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Rewilding the digital learning ecology

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HIP
DIGITAL EDUCATION REWILDED

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The HIP framework aims to guide higher education (HE) teachers and researchers to reconsider and reflect on how to rethink HE pedagogy in new and different ways. It builds on insights from the report *Hacking Innovative Pedagogy: Innovation and Digitisation to Rewild Higher Education. A Commented Atlas* (Beskorsa, et al., 2023) and incorporates the spirit of rewilding and hacking pedagogies to inspire new professional communities focused on innovating digital education. The framework considers and guides the development of teachers' digital pedagogy competences through an inclusive bottom-up approach that gives space for individual teacher's agency while also ensuring a collective teaching culture. The framework emphasizes how pedagogical approaches can address the different needs that HE teachers and student communities have that reflect disciplines cultures and/or the diversity of learners. Only a framework mindful of heterogeneity will be able to address questions of justice and fair access to education. Likewise, in the spirit of rewilding, the framework should not be considered a static "one size fits all" solution. We aim for an organic and dynamic framework that may be used to pause and reflect to then turn back to one's own teaching community to consider (learn from, listen to and respond to the teaching and learning of different communities). Therefore we plan that this framework will be a living document throughout the HIP-project's lifetime.

In the HIP-project, the framework will serve to guide the design of teaching and learning resources and activities that are to be developed. Including content, processes, pedagogy and learning outcomes. The framework should help to address the process for planning and reviewing how to use digital tools to rewild HE teaching, how to engage students through digital approaches, share new insights through digital communications, and plan curriculum activities using the HIP-framework.

The development of the framework is based on desk research in the form of a literature review of HE educational research that has been reported to have shaped recent developments in digital education. It includes a section that describes recent development and trends and a more focused review of literature on digitalization of education within engineering education. The decision to include insights from this specific discipline is manifold: there is a substantial body of research in this field, since engineering

education struggles at times to address known risks to fair and just access such as gender, race as well as being a disciplinary field that uses highly codified language and knowledge constructs that are known barriers to educational success (Faulkner, 2015). However, as part of a hacking and rewilding approach we also wish to include, in this context, more niche voices from different communities and disciplines to identify less described alternatives of digital education. By including voices from more research communities working with and understanding digital technology differently, we also hope to ensure a wider applicability and responsiveness of the framework. Digitalization of education is a well-established, but also nested area of research. As we will elaborate on later in this review, different agendas and ideologies drive digitalization in very different directions.

Together, the literature review will identify general trends and developments within digital education. We begin with a section describing the development from digital, postdigital up until post pandemic times followed by the focused review on engineering education literature.

This will be presented in section 1 as a background of the framework giving indications of in which ways digital technology can make a difference for education and inspire the HIP-framework. This will be followed by section 2 that ties together findings and introduces our own thoughts behind and core values of the HIP-framework. In the final section 3, we present our own framework and make suggestions how to rewild digital education by introducing a learning design tool.

The digital technology to transform higher education is in principle mature and ready – we hope this framework will support teachers, researchers and students to find their own voice and direction within digital education.

1. Literature review

1.1 From digital to postdigital and post-pandemic literature

The following sections provide background to the development of digital education from the modern digital age to postdigital and -pandemic times followed by a review of digital transformation frameworks in engineering education.

The digital age in higher education

Digital technology in higher education, in the beginning, and to some degree still to this day, has been approached in a largely uncritical manner leading to false truisms of the unconditional positive effects of digital technology (Tsui & Tavares, 2021). Utilizing a deterministic approach to digital technology has resulted at times in absurd scenarios where school management equipped whole classes and teachers with devices without prior consultation or plans for pedagogical training or detailed support. The underlying

logic being that adoption of technology by itself will lead to better education and digital literacy (Kirkwood & Price, 2012).

"Pedagogy first!"

