Assessing university students' study-related burnout and academic well-being in digital learning environments: A systematic literature review

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Abstract

Previous research suggested a strong connection between students' experiences of traditional learning environments and study-related burnout (Brown et al., 2012; Chen et al., 2017; Meriläinen, 2014; Kuittinen & Meriläinen, 2014). However, digital learning environments and how they can pedagogically support students' well-being remain, in many respects, an unexplored area (Ruokamo et al., 2016; Lewin & Lundie, 2016). Moreover, pedagogical assessment, including how it can support students' academic well-being, often lags behind the latest technological developments (Spector, 2014; Popenici & Kerr, 2017; Bates et al., 2020; Holmes et al., 2019; Luckin et al., 2016).

This research systematically reviews the literature relevant to study-related burnout and academic well-being in digital learning environments. It is done by surveying articles published between 2012 and 2021. First, the findings suggest that there is a body of studies focusing on certain dimensions of study-related burnout. Second, students' well-being in digital learning environments is less studied and relies mostly on emotional achievement theory and research on academic emotions. Finally, supporting students' academic well-

being through digital assessment is mostly enabled through formative assessment, but it is moving toward artificial intelligence and game-based assessment. Thus, more research is needed on the subject.

Keywords: digital learning environment, digital assessment, academic well-being, study-related burnout, systematic literature review

Introduction

"Constant change" has perhaps never better described the field of higher education and educational technology than in the current global situation. The worldwide pandemic and ecologically sustainable endeavors to bring about human interactions have created a demand for transforming most in-person education to online learning. Both the OECD (2021) and United Nations (2015) have defined individual and collective well-being and changing and equal learning environments as central to their strategies for the next decade. In an era of expanding technological possibilities, digital learning environments are part of the space of university education (e.g., Väätäjä & Ruokamo, 2021; Thompson, 2013; Luckin, 2018; Bhagat & Kim, 2020). As digitality and diverse digital learning environments have become an ever-expanding area in university pedagogy as well and the rates of experienced academic burnout are constantly rising, it is a necessity to identify how these phenomena have been previously studied and what factors should be considered in future research on digital university pedagogy.

While university students' well-being and study-related burnout in traditional learning environments is rather well studied (Salmela-Aro & Upadaya; 2020, Boada-Grau et al., 2015; Pekrun et al., 2010), it remains unclear as to how the rapid digitalization of university pedagogy is affecting students' academic well-being in different digital learning environments and how digital assessment can support students' well-being online. University students' academic well-being as a topic has been approached by examining factors such as exhaustion, cynicism toward the meaning of studies, and a sense of inadequacy as means to measure their study-related burnout (Salmela-Aro et al., 2009; Parpala et al., 2013; Boada-Grau et al., 2015). While the variations in different digital education platforms increase, it has yet to be examined how students perceive digital learning environments and how they are connected to students' learning processes and academic well-being (Parpala et al., 2021; Luckin, 2017). In this context, study-related burnout remains a significant indicator of students' study processes as well as academic drop-out and achievement (Parpala & Lindblom-Ylänne, 2012; Väisänen et al., 2018; Asikainen et al., 2020). Academic emotions and their role in supporting students' well-being, and thus preventing academic burnout, have also been shown to play an important role in their academic endeavors (Asikainen et al., 2020; Pekrun et al., 2010).

Assessment of study-related burnout and academic well-being in traditional teaching-

learning settings is largely formative (e.g., Herrmann et al., 2016, Parpala & Lindblom-Ylänne, 2012; Salmela-Aro et al., 2009). However, it is often fragmented, and thus does not necessarily grasp the multifaceted processes in digital university pedagogy (e.g., Luckin, 2017; Parpala et al., 2013; Hailikari et al., 2018). As there is very little previous research on assessing university students' experienced study-related burnout and academic well-being in digital learning environments, it is useful to investigate the concept of digital learning environments per se in higher education as well as whether the assessment process or methods differ from that of traditional learning settings. As most assessment is already executed online while different types of applications for assessment continue to be integrated into curricula, it has become increasingly difficult to define digital assessment.

The aim of the current research is to identify how university students experience study-related burnout or academic well-being in digital learning environments and how they are assessed online. Further, these frameworks provide guidelines for assessing and supporting student's well-being online by identifying the existing research on students' experienced study-related burnout and other academic emotions in different digital learning environments.

Digital Learning Environments in Universities

A decades-long debate has been ongoing about whether digital pedagogy is actually a concept per se or a self-constructed phenomenon beyond the Heideggerian philosophy of natural technology (Lewin & Lundie, 2016; Davies, 2016). In this context, Lewin and Lundie (2016) suggested that it is imperative to understand the kind of meanings we assign to the technology used in digital education. Digital learning environments can be understood as a multidimensional entity that is observed as a construction between the university student, teacher, and the digital learning environment (Väätäjä & Ruokamo, 2021; Thompson, 2013; Luckin, 2017; Hofer, 2021). Here, it is worth considering how pedagogical digital modalities affect students' learning processes as well as on the other hand, how humans can harness technology for learning in a way that best supports students' overall learning processes and well-being (e.g., Thompson, 2013; Luckin, 2017; Väätäjä & Ruokamo, 2021; Parpala et al., 2021).

