Curriculum Agility: Strategies for Future-Proofing Learning and Teaching

Workshop

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CURRICULUM AGILITY: STRATEGIES FOR FUTURE-PROOFING LEARNING AND TEACHING

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ABSTRACT

This workshop addresses the critical need for Curriculum Agility (CA) in contemporary engineering education, defined as the ability of a curriculum to be responsive and adaptable to rapid changes in society, industry, and student and university faculty needs by dynamically adjusting its structures, learning outcomes, and activities. Participants will explore the rationale behind CA, emphasizing its role in mitigating the Stakeholder Expectation Error that arises when educational programs fail to meet evolving stakeholder demands. The workshop delves into the concept of CA as a responsively organized education with dynamic learning content and flexible pedagogies, supported by the continuous development of staff. The ten principles of CA are discussed, which were formulated through extensive research

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and co-creation within the international engineering education community. The workshop also introduces the CA Self-Mapping Protocol, a facilitated, multi-level, co-creative process, designed to enable higher education institutions to assess and enhance their CA. This protocol, developed and refined through workshops and pilot studies at various European institutions, facilitates curriculum stakeholders to come to a shared understanding regarding the current state of CA and identify strategic actions for future improvement. Participants will gain insights into the protocol's key phases—Informing, Probing, Envisioning, Strategizing, and Prioritizing—and its emphasis on inclusive dialogue. The expected outcomes include a comprehensive understanding of CA, its guiding principles, and the value of the Self-Mapping Protocol as a tool for strategic curriculum innovation to ensure sustained quality and relevance of engineering programs.

1 BACKGROUND AND RATIONALE

Engineering education operates within an increasingly dynamic environment, characterized by rapid technological advancements, evolving societal needs and disruptive global events, including the shifting profiles and expectations of students and staff in an increased multifaceted environment.

1.1 Curriculum change: a wicked problem in itself

Today, societal changes, environmental challenges, and technological leaps dictate a fundamental re-evaluation of traditional curriculum design and delivery models (Grasso & Burkins, 2010; Sheppard et al., 2008). The conventional, often lengthy and bureaucratic processes associated with curriculum change can lead to a significant lag between the knowledge and skills offered by educational programs to match the competencies necessary in society and desired by industry (Malmqvist et al., 2022; Kolmos et al., 2016). This disconnect can be conceptualized as a Stakeholder Expectation Error, where the attributes and capabilities of graduates do not align with the expectations of employers, communities, and the learners themselves (Sheila et al., 2021; Zachariah, 2007).
To effectively address the complex challenges of the present and anticipate those of the future, engineering curricula must possess a greater degree of responsiveness and adaptability and include those stakeholders to manage expectations and include pivotal aspects in the engineering curriculum (Kamp, 2021). In practice, however, resources do not always allow for this, or it does not suit the organisational traditions and policies. Not all consider curriculum in its holistic sense – more than the sum of separate courses offered within a degree programme (van den Akker & Hameyer, 2003), with progression, overarching competency development, and student learning experience at its heart (Knight, 2001). This makes changing a curriculum a wicked problem (Hanstedt, 2023) in itself, with many, and sometimes opposing, constraints.

1.2 Curriculum Agility, or how to make continuous curriculum change possible

CA is a critical framework for navigating this evolving landscape. It is defined as the capacity of an educational program to proactively and promptly adapt its curricular and organizational structures, learning content and outcomes, learning activities and pedagogies, staff development, and examination design in response to changes in society, industry, and student and staff characteristics and needs (Brink et al., 2024a). CA represents a paradigm shift towards "future-proof engineering curricula" capable of coping with fast-changing circumstances and the associated opportunities

and threats. This involves cultivating a "responsively organised education, with dynamic learning contents and flexible pedagogics and didactics, while all involved staff is continuously developing competency to deal with the necessary transitions", (see Figure 1). Instead of working with a one-result, project-based mindset, CA prepares the organisation to work in perpetual prototyping versions of the curriculum, as new challenges demanding change evolve quickly in the dynamics of our global society. Curriculum change is seen as a process rather than a product, supported by and embedded in a culture of change.