As a counter-reaction to this technology focused period, a wave of "pedagogy first" research activities followed. This became a common catchphrase among teachers, suggesting that despite the wide introduction of digital technology within HE and the wider society, proven models of teaching and pedagogic thinking should accommodate these changes (Beetham & Sharpe, 2007). This idea was later most famously described as "putting the pedagogical horse in front of the technology cart" instead of the other way around (Sankey, 2020). According to this understanding, new digital technologies are not regarded as transformative to how people learn. They are merely another addition to existing technologies for learning such as blackboards and chalk, video, paper, etc. that can be mastered and assimilated to existing pedagogical practice. Seen this way, technology is considered a neutral tool over which teachers have complete control and can be adapted to serve any mode of learning. Pedagogy, then, is not in need of rethinking as there is nothing new (Brett & Cousin, 2010). Critics of this approach warned that technology cannot be regarded as neutral to learning design and processes and should therefore not be disregarded in pedagogy (Fawns, 2022). Learning is both an individual and social process that is situated in specific social and cultural contexts, this also means that when context change – learning change (Beetham & Sharpe, 2007). Digital technologies represent a paradigm shift – a potential transformation with impacts on how knowledge is created, shared, accessed, and managed and therefore this also impacts the nature of learning.

Educational transformation postdigital and postpandemic

There are different understandings of the term postdigital education. At face value, it suggests that digitalization of education is something that has already "happened" into its complete and finished form and the fascination and novelty surrounding it have worn off (Fuller & Jandrić, 2019; Jandrić et al., 2018). This insinuates a digital transformation where digital technology no longer stands in the way of practices but are deeply entangled in and partly constitutes practice. The Hacking Innovative Pedagogy: Innovation and Digitisation to Rewild Higher Education. A Commented Atlas (Beskorsa, et al., 2023) highlights that digital technology has become intertwined with learning activities in HE, ranging from the technical infrastructures, the digital ecosystems we make use of everyday, to the formal and informal organizational structures. Despite this pervasiveness, we do not believe the potentials of digitalizing higher education have been realized to full effect. We take a critical stance to the question of whether we have successfully

digitalized teaching and learning in higher education. A lot was learned about the state of digital education from the Covid-19 lockdowns, including that for many teachers and students digital technology is not experienced as seamless and invisible as the postdigital marker might suggest. On the contrary, much online learning has been described as counter intuitive and as obstructions for good education (Lyngdorf et al., 2021; Rapanta et al., 2020). Based on this sense of "postdigital", maybe it is more accurate to talk about a postdigitized era in education, where 1:1 transfers of analogue media to digital ones have "happened" with the help of digital twins, and not a postdigitalized one, where the core of education is reshaped through the use of new digital media and practices (Knox, 2019). Cramer (2015) writes that the notion of postdigital should be understood more pragmatically, i.e. that digitalization has progressed from a discrete breaking point to an ongoing condition. Although, it can be problematic to describe any ongoing condition as "post-", this understanding might be more accurate at least for the characteristics of the postdigital literature, which tend to focus on the experiential rather than the conceptual.

Knox (2019) suggests that postdigital notions should introduce alternative views of human-technology relations than the commonsense, limiting views that technology is either the answer, or the problem to the future of education. Such critical engagement also serves to avoid simplistic determinisms, e.g. optimistic technological determinism (tablets to everyone will make all learning more efficient), or pessimistic (AI leads to dehumanization), and pedagogic determinism (only humans drive change). In this connection Fawns (2022) suggests an entangled understanding and approach to pedagogy. The deterministic positions neglect to see digital activities as social, material and embedded in rich and diverse contexts (Fawns, 2019), which learning designs should be responsive to. This demands a recognition of the mutual shaping of digital technology and pedagogy, which can be seen in figure 1 (Fawns, 2022).

