in Norway the government dictates curricula have the same structure, which includes descriptions of knowledge, skills, learning outcomes, and general competence for each

course. In the UK there is no such regulation, allowing for different curricula forms; learning outcomes are listed for the entire program rather than divided by subject. This makes comparison difficult.
Another limitation is the criteria we used to select the British curricula, which was a random selection. However, as the curricula are compared to employee demand according to the outcomes of the design skills report, they could have been selected using the employability rate of design schools. Nevertheless, further research will be conducted using a mixed methods approach. Finally, the data does not represent empirical evidence of the impact of education for sustainability on design education, but rather the frequency of topics used by curriculum designers when describing design course.

6 CONCLUSION

Matching the necessary knowledge and design skills to address future challenges in promoting education for sustainability is not an easy task. However, this preliminary exploratory study identifies three topics for discussion: 1) although technical skills in design education could be a way to address future challenges, there may be a disparity between what employers expect from designers and what skills they have after the education; thus, how can we develop education for sustainability?; 2) the need for critical reflection rather than essentialist thought when designing curricula, so that future designers will be able to develop and relearn skills in new contexts; 3) the need to address the aging of society is not reflected in the design curricula, which indicates a gap in the necessary knowledge for sustainable learning.

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