In traditional learning environments, it has been suggested that concentrating on students' perceptions of teaching-learning environments offers an adequate tool for measuring the quality of university pedagogy (Entwistle et al., 2003; Herrmann et al., 2016; Parpala et al., 2010; Harvey, 2003; Richardson, 2005), including the interest and relevance of the study content, constructive feedback received during teaching, peer support, and alignment of aims and teaching methods (Entwistle et al., 2003; Herrmann et al., 2016. Additionally, it is also known that there is high individual variation between students and how they evaluate the same study context (Entwistle et al., 2002). However, it is important to

remember that the research, based on teaching-learning environments in traditional settings, is built on years of research on, for e.g., social, cultural, and political contexts in which university education has operated. Therefore, the rapid integration of digitality in these environments is yet another dimension that should be considered as an implicit factor for students' learning and well-being (Kümmel et al., 2020).

As different technologies rapidly emerge into the educational realms and their availability and readiness of use varies greatly, it may be fruitful to focus on the following: how students, overall, experience digital learning environments; and whether there are some aspects of the pedagogical processes that can be made more holistic using digital parallels in the educational context (Rasi et al., 2019; Parpala et al., 2021). There is a fairly large amount of research on different digital learning environments in education and their impact on academic success (Thompson, 2013; Väätäjä & Ruokamo, 2021). Here, students' perceptions on digital learning environments have been suggested to indicate their academic achievement and used studying strategies, collaboration, and engagement (Thompson, 2013; Asikainen et al., 2020; Väätäjä & Ruokamo, 2021; Rasi et al., 2019; Cai et al., 2019, Ellis & Goodyear, 2013, Parpala et al., 2021). However, the more profound observation of the digital learning environments and how they can support students' overall academic well-being has not yet been undertaken.

Study-related Burnout and Academic Well-being in Universities

Although it is a relatively new research topic, study-related burnout has rapidly gained international attention, which speaks to its perceived relevance (Salmela-Aro & Kunttu, 2010; Salmela-Aro & Read, 2017; Salmela-Aro & Upadyaya, 2017; Fiorilli et al., 2017; Seibert et al., 2016; Yang & Chen, 2016). In this context, study-related exhaustion refers to feelings of being burdened or exhausted resulting from overtaxing work, cynicism refers to a lack of interest and a cynical or indifferent attitude towards studying generally and in relation to others, and a lack of professional efficacy refers to feelings of incompetence and poor achievement in studying (Salmela-Aro et al., 2009; Asikainen et al., 2020). All these aspects of study-related burnout have been found to affect students' engagement, including their dedication to university studies (Salmela-Aro & Read, 2017). Recent research has also highlighted that exhaustion seems to be the core of study-related burnout and that emotional and cognitive impairments are the outcomes of burnout (Schaufeli et al., 2020). However, even though research into study-related burnout has been undertaken, the relationship between study-related burnout and students' experiences of digital learning environments has not yet been widely examined. Moreover, students who experience more burnout symptoms have been shown to perceive their learning environment more negatively (Meriläinen, 2014; Meriläinen & Kuittinen, 2020). Thus, it is important to examine how students with different experiences of digital learning environments experience study-related burnout to better understand the connection and support students and their wellbeing in their university studies (Salmela-Aro & Read, 2017;

Väisänen et al., 2018; Parpala et al., 2021). More specifically, Parpala et al. (2021) found that the transition from traditional learning to online learning during COVID-pandemic did seem to increase some students' negative perceptions of learning environments and experienced exhaustion and cynicism in their studies.

On the other hand, socio-emotional skills such as curiosity, grit, belongingness, apt cognitive load, and academic buoyancy have been shown to support students' cognitive and social engagement in different learning environments and prevent study-related burnout (Pekrun et al., 2010; Salmela-Aro & Upadaya, 2020; Kankaraš & Suarez-Alvarez, 2019). Similarly, positive academic emotions that refer to emotions that arise in an academic context are directly linked to academic instructions and achievement, encourage, for e.g., students' self-efficacy and self-regulated learning, and reduce boredom that may manifest as a lack of engagement (Pekrun et al., 2010; Mattsson et al., 2020). Appraisal of positive academic emotions, the cognitive-motivational model of the achievement effects of emotions, and a control/value theory of their antecedents have also been shown to have a longitudinal impact on students' learning processes, which highlights the importance of this study (Pekrun et al., 2010).