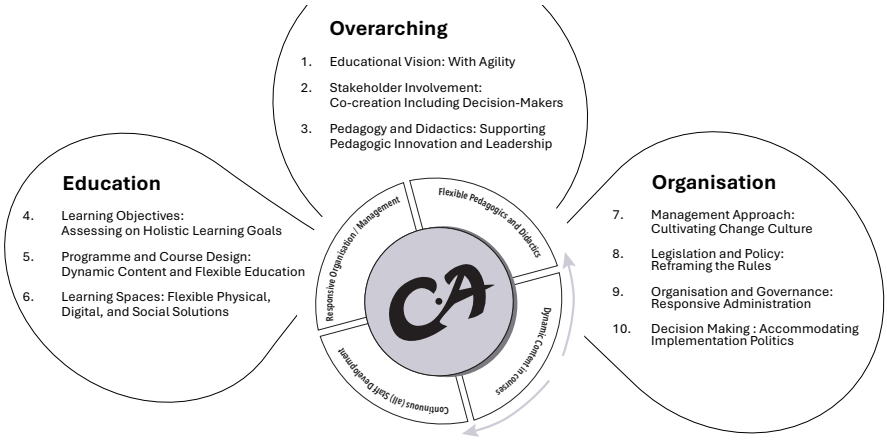

Figure 1: Curriculum Agility and its ten principles (Brink et al., 2024a)

1.3 Practice as we preach: a co-created frame of mind

The CA concept has been developed collaboratively, mainly by members of the CDIO (Conceive Design Implement Operate) network (Crawley et al., 2014). Since 2018, a sequence of research by design activities has taken place at workshops, roundtables, interactive working lunches, working groups, and conference presentations across various international engineering education forums including SEFI. This iterative and co-creative process, involving a diverse and inclusive range of international curriculum owners, experts, and innovators, has defined the scope of CA and identified barriers to change while generating principles for good practice. The outcome of this extensive work is the comprehensive concept of CA, underpinned by a set of ten principles designed to guide transformative curriculum innovation. These principles provide a holistic framework for Higher Education Institutions to consider various facets crucial for fostering agility on overarching, educational, and organisational aspects, see Figure 1.

1.4 Self-mapping Curriculum Agility

Throughout the conceptualization of CA, a crucial need was identified for a mechanism to assess and enhance an institution's level of agility. Therefore, the CA Self-Mapping Protocol was developed as a facilitated, multi-stakeholder, co-creative method. This protocol is designed to actively engage curriculum stakeholders at all levels—including faculty, middle and senior management, students, and external partners—in a structured dialogue to foster a shared understanding of Curriculum Agility (CA) within their local context. It supports the collaborative development of narratives that reflect the current state and facilitates the identification of viable, feasible, and desirable measures and priorities to enhance curriculum agility.
The self-mapping process typically involves five key steps: *Informing* (introducing CA and its principles), *Probing* (writing and sharing narratives), *Envisioning* (developing

future scenarios), *Strategizing* (identifying CA measures), and *Prioritizing* (agreeing on a strategic plan). However, pilots with the CA Self-Mapping Protocol at various European universities and spanning different institutional levels (university, faculty, school, department, and program), have demonstrated the value of customizing the process to the diverse higher engineering education contexts, stakeholders, and hierarchical levels in the university organisation involved (Brink et al., 2024b).
With this flexibility, the pilots have demonstrated the value and feasibility of self-mapping in the diverse higher engineering education contexts. Highlights mentioned by pilot participants were the importance of negotiating a local interpretation of CA and the instrumental role of the ten principles in guiding discussions. Furthermore, the multi-stakeholder, co-creation approach inherent in the protocol has facilitated dialogue and the exchange of perspectives that might not ordinarily occur, leading to new insights and a more comprehensive understanding of the challenges and opportunities related to curriculum change. The feedback from these pilots has been crucial in refining the protocol and developing a supporting toolkit to aid facilitators in guiding institutions through the self-mapping process.

1.5 Curriculum Agility Quick Scan

As part of the first step of the self-mapping (*Informing*), a quick scan introduces the concept of CA to those unfamiliar with it quickly and interactively. A Quick Scan is a rapid, structured assessment tool used to gain an initial, high-level overview of the agility of a curriculum. It engages key stakeholders—such as faculty, students, and institutional leaders—in reflecting on core dimensions of CA, such as change responsiveness interdisciplinary integration, flexibility in learning pathways, and stakeholder involvement. The goal is to identify strengths, gaps, and opportunities for improvement, which can inform deeper dialogue and strategic planning.
The Quick Scan approach has been tried out in different settings and is now brought to the SEFI community. This workshop is therefore designed to provide participants with an emerging foundational understanding of the concept, rationale, and guiding principles of CA. It also serves as an introduction to the CA Self-Mapping Protocol as a practical and valuable tool for self-assessment, fostering multi-stakeholder engagement, and strategically planning for curriculum innovation. By engaging with the core ideas and the initial steps, the self-mapping process enables participants to consider how they can contribute to enhancing the agility of their engineering education programs.