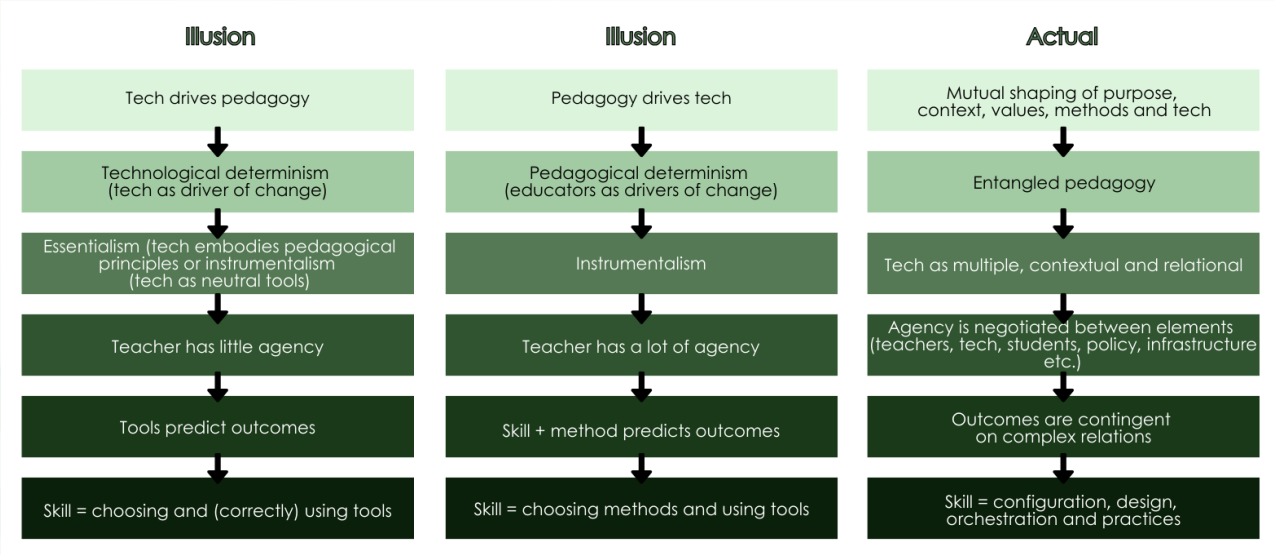

Figure 1: An entangled relationship of technology and pedagogy. Inspired by Fawns (2022).

The differentiation between digital and analogue thus becomes less important and new critical theory and practice based on hybridity and entangledness emerge, suggesting that "learning situations are complex entanglements of people, spaces, activities, and material, in which the digital and non-digital are intrinsically and inextricably interconnected" (Otto et al., 2023). It is this revised critical and complex approach to digital education that must be "ongoing" in any form of postdigital era, where we continuously question what purposes and values should drive digital education and try to understand challenges and affordances of new technology.

The postpandemic literature

After the covid-19 pandemic, studies on effects and impacts on education during and after lockdowns emerged rapidly. This body of literature is now called the postpandemic literature and can largely be characterized by comparative and intervention studies that aim to describe what has been called the "new normal" – implying the experiences and innovations that came out of the pandemic have changed education for the future. Because the pandemic caused such extreme conditions for education, an acceleration and enhancement of agendas and innovation within digital education also took place as a response and brought back an emphasis on previously displaced needs such as well-being and care (Graham, 2022; Tschaepe, 2020).

For example, the opportunities for more flexible learning were accelerated and enhanced as the production of and implementation of digital materials and resources were used more widely. Some (maybe even the majority) was not of high quality and teacher centered, e.g., pre-recorded lectures, nevertheless there was an acceleration in flexible learning opportunities which brought closer other related innovations such as micro credentials (Selvaratnam & Sankey, 2021). Another result that flexible learning brought about, was more online remote cross-cultural experiences as it became possible to sync up courses across institutions (Graham, 2022).

At the same time, wellbeing became a wider concern for institutions. From being a matter of identifying at risk students, well-being has now become a general concern for all students and staff, which has resulted in efforts on fostering pedagogies of love and care by e.g., supporting development of mindsets and skills for collaboration and resilience in online environments and program designs that consider well-being to a greater extent than earlier (Otto et al., 2023). In the same vein issues inspired by feminist theories (Schwartz, 2018) and related to ethical responsibilities, especially social and environmental, such as accessibility and inequality among students, became more visible (and thereby less private) when seeing into each other's homes, which has brought more reflection on these matters (Graham, 2022).

Together, the acceleration and enhancement of these innovations and agendas and the forced experiences that multiple lockdowns entailed have brought higher education closer to a systemic blended approach, that turned to inverted, flipped, blended and other hybrid modalities. Such systemic approaches also entailed the involvement of a wider organizational apparatus as it requires digital infrastructure, open access to computer equipment, stable internet connections, and the training of staff, teachers and students in the preparation and use of targeted collaborative platforms (Otto et al., 2023). This suggests that a shift has taken place in recent years where previously learning design to a large degree has been a responsibility of the individual teacher to now include teams consisting of teachers, IT, secretaries and other staff. This increase in involvement from other professional staff is not as dominant in existing learning design models though is being seen more often (Goodyear et al., 2021). Furthermore, the support and development of more collective, team-based approaches to teaching innovation using digital technology became evident during lockdowns. On the one hand teachers were left to their own to cope with the new conditions using new digital technology (Lyngdorf, Bertel & Andersen, 2021). On the other hand learning designers who answered the online learning call, as the fastest growing profession in higher education (Decherney & Levander, 2020) and other so-called third space professional support staff (Prusko & Kilgore 2023; White & White 2016) often found themselves laboring in the shadow of the more prominent teacher and student narratives (Costello et al, 2022). Equally important is the transformed role of students in helping teachers discover how best to develop new pedagogies. Inclusion of students in co-creative learning design processes can be a chance for exploration of greater empowerment of students in which could be another significant shift driven by digital pedagogy. However, the same technologies that allows for synchronous, inclusive collaboration on learning design, has also opened increased access to student data for teachers. Learner analytics that can track students' digital footsteps, be it debates in online forums, trajectories and progress through online learning modules, or reflections in e-portfolios. All data that can be food for thought for the reflective practitioner, but also data that can be used to survey, control and manage students in a more technocratic, dystopian direction (Williamson, Bayne & Shay, 2020).