Digital Assessment of Academic Well-being in a Pedagogical Context

When examining students' well-being in a pedagogical context, the assessment should not only benefit students' learning but function as a factor preventing students from experiencing more study-related burnout. Assessment itself in the educational context has a crucial role in how students perceive their learning environment, and thus has the capacity to enhance their learning processes (Entwistle, 2000; Biggs, 2003; Parpala et al., 2013; Nieminen et al., 2021). When students' learning processes are seen as a socio-emotional pedagogical feature, it is understandable that their well-being affects their overall learning (Postareff et al., 2017; Kankaraš & Suarez-Alvarez, 2019). Thus, to employ a holistic approach to university students' teaching and learning, it becomes imperative to also assess their well-being as part of pedagogical modelling (Kankaraš & Suarez-Alvarez, 2019; Pekrun et al., 2010; Parpala & Lindclom-Ylänne, 2012).

Moreover, students' self-assessment in higher education is used to enhance their complex learning processes and ensure their engagement throughout the learning process (Nieminen et al., 2021; Panadero et al., 2016; Tan, 2007). Formative self-assessment is traditionally considered to enable a more holistic assessment approach to learning, thus making it possible to employ multifaceted pedagogical features in curricula (Panadero et al., 2016). Simultaneously, summative self-assessment is seen as a future-driven act that branches out from the campuses and supports skills needed outside the pedagogical context, which further emphasizes students' agency in their own learning process (Tan, 2007; 2009; Boud & Falchikov, 2006; Nieminen & Tuohilampi, 2020). Furthermore,

Nieminen et al. (2021) claim in their study that summative assessment supports students' self-efficacy and is linked to more beneficial approaches to learning. These findings support the idea that not only does "why" something is measured matter in a pedagogical context but also "how."

Meanwhile, digital assessment in higher education is often portrayed as technology-enhanced formative assessment (Luckin, 2018; Luckin et al., 2016; Shen & Ho, 2020; Kankaraš & Suarez-Alvarez, 2019). However, AI has also been making its way forward—but not very fast—in the field of pedagogical assessment in the past three decades (Luckin, 2017; Luckin et al., 2016; Zawacki-Richter et al., 2019; Popenici & Kerr, 2017). Additionally, to assess students' well-being online also requires a more subtle approach than the assessment of academic achievement (Sargent & Lynch, 2021; Mattsson et al., 2020). In this context, it should be noted that the digital environment itself causes very different academic emotions in different students and therefore needs to be examined accordingly (Sargent & Lynch, 2021; Pekrun et al., 2010; Heckel & Ringeisen, 2019). Specifically, students' ability to embody emotions supporting (or interfering with) learning in digital learning environments may have many implications on how the assessment of these emotions should be undertaken.

Research Questions

The aim of this study is to identify how university students' well-being is assessed online and how they experience study-related burnout and other academic emotions in different digital learning contexts. To this end, the following research questions are examined in particular:

1. How do university students experience study-related burnout in digital learning environments?
2. How do university students experience academic well-being in digital learning environments?
3. How is students' academic well-being supported through online assessment?

Methodology

The systematic literature review (SLR) methodology was used in this study. When compared to a narrative literature review, an SLR that employs a strict methodology in a documented and structured process results in a more reliable and validated conclusion (Sawyer, 2017). Further, it offers researcher a tool for deeper understanding of a research topic and the context in which it exists (Hart, 1998, pp. 13, 26–27). However, while there is no single way to conduct an SLR, many researchers agree that it essentially involves capturing, evaluating, and summarizing the existing literature (Creswell, 2018, p. 29).

Literature Review

The reviewed papers were first identified through keywords and phrases in referenced electronic databases in June 2021. The keywords were identified through preliminary readings. In the current article, ERIC (ProQuest), ScienceDirect (Elsevier), SpringerLink, SAGE Journals, Academic Search Elite (EBSCO), ABI/Inform Global (ProQuest), Social Science Database (ProQuest), and ACM digital library were used (see Table 1). The literature searches in the ScienceDirect database provided the largest number of articles, while those in EBSCO provided the smallest number of articles. These online retrieval systems and databases were chosen because of their multidisciplinary ranges and their relevance to digital university pedagogy research. The keywords were a combination of the term "digital learning environment" paired with "higher education," "assessment," and finally "well-being/burnout" as these are close to the current article's keywords in meaning. The search terms were adjusted as needed for the retrieval system. Here, the Boolean operator "AND/OR" was employed to combine the keywords. In the end, a total of 158 articles were found with these terms (see Table 1).

Table 1

Number of the Retrieved Articles from Different Databases

Online retrieval system	Database	Number of retrieved articles (N)	Selected articles (N)
ProQuest	ERIC, Social science database, ABI/Inform global	13	2
	SpringerLink	47	5
Elsevier	ScienceDirect	70	5
	SAGE Journals	6	0
Ebsco	Academic Search Elite	4	0
	ACM digital library	18	1
		158	**13**

Inclusion and Exclusion Criteria

Inclusion and exclusion criteria were used to select appropriate and focused studies (Boelens et al., 2017). The former were peer-reviewed, journal articles, published between 2012 and 2021, written in English, and presenting empirical or theoretical research and pedagogical assessment in the framework of students' well-being. The exclusion criteria were short conference articles without clear descriptions, book or article reviews, as well as studies that focused on assessing academic achievement in the digital learning environment, exclusively on digital learning environments (not including well-being), and on a different level of education along with those in which well-being was not considered in a pedagogical context.

