

EXPERIENCES WITH SELF-MAPPING CURRICULUM AGILITY

Suzanne Brink

Centre for Educational Development, Umeå University
ICLON, Leiden University

Sonia M. Gomez Puente

Academic General Affairs Department, Eindhoven University of Technology (TU/e)

Remon Rooij, Kristel Aalbers

Department of Urbanism, Faculty of Architecture & the Built Environment, TU Delft/4TU.CEE

Carl Johan Carlsson, Mikael Enelund

Chalmers University of Technology

Liisa Lehtinen

Unit of Chemical Industry, Faculty of Engineering and Business, Turku University of Applied Sciences

ABSTRACT

Future-proof engineering curricula can cope with fast-changing circumstances, and the opportunities and threats these bring along in the context of the curriculum. Curriculum Agility (CA) is a concept aimed at helping higher education institutions analyse how responsive their programmes are to changes in society, industry, and student characteristics and needs. The CA model describes features needed to adapt curricular and organizational structures, learning content and outcomes, learning activities and pedagogies, staff development, and examination design in a timely and proactive manner. Based on the model, a CA Self-Mapping Protocol has been developed that aims to actively engage and simultaneously enable curriculum stakeholders in the self-mapping process. It was tested at five European universities and at different levels, i.e. university, department, and program level. Leading questions focused on the effects of the CA self-mapping process; and what that could mean for the set-up of the protocol. The aim of this paper is to present to what extent, and in which form, the self-mapping protocol, as a design-thinking, guided dialogue with multiple stakeholders, is valuable and feasible in different higher engineering education institutional contexts. All facilitators were able to adjust the protocol to local contexts. And although there were all kinds of differences (of use and process) between the institutes, what 'stands firmly' is the importance of the negotiating understanding of what CA is and what it means to the local context. The presence of the ten principles were instrumental to 'guarantee' that people were discussing and considering the themes that needed to be addressed.

KEYWORDS

Curriculum Agility, Self-evaluation, Transformative Curriculum Change, Future-proof Engineering Education, Standards: 1-12

INTRODUCTION: MOTIVATION FOR MAPPING CURRICULUM AGILITY

Curriculum Agility (CA) refers to the proactive responsiveness of the educational design and organisation of a higher education programme to changes in its context with high impact, such as technological developments, societal trends and disruptions, and the increasing diversity of the student body. The concept of CA has been developing since 2018 within the CDIO network in co-creation with members worldwide collaborating and co-creating in working group days, workshops, and roundtables (Brink et.al., 2023).

CA characteristics are flexible education, dynamic contents of learning, responsive organisation of the programme, and continuous (pedagogic) development of all involved academic staff. The ten principles to advance the CA of a programme are, in non-hierarchical order: (a) having an educational vision with agility in it, (b) involving stakeholders in the co-creation, including decision making, of the programme, (c) supporting pedagogic innovation and leadership through staff development, (d) assessing on holistic learning goals on programme level, (e) having dynamic content and flexible pedagogy in the programme and course design, (f) having flexible physical, digital and social learning spaces, (g) cultivating a change culture in the management approach, (h) reframing rules and legislation in its interpretation, (i) having a responsive administration governing the organisation, and (j) accommodating change implementation in the decision making processes. Throughout the iterative co-creation process of the CA model, the number of principles has grown from seven to eventually ten, and their grouping, wording, and descriptions have repeatedly been tweaked with consensus among the working group.

From the start, parallel to the process of establishing what CA beholds and how it can be accomplished, a way was sought to assess one's CA, much in line with the self-assessment on the CDIO standards, (Brink et. al., 2020). At the International CDIO Conference in Reykjavik, 2021, the CA working group started setting up a self-mapping protocol. It was agreed that the holistic character of the CA concept asked for a multi-level curriculum-stakeholder process, facilitating dialogue on a shared understanding and the narrative of the status quo of CA within the institution, followed by co-creation of plans and priorities. A toolkit was made to guide programme stakeholders and their facilitator(s) through the process.

