



The Digital Transformation of Higher Education Teaching: Four Pedagogical Prescriptions to Move Active Learning Pedagogy Forward

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INTRODUCTION

Digital learning technologies are expected to reform higher education: The recent Digital Education Action Plan (2021–2027) of the European Commission (EC) states that digital education should facilitate more personalised, flexible, and student-centred teaching (European Commission, 2021). This places great demands on university teachers, whose technological skills have long been considered the most formidable barrier to the digital transformation of higher education (Børte et al., 2020). Meanwhile, the COVID-19 pandemic has resulted in a steep technological learning curve among higher education teachers. Overnight, university teachers were forced to adapt their teaching to a digital, online format to meet the needs of more than 1.5 billion students across the globe who have been affected by COVID-19 restrictions (UNESCO, 2021). Despite a great willingness to change, over a year into the pandemic, the frustration among (university) teachers has become apparent. A United Kingdom survey found that higher education teachers thought that their pedagogical practis had been “reduced to the fulfilment of rudimentary technical functions” and that they played more of a transmissionist pedagogical role (Watermeyer et al., 2020). Taking the perspective of the students, recent survey data from Norwegian higher education shows that, during the pandemic, lack of motivation and sense of loneliness have been an increasing problem among students (NOKUT the Norwegian Agency for Quality Assurance in Education, 2020). From this we learn that a fully digital approach in higher education has limitations both when it comes to pedagogical practices and students’ well-being.

A review of the literature in undergraduate science, engineering, and mathematics courses found that compared with traditional lecturing, active learning in combination with traditional lecturing, increases student performance and is therefore the preferred teaching practice in regular classrooms (Freeman et al., 2014). The same is true for higher education in general, where the literature broadly supports active, collaborative, cooperative, and problem-based teaching approaches (Prince, 2004). Despite this support, the adoption of active learning by higher education teachers has been contested for decades. A widely cited report on United States universities in the early 1990s concluded that the implementation of active student learning was obstructed by the powerful influence of educational tradition and a lack of coordinated institutional actions (Bonwell and Eison, 1991). It has been suggested that to promote active learning, institutions must take a more active role in changing teaching beliefs among academic staff (Antunes et al., 2021).

Despite the high expectations to digital education, a review commissioned by the Norwegian Ministry of Education and Research found that technology was most often used to support traditional teaching and that scholarly approaches that promote active pedagogies are lacking

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(Lillejord et al., 2018). An updated review by the same group concluded that staff's professional development is a prerequisite for successful implementation of technologies in active pedagogies (Børte et al., 2020).

Digital education is an umbrella term for various technologies and pedagogical practices in which online learning, distance learning, and blended learning are particularly highlighted in the EC action plan (European Commission, 2021). Blended learning designs combine digital technologies and face-to-face teaching, thus providing opportunities for social interaction between students and between teachers and students. Despite their popularity, the development of pedagogical elements in blended learning designs is anaemic. Perhaps as a result, the use of technology in higher education remains a divisive issue (Johnson et al., 2012; Lillejord et al., 2018).

The aim of this paper is to introduce four pedagogical prescriptions to move Active Digital Learning Pedagogy forward, to compile a list of barriers to the implementation of such a pedagogy, and to propose needed institutional actions to accelerate the implementation. Hence, this paper sets out to suggest directions for future empirical research that will add knowledge on which institutional actions are more important. We draw on the higher education literature and the authors' more than 50 years of teaching experience in health education and teacher education, in which we have conducted research on higher education teaching and supervision, including blended learning approaches. Although most examples provided herein are from Norwegian higher education, we believe that due to the extensive digitalisation of Norwegian society, the Norwegian context constitutes a pioneering and interesting case for other countries.

THE ACTIVE DIGITAL LEARNING PEDAGOGY

The EC's Digital Education Action Plan emphasises that digital technology is reshaping society and that it should offer personalised, flexible, student-centred, collaborative, and creative learning (European Commission, 2021). However, despite these high ambitions, studies suggest that technology is predominantly used to support existing educational practices (Damşa et al., 2015; Lillejord et al., 2018; García del Dujo and Martín-Lucas, 2020). Because classroom engagement is found to promote deeper levels of thinking and learning than traditional lectures (McGlynn, 2005), we suggest that the policy aims of digital education outlined in the EC plan can be fully achieved only when integrating digital technologies with active face-to-face learning (as in blended learning).

Active learning is a contested concept. A critical examination of its educational purposes found that it may be unfocused and unsettling, at times leaving students feeling "confused and (temporarily) incompetent" (Dall'Alba and Bengtson, 2019). On the other hand, it has been shown to increase student performance (Freeman et al., 2014), and a classic review concluded that there is broad support for the core elements of active learning (Prince, 2004).