The above criteria were defined based on the research aims and questions: to find information relating to the concept of "digital learning environments" AND "higher education" AND "students' well-being" AND/OR "study-related burnout" AND/OR "assessment." Here, several articles were related to only approaching digital learning environments per se or academic achievements or did not consider well-being as a pedagogical feature or focused on a different level of education; these were excluded from the review. Table 2 presents the inclusion and exclusion criteria used in this research.

Table 2

Inclusion and Exclusion Criteria

Inclusion criteria	Exclusion criteria
Peer reviewed	Short conference articles
Written in English	Book or article review
Published between 2012–2021	Focus on assessing academic achievement in digital learning environment
Presents empirical or theoretical research	
Papers found in authors' institutional database	Well-being is not considered as a pedagogical feature
Assessment is considered in the scope of students' well-being and study-related burnout in digital learning environments	Focuses only on digital learning environments
	Focuses on a different level of education

Data Extraction

The data extraction process began with the identification of articles from the eight chosen databases. This was followed by the screening of the articles. Literature searches in the eight selected databases identified a total of 158 articles. The 158 articles' titles and abstracts were screened to exclude ineligible articles. Here, the screening focused on finding the keywords and determining whether the context of the study was suitable for the scope of this research according to the inclusion and exclusion criteria. In total, 26 articles were retained, at which point the full text of the articles was screened. In the end, 13 of the screened articles, published between 2012 and 2021, were included in the final literature review. The excluded studies did contain some keywords but did not correspond with the focus of the research. The process of article identification and the data extraction method is described in the Figure 1.

Figure 1

Method used for Article Identification and Data Extraction Process
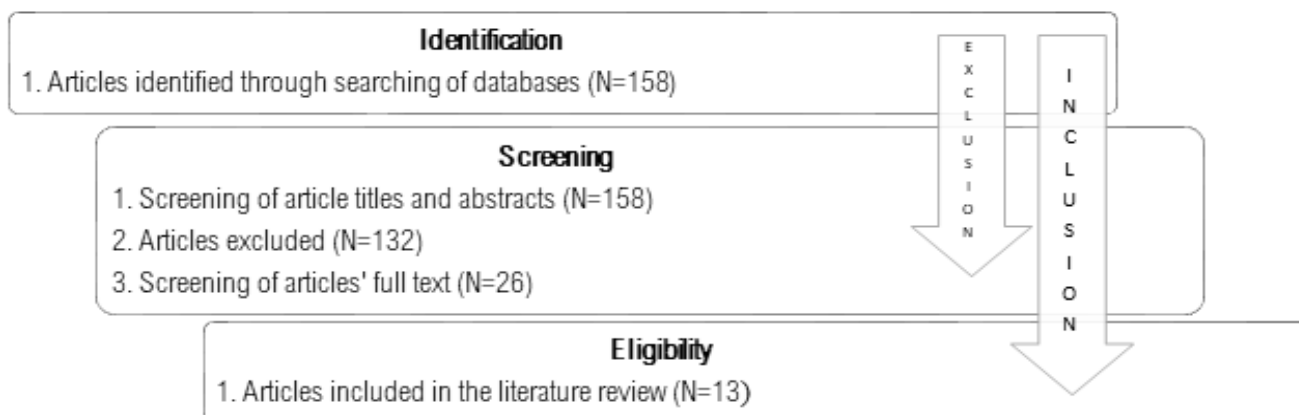
Selected Articles and Their Contents

The selected articles discussed students' well-being and study-related burnout in digital learning environments in higher education. Here, 11 of the 13 articles focused on the assessment of students' online well-being or that of study-related burnout in digital learning environments. Here, only papers found in the databases through the authors' institutional libraries were included. Table 3 presents the central topics discussed in each of the 13 chosen articles.

Table 3

Selected Articles and Their Contents

Study	Digital learning environments and students' wellbeing/study-related burnout	Assessment of students' well-being/study-related burnout in digital learning environments
Arity and Vesty (2020)	Cognitive load theory and flow state in digital learning environment	Combination of self-report questionnaire data and AI (digital cognitive feedback)
Kim and Rosenheck (2020)	Students' sense of agency in digital learning environments	Collaborative gamified assessment; peer-feedback
Lajoie et al. (2020)	Achievement emotions in simulation settings; socially shared regulation technology	Self-report questionnaire data; visual feedback
Reisoğlu et al. (2017)	Cognitive and emotional achievement in 3D virtual learning environments	
Ryan (2020)	Students' sense of agency in digital learning environment	Peer feedback and self-assessment
Schiff (2021)	Student differentiation and socio-emotional support	AI (Intelligent tutoring systems and anthropomorphism in AI)
Srivastava et al. (2019)	Confidence and mental workload/difficulty during video lectures	Biometric signals
Subhash and	Academic emotions in gamified and	