AIM, RESEARCH APPROACH, AND STRUCTURE OF THE PAPER

The aim of this paper is to present to what extent, and in which form the self-mapping protocol, as a design-thinking, guided dialogue with multiple stakeholders, is valuable and feasible in different higher engineering education institutional contexts, based on a pilot that has been done. In addition, the different insights and plans for action that result from the self-mapping process are described, as well as the impact the process had on its participants.

The paper briefly introduces the self-mapping protocol. The core of the paper presents five self-mapping pilots: the local motivation and objectives, the contextualised and tailored interpretation of the protocol, important results, and the experiences and reflections of the participants and facilitators. The next section synthesizes the main insights, on which the conclusion bases an indication of the value of self-mapping CA, recommendations for the self-mapping toolkit, and recommendations for the next steps of the CDIO CA workgroup.

METHOD: THE SELF-MAPPING PROTOCOL OF CURRICULUM AGILITY

Five European universities tried out the CA Self-Mapping Protocol in one pre-pilot and four pilots: Eindhoven University of Technology at institutional level, Umeå University at faculty level (pre-pilot), Chalmers University of Technology at school level, Delft University of Technology at department level, and Turku University of Applied Sciences at programme level. The authors were the facilitators. The pre-pilot was executed in 2022 and the pilots in 2023. Preliminary results were discussed at the CA working group day at the International CDIO Conference in Trondheim in 2023.

The toolkit was a PowerPoint presentation with supportive materials included in the slides, some to be shown, others to be printed and worked with as templates during the interactive sessions. For the facilitator, there were hidden slides that gave supportive information, including facilitator's task slides, and instructions in the notes of each slide. Facilitators organised the CA self-mapping sessions, invited relevant participants, kept overview, and communicated the results within their organisation. The self-mapping protocol contained five main steps: Informing, Probing, Envisioning, Strategizing, and Prioritizing, each with their own goals, deliverables, and suggested approach, see Table 1.

Table 1: The Self-mapping Curriculum Agility protocol.

ON THE 10 PRINCIPLES of Curriculum Agility (CA)		Reflective Dialogue	Co-Creation
Step 1	Informing	Negotiating local interpretation of CA and its principles	Shared Understanding
Step 2	Probing	Sharing single-level experiences and perceptions of strengths, weaknesses, obstacles, and enablers in CA	CA Narratives per principle of the present situation within the institution
Step 3	Envisioning	Imagining desirable curriculum designs 10 years from now	Future Scenarios of curriculum design and organisation with agility
Step 4	Strategizing	Finding agreement and grouping actions to increase CA	Strategic CA Plot
Step 5	Prioritizing	Weighing actions in focus and direction on importance and timeline	CA Transformation Plan

The self-mapping protocol was flexible in its set-up, to enable universities in different local contexts to use it in a meaningful way. Therefore, variety in the self-mapping approach was stimulated and expected in the pilot and asked to describe by the facilitators afterwards.

RESULTS: SELF-MAPPING PROCESS EXPERIENCES

The following subsections describe the pilot experiences on five aspects. In each institute, there were local objectives and motivations for doing the self-mapping (i). The protocol was tailored to local circumstances (ii) and different stakeholders (iii) were involved. There were various concrete outputs (iv) in each case. And reflections by the participants and/or the facilitators on CA and its (tailored) self-mapping process (v) were tracked.

Eindhoven University of Technology – Institutional Level

The self-mapping pilot at Eindhoven University of Technology (TU/e) was carried out in the context of the university-wide redesign of the bachelor curriculum in all engineering departments. After an evaluation of the engineering bachelor programs in 2019/2020, a curriculum transformation took place to align the programs with the TU/e vision on education and current developments. The redesign of the BC curriculum was chosen as it follows a developmental approach which is constructed throughout the years to achieve the education vision. Other characteristics of the redesign are the TU/e stakeholders' involvement, and the piloting phases to iteratively develop, test and adjust the programs with a departmental flavour.

