A Conceptual Model of Blended Learning in the Context of Digital Teaching and Learning Transformation

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Abstract: This paper explores the necessity for a new vision in education, emphasizing the significant role of the digital dimension in skill development and lifelong learning opportunities, alongside the traditional didactic triangle of learner, teacher, and content. We propose a conceptual framework for digital teaching and learning transformation, focusing on three main components: the digital learning ecosystem, quality learning contexts, and support for digital transformation. Finally, we discuss the potential influence of generative artificial intelligence (GenAI) solutions on digital teaching and learning transformation, highlighting the need for further research in this area. Overall, this paper provides insights into the complex process of digital transformation in education and offers key components enhancing teaching and learning practices in the digital age.

1 INTRODUCTION: DIGITAL DIMENSION IN EDUCATION

The rapid development of technology, the increasing globalization of the digital world, and changes in societal structures highlight the need for a new vision in education, where the digital dimension is considered significant both in terms of skill development and in ensuring more accessible, personalized, and transformative lifelong learning opportunities for every citizen. Therefore, modern or, using the term of Fullan and Donelly (2013) 'new pedagogy' relies on the acceleration and deepening of the learning through effective use of pervasive digital technologies (Fullan et al., 2017; Sinay & Graikinis, 2018).

Digital dimension appears prominently in both national and global policy documents, e.g., in OECD's Four Scenarios of Schooling (OECD, 2020) in which none of the four suggested learning scenarios is based on a traditional model of a school as a brick-and-mortar establishment, but rather distributed and networked personalized ecosystems of learning, all of the scenarios imply hybrid learning environments; WEF's Education 4.0 Framework (WEF, 2020) calls for technology skill development and innovative pedagogies such as personalized and self-paced learning; accessible and inclusive learning.

In these frameworks, digital dimension is seen as an enabler of more inclusive learning opportunities where digital tools and information are to be used in a meaningful, human-centred context with careful consideration of its potential benefits for transforming individual's lives as well as associated risks. With digital technology, teaching and learning methods can be enhanced, fostering deeper learning experiences. This enables opportunities for student development in critical thinking, collaboration, creativity, communication, and independent learning both in and out of the classroom (Dede & Frumin, 2016).

These frameworks, in a sense, set a high bar for technology use – it is insufficient and maybe even counterproductive to view use of technologies in education as an end in itself or as merely a way for teachers and administrators to do their tasks more efficiently, but rather consider use of technologies as

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part of future-focused transformative education scenarios. Technology has the potential to change how learners, educators, resources, and content are viewed in modern learning settings (OECD, 2017). Additionally, the advancements in generative artificial intelligence (GenAI) solutions (Gottschalk & Weise, 2023) in recent years holds the potential to fundamentally alter the didactic triangle (Kansanen & Meri, 1999) and reshape the dynamics of student-teacher interaction in the future. Such scenarios call for deeper system-wide changes at all levels, not only practices of individual teachers for the promise of digital transformation to be realized.

The situation described above leads us to the central question of this position paper: how to conceptualise digital teaching and learning transformation at all education system levels?

We first review three integral concepts for digital teaching and learning transformation – digital learning ecosystem, quality learning contexts and support for digital transformation. Furthermore, we use the reviewed concepts to justify our proposal for the conceptualization of digital teaching and learning transformation in education – a theoretical framework, which is further explored at the classroom level in a conceptual model of blended learning. We conclude this position paper with a discussion of future research directions.

2 THEORETICAL FRAMEWORK FOR DIGITAL TEACHING AND LEARNING TRANSFORMATION

2.1 The Digital Learning Ecosystem Levels

Digital learning ecosystem (DLE) frameworks identify critical components and processes that need to be attended to in order to help schools and teachers better leverage digital opportunities. For example, Nguyen and Tuamsuk (Nguyen & Tuamsuk, 2022) suggest that DLE is like a natural ecosystem in which biotic (teachers, learners, stakeholders etc.) and abiotic components (technologies, infrastructure, learning contents, administration) interact with each other and with their social, economic and cultural environment; within it teachers, students, educational institutions and stakeholders share learning resources and tools to boost the learning process.

