SHAPING THE FUTURE: THE ROLE OF EDUCATORS IN CONSTRUCTION PROGRAMS TOWARDS CLIMATE LEGISLATION IN A DANISH CONTEXT

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Construction Educational Programs (CEPs) are vital in adapting governmental climate initiatives, qualifying graduates to tackle climate challenges and comply with CO2 regulations professionally. This study investigates how CEPs adopt new CO2 regulations, focusing on educators' perceptions, frustrations, and curriculum development initiatives. A mixed-method approach was used, involving a questionnaire sent to CEP educators and leaders. Results were analysed using Sinek's Golden Circle theory and Argyris's Theory-in-Use. The study highlights a shared commitment across CEPs to foster environmental stewardship and societal responsibility. Findings emphasize that educators are proactive in implementing CO2 legislation in teaching, equipping students with skills to meet industry challenges. By emphasising practical applications and interdisciplinary collaboration, educators navigate challenges such as institutional resource limitations and insufficient knowledge sharing, calling for improved communication and cooperation between CEPs. However, the lack of a strategic approach to curriculum development results in single-loop learning, hindering double-loop learning and effective organisational learning.

Keywords: construction; education; climate change; regulatory; organisational change

INTRODUCTION

The building sector and government recognise higher education's pivotal role in fostering a sustainable future. Universities shape society's sustainable development through education, research, and outreach (Rieckmann 2013). Thus, when educating students in construction educational programs (CEPs), it is essential to implement climate change topics. Higher education is crucial for Sustainable Development (SD) as a key driver for change (Rowe 2010), (Zilahy and Huisingh 2009). Therefore, more research is needed on how SD principles are implemented in higher education in construction programs (Gade *et al.,* 2022). Academic institutions have significant potential to contribute to SD initiatives, yet they often require encouragement to actively engage with local, regional, and global developmental issues (Zilahy and Huisingh 2009). Although some sustainability initiatives are being implemented in academia, challenges remain (Gade *et al.,* 2022). Achieving green transition goals requires deep transformations in every country and significant efforts in monitoring and measuring progress (Schmidt-Traub *et al.,* 2017). Indeed, it explicitly calls for

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action by governments, the private sector, and society (United Nations 2015). Practitioners' knowledge, skills, and competencies are required to meet the increasing sustainability demands (Opoku and Guthrie 2018). Educators should foster students' critical thinking and skill development, moving beyond traditional teaching. Development thrives when employees show initiative, creativity, and passion (Hamel 2007)). Caiado *et al.,* (2018) found that educators prepare their curriculum based mainly on legislation; individuals have ample leverage for autonomy and the ability to drive the change they see fit. Denmark's political agenda focuses on enhancing students' skills and competencies in sustainability and climate change (Danish Ministry of Education and Research 2022). The Danish government's executive order for professional high schools, Bachelor's degree programs must include practical and applied theoretical teaching in the profession, covering environmental issues, cultural interaction, and entrepreneurship (Danish Ministry of Education and Research 2023). The Danish higher educational system, outlined by the Danish Ministry of Education, emphasizes two crucial aspects: (1) Educational programs must be updated to meet society's needs and labour market, addressing current and future industry developments, ensuring students acquire relevant knowledge, skills, and competencies for their professions (Danish Ministry of Higher Education 2022). (2) Educators must work independently and innovatively on institutional development, leading in developing study programs and curricula (Danish Ministry of Higher Education 2020).

While the importance of educators in developing study programs is widely acknowledged (Stenhouse 1975), (Elliott 1994), there has been limited investigation into this within the contemporary settings of the Danish educational system. In Denmark, construction professionals face significant challenges in meeting CO2 requirements in their projects (Selman *et al.,* 2022). Reflecting this in a Danish context, a workshop held in Odense (UCL) in Nov. 2022 at an annual event brought together educators and leaders from CEPs to discuss challenges and share experiences integrating climate legislation into their curricula, revealing challenges in developing curricula to address these requirements.