As the TU/e CA experience focused on the redesign of the bachelor's degree programs university-wide, representatives from the different educational processes of the curriculum development were selected for the pilot. Individual sessions were organized by a facilitator with broad experience in curriculum development and innovations in teaching and learning. The pressure felt to finalize the design of the first year of the engineering study programs on time to be implemented from September 2024 onwards, together with the fact that many educational processes supporting the implementation of the new bachelor programs needed to be quickly aligned, caused less availability of the stakeholders to participate in several workshops following the CA protocol. Therefore, individual interviews with each participant were organized. Selection of stakeholders (N=11) was based on representatives from different processes, e.g. quality assurance, educational advisors support to teachers, information management systems, policy and regulations, academic teaching, management, etc. Individual interviews lasted a maximum of one hour and a half.

To set up the context for the analysis, participants were exposed to a general introduction of the CA elements as well as the 10 principles (Step 1), with the use of the toolkit. Likewise, a shared of comparisons between the CA model and the current experiences of the redesign of the bachelor curriculum (Step 2) facilitated a better understanding of the principles. For example, Principle 5 on decision-making was compared to current processes of educational committees at the departments to approve courses; Principle 8 related to learning spaces was compared with the university systems, tools and learning environments being currently updated to meet innovations in teaching and learning; or Principle 10 on stakeholders' involvement, similar to the co-determination processes at the university and the involvement mechanism of communicate to consult university employees. These comparisons supported participants to, consequently, visualize a desired curriculum and the processes for future and similar curriculum change and experiences (Step 3). Finally, future directions were formulated in the canvas by not only prioritizing the desired changes, but also formulating actions that may foster a more agile curriculum transformation (Step 5). As interviews were individually conducted no co-creation of a joint strategic plan was formulated, and therefore, Step 4, was missing in this process.

The self-mapping process helped participants to reflect upon the curriculum process which has enriched the understanding of what agility is and how it can be applied in a curriculum transformation. There is no doubt that the CA model is insightful to strategically visualize the improvement of processes that lead to educational reform in a university. In addition, the experience is promising to create ownership of the process, reinforcing the involvement of key participants, making changes successful. Participants appreciated the value of the CA self-mapping process, and in particular, the tool that serve as a guideline to visualize the different elements and processes involved in a curriculum redesign. Although the participants were part of individual interviews, they considered that it would be interesting to have a joint session to

convey on main directions of future actions. Likewise, the facilitated valued the CA model as it provides opportunities for dialogue with all stakeholders and layers of the university.

Umeå University – Faculty Level

The faculty of Science and Technology at Umeå University has been a CDIO member for over twenty years and has fully integrated the CDIO standards in its quality system. Programmes and courses are improved, tweaked, and sometimes newly designed in accordance. The CA self-mapping was done as a pre-pilot at the faculty, with five stakeholders of the Interaction and Design programme from faculty management, department management, program management and lecturer level. When asked, participants indicated they engaged to learn about the CA concept and how the faculty was doing, be inspired to get more CA, and to help develop CA from academic motivations.

Four steps of the protocol were done January and May 2022, one step each month. They were prepared, planned, and executed by a facilitator, who was involved in the CA project from the start and thus had ample pre-knowledge about CA. After the pre-pilot, facilitator-instructions were added to the protocol so any facilitator could do the task.

In Step 1: Informing, each participant took part in a semi-structured, 60-90-minute interview. The participants read and responded to each principle in dialogue with the facilitator, based on four questions: Is and should this be strategically prioritised? Do you have this on your level? How is this at other levels within the faculty? What are obstacles and facilitators for this? The interviews were recorded, transcribed, and put together per principle to form narratives for Step 2: Probing.