2 WORKSHOP OBJECTIVES

2.1 Target audience

The workshop aims to engage a diverse group of higher engineering education practitioners, varying from teaching staff to (higher) management. The content and activities are designed to be relevant for those who are seeking to understand and implement strategies for increasing the agility of their curricula to be more responsive to the evolving needs of society, industry, students and staff. The workshop is designed to equip participants with the knowledge and skills to apply the ten CA principles as a framework for self-mapping curriculum changes within their own universities. Additionally, it prepares participants to reflect upon current situation and to effectively facilitate similar CA processes in their institutional contexts.This includes individuals responsible for programmes and courses, and those otherwise

involved in curriculum planning, quality assurance, organization, and innovation and research within higher engineering education:

- Faculty members who teach courses and coordinate (the development of) courses and programmes.
- Management such as department heads, deans, program managers, and other administrative staff responsible for curriculum decisions and implementation.
- Individuals in educational support roles, such as academic developers, curriculum designers, quality assurance staff, and educational advisors.
- Potentially, other stakeholders who are interested in the outcomes of engineering education, e.g. industry and other collaboration partners within and outside of academia.

2.2 Expected learning outcomes

By the end of this workshop, participants will:

- Understand the definition and rationale of CA in the context of contemporary engineering education.
- Recognize the importance of CA in addressing the evolving needs of society, industry, students, and staff.
- Become familiar with the principles of CA as outlined in recent research.
- Get an overview of the CA Self-Mapping Protocol, including its key phases and underlying philosophy of multi-stakeholder engagement and co-creation.
- Appreciate the potential of the CA Self-Mapping Protocol as a tool for self-assessment and strategic planning for curriculum innovation.

3 WORKSHOP DESIGN

3.1 Time plan

The workshop is structured in an interactive and flexible manner, combining short presentations with group discussions in different introductory activities, related to the CA Self-Mapping Protocol.

Table 1. CA workshop time plan

Run time	Activity	
10 min	Introduction	The concept, the 4 domains, the 10 CA principles
20 min	CA Quick Scan (individual)	Evaluating the CA Principles, see CA QS questions below
5 min	Reflection (plenary)	On principles and on Quick Scan
15 min	Dive deeper activities (small group)	• Further discuss a specific principle • Discuss change approaches regarding a selected principle to reach curriculum agility • Comparing institutional context differences
10 min	Wrap up Results and Outcomes	

3.2 Interactivity

The CA Quick Scan and the CA Principles are used as artefacts for the participants to work with. Depending on the level of pre-knowledge and interests of participants, they can choose activities:

1) Answer the quick scan questions individually and discuss the answers and relevance of the questions from the perspective of their specific contexts with others in groups.
2) Dive deeper into one or two of the principles that are most relevant to their practice and discuss with peer participants the rationale, enablers and obstacles, and approaches.
3) Both, as is depicted in table 1. Participants will conduct a Quick Scan and will conduct a deep dive in one or two principles.

4 WORKSHOP RESULTS

The workshop gave people both a vocabulary to discuss and an approach to (quickly) evaluate curriculum agility. Participants were asked to do a Quick Scan for an educational context that they are familiar with, e.g. their institution, their department, their degree program, their course. An important insight that was discussed is that teachers and education researchers tend to focus – when thinking about CA – on the fields of 'Education' (principles 4-6) and 'Overarching' (principles 1-3).' The organisational principles for these two groups of stakeholders tend to be either a blind spot, or something they feel no control over. However, to have stakeholders around the table from throughout the educational context when assessing CA (teachers, researchers, support staff, management, educational advisors, students, industry, …), enriches everybody's view on perceived hard-to-solve bottlenecks and room for change.

Some findings from the participants' discussions were:

- Alignment of Intended Learning Outcomes (ILOs) among all courses of the program is a challenge and a priority.
- Curriculum change does mean going through all levels in the organization and operations, so strategy and implementation go hand-in-hand.
- Change of regulations to accommodate changes in the curriculum is important, e.g., assessment, use of AI, etc.
- Carrying out this exercise of self-assessment brings out what is needed in terms of resources. It helps to get a holistic view of the changes and how to address them by making a plan for action.

Participants were informed about next steps of this CA initiative (the CDIO CA working group) and follow-up possibilities that they could consider themselves for doing in their home institutes:

- The workshop organisers are part of the editorial team writing *The Curriculum Agility Guide – for Continuous Curriculum Innovation*. The book will present the ins and outs of CA, including examples and self-mapping materials.
- The extensive CA self-mapping protocol is meant to engage with stakeholders in one's own community and is adjustable to the local context. The protocol consists of five main stages from creating shared understanding of CA, via the different narratives on local CA features, to developing a CA vision, strategy and prioritization in joint effort.
- An open invitation to join the CA initiative as a CA co-thinker, a co-creator, or user and practitioner of CA.

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