LITERATURE REVIEW

The green transition calls for change norms so that all students and the community become environmentally, socially, and economically responsible, creating sustainable abundance and a higher quality of life (Rieckmann 2013). Denmark's ambitious climate goals require a comprehensive and rapid green transition. It is essential to reach this goal through training programs to acquire the right skills for the workforce and society (Danish Ministry of Education and Research 2022). Advancing sustainability is becoming a core mission for universities, requiring collaboration in education, research, and outreach. Universities must invest in co-creating sustainability with society, leading to significant changes in their missions, disciplines, education approaches, partnerships, and functions (Beynaghi *et al.,* 2016). Educational institutions promote SD through collaborative education and research by investing in education, strong leadership, partnerships, innovative solutions, and reliable indicators (Caiado *et al.,* 2018). Promoting systematic thinking and integrated sustainable development plans in education is essential. High-level political leadership on SD and integrating the UN's SDGs as a common reporting standard can enhance collaboration across sectors (Stafford-Smith *et al.,* 2017). Furthermore, Goodlad (1979) discusses the problems of making curriculum decisions in all educational systems, illustrating the nature of these decisions and the social and

political issues that complicate them. The curriculum in the CEPs must follow a legislative framework, and the educator in the curriculum interprets the formal documents; hence, the content is continuously variable. Indeed, sustainability is a transdisciplinary discipline, meaning that incorporating it into the curriculum requires particular focus, Bond *et al.,* (2010) argue that to support a common understanding of sustainability, it is necessary to integrate knowledge which concentrates on information, opinion exchange, and the construction or grouping of data in an interdisciplinary and trans disciplinarity manner.

Consequently, educational institutions need to continuously learn why, how, and what must be developed to meet the demand. Organisational learning (OL) is creating, acquiring, and integrating knowledge to build resources and capabilities contributing to organisational performance. A learning organisation continuously learns, develops and sustains innovation to improve performance (Opoku, Ahmed, and Ofori 2022). OL is seen as an improvement process, linking organisational cultures and environment, driving business growth and innovation by influencing knowledge, beliefs, and behaviours (Tortorella *et al.,* 2020). OL involves individuals acquiring organisational knowledge through structures, values, practices, and routines. While only individuals learn, organisations influence and conserve this learning, creating a larger system where individual knowledge is exchanged and transformed (Opoku, Ahmed, and Ofori 2022).

A community of practice is a learning partnership where individuals benefit from learning with and from each other about a specific domain. They utilise each other's practical experiences as learning resources and collaborate to understand and address individual and collective challenges (Etienne and Wenger-Trayner 2015).

Golden Circle (GC) theory offers an efficiently structured approach to understanding why some people and organisations can learn and develop so they can ensure organisational performance (Sinek 2009). The GC has this name because the scheme comes precisely from a circle, divided into three parts, the largest being the “what”, the middle one the “how”, and finally the smallest the “why”. GC explains why some people inspire while others do not. They emphasize that while most people and organisations know WHAT they do and some know HOW they do it, very few understand WHY they do what they do—the WHY represents the purpose, cause, or belief behind their actions. The HOW refers to the process or strategy employed to achieve a goal or fulfil a purpose.

Inspired individuals and organisations, regardless of size or industry, operate from the inside out, starting with their WHY and moving outward, while others typically operate from the outside in, starting with the WHAT. (Chaffey 2024). However, Golden Circle theory may need to adequately account for contextual factors such as cultural, organisational, and political influences that shape educators' actions and decisions. For example, differences in institutional support, availability of resources, and regulatory environments can significantly impact how educators implement sustainability initiatives. Because GC offers little insight into the continued development of learning organisations, a theory of action perspective, elaborated by Argyris (1997), could be relevant to cover this gap. This theory is relevant as it differentiates between two types of learning: Single-loop learning (SLL), which corrects mismatches by altering actions while staying within existing governing values, and double-loop learning (DLL), which corrects mismatches by first changing the underlying governing values and then the actions. As Argyris further argues,

while SLL may be “effective for routine issues”, it is only DLL that indeed promotes effective learning (1997).