Study	Digital learning environments and students' wellbeing/study-related burnout	Assessment of students' well-being/study-related burnout in digital learning environments
Cudney (2018)	game-based learning; SLR	
Tempelaar (2020)	Disposition of achievement emotions and engagement in hybrid learning environments	AI (dispositional learning analytics)
Tempelaar et al. (2012)	Achievement emotions in online learning and blended learning	Self-report questionnaire data
Tzafilkou and Economides (2021)	Learning emotions in a game-based learning environment	Self-report questionnaire data
Troussas et al. (2020)	Student-centered/individualized learning environments and collaboration using mobile game-based learning	Intelligent mobile game-based application
Zheng et al. (2020)	Self-efficacy and perceived social support in an online learning environment	Self-report questionnaire data

Each of the selected articles addressed research questions that were relevant for constructing the understanding of the current research on university students' study-related burnout and/or wellbeing in digital learning environments. Most of the selected articles were also addressing digital assessment or how it can support students' wellbeing in digital learning environments.

Results

First, university students' well-being in digital learning environments is less studied and relies mostly on research on the achievement emotions theory (Lajoie et al., 2020; Reisoğlu et al., 2017; Tempelaar et al., 2012; Tempelaar, 2020) and academic emotions

(Subhash & Cudney, 2018; Tzafilkou & Economides, 2021). However, there is a body of literature focusing on certain dimensions of university students' study-related burnout (Arity & Vesty, 2020; Srivastava, et al., 2019; Troussas et al., 2020) and how they represent their agency and socio-emotional skills in digital learning contexts (Ryan, 2020; Schiff, 2021; Troussas et al., 2020; Zheng, 2020; Kim & Rosenheck, 2020). Second, the findings of the current study suggest that first the assessment of university students' overall well-being in digital learning is a combination of the formative online self-assessment questionnaire (Arity & Vesty, 2020; Lajoie et al., 2020; Ryan, 2020; Tempelaar et al., 2012; Tzafilkou & Economides, 2021; Zheng, 2020), peer-feedback (Ryan, 2020; Kim & Rosenheck, 2020; Troussas et al., 2020), and a rubric of different digital artefacts including AI (Schiff, 2021; Tempelaar, 2020; Arity & Vesty, 2020), augmented reality (Lajoie et al., 2020), biometric feedback (Srivastava, 2019), visual feedback (Lajoie et al., 2020), and game-based or gamified assessment trajectories (Troussas et al., 2020; Tzafilkou & Economides, 2021; Kim & Rosenheck, 2020), which are often perceived very positively by learners. Thus, it is important to support students' agency and positive academic emotions in digital learning environments (Troussas et al., 2020; Subhash & Cudney, 2018; Kim & Rosenheck, 2020).

Students' Study-related Burnout and Academic Well-being in Digital Learning Environments

Study-related Burnout

Few studies described emotions directly associated with study-related burn-out in digital learning environments (Arity & Vesty, 2020; Subhash & Cudney, 2018; Troussas et al., 2020; Srivastava et al., 2019). Arity and Vesty (2020) as well as Srivastava et al. (2019) found that using scaffolded digital design results in the correct cognitive load, which was in relation to students' feeling less burdened by the task. Additionally, some of the studies reported students increased experienced interest when using digital learning environments. Troussas et al. (2020) found that when using a game-based learning environment, students experienced stable interest throughout the course as compared to a traditional learning environment. On the other hand, students' distraction and frustration caused by inadequate instructions or skills to use the digital platforms also increased in these learning environments (Subhash & Cudney, 2018). The findings resulting in increased/decreased levels of the emotions contributing study-related burnout in digital learning environments are presented in Figure 2. Where increased levels of emotions contributing study-related burnout are marked with plus (+) and color green, are decreased levels marked with minus (-) and color red.

Figure 2

Study-related Burnout in Digital Learning Environments
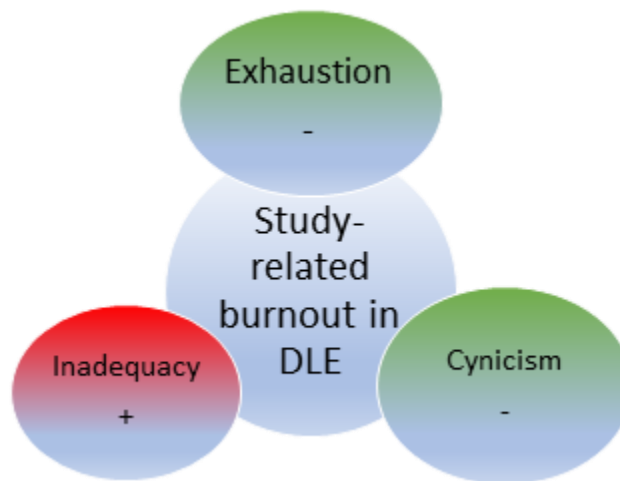
Engagement