From a systems perspective, it is helpful to consider digital learning ecosystem as consisting of three levels: micro-level (teaching and learning practices), meso-level (institution), and macro-level (system, society):

- The micro-level focuses on teachers and students at the classroom level, encompassing collaboration between individual teachers and students, as well as the use of digital tools and technologies to enhance the teaching and learning experience.
- The meso-level encompasses the school culture, structure, and internal policy actions (for example, the use of artificial intelligence in the learning process), as well as the integration of digital technologies at the school level. This includes the implementation of learning management systems, digital content, and collaboration platforms.
- The macro-level encompasses national policy and global trends that shape the educational environment. This includes the development of infrastructure, funding mechanisms, and policies to support digital learning initiatives on a broader scale, as well as international frameworks for digital education.

These levels interact and influence each other within the digital learning ecosystem. Alignment among the three levels is crucial not only in any teaching and learning environment but it becomes particularly significant in hybrid and online learning environments, where there is an increased responsibility and self-regulation on the part of the learner (Voogt & Knezek, 2021). For instance, during the COVID-19 pandemic students struggled to adjust to online learning and found learning a burden (Oyedotun, 2020), faced challenges with self-regulation (Van Dorresteijn et al., 2020).

Voogt and Knezek posit that alignment can be achieved in three ways – a) through quality learning contexts; b) teacher support; c) collaboration among representatives of different levels. We will tackle quality learning contexts first as key concern of the micro-level of a digital learning ecosystem, while the latter two will be addressed primarily at the meso- and macro-levels.

2.2 Quality Learning Contexts

There is a growing consensus in the scholarly community that mere presence of technologies in the classroom does not enhance learning or improve learning outcomes for students (van den Berg et al., 2004; Jenkins, 2007; Consoli et al., 2023). Digital tools have the potential to enhance or even transform teaching and learning practices if and when used in a

deliberate and appropriate way, considering whole student experience and context of use. Without deliberate attention to digital learning environment design, there is a danger of replicating or even reinforcing poor pedagogical practices.

Consoli et al. (2023), in their review of large-scale studies, conclude that the mere frequency of technology use at school does not lead to better learning outcomes. Juuti et al. (2022) found that while frequency of technology use did not have a significant impact, functional use of technology (appropriate, seamless use in context) did yield positive effects on student academic achievement.

With regard to quality learning contexts, Voogt and Knezek (Voogt & Knezek, 2021) emphasize two alignment issues: 1) how to consider the entire student experience using digital tools (for instance, the use of technology as a cognitive tool for learning support cannot be isolated from the psychological and emotional impact of digital technologies on student); 2) how to integrate technology into educational and pedagogical objectives.

Thus, to foster deeper learning, greater student engagement and academic achievement, sound pedagogical models and thoughtful integration of technology, content and pedagogy to achieve specific learning outcomes are key, especially in hybrid and blended learning settings.

2.3 Institutional and System-Wide Support for Purposeful Digitalization

With regard to meso- and macro-level system alignment in support of teachers, Voogt and Knezek (Voogt & Knezek, 2021) emphasize that support offered needs to be aligned with the teachers' competency needs in four competency domains. required for online teaching, i.e., interpersonal skills, organizational skills, technological pedagogical content knowledge, and flexibility. In addition, professional learning activities should target teacher pedagogical reasoning about technology use in education, so that they would then be able to align technology affordances with the learning activities and educational goals. Furthermore, when school leadership and teachers share a vision about the role of technology in the teaching and learning process technology integration efforts are more effective (Christensen, R. et al., 2018).