METHOD

The research design of this investigation was informed by the following theories: Golden Circle (GC) by Sinek (2009) and Theory-in-Use by Argyris (1991). According to Argyris's (1991), Theory-in-Use learning processes in organisations can be presented through the sequence of "governing variables," "action strategies," and "consequences." Given our investigation's focus on educators and their roles in changing the curriculum, it was necessary to incorporate another theoretical perspective that allows us to explore learning (and teaching) processes and how educators actively contribute to these processes. At the same time, it is crucial to recognise that within an organisation, and specifically in the case of curriculum change, educators who take the initiative and are responsible for curriculum development to ensure the relevance of education are simultaneously interdependent on other stakeholders within the organisation. They represent "communities of practice" that work collaboratively (Brown and Duguid 2009).

This led us to include the GC theory, which helps unfold the phenomenon under investigation by focusing on the "What, How, and Why" framework. By combining the GC theory and the Theory-in-Use framework, we can analyse a learning organisation's context (in our case, CEPs) and draw conclusions regarding the perceptions, challenges, frustrations, and initiatives of educators in the learning context. Additionally, this research will shed light on whether DLL processes take place (Auqui-Caceres and Furlan 2023). We have illustrated this in Figure 1.

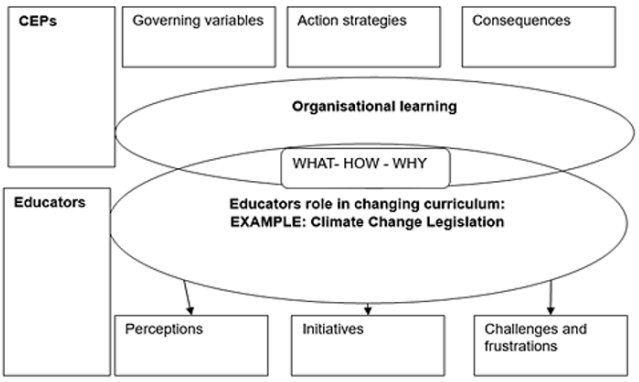

Figure 1: Research design inspired by GC theory (Sinek 2009) and Theory-in-Use (Argyris 1997)

A mixed research approach was applied, combining qualitative and quantitative enquiries, to investigate educators' and leaders' perspectives on integrating building regulations and climate legislation into the curriculum. An online survey questionnaire (Dillman 2007) was sent to educators and leaders across CEPs to investigate their efforts towards implementing climate legislation in education and identify their perceptions, frustrations, and initiatives, where 68 educators and six leaders have responded. The survey consisted of closed-ended questions with rating questions using the Likert scale. (Likert 1932), Moreover, open-ended qualitative questions extend some of the answers in depth. The survey was available from Feb. 27 to Mar. 15, 2023, with a reminder email after two weeks to boost responses. The response rate of 35%, according to Dillman (2007) is satisfying, as a 15-35% response rate is adequate for analytical purposes (Ørngreen and Levinsen 2017).

The collected data are analysed through the lens of the GC theory by Sinek (2009) and Theory-in-Use by Argyris (1991). The research explores various aspects of educators' perceptions and experiences related to changes in education. It delves into the beliefs driving the need for change (why to change), examining the purpose and reasons behind these actions. It also focuses on the tangible outcomes of such changes (what to change), particularly modifications to curriculum content. Also, the research addresses the challenges and frustrations encountered in implementing climate legislation into the current curriculum (how to change). It explores the methods and approaches used to integrate this legislation effectively (how to change).

FINDINGS

Educators' Perception of the Need to Change (Why to Change)

According to the study participants, incorporating climate legislation in education has become increasingly evident in CEPs. Most respondents, 83%, agreed that it is a shared responsibility to implement CO2 legislation in education, setting high student standards to develop their skills and competencies. Most educators, 74%, strongly agreed that climate legislation is significant for their teaching approach and personal engagement in developing curricula to meet the new requirements. Regarding the anticipated impact of climate legislation on education, results reveal that 74% of educators agreed that the new climate requirements would significantly influence education, 17% slightly agreed, and 9% disagreed. Respondents were asked if the climate requirements would affect their own teaching; 67% agreed that it would, 19% agreed somewhat, and 14% disagreed.