1.2 Frameworks for digital transformation of Engineering education

Empirical studies on digital innovations in specific small-scale contexts, such as the classroom, are numerous and the literature is rich. In contrast to this, in this review of engineering literature we are interested in more deliberate, informed, or ideological approaches to digitalization asking and answering what digitalization should do for education and how. All the way back in 2007, Laurillard (2007) wrote that digital technology has merely been consigned to support traditional modes of education, while Bayne (2015) almost ten years later described its role as simply an enhancement of learning. This is to a large

extend still true. A blind eye has been turned to the transformational role digital technology could play in realizing our educational ambitions, including issues of inclusion and diversity, but in order to convert this potential digitalization should address education in its entirety and not only specific classroom activities. Digital transformation in this connection is based on Kræmmergaard's (2019) definition, where understanding and use of digital technology becomes deeply entangled with and partly constitutes the educational practice and experience. Core practices and processes are to be reconsidered by exploring the new affordances that digital technology offers. Therefore, we need to start by asking how frameworks for digital transformation are informed and conceptualized, what technologies are used, what pedagogical values are promoted and consequently the possible connections between. For this review we identified 19 studies presenting frameworks for digital transformation of engineering education. These papers were analyzed in terms of underlying ideologies, beliefs about the relationship between digital technology and pedagogy, and promoted pedagogical values.

Drivers, ideology, and values

Management, strategy documents, major digital technology providers (referred to as Big EdTech), and other influential stakeholders seldom explicitly articulate perspectives, underlying motivations, or core values concerning digital education. This lack of transparency can present difficulties when attempting to discern the rationales and driving forces behind digitalization initiatives. Furthermore ideology tend to guide and permeate practice (Moore, 2010), meaning different drivers and ideologies might lead to the promotion and practice of very different pedagogical values and in some cases, from the teacher's point of view, even unintended and unwanted ones.

The review analysis indicates that digital education in the context of engineering education is driven by a blend of internal and external factors, as illustrated in Figure 2, with the highest frequency factors at the top and the lowest at the bottom. Around two-thirds of the studies, 12, (Block, 2018b; Broo et al., 2022; Caratozzolo et al., 2021; Chuchalin et al., 2019; Franuszkiewicz et al., 2019; Guray and Kismat, 2023; Hulla et al., 2019; Karstina, 2022; Luengo et al., 2022; Oh et al., 2021; Salinas-Navarro and Garay-Rondero, 2019; Taborda et al., 2021), identify Industry 4.0, often referred to as the Fourth Industrial Revolution, as a prominent driving force. These studies find that within the context of Industry 4.0, adaptation is necessary to meet societal demands for highly skilled graduates and respond to the needs of employers and industry. Consequently, employability emerges as another significant driver, mentioned in 10 studies. As such, a majority of the included digital transformation frameworks are industry and market oriented and foresee a concrete future dominated by Industry 4.0 development. These frameworks are often connected to a more tech-dominant view and approach to education.