Various studies found an increase in students' engagement in different digital learning environments (Subhash & Cudney, 2018; Reisoğlu et al., 2017; Lajoie et al., 2020; Troussas et al., 2020; Kim & Rosenheck, 2020). More specifically, Lajoie et al. (2020) noted that students' engagement can be improved using augmented reality in learning as it typically gives them more control over the learning situations and thus enhances their positive emotions through valuing engagement in a task. Similarly, Troussas et al. (2020) found that students' engagement can be significantly improved by using intelligent game-based assessment systems in education. Further, in their study on the MetaRubric, Kim and Rosenheck (2020) showed that students' engagement can be enhanced through playful assessments.

Self-efficacy

Some studies found that different digital learning environments may enhance students' self-efficacy (Reisoğlu, 2017; Arity & Vesty, 2020; Tempelaar, 2020), which is a result of students' sense of control over and value regarding the task at hand (Reisoğlu, 2017; Arity & Vesty, 2020). Additionally, Tempelaar (2020) also found that students' self-efficacy is related to their adaptive learning approach. On the other hand, contrary to some previous studies, Zheng et al. (2020) showed that advanced digital self-efficacy is an insignificant mediator between proactive personality and acquired digital social capital.

Enjoyment

Various research has found that students experience more enjoyment and satisfaction in digital learning environments (Tempelaar et al., 2012; Reisoğlu et al., 2017; Lajoie et al., 2020; Subhash & Cudney, 2018; Kim & Rosenheck, 2020). Specifically, in their study, Tempelaar et al. (2012) showed that students' favorable academic emotions should be induced when the goal is enhancing students' active participation in online learning. This clearly resulted in students who represented negative effort beliefs. Moreover, Lajoie et al.

(2020) found high levels of enjoyment using augmented reality in learning. In turn, Subhash and Cudney (2018) found that gamification and game-based learning has benefits for students' well-being in digital learning environments. Here, the most important findings, considering the current study, were students' increased positive attitude and enjoyment. Similarly, Tempelaar (2020) found that students who use the adaptive learning approach experience more enjoyment and less negative achievement emotions in online learning.

Easiness

Many of the articles examined in the current review concluded that students experienced easiness in digital learning environments (Troussas et al., 2020; Tempelaar, 2020; Reisoğlu, 2017; Arity & Vesty, 2020). Although, here, it must be noted that many of the studies were specifically interested in whether students experienced easiness in using the digital learning environment itself and not in the whole learning process, which explains the studied subject.

Empathy and Other Socio-emotional Skills

It was also seen that different digital learning environments can increase students' empathy and other socio-emotional skills in collaborative learning settings. Lajoie et al. (2020) found that by using a socially shared regulation technique, students could share their emotions in a collaborative digital learning setting, thus identifying recurring "group emotions." Additionally, collaboration and communication skills were improved using digital learning environments (Reisoğlu, 2017). Further, Zheng et al. (2020) found that acquiring digital social support significantly enhances the influence of students' proactive personality on online interaction and self-efficacy.

Agency

Students were also found to have experienced more individualization and agency in digital learning environments. When they were given multiple choices by AI software on how to complete their task at hand, they achieved the same score despite the chosen method, while also experiencing less negative and more positive achievement emotions (Tempelaar, 2020). Meanwhile, Troussas et al. (2020) showed that individualized cognitive advice, along with peer collaboration, is a key characteristic that can further foster more personalized and adaptive digital learning environments. Ryan (2020) pointed out that effective learner-centered feedback processes enable students to make sense of the information they receive and experience beneficial impacts because of feedback information, thus gaining agency in the feedback process in digital learning environments using a range of different digital tools. Additionally, Kim & Rosenheck's (2020) research suggested similar benefits of gamified assessment methods, further supporting the theory of students' agency through self-assessment. Finally, Schiff (2021) summed up the AI-related trends, considering its important role in digital tutoring and the benefits for students' differentiation in different digital learning environments. Different socio-

emotional skills, achievement emotions, and academic emotions are grouped as academic well-being and presented in Figure 3.