Educators' Perception of Changing Curriculum (What to Change)

Generally, most educators acknowledged that to incorporate new teaching material, there must be adequate space allocated for it in the curriculum, naming it “dust cleaning”. They noted that there might be a need to remove existing content to accommodate the new material. One educator expressed:

> *“Our study programs should mandate Life Cycle Assessment requirements, which necessitates removing existing content. Unfortunately, without additional resources, and given the reluctance of educators to part with any existing material voluntarily, this poses a challenge!".*

Most educators, 80 %, already have directly included the new climate requirements in their curriculum, while 20% have not started yet. Similarly, 72% of educators included Life Cycle Assessment (LCA) in their curriculum, and 28% did not. 35% of educators have incorporated LCA into their curriculum through presentations, 35% via guidance, 17 % via student optional courses, 10% in research and 5% in other aspects. Results indicate diverse approaches to integrating the new climate requirements into the curriculum. Many integrate sustainability into their teaching through various methods like case studies, presentations, and providing guidance. Some have introduced sustainability-related assignments and restructured coursework to align with new requirements. Additionally, student research supports faculty research on construction site requirements and waste sorting. Specific examples include creating pitches on sustainability for fictitious companies or working on projects related to the UN's global goals. One mentioned:

> *“In the 2nd semester, students work interdisciplinary to rescue a company from imminent bankruptcy that must invest with sustainable initiatives, creating a new vision and mission”.*

Others focus on practical applications, including LCA calculations, waste sorting on construction sites, and using Environmental Product Declarations (EPDs) in teaching source criticism: *"I remind students that they must always consider EPDs and labelling schemes in their analysis".* Another educator set specific requirements for students, including resource use on construction sites and conducting LCA calculations on building elements in projects. Other educators mentioned that they have developed a database featuring fifty types of sustainable building materials to aid students in their selection process. However, concerns about potential limitations on student creativity and design flexibility were raised. Certain respondents spearhead the implementation of climate requirements in their courses or research projects. They initiated this effort years before the climate legislation, integrating practices like LCA into student learning, driven by industry demands such as those for Danish Green Building certification (DGNB). Initially using Excel, now utilising advanced life cycle assessment tools such as LCAByg, provided by Danish authorities and software companies (e.g., Ajour), and actively exploring other program options via close collaboration with the building industry.

> *"For us, it is nothing new. We have taught it in our education program for many years, but now there are just some official requirements. However, I have contributed to Ajour's integration with the LCAByg tool used in teaching".*

Several respondents are involved in curriculum development, organising workshops, and preparing teaching materials to address climate legislation in various courses. One respondent coordinated academic and pedagogical activities related to LCA implementation and conducted workshops on LCA for colleagues. Respondents highlighted the importance of interdisciplinary collaboration and networking in improving comprehension and application of sustainability principles. They also stressed the value of real-life examples.

Frustrations and Challenges (How to Change)

Most educators, 87%, are highly impressed that students demand more education in sustainability. One comment emphasized the importance of looking into the broader perspective of the environmental problems and not only on CO2 limits:

> *"The CO2 load is only a small corner of the construction's environmental/climate loads, and seen from a sustainability perspective, the requirements, to what is in reality built, are a farce. This also means that we risk that with the implementation of the new requirements in education, losing the broader perspective on the environmental problems caused by construction".*

Furthermore, 33% of educators find conducting an LCA challenging for students, 42% slightly agree, and 25% disagree. For educators, 41% agree it is challenging, 36% slightly agree, and 24% disagree. Educators are frustrated with LCAs, debating whether students need comprehensive knowledge or just a basic understanding. They also struggle with analysing LCAs and have concerns about missing information and hidden details in CO2 legislation.

Educators face challenges in implementing climate legislation into education: 50% strongly agree, 22% slightly agree, and 28% disagree. Issues include resource limitations, insufficient knowledge sharing, and adjusting teaching approaches. Some pursue a master's in sustainable construction or research to enhance expertise. Additional challenges include lack of cooperation, insufficient research, and compliance. A few also mention a lack of employee interest. Educators speculated on the extent of communication and collaboration between higher education institutions

and professional high schools. They perceived insufficient interaction and support from universities for CEPs, perceiving a lack of effective cooperation and feedback.