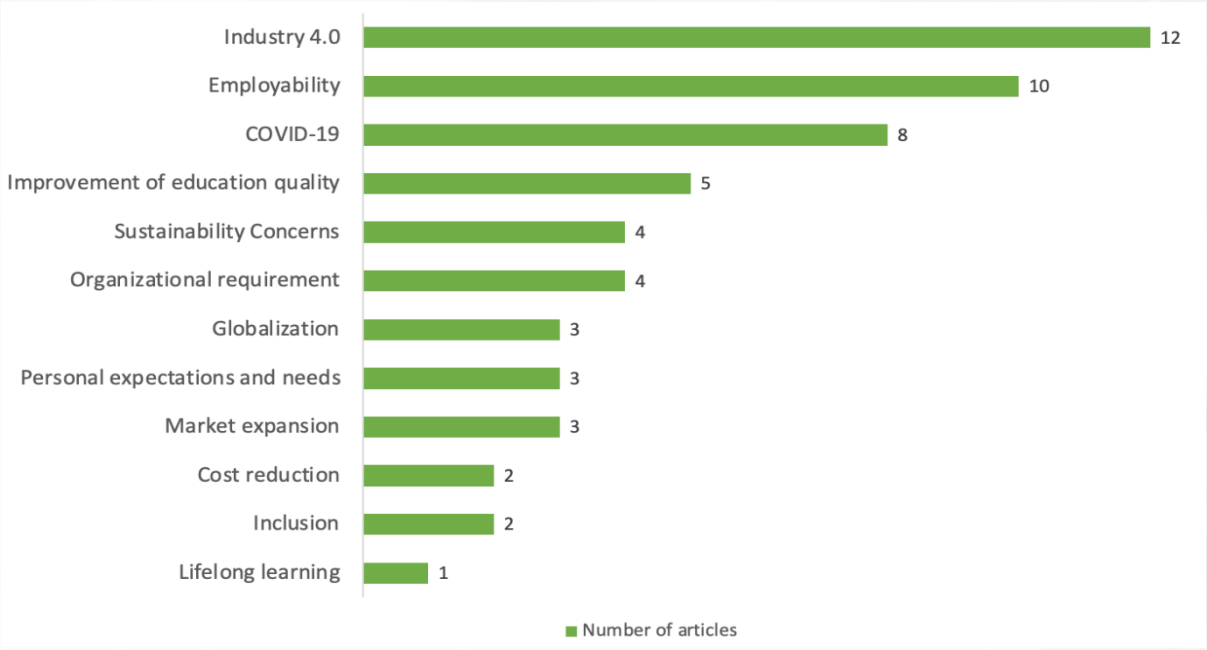

Figure 2: Drivers of digital transformation in engineering education

Figure 3 illustrates the distribution of the frameworks' underlying beliefs regarding the relation between digital technology and pedagogy based on Fawn's framework on entangled pedagogy. The frameworks with a tech-deterministic understanding (5) were all identified in market driven and oriented frameworks (Broo et al., 2022; Gardanova et al., 2020; Guray and Kismat, 2023; Hulla et al., 2019; Villarreal et al., 2021). Quality of education is only fourth highest in frequency, covering drivers such as best practice for learning, student expectations, education 4.0, social equality and responsibility, (Block, 2018b; Franuszkiewicz et al., 2019; Luengo et al., 2022; Suárez et al., 2021; Taborda et al., 2021), while only two frameworks emphasized issues of inclusion (Kammerlohr et al., 2022; Rodriguez-Paz et al., 2022). Focusing on frameworks that align with notions of transformative pedagogy and EDI, we find that such frameworks have more entangled beliefs about the relation between digital technology and pedagogy. Five of the eight studies analyzed as having an entangled understanding had quality of education as a main driver for digitalization.

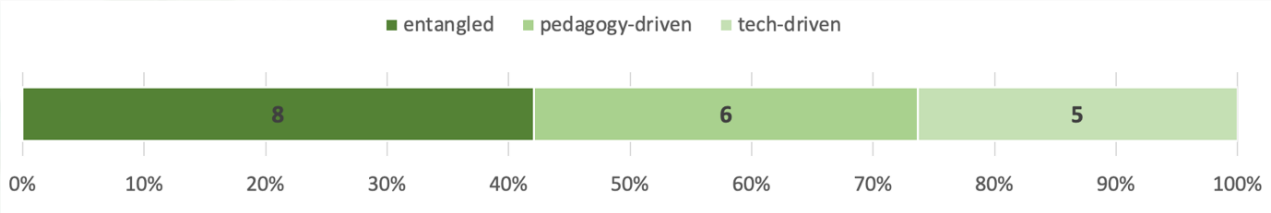

Figure 3: Beliefs about the relationship between digital technology and pedagogy

They promote distinct pedagogical values and benefits afforded or enhanced by digital technology. These include providing greater variation in teaching formats and flexibility for students; promoting inclusion, accommodating diversity and ensuring greater access to education; enhancing learner motivation and creativity through empowerment, engagement and personalization; fostering globalization and interdisciplinarity through openness and community. In creating our own framework, we are inspired by such frameworks' value driven approach that consider pedagogical values and affordances relevant to transformative pedagogy, EDI education, hacking and rewilding.