Overall, research suggests that successful digital transformation in K-12 settings requires a combination of strong leadership, effective professional development, collaborative planning, stakeholder engagement, and establishment of a culture of innovation and risk-taking (Christensen et al, 2018; Elkordy et al., 2021; Yuliandari et al., 2023; Reich, 2020; Voogt & Knezek, 2021; Ninkovic et al., 2023). Additionally, alignment of technology with instructional goals, integration of digital technology into the curriculum, and presence of appropriate resources are also important factors to consider. For example, Luckin et al. (2012) offer Ecology of Resources framework distinguishing between four different types of resource – People (and their attitude and skills): teachers, adults, peers; Tools: learning materials; Environment: the setting in which learning is taking place; and Knowledge and skills: the learning outcomes in focus at any particular moment). We have incorporated these elements in the theoretical framework described below.

2.4 Theoretical Framework

The theoretical framework outlined in this study (see Figure 1) has evolved over the past two years within the project titled "*Innovative Solutions for Blended Learning Implementation: Teaching and Learning Processes in the Context of Digital Transformation.*" It has been shaped by insights from other researchers and the expanding literature on digital technologies in education. The proposed Theoretical Framework for Digital Teaching and Learning Transformation (TF) is an attempt to systematically integrate the three main components: content, pedagogy and technology to ensure that the promise of digital transformation in education is fully realized and an increasing number of students can benefit from personalized and meaningful learning experiences. It also links together the three digital learning ecosystem levels to ensure better support for meaningful technology integration. The TF will further be used to analyze complex relationships between digital transformation and its impact on teaching and learning.

The TF (see Figure 1) centers around student learning and purposeful integration of content, sound learning principles and the use of digital tools at the classroom (micro) level. At this level, the TF highlights the importance of aligning teaching and learning approaches with technologies, based on specific learning principles - communication, cooperation and cognitive activation. In simple words, the teacher in the classroom have to match the curriculum's content to the specific learning needs of students and select suitable digital tools to offer the most effective learning experience, taking into account the type of learning goals involved.

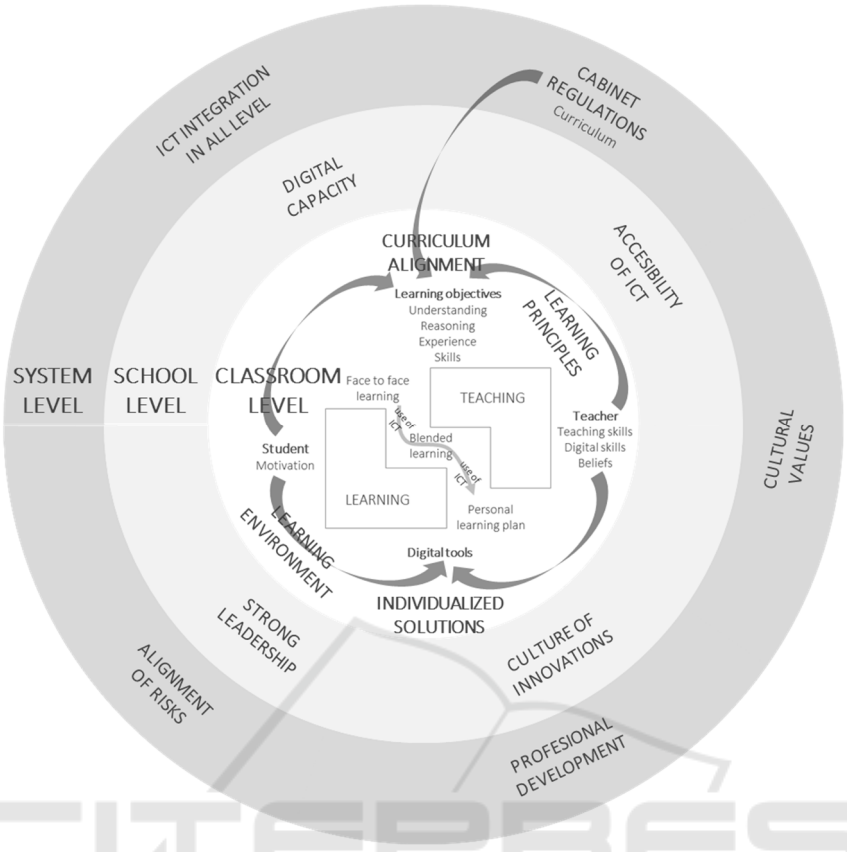

Figure 1: Theoretical Framework for Digital Teaching and Learning Transformation.