We draw on the work of Bonwell and Eison, who defined active learning as "instructional activities involving students in doing things and thinking about what they are doing" (Bonwell and Eison, 1991). Building on this and the EC's initiative to reset education for the digital age, we suggest that Active Digital Learning Pedagogy constitute four rudimentary pedagogical prescriptions on which we will embark below. **Table 1** shows how these pedagogical prescriptions (given in the first row) map on to the EC's list of the advantages of digital technology in higher education.

Student-centredness is a multidimensional concept that encompasses the involvement of students in course decisions (including the selection of learning content and assessments), in the development of learning skills, and in shaping the (higher education) teacher's role (Lemos et al., 2014). The concept of student-centred learning has been linked to flexible, experiential, and self-directed learning (O'Neill and McMahon, 2005), which are clearly mapped on to the predicted outcomes of flexibility and creativity achieved through the introduction of digital technologies in higher education (European Commission, 2021). It has been argued that student-centred learning is about spaces that provide students with the opportunity to act upon their learning needs, intentions, and interests (Blackie et al., 2010; Damşa and Lange, 2019). To achieve this, students must engage with peers and teachers and work on meaningful tasks and projects, such as group discussions, and student meaning-making (Teo et al., 2008). Digital technologies offer such personalised, collaborative opportunities (European Commission, 2021).

Formative feedback constitutes the next pedagogical prescription on our list. Formative feedback means that learners make sense of information from various sources and that they use the information to enhance their learning strategies while integrating feedback into their learning processes (Carless and Boud, 2018). A literature review identified factors that influence students' use of teacher feedback: feedback must be specific, detailed, individualised, unauthoritative, and without an extensive use of academic terminology and jargon (Jonsson, 2012). Additionally, one must consider that students may lack strategies for productive use of feedback (Johansson et al., 2012). The five factors and the additional comment remind us that feedback is also about the receiver. A line of research has focused on developing students' feedback literacy, which entails appreciating feedback processes, developing the capacity to make judgements, managing affect, and taking action to use the feedback (Carless and Boud, 2018). It should also be noted that peer assessment as a formative practice has been found to be effective across a wide range of contexts (Double et al., 2020). However, although various models of formative feedback have been suggested across disciplines, none have been specifically proposed in a digital educational context (Steen-Utheim and Wittek, 2017; Tripodi et al., 2020). Besides in-person feedback, digital education offers unique opportunities for instant feedback by integrating it into the software. As an extension of these technological opportunities, we suggest that a collaborative, team-based working environment can offer a possibility of

TABLE 1 | Pedagogical prescriptions for the Active Digital Learning Pedagogy, mapped on the advantages of implementing digital technologies as outlined by the EC.

	Student-centredness	Formative feedback	Constructive alignment	Flexible infrastructure
Advantages of digital technologies	Personalised Flexible Student-centred Collaborative Creative	Personalised Flexible Student-centred Collaborative	Student-centred Creative	Flexible Collaborative Creative

providing formative feedback. The relevance of the social learning environment in digital education is supported by findings showing that being committed to peers, being recognised, and feeling safe are conducive to learning in flipped classroom education (Steen-Utheim and Foldnes, 2018).

Although digital technologies in higher education have the potential to introduce new and more compound learning activities, they may alienate teachers and students from the learning process. The concept of Constructive Alignment arose from the seminal work of John Biggs (Biggs, 1996). “Constructive” refers to constructivism theory, while “Alignment” refers to a principle of curriculum theory emphasising that assessment tasks should be aligned with what is intended to be learned (Biggs, 1996). Alignment is achieved only by ensuring that the language terms used in the learning outcome descriptions are consistent with the educational and assessment methods. In educational interventions (such as those aimed at introducing digital technologies) designed to help students progress from lower- to higher-order learning skills, it is important that assessments reflect not only fact-based knowledge but also in-depth understanding. Although it can be argued that coherence is important for all types of teaching, in our experience, the use of digital technology in teaching without this in mind can easily lead to more fragmented learning processes. Moreover, empirical evidence suggests that teacher training programmes based on these principles result in more student-centred beliefs among participants (Warriem et al., 2014). Although it can be argued that constructive alignment is ideal for all types of teaching, we believe that in digital education, attention can easily be diverted towards the technology itself, thus alienating students from the learning process. We must remember that technology is not pedagogy.

Lastly, building on McGlynn. (2005) suggestion of classroom engagement, we suggest that learning should take place in a physical context that facilitates social interaction, variation, and (almost) unlimited digital access. Therefore, *flexible infrastructure* constitutes the last pedagogical prescription in our list. Our experience of giving far too many lectures in halls with fixed seats has taught us that learning spaces would benefit from flexible furnishing that can allow for different configurations adapted to the purpose at hand. Such flexible learning environments require a basic technological infrastructure.