The four perspectives of teachers, and faculty, department, and programme management, were categorized in topics and clustered. These narratives showed the similarities and discrepancies between the perceptions of the respondents on each principle. For instance, under Continuous Staff Development, the faculty management indicated all the room, resources, and stimulation there was for teachers to develop their teaching competence, initiating pedagogic innovation, and taking part in engineering education research. At teacher level, the eager ones were seen to find their way to these resources. But the department saw all too many teachers not willing to participate in such endeavours, also in other departments. However, under Programme Design, all agreed on the value of the electives and projects allowing for more dynamic content, and the cross-disciplinary learning opportunities in the year-4 design-build-test course. The participants edited the narratives, at the same time getting a peek into the others' perceptions.

Step 3, was done by the two programme managers, dreaming about the programme in ten years. Then, CA measures needed to get there were back-casted. These were added in Step 4: Strategizing. First, each participant was asked individually to prioritize CA measures based on the CA Narratives, the dream scenarios, and personal reflection three months into the trajectory. These measures were mapped on importance (must-have, should-have, would-like-to-have), and implementation time (short-term, long-term, probably not going to happen). All participants met in a final session. They discussed the overlap and differences in their views, rearranged measures, and dot-voted on the most important ones together. They spotlighted working on the perception that it was difficult if not impossible to change a course, getting more academics to do staff development on teaching, and getting the focus of course and programme renewal directed at the students' learning (throughout the programme), instead of the teachers' teaching.

The pre-pilot evaluation showed that the concept of CA had been new to the participants but associated with CDIO and educational development directly. The expectations of the participants were met and exceeded, and all principles were deemed meaningful and important. The collaborative process was appreciated, especially being able to first formulate one's own thoughts, then learn about other people's perceptions, and so come closer to significant issues. However, the facilitator had learned that Steps 1 and 2 had taken over 40 hours, which was undesirable.

Chalmers University of Technology – School Level

Education at Chalmers is organized in Educational Schools, and the self-mapping pilot was carried out at the School of MATS (Mechanical engineering, Automation and mechatronics, Industrial design engineering and Marine engineering and Shipping). It suited the school very well to conduct the CA self-mapping pilot since several of the programme heads were new and needed to get to know their programmes well to identify strengths, weaknesses, and development opportunities. Furthermore, the rapid technological development and demands from industry, society, and students to act more swiftly motivated an examination of how agile the programmes are. As Chalmers recently formulated a new vision for the university, with a strong focus on excellence in research, education, and innovation, this worked as an additional catalyst for undertaking the CA mapping.

The mapping process was designed as a full-day workshop with eight programme heads. The school management was also taking part in the workshop with three participants: the dean, the coordinator, and the administrative support. During the workshop, steps 2-4 in the self-mapping process were covered. The first step was initiated by the dean at a regular school management meeting about a week before the workshop. During that meeting, the dean (who was also a co-facilitator and participant in the workshop) informed the participants about CA and the mapping process. The actual workshop the following week was led by a facilitator with a long experience from the CA project. After a concise introduction by the dean to the remaining steps of the CA self-mapping process, the dean joined to take part in the mapping process as a participant. Then, all the participants were divided into four teams. The teams were formed according to the different roles of the participants, with three teams of programme heads and one team consisting of the management group. The teams with the programme heads were based on "adjacency", that is, similarities in fields of study.

Throughout the workshop, the steps were introduced and then followed by the work of the teams on each step before moving on to the next step in the process. The participants completed the steps using post-it notes and visualizing the output on paper. The documentation from the steps became somewhat fragmented when the facilitator collected the materials from the teams, as the different participants chose to record the steps in slightly different ways. It was also difficult for the facilitator to summarize each step since time between each step was restricted. Despite the challenges with logistics and clear summaries of each step, the outcome of the workshop was positive. All participants expressed that the mapping process was intuitive and useful for evaluating their programme's curriculum design as well as envisioning new possibilities, not least in the light of a new overall vision for Chalmers. Particularly the program heads that were new in their positions, expressed that the mapping process was very useful for a broader, as well as deeper, understanding of the programmes. In addition, the workshop yielded valuable results, encompassing narratives, identified obstacles, and enablers linked to various CA principles, along with potential areas for improvement. These findings are currently being employed in a broader programme reform initiative that engages teachers, students, and external stakeholders.