Figure 3

Experiencing Academic Well-being in Digital Learning Environments – The Six Es
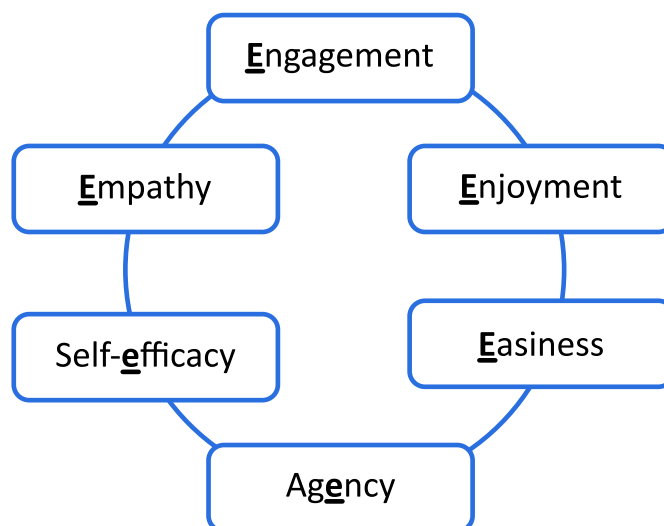
Assessing Students' Academic Well-being in Digital Learning Environments

Online Self-report Questionnaire

The most used assessment method of digital learning environments in the papers reviewed in this review was the online self-report questionnaire. Lajoie et al. (2020) aimed to identify authentic ways to identify different emotions in technology rich environments. They pointed out that with a well-adapted (for digital learning environments) self-report questionnaire, it is possible to capture the intensity of students' emotions. Thus, the measurement instruments need to be properly validated for each digital learning environment. Similar observations were made using other self-report questionnaires (Zheng et al., 2020; Arity & Vesty, 2020; Lajoie et al., 2020; Ryan, 2020; Tempelaar, 2012; Tzafilkou & Economides, 2021).

Peer Feedback

In the current study, some of the examined articles considered peer feedback in the assessment of students' well-being in digital learning environments (Ryan, 2020; Troussas et al., 2020; Kim & Rosenheck, 2020). Specifically, Troussas et al. (2020) highlighted that by using mobile game-based assessment, peer-support can be encouraged in a critical moment in learning. Further, Ryan (2020) encouraged students to participate in informal or structured feedback dialogues with others by supporting private and individualized

task-related feedback interactions with peers in digital learning environments using various digital artefacts.

AI

Many research papers have approached assessment by using AI. In particular, fast, continuous, and relevant feedback was considered an advantage when using AI in assessment (Arity & Vesty, 2020). Additionally, e-tutoring through AI was seen to offer students' different variations of the assessment methods, which resulted in equal academic achievements (Tempelaar, 2020; Schiff, 2021).

Game-based and Gamified Assessment

Some articles examined in this review considered game-based or gamified assessment in university students' well-being. Troussas et al. (2020) studied intelligent mobile game-based application in assessment as a way to support university students' learning process and noticed positive results using cognitive advising. Meanwhile, Kim and Rosenheck (2020) pointed out that gamified assessment makes it possibly easier to integrate students in the assessment process, thus supporting students' agency and authenticity.

Other Digital Artefacts: Biometric Feedback, Augmented Reality-based Assessment, and Multimedia Modalities

Some of the explored articles considered a scaffolding of different kind of digital assessment tools that are specifically tailored to their respective concerned studies (Srivastava et al., 2019; Lajoie et al., 2020). Most relevant to the current study, Lajoie et al. (2020) found that by using visual feedback in a collaborative learning setting, students were not only able to identify but also regulate their group emotions (socially shared regulation). The different assessment methods of university students' academic well-being are categorized and presented in Figure 4.

Figure 4

Digital Assessment of University Students' Well-being
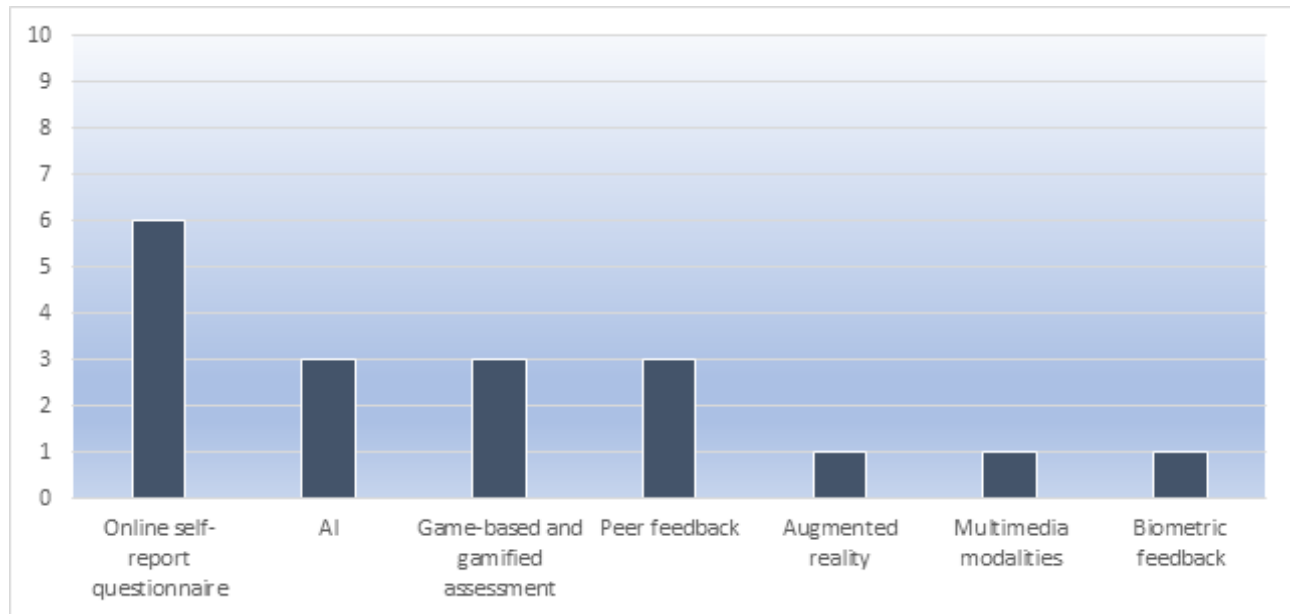
Discussion and Conclusions