Types of digital tools specific to engineering education

Another emerging finding of the review emerged through a cross analysis of digitalized learning activities and digital tools. By focusing on the key role and purpose of digital tools in relation to engineering education the data analysis identified four types of digital tools and one last type was added by the authors based on recent technological development that were not evident in the included studies but already evident in education. The typology is presented in table 1 below.

	Types of digital tools in relation to learning	Description
1	Content Digitalization	Tools for digitalizing content for the purpose of acquiring and mastering knowledge (e.g., podcast, video, texts, etc.)
2	Cognitive Facilitation	Tools that support and enhance processes such as brainstorming ideas using online whiteboards, project management tools, etc.
3	Physical Emulation	Tools that replicate or augment physical experiences (e.g., AR and VR glasses)
4	Interaction	Tools that facilitate communication and interaction between people (e.g., MS Teams, Zoom, Messenger, etc.)
5	Creation	Tools that enable creation based on human input (e.g., AI)

Table 1: Typology of digital tools

Each type of digital tool represents a functionality that was reported to assist engineering education activities/needs. Most often tools will have a core purpose and functionality but might incorporate features from other types as well. For example, online whiteboards can be used for cognitive facilitation when doing a brainstorm. However, many online whiteboards offer multiple users at the same time and therefore also a (limited) form of interaction. In this way, some tools will have characteristics from different types, but can still be categorized by its main function.

The typology can have value in different ways to different stakeholders. As other frameworks, with a broader approach (no specificity to engineering education) such as TPACK (Mishra & Koehler, 2006), have pointed out how to identify pedagogical approaches that are mindful of and combine the affordances of technology, the subject specific content details and good pedagogy.

2. The HIP framework

The HIP framework is based on transformative pedagogy and the values of EDI in education (Beskorsa et al., 2023). This entails a framework that promotes teacher and learner empowerment and agency to critically examine beliefs and values to engage in social action by placing learners at the heart of the learning process. It also includes addressing issues related to ethics and consideration of EDI in terms of race, gender, ability, economic capital and cultural background. Therefore the framework should expand and widen possibilities of promoting and considering such values, but also explore and take advantage of the affordances of digital technology. In the literature review above, we have attempted to give a thorough review of the general development in recent time and frameworks, and identified elements that inspire us in developing our own framework for HIP digital pedagogy. This entails a post-pandemic pedagogy that looks beyond boundaries such as formal and informal education, boundaries such as semesters, programs, disciplines. A postdigital pedagogy that acknowledges the entanglement of teaching and learning. A pedagogy that is inclusive and recognize individuals' capabilities and needs. A responsive pedagogy based on reflective practice. And finally, a pedagogy inspiring teaching cultures and communities with the spirit of rewilding and hacking. We see the modern educational space as a hybrid reality, where physical and digital practices are interwoven and evolve together leading to new possibilities. Hybridity is thus a condition that shapes pedagogical decisions. Digital education cannot be isolated with its own unique and categorical values but must be regarded as entangled and negotiated with broader educational practices and values. From the literature review we learned that digital technology has the potential to change how we work with education in specific areas of education, but we also learned much of this potential has not been realized in higher education. Some of the identified pedagogic values that digital technology has been used to promote in relation to transformative pedagogy, rewilding and hacking were flexibility and variation;

inclusion, and accessibility; agency and empowerment. Based on these findings synthesized with findings from Beskorsa et al. (2023) and values of EDI and transformative pedagogy we present an alternative vista of digital education that the framework aims to promote.

- Flexibility and variation
- Access, diversity and inclusion
- Teacher and student agency and empowerment
- Community and openness

Thus, the framework should provoke reflection on and examination of how educators, and other stakeholders, and digital technology complement each other to make education flexible and varied, accessible, inclusive and diverse, supportive to agency and empowerment of teachers and students, and community based and open. These values and visions for digital education reflect the core beliefs of our rewilding and hacking methodology and should be implemented in the spirit as they were presented by Beskorsa et al. (2023).