The workshop format aided the mapping process, but maintaining a consistent pace proved challenging for participants. Consequently, there was overlap between steps, leading to the merger of steps 2 and 3. Step 4, strategizing, marked the workshop's conclusion, while step 5 seamlessly integrated into ongoing program development. Participants found the workshop valuable and productive, yet facilitators encountered challenges in time management, collecting, and summarizing output from various steps. Based on this experience, a digital format for the participants to enter the data from the different steps would have made collecting and comparing the results easier.

Delft University of Technology – Departmental Level

The Department of Urbanism in Delft has a Daily Board Education (DBE) in which all its six research groups are represented by their section education coordinators. Additionally, this DBE consists of a chairperson, the Head of the department, the departmental manager, and secretarial support, and is visited regularly by degree program leaders. It monitors all kinds of education quality, staff deployment, and education organization issues. Two CA facilitators together prepared and documented the self-mapping process for the Urbanism department. They perceived that within the department, there is a shared, but implicit idea that its CA could be improved.

First, several pre-selected colleagues in four categories were invited for four separate 1.5hrs sessions: [i] tenured scientific staff (3 persons), [ii] departmental management (3 persons), [iii] junior teachers/Ph.D. candidates/M.Sc. students (2 persons), and [iv] colleagues who are committee members (board of studies, board of examination) and educational support staff (4 persons). In those four sessions, a shortened slideshow was used to introduce (step of Informing) the CA concept, model (including the 10 principles), and the process. Then people were asked to individually develop their narratives in 20-mins based on the ten principles that we printed out for everybody as 'puzzle pieces'. People were then asked to pitch their narrative (step of Probing). Photos were made of all the puzzles. The facilitators made personal notes of what people were emphasizing. Then for each principle, a statement or position was plenary developed (step of Probing and partly Envisioning). At the end of the session, people were asked to share their experiences and feelings about this workshop.

Secondly, the facilitators together developed a 500-word departmental CA narrative, based on the workshop results and own – as departmental education leader and M.Sc. program leader – view on things (step of Envisioning). The main building blocks of this departmental narrative were the conflicting perceptions of the colleagues on almost all principles. Thirdly, this narrative was shared with all DBE members (11 persons), and further discussed and reflected upon in a 2hrs workshop session (steps of Strategizing and partly Prioritising; 9 persons) based on two questions:

- What is the desired direction of improving our CA? What is a need-to-have and what is a nice-to-have?
 - Do you see the first concrete priorities, actions, or steps that you would like to propose?
- Many DBE members were on the one hand surprised by the shared narrative but agreed with it anyway as a realistic snapshot of our department. Many ideas popped up and it was decided to discuss the CA of our department twice a year in a DBE meeting based on the updated document the facilitators made (shared narrative + strategies).

Several responses and reflections to the CA model and CA self-mapping process stood out:

- The model and principles were very helpful for everybody building their own narrative. Many people felt that there was substantial thinking and knowledgeability behind the materials.
- Making explicit your view and perception of things was appreciated a lot. The 'puzzle exercise' helped people to strengthen their vision (they said themselves). Participants were happy that there was/is no good or bad in the individual self-mapping. Your perception is just what it is.
- Participants were happy to share and discuss their individual narratives but also to hear and comment on the ones of others. It simply gave them a more in-depth understanding of the issues at hand and their complexities.
- Nobody had suggestions for additional principles. These ten were doing their job properly.