Initiatives (How to Change)

The initiatives are undertaken at several levels, starting from the educational institutions at a strategic level, followed by education leaders and then educators in the individual institutes. Regarding educational institution initiatives from a strategic level, more than half of the respondents (53%) agreed that their institution had created strategies for the implementation of the new climate requirements in education, 17% slightly agreed, and 25% disagreed with them. Regarding leaders' initiatives, 71% of respondents agreed that their leaders support implementing the climate requirements in education, while 12% disagreed. According to respondents, institutions and education leaders primarily enhance educators' skills for the green transition and climate legislation implementation through various strategic initiatives. As 23% of respondents agreed that these initiatives mainly involve courses 23%, followed by network meetings and activities (18%), research and development (17%), participating in events (15%), further higher education (11%), international activities (8%), and other aspects (9%). Results show educators proactively seek information on sustainable construction advancements and regulatory compliance. While they primarily rely on industry news sources for updates. They also utilise their networks and contacts, participate in research activities, and attend courses. However, they express dissatisfaction with the level of sustainability-related updates provided by their institutions, such as department meetings and team gatherings, as well as the limited exposure to relevant developments at conferences and seminars.

From the educators' perspective, the results indicate that 62% have a strategic aim regarding implementing climate legislation in their teaching practices. Educators were queried about the key factors driving changes in educational strategies for integrating sustainability into the curriculum. Findings reveal that top priorities include preparing students for the future construction sector and meeting legislative requirements. Additionally, many respondents emphasized the necessity of addressing global environmental, social, and economic challenges, viewing it as a shared societal responsibility. Other factors cited include student demand for sustainability education and the potential to enhance research efforts in this domain. A smaller subset of responses highlighted the prospect of improving institutional competitiveness.

CONCLUSIONS

We set out to investigate the educators' perception of the need for curriculum development when the construction industry faces new climate legislation and the educators' frustrations when dealing with a need for curriculum development and the initiatives they implement. The investigation left us wondering whether the educators' organisations are learning from the educators' curriculum development to enable a smoother curriculum development next time the construction industry faces new legislation.

The study's findings reveal a growing integration of climate legislation into CEPs. Educators recognise the collective responsibility in implementing CO2 legislation into curricula. They are dedicated to equipping students with the skills needed to navigate real-world challenges and stay abreast of industry advancements. This aligns with Goodlad's (1979) acknowledgement of the intricate process involved in making

curriculum decisions within education, influenced by the nature of these decisions and the social and political issues that complicate them (Goodlad 1979). However, educators expressed the need for "cleaning" in curricula to accommodate new teaching material effectively, demonstrating the difficulties of developing curricula. In addition, developing a curriculum in a problem-solving effort to align the curriculum with legislative requirements for the construction industry may come with the risk of losing the broader perspective of environmental problems caused by the construction industry. Argyris (1991) commented on this dilemma when he explained the difficulties of teaching people how to learn, as they become very focused on problem-solving and can miss the underlying causes of the problem.

Overall, the results of the research point to the fact that educators (and their organisations) only obtain single loop learning on how to implement new climate change legislation (Argyris and Schön 1978). Questions arise about the extent of collaboration between different educational institutions, indicating a need for improved communication and cooperation. Indeed, such collaboration may improve the educator's learning about how to develop their curriculum as improved collaboration between educators can cause a focus on the practice of developing curriculum, which, according to Wenger's (1998) learning theory, "communities of practice", should generate learning for educators. GC is a simple framework and provides a limited understanding of the contextual factors, such as cultural, organisational, and political influences, that shape educators' actions and decisions. It has exposed weaknesses in the present method for developing the curricula. The weaknesses are limited learning among educators due to a lack of community of practice and a lack of DLL.

Thus, the opportunity for more effective implementation of changes in the curriculum that enhance students' skills and preparedness to engage in relevant practices is missing. This calls for further research to determine how DDL processes can be initiated in CEPs.

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