While taking the EC’s advantages of digital technologies as our point of departure when describing our four proposed pedagogical prerequisites, it should, however, be noted that none of them (the way they are described above) fully capture

the “... and thinking about what they are doing” part of the definition put forward by Bonwell and Eison (Bonwell and Eison, 1991). As we read it, the concept of metacognition captures this important aspect. Metacognition was originally referred to as the knowledge about and regulation of one’s cognitive activities in learning processes (Flavell, 1979), while more recent research makes a distinction between metacognitive knowledge and skills revealing ample evidence that metacognitive skills are an important predictor for learning (Veenman et al., 2006). A closer look at the body of research on student-centredness and formative feedback reveals that metacognition is an important feature both in student-centred learning [i.e., Lee and Hannafin (2016)], and when orchestrating formative feedback (Veenman et al., 2006). More research is needed to decide whether *learning of metacognitive skills* should be put forward as a separate pedagogical prescription in digital education.

The list of pedagogical prescriptions is obviously preliminary, inconclusive and needs to be further developed in a digital educational context. The slow adoption of digital pedagogies to date indicates that several factors in the educational context may hinder the promotion of Active Learning Pedagogy. These barriers are discussed in the next section.

BARRIERS TO AN ACTIVE DIGITAL LEARNING PEDAGOGY

A recent review found that teachers’ conceptions of teaching, lack of digital competence, and added workload are among the barriers to the implementation of technology-supported education in general (Børte et al., 2020). The implementation of Active Digital Learning Pedagogy faces similar obstacles.

Established Teaching Cultures

A survey in Norwegian higher education found that teachers were generally rather positive about digital education but still sceptical of its benefits for their own disciplines (Kofoed et al., 2019). Evidence also suggests that teachers with a student-centred approach are more open to the use of purposeful technological tools in their teaching (Judson, 2006; Ertmer and Ottenbreit-Leftwich, 2010). In contrast to these teachers’ more innovative approaches, teachers with a transmissionist focus tend to use technology as a supplementary tool (Damşa et al., 2015). Teachers play a decisive role in the digital transformation of higher education. Their autonomy allows them to choose their own teaching approaches, which in turn influence their contributions to long-term curriculum development. Consequently, teachers’

individual beliefs about teaching and learning are crucially important, as underlined by a recent study on the attitudes of academic staff towards a pedagogic shift to active blended learning. Antunes, Armellini, and Howe (2021) identified four main categories of teachers in higher education: “active innovators,” who believe that change is positive and apply it to their academic practice; “lagging innovators,” who hold positive beliefs but fail to fully implement changes; “sceptical but obliging” teachers, who hold negative beliefs, but their practices are consistent with new approaches; and “sceptical and resistant” teachers, who hold negative beliefs and actively resist integrating new approaches into their practice. Without a significant share of “active innovators,” the pace of pedagogic shifts in higher education will probably remain slow.

Another important but largely ignored point is that tensions can arise between existing teacher-centred cultures and the student-centredness of Active Digital Learning Pedagogy. A study conducted by our group on the experiences of health education teachers participating in blended learning found little evidence that the approach challenged their conceptions of teaching and learning (Røe et al., 2021). However, we suspect that there might be variations according to teachers’ experience, age, and discipline. Evidence shows that experience is an important factor. A Swedish 10-year longitudinal study on teachers providing technology-supported education found that novice teachers initially had more teacher-focused conceptions but exhibited a faster and more profound shift towards student-centred conceptions than more experienced colleagues (Englund et al., 2017).

Lack of Digital Incentives and Legislation for Teachers

Teachers’ practical approaches to teaching tend to be heavily influenced by situational factors, the social teaching environment, and the discipline (Smeby, 1996; Richardson, 2005; Lindblom-Ylänne et al., 2006). Institutional incentives and regulations can influence teachers’ motivation to reform their teaching. Research shows that a lack of institutional support is the main cause of concern among teachers regarding the implementation of digital education (Wanner and Palmer, 2015). To our knowledge, few universities have developed incentive structures that capture unique aspects of digital education, such as the considerable additional workload in the design phase. Another reason that teachers may disfavour digital teaching is the current lack of clarity regarding digital material ownership. According to Norwegian law, traditional lectures are the property of the teacher, whereas the ownership of video lectures is disputed (Kielland, 2018). Due to this grey area, teachers face uncertainty regarding compensation for the reuse of digital material. We are concerned that this lack of legislation reduces teachers’ motivation to participate in digital reform.

Unequal Status of Education and Research

In higher education, teaching and research are often equated and are considered to have mutual benefits. However, this widely publicised equality between the two is disrupted by structural

discrepancies in their descriptions in policy documents. For example, the title of the recent digital strategy for Norwegian higher education reads “Innovative education and excellence in research” (UNIT, 2021). Considering that the lack of scholarly approaches is one of the challenges highlighted in a review of technology-supported education (Lillejord et al., 2018), we believe that excellence and quality in research and educational activities should be given equal weight.