Turku University of Applied Sciences – Programme Level

The CA self-mapping piloting at Turku University of Applied Sciences (Turku UAS) was carried out in the unit of Chemical industry in the faculty of Engineering and business. At Turku UAS, CDIO based pedagogy has been applied for 5-10 years depending on the unit and it has been seen as a solution for more fluent combination of education and research, development and innovation activities that also eases teachers' workload. Turku UAS is currently undergoing a curriculum reform, which will take place from August 2024. Thus, CA mapping pilot was seen as a good opportunity to map the status quo. We were eager to explore in what areas we have succeed, but also to point out the development needs. The general idea was to keep it simple for understanding the value of the pilot at first. Therefore, CA self-mapping pilot was implemented with a small team at the programme level. The group included 4 curriculum designers (Degree programme leaders), Head of education and research, and facilitator (Research team leader). At this point no other stakeholders were invited to the piloting. The piloting was carried out in 4 sessions within 7 weeks in April and May 2023. Steps 1 and 2 were combined, but otherwise the piloting was carried out according to the pilot instructions. The first session was longer (2,5 hours), and all the other sessions were 2 hours long. There were about two weeks between the sessions.

All participants were aware of the self-mapping process and the principles before the first session. Later, the participants prepared themselves in advance for the sessions by going through the material generated during previous session. During the first session, the pilot group went through each principle by discussing what it meant and what thoughts they had of the principle, after which they wrote down their own narratives into a template in Forms. This way, a common understanding of the principles was achieved. Later, the facilitator collected the narratives into a PowerPoint presentation and delivered it to participants for reading. For the sessions 3 to 5, post-it boards were built into a Mural board, where all the participants had access. During the discussion, either the participants themselves or the facilitator wrote down the ideas into Mural. These post-it notes were then further processed during the process.

As outcome, we achieved an understanding of our status quo and positive feeling that we can affect our work. We have freedom to manage our work and the organization is not limiting our CA. We also found ourselves to be proud of our multidisciplinary courses with holistic goals, agile course design and modern learning spaces. The area of development was lack of time. As our curriculum was already in a reform process, the new curriculum was listed as a direct must-have outcome. Other must-have outcomes were all dealing with communication at the short-term level.

The CA self-mapping pilot was perceived as interesting and meaningful. However, the biggest advantage of the sessions was considered to be the opportunity to discuss, as in the unit, there

is not much time left for dialogue in everyday life. The conversation was active, and it was the facilitator's job to make sure that the topics were recorded, and from time to time to get the conversation back on track. Finally, a couple of improvements to be carried out on a quick schedule were selected, also implementers were selected from the group. Based on the feedback, the participants were satisfied with the tools and the way the sessions were organized.

SYNTHESIS

The CA Self-Mapping Protocol was meant to guide and support facilitators, while leaving them room to adjust working methods in each step to their context, the desired resolution of the mapping, and available resources. With five different resolutions of mapping in the pilot, being university, faculty, school, department, and programme level, both similarities and differences in execution show.

From Umeå it became clear that transcribing and coding interviews was too time-consuming, and the narratives could be better generated in collaborative sessions in the protocol. Also, it was nice to have a strategic CA measures map, but to secure a follow-up an action plan needed to be formulated as well. At TU/e, the interviews were also held individually, as well as follow-up steps. Reason for this was that the stakeholders could not participate in several workshops at the same time. Although this set-up was still very insightful, a joint formulation of strategy and action was lacking. Chalmers had the opportunity to introduce CA during a management meeting when all were already present, bypassing TU/e's problem. They chose to have all the other steps in one day with the whole group present. The interactions gave participants valuable insights, but there was not enough time for the last steps. At TU Delft, an interactive exercise done during the CDIO conference working group day inspired to organize step 2 likewise as a workshop series for small groups. Here, participants not only developed their personal narratives but were also able to present and discuss them with colleagues. Turku was well on their way to design a new program and used the self-mapping for evaluating their status quo. Combining steps 1 and 2 reduced the number of sessions which made it easier for all to participate the whole process. Using digital tools for the templates in the toolkit helped them a lot while reporting the results. And their pilot showed that different language versions might be desirable, as talking about complex issues in a language different from the mother tongue sometimes caused more confusion than shared understanding.