3. A responsive and entangled flow approach - A learning design tool based on an entangled and reflective flow model

The following model takes departure in the framework values and should be regarded as a tool for guiding teachers to design learning activities in their teaching communities, with students or by themself. It supports practitioners' reflection and agency in an increasingly entangled and complex relation of pedagogy and digital technology by taking practitioners and/or students on a collective reflective journey through a series of steps. As can be seen in figure 4, we have situated the teaching challenge/experiment in the center surrounded by the values and visions of the framework together with hacking and rewilding ideology. This is to ensure a value-driven process that ensures working with challenges and experiments that address the core values of the framework. The surrounding circles each represent a point of attention for responsive reflection and action. The connections between the reflection points through the center reflect the entangledness of digital technology and pedagogical ideology and choice, e.g. if your designing a knowledge acquisitional activity it should spawn reflection on interdependencies and interconnectedness, what characterises such an activity, what are the digital affordances of promoting the central values, what is my personal, communal and institutional digital ecology etc.

Depending on the nature of the teaching challenge or experiment, the relevant starting point will be different. Otherwise, to promote inclusion, student centeredness and community building with students, we suggest starting by considering the student, by asking *who are my students and what are their strengths and challenges?* This might include reflections on discourses related to race and gender, students ability,

their social and cultural background and more. At the same time, it is equally important to consider *who am I as a teacher and what are my strengths and challenges, e.g. digital competences?* As the postpandemic literature has shown, it might also be relevant to consider how other stakeholders, such as administrators, IT specialists and others might play a role in the design. However, the point of departure can vary. In some cases, we might have to take point of departure in a specific choice of digital technology, as was the case during lockdowns imposed due to COVID-19. In other cases, teachers are tasked to design a specific teaching activity, which then will be the starting point. This will affect other choices due to the entangledness of all points of the model. A reflection cycle would start with the Intended Learning Outcome(s) (ILO). Where we ask *what learning outcomes or skills do my students need?* At this step, practitioners should consider the type of ILO. This reflection could be guided by a taxonomy of learning to further reflection on constructive alignment between activities and assessment (Biggs, 1996). This leads on to the reflection point on Types of activities, where we could ask ourselves *what kind of activities would develop such knowledge and skills best?* Diana Laurillard's (2013) typology of 6 learning types can be a reference for reflection and discussion for this step. The types include acquisition, collaboration, discussion, investigation, practice, and production. Most often a learning activity or design would include several different types of activities, but one type might be more dominant than another. Some types also might be more inviting to include students' reflections or other stakeholders into the reflection point.

Next, we ask *what are the basic processes of learning of the selected type of learning? And what type of digitalization is then needed to support it?* This reflection can be supported by a learning type differentiation theory, such as the ICAP framework by Chi (2009) that distinguishes between passive, active, constructive and interactional learning types. A learning activity might include different types of learning, but again, one type might be more dominant than another. Based on those reflections and choices the practitioner should consider the different types of digital tools, that emerged from the review, and can best facilitate these types of learning, content digitization, cognitive facilitation, interaction, physical emulation and creation. The situatedness of these activities are a point of reflection in the next point about Digital learning space, where we consider *is it an individual activity, part of a work group or team, supporting a community of interest, or open connections to other more peripheral or external stakeholders* and how these different digital spaces can expand opportunities of learning (see Dalsgaard & Ryberg, 2023 for more details). The next point of the model lets the practitioners reflect on the digital ecology both in terms of what is offered from a top-down institutional perspective, but also from a bottom-up perspective, where teachers

Quick tip: Gamify the model with either colleagues and/or students. Choose a value or ideology from the center that you want to develop in your practice and visit the reflective circles 5 minutes each. For each circle you have to discuss possible barriers, ideas and possible actions needed to be taken. Finish by narrating your co-created design of the learning activity.

and students explore and search for alternative digital technologies outside of the institutional ecologies and thereby supporting acquisition of conceptual, procedural, technical and societal learning aspects.
In the last step, by piecing together different reflections and choices to a narrative, a learning design emerges. The narrative serves to provide an open semi-structure, speculative of how the learning design would work. For this step the practitioners are prompted to narrate the imagined future learning process based on collective reflection on previous experiences. Yishai Mor's work on participatory pattern workshops (PPW) (2012) and the collaborative e-learning design method (CoED) (Ryberg et al., 2015) can provide as references for inspiration for this step. It aligns with the wider speculative turn in critical education research (Ross, 2022; Houlden & Veletsianos, 2022) and is fitting as the final step for the outcome of education is never certain and always has a quality of no-yetness (Collier & Ross, 2017).)