Student motivation and readiness for technology-enriched learning environments as well as subject knowledge, pedagogical skills, technological competencies and confidence in their abilities are important considerations for successful digital transformation of teaching and learning at the classroom-level.

At the school (meso-) level, the TF includes the following key prerequisites for successful digital transformation: digital capacity and accessibility of ICT, strong leadership and culture of innovation. Low digital capacity can result in widening gaps, inequalities, and learning losses (Blasko et al., 2022) Schools need to enhance their digital capacity by building the right culture, policies, infrastructure, and ensuring that both students and staff have the necessary digital skills to effectively use technology in teaching and learning (Costa et al., 2021; Timotheou et al., 2023). Our previous research demonstrates that for any transformative change at the school level, the role of school leadership in supporting professional learning of its staff, creating trusting and mutually supporting environment and fostering collective efficacy beliefs around increased student achievement are critical for long-term sustained change (Lazdiņa & Daga-Krūmiņa, 2023; Greitāns & Namsone, 2023).

At the system (macro) level, the TF model emphasized the importance of personalized and needs-based professional development for teachers, acknowledging the transformative nature of changes in teachers` perspectives and the acquisition of essential skills for digital transformation.

Therefore, comprehensive support at all levels is necessary, which encompasses ICT integration, regulatory frameworks, and risk mitigation strategies, to effectively promote the desired transformation of teaching practices and ensure the successful implementation of the theoretical framework.

3 BLENDED LEARNING

To further refine content, pedagogy and technology integration options at the micro or classroom level, we offer a conceptual model of blended learning. Blended learning has been described as the integration of face-to-face and online instruction

(Graham, 2013). Blended learning has also been conceived as a structured educational program where students engage in learning partially through online content delivery and instruction, allowing them control over such aspects as timing, location, path, and pace. Additionally, part of their learning occurs in a supervised, physical setting away from home. Furthermore, the modalities along each student`s learning path within a course or subject are connected to provide an integrated learning experience (Christensen, Horn and Staker, 2013).

3.1 Characteristics of Blended Learning

Blended learning requires a significant re-evaluation of the roles of both students and teachers, a deep understanding from the teacher regarding the interaction between content, technology, and pedagogy. It may impose additional demands on program design and digital infrastructure.

A common feature of blended learning is that, in cases where a course occurs partially online and partially in-person, typically both parts of the course are integrated. In other words, what students learn online informs what they learn in person, and vice versa. If students have control over their learning pace in a blended learning environment, this control often applies to the entire subject/course (including in-person activities), not just to the online portion of the course.

3.2 A Conceptual Model of Blended Learning

The goal of our Conceptual Model of Blended Learning (see Figure 2) is to help teachers expand on their teaching and learning repertoire by making use of digital affordances and sound learning principles to foster students` cognitive activities, engagement, communication, and collaboration. According to Consoli et al. (2023), “digital affordance” denotes the specific potential of digital technology to change the way teaching and learning takes place. For example, they have identified the following digital affordances from within a broad spectrum of technology integration studies: to promote connectivity and collaboration among students; to enable simulations, animations, and visualizations; to increase differentiation in teaching practices, and to promote self-regulated and independent learning. These digital affordances offer useful criteria for designing and evaluating blended learning solutions and we have incorporated them in our model.

Our Blended Learning Model highlights the importance of considering sound learning principles and selecting appropriate methods, tools and environments, including digital, that are effective for teaching particular learning objectives. It incorporates technology–enhanced face-to-face learning in the classroom, personalized online learning, and blended learning approaches.

The Theoretical Framework of Digital Teaching and Learning Transformation examined earlier (see Figure 1) outlines the prerequisites for the practical application of the blended learning model.