Looking at the nature of the local adjustments to the protocol, what 'stands firmly' in the protocol for all as valuable is the importance of negotiating a local understanding of what CA means, whether this happens in Step 1 or 2. Second, all ten principles and their descriptions were helpful for both facilitator and participant. They were also instrumental to 'guarantee' that people were discussing and considering the themes that needed to be addressed. Even when participants felt they had no control over some of the educational or organisational principles, talking about the perceptions with those who do, gave new insights on both sides. Third, all five steps of the protocol stood firmly in being regarded as valuable. It became clear that not all steps can be done in one day or one session, as lean as that would be, and it is hard to get everybody in the same room at the same time. But the pilots that did not make it all the way to Step 5 noted that this stands in the way of a structural work continuation on the measures and plans. Fourth, the multi-stakeholder, co-creation approach had the effect that dialogue happened which normally didn't take place, either for lack of time or for lack of occasion in the existing operationalisation of the curriculum organisation. And this dialogue was much appreciated.

CONCLUSIONS AND STEPS FORWARD

Lessons learned for CA and its Self-Mapping Protocol

Curriculum change is *daily business* in education nowadays. Universities are challenged with rapid technological and societal developments, industry requirements, and students' changing characteristics that need to be incorporated in study programmes. This requires a holistic or integrated approach working from a joint educational vision in joint ownership. The CA Self-Mapping Protocol invites to think critically and together with other stakeholders about the future of a programme and the (re)design of its curriculum. From the pilot, we have learned that participants consider CA an intelligent concept and its model complete and meaningful. That (practical) expertise was at the base of the model became evident in recognition of the principles, and it made it easy to trust the self-mapping process. The inter-level collaboration was appreciated and once everyone was together in the room, the protocol was experienced as smooth and productive.

For the facilitators it was challenging to get everybody in the same room at the same time when the protocol asked for that. This was one of the main reasons for local variations of the protocol. It makes planning ahead extra important. Opportunities of existing meetings in which the self-mapping activities can take place are worth using. The facilitators were aware that their participants were curious and willing to be part of the pilot. Hence there was less resistance to overcome, which in a non-pilot situation might be different. It's difficult to decide which participants best to invite. On the one hand, the ones who are pedagogically involved are most willing to put time and effort into it, but the ones who don't see the value per se are also of interest to be heard in the self-mapping. In any way, getting the different level stakeholders involved is important for a fruitful self-mapping. Solutions were found in breaking sessions up in smaller groups, leading to more work for the facilitator, but better coverage of the stakeholders. Sharing the burden with two facilitators can be a solution to that problem. Another variation to the protocol to consider is combining steps: Step 1 and 2 in one session, and Step 3, 4 and 5 in the next; or three sessions, a short Step1, a long step 2, 3 and 4, and a short Step 5; or combining Steps 4 and 5 to use the enthusiasm raised during strategizing directly to think implementation. But the larger the groups, the harder it might become to combine different steps.

Beyond the Self-Mapping, a challenge was seen in what happens afterwards. Who takes over and sees the strategies, priorities, and action plan through? In the pilot, the intention with which the self-mapping was done differed considerably, and hence also the follow-up. It would be good to add follow-up of the action plan in the toolkit's workshop templates.

Lessons learned for the Toolkit and Facilitator

The facilitators agreed that the toolkit, the PowerPoint materials, helped to get the flow up right away during the sessions. The materials offered were deemed important in facilitating dialogue. The liberties in approaching the protocol and seeing what works best for each situation were highly regarded and necessary. In the toolkit, multiple variants could be mentioned to give future facilitators guidance in the possibilities and their consequences.