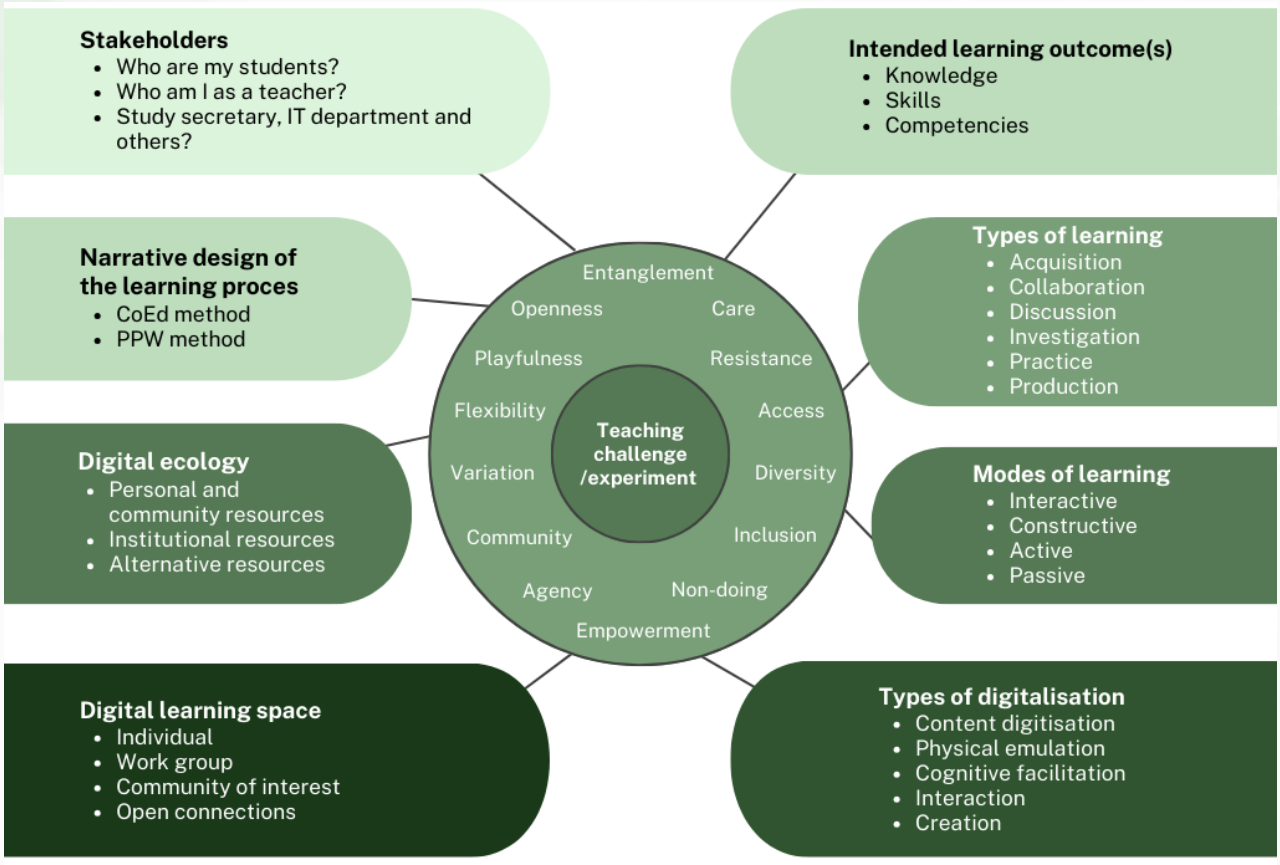

Figure 4: An entangled flow model

This report has delved into literature surrounding the digital transformation of education, with a particular emphasis on transformative pedagogy and EDI. Through a review of existing knowledge, we have uncovered valuable insights and trends that underscore the critical roles of both digital technology and pedagogy in reshaping the educational landscape. Our hopes are that the HIP framework will serve as a potent guidepost for educators and institutions seeking to navigate the complexities of digital education. Coupled with the entangled flow model we have introduced this framework offers a practical pathway towards the creation of innovative and engaging learning experiences. Yet, the true power of these resources lies in their potential to foster and support learning communities that will use the framework as a catalyst for change, for it is through our collective efforts that we can reshape the future of education.

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