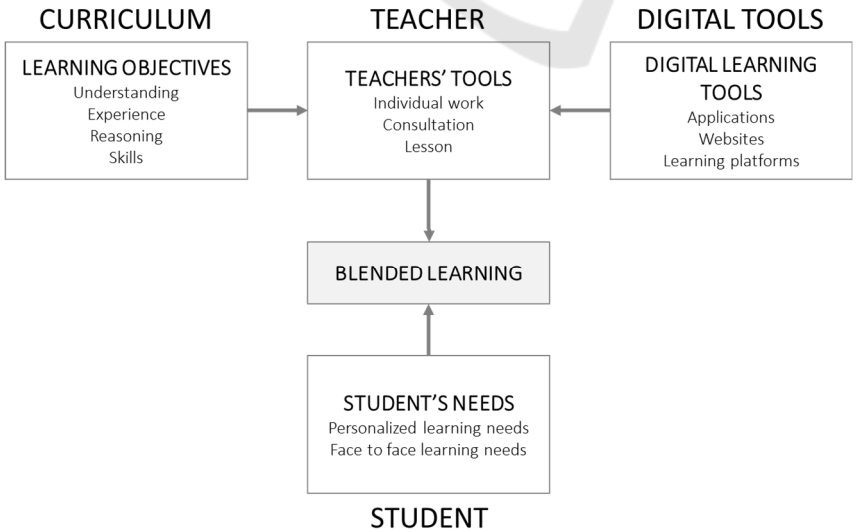

Figure 2: A Conceptual Model of Blended Learning in the Context of Digital Teaching and Learning Transformation.

4 CONCLUSIONS

In this paper we propose thesis that mere presence of technologies in the classroom does not enhance learning and only purposeful integration of content, learning principles and use of digital tools in the teaching and learning process can improve student achievement.

To explain the complexity of digital transformation and identify the essential components for successful technology integration in classrooms, we created a theoretical framework for digital teaching and learning transformation. We argue that digital transformation should be viewed as a multi-level ecosystem, where changes at one level alone cannot effectively support schools and teachers in leveraging digital opportunities. At the classroom level, having access to technologies, motivated students eager to use them, and confident teachers with digital and teaching skills are crucial for successful digital transformation in teaching and learning. Achieving these conditions depends largely on factors such as digital capacity, leadership, and an innovative culture within the school. Furthermore, achieving alignment among content, pedagogy, and technology to meet learning goals is a challenging task for teachers. They require high-quality professional development that is tailored to their specific needs. Such personalized and consistent support should be a priority at the system (macro) level.

Only when there is alignment in understanding of the role of technology in teaching and learning process and what resources are required for successful technology integration at all decision making levels from the classroom, to school and system levels, powerful learning opportunities can be provided.

In this paper, we concentrate on the classroom level and present a conceptual model of blended learning. We suggest that teachers play a crucial role in choosing suitable methods, tools, and environments based on specific learning goals. Put simply, technologies are tools that require skilled individuals to use them effectively.

After the rise of generative artificial intelligence (GenAI) solutions (Gottschalk & Weise, 2023) in the last two years (e.g. ChatGPT was launched by OpenAI in 2022), future studies should explore how these solutions could influence digital teaching and learning transformation. It is assumed that GenAI solutions hold potential for conceptual changes in the digital learning ecosystem models. Several authors agree on the idea that in the 21st century, the canonical didactic triangle (learner – teacher – content) should be reconsidered by adding a fourth pillar – the digital technologies (Seghroucheni et al., 2014; Daaif, 2019; Prediger et al., 2019). From our perspective, an emerging research question is – can high-quality GenAI solutions push out teachers (at least in some cases) from the didactic triangle? Recent studies highlight the important role of teachers when using GenAI solutions (Dasari et al., 2024), yet these solutions evolve rapidly and possibly even now can replace low performing teachers in some instances (Thuy et al., 2024). Therefore, we see a need for an extended discussion around digital teaching and learning transformation by including not only the educational teaching and learning and educational management school leadership perspectives but also the ethical, developmental psychology, and other perspectives.

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