Of course, a facilitator must know something about CA to feel comfortable with the role and be able to answer participants' questions. At the time of writing, a CA Quick Scan is being developed, which will help facilitators with this on top of the toolkit material. However, the protocol in Step 1 and 2 also leaves room for session designs in which participants together

find out the answers to unclarities, and thus only increasing their shared understanding and detailing their narratives. It was also discussed that documentation on CA could be made to send around beforehand, but the pilot facilitators felt participants hardly had enough time to come to the sessions, let alone prepare in advance. Homework in between the steps is another option to give participants the opportunity to be involved and feel their voices heard.

Another idea is to make a digital interactive version of the toolkit, in which all the steps can be done online (both synchronous or asynchronous). Some universities have locations far spread out and are destined to work online for such endeavours. Additionally, the difficulty of getting busy colleagues in the same room at the same time can be overcome by working digitally in an asynchronous way. Special attention would have to be paid to guaranteeing true dialogue in this set-up, for instance by synchronous online meetings in the first and last steps.

The recommendations from this pilot will be discussed with the CA working group and integrated into the design of the protocol and toolkit. A next round of Self-Mapping universities is already forming, so they can work with improved materials. And the materials are aimed to become available to all CDIO members as well.

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REFERENCES

- Brink, S.C., Carlsson, C.J., Enelund, M., Edström, K., Keller, E., Lyng, R., & McCartan, C. (2023). 'Curriculum Agility as Optional CDIO Standard', in *Proceedings of the 19th International CDIO Conference*, NTNU, Trondheim, Norway, Jun. 2023, p.18.
- Brink, S.C., Carlsson, C.J., Enelund, M., Georgsson, F., Keller, E., Lyng, R., & McCartan, C. (2020). 'Assessing Curriculum Agility in a CDIO Engineering Education', in *Proceedings of the 16th International CDIO Conference*, Gothenburg, Sweden: Chalmers University of Technology, 2020, p.13.

BIOGRAPHICAL INFORMATION

Suzanne Brink is an associate professor and Distinguished Teacher in Higher Education Pedagogics at Umeå University. She has background in Industrial Design Engineering and Educational Sciences. Her doctoral research at Leiden University, focuses on Transformative Curriculum Innovation. She serves as European Regional Leader in CDIO.

Sonia María Gómez Puente, PhD, is Strategic Advisor in Innovations in Teaching and Learning at the Academic General Affairs department at the Eindhoven University of Technology (TU/e). Research focus: innovations in engineering education. Broad experience in curriculum development, instructional design, active methods in teaching and learning, and in professionalization and coaching of teachers. Member of SEFI Board of Directors.

Remon Rooij is an Associate Professor at the Department of Urbanism and TU Delft's institutional CDIO leader. Since July 2023, Remon has been chair and scientific director of the Dutch 4TU Centre for Engineering Education, that promotes and supports innovation and pedagogical research in engineering education.

Kristel Aalbers is a Senior Lecturer Environmental Technology & Design at Delft University of Technology, Department of Urbanism. She is the master Urbanism program leader (150+ students). She leads the curriculum change in Urbanism that aims to stimulate more flexibility and student agency and ownership.

Carl Johan Carlsson is a senior lecturer and assistant head of education at the Department of Communication and Learning in Science at Chalmers University of Technology. His teaching focuses on disciplinary and interdisciplinary communication. His main interests include writing in higher education, integrated and cross-disciplinary learning, disciplinary socialization, pedagogical development work and curriculum design.

Mikael Enelund is a Professor in Structural Dynamics and Dean of Education at Chalmers University of Technology. Currently he is the leader of Chalmers ten-year initiative Tracks to develop education to become more flexible and responsive to changes in the society.

Liisa Lehtinen is a Research team leader and a Principal lecturer (Materials Technology) at the education and research unit of Chemical Industry at the faculty of Engineering and Business at Turku University of Applied Sciences. Her ambition is to find solutions for fluent integration of education and research.

Corresponding author

Suzanne Brink
Umeå University
90187, Umeå
Sweden
suzanne.brink@umu.se



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