Recent findings suggest that the role of research in education is contested and that teachers’ teaching strategies uncritically draw on their personal preferences (Brew and Saunders, 2020). We are concerned that educational research efforts by teachers, are severely hampered by lack of support from institutional administration for this type of research.

Inflexible Physical Learning Environment

The extent to which the physical infrastructure at higher education institutions is adapted to modern perspectives of how learning should take place is questionable (Damşa et al., 2015; Børte et al., 2020). Despite a paucity of relevant research, evidence suggests that innovative, flexibly furnished technological classroom designs have a positive effect on teachers’ choices of educational approaches (Siegel and Claydon, 2016). In our experience, access to flexibly furnished technological classrooms is limited. A reason for this may be that a considerable share of learning spaces is occupied by either lecture theatres or rooms with permanently installed equipment, limiting the applicability of Active Digital Learning Pedagogy.

Acknowledging these barriers, we suggest that a vigorous and more beneficial way forward is to reduce barriers by facilitating the prerequisites for Active Learning Pedagogy. Therefore, we end this section by presenting a list of steps that need to be taken for the “resetting of education and training for the digital age” (as worded in the EC’s Digital Education Action Plan):

- Support student-centred teaching cultures.
- Introduce personalised digital incentive structures.
- Equate the status of research and teaching.
- Redesign the physical infrastructure.

With this list in mind, we propose actions to be taken by higher education institutions.

NEEDED INSTITUTIONAL ACTIONS

A recent study on active blended learning suggested that institutions aiming to promote large-scale sustainable change should actively promote changes in teaching practices and educational beliefs among teachers (Antunes et al., 2021). The same applies to technological skills. Børte et al. (2020) stress that there is an urgent need for more technological skills among higher education teachers. We strongly support this view. We believe that it is necessary for educational leaders at all levels to encourage reform in teaching, provide opportunities to increase teachers’ technological skills, and confront established beliefs

about education, especially those that are not supported by recent research.

It has been suggested that leadership responsibilities are more in the hands of institutional administration than academic leadership (Damşa et al., 2015). Therefore, increased attention to contextual factors may be required. An urgent step to be taken by institutions is to provide incentives for the compensation of teachers for digital development work and guarantee their ownership of video lectures and other digital material created without the direct involvement of institutional support functions. Reuse must be compensated for in a reasonable manner. Although this may be seen as costly in the short term, increased opportunities for the reuse of digital material may produce the opposite outcome. However, to take full advantage of such opportunities, educational leadership and planning across units and programmes are required.

Another issue is that good teaching practices are not being transferred to colleagues, nor do they change practices over time (Sinclair and Aho, 2018). The implementation of Active Learning Pedagogy should adopt a scientific approach, including dissemination in conferences and academic journals. To achieve this, both administrative support functions and educational research networks at institutions must be strengthened.

Good will and ambitious institutional strategies may not be enough. It is imperative that institutions take a holistic approach to educational quality and the design of the physical environment on campuses. In our experience, the design, maintenance, and rebuilding of learning spaces are often the responsibilities of separate institution departments. We believe that learning spaces designed for a particular pedagogy or practical skill should be kept to a minimum. The requirements for spaces suitable for Active Digital Learning Pedagogy should be met. Educational spaces that meet basic technological requirements (e.g., wall-mounted monitors, wireless internet access, and power outlets for laptops) may offer better and longer-term solutions than advanced digital showroom prototypes. Based on observations at our university, pilot digital learning spaces that meet these

requirements have become immensely popular with teachers and students, even in after-work hours. We believe that this type of flexibly furnished digital learning spaces is the future.

CONCLUDING REMARKS

Significant pedagogical advancements in the use of digital technologies can be achieved only if higher education leaders and teachers pull in the same direction. Active Digital Learning Pedagogy and our suggested preliminary list of pedagogical prerequisites can provide insights into how to “pull” and in what direction. This unstructured literature review, informed by our own experiences as digital innovators, made us realise that the digital transformation of higher education can be far slower than desired, and is even at risk of maintaining at status quo. This is a problem: Higher education students of today are familiar with using digital technologies in their daily life and will increasingly expect educational practices that fully utilise the opportunities offered by digital learning technologies. There is a need for empirical research to investigate how our proposed pedagogical prescriptions for active digital pedagogy can move the digitalisation of higher education forward. In order to facilitate an Active Digital Learning Pedagogy, we propose that institutional actions must be taken.

DATA AVAILABILITY STATEMENT

The original contributions presented in the study are included in the article/Supplementary Material, further inquiries can be directed to the corresponding author.

AUTHOR CONTRIBUTIONS

YR was responsible for the planning of the paper. YR, SW, and AB participated in the writing of the paper.

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