This study has examined how university students experience study-related burnout and academic well-being in digital learning environments and how their well-being can be supported through digital assessment. The first research question inquired into how university students experience study-related burnout in digital learning environments. During the literature analysis, distinctive themes—considering study-related burnout—emerged from the reviewed articles. As there is very little previous research on the matter, the findings are of high importance when exploring the relevance and incidence of study-related burnout in digital learning environments. The findings of the current study showed that whereas students experience less exhaustion (Arity & Vesty, 2020) and cynicism (Troussas et al., 2020) in digital learning environments, the feelings of professional inadequacy were increased due to the difficulties in using technology (Subhash & Cudney, 2018). Also, contradicting results have been emerging during Covid-19 pandemic (Parpala et al., 2021). More specifically, study-related burnout is considered a three-dimensional phenomenon resulting in feelings of exhaustion, cynicism, and professional inadequacy (Salmela-Aro et al., 2009; Asikainen et al., 2020).

In relation to the second research question, students' experienced academic well-being in digital learning environments could be divided into six different categories: engagement, self-efficacy, enjoyment, agency, easiness, and empathy. Considering students' experiences of study-related burnout and professional inadequacy in digital learning environments, the literature encouragingly showed that students experienced also more enjoyment, satisfaction, and easiness in digital learning environments (Tempelaar et al., 2012;

Reisoğlu, 2017; Lajoie et al., 2020; Subhash & Cudney, 2018; Kim & Rosenheck, 2020; Troussas et al., 2020; Arity & Vesty, 2020), which furthermore resulted in active online participation. Moreover, in the current research, as shown in several of the examined articles, digital learning environments can also improve student engagement (Reisoğlu et al., 2017; Arity & Vesty, 2020; Subhash & Cudney, 2018). Students' engagement is also enforced through experienced self-efficacy which, according to the current study, might furthermore, be enhanced through different digital learning environments (Reisoğlu, 2017; Arity & Vesty, 2020; Tempelaar, 2020; Kim & Rosenheck, 2020). Furthermore, other positive academic emotions that refer to emotions that arise in an academic context again support students' self-efficacy and self-regulated learning as well as the reduction of boredom that may manifest as a lack of engagement (Pekrun et al., 2010; Mattsson et al., 2020). As students' cognitive and social engagement have been shown to have multiple positive relations to their learning processes and to, for e.g., preventing study-related burnout (Pekrun et al., 2010; Salmela-Aro & Upadyaya, 2020; Kankaraš & Suarez-Alvarez, 2019), it can be concluded that there is great potential in providing engaging digital learning environments to support students' well-being in universities and prevent students experiencing study-related burnout. However, there must be emphasis on providing sufficient support for students' using the digital learning environments as the inadequacy of using them could result, as stated before, in increase of study-related burnout (Subhash & Cudney, 2018).

As previous studies have shown, students' perceptions on digital learning environments indicate, for e.g., students' academic achievement and their studying strategies and collaborations (Thompson, 2013; Asikainen et al., 2020; Väätäjä & Ruokamo, 2020; Rasi et al., 2019; Cai et al., 2019, Ellis & Goodyear, 2013, Parpala et al., 2021). Current research has strengthened these findings (Reisoğlu, 2017) and found that collaborative digital learning environments can also increase students' empathy and other socio-emotional skills (Lajoie et al., 2020; Zheng et al., 2020). As digital learning environments can often be seen as a barricade to emotional expression, this finding suggests that the opposite is true: in a well-designed collaborative digital learning environment, students can be more prone to express their emotions, proactive personalities, and e.g., empathy toward their peers (Lajoie et al., 2020; Zheng et al.,2020).

Further, students' increased agency in digital learning environments was considered in many of the examined articles. A clear result was that students experienced more individualization when using AI in education (Schiff, 2021. Additionally, experiences of enforced academic agency were found in different digital learning environments (Schiff, 2021; Tempelaar, 2020, Troussas et al., 2020; Ryan, 2020; Kim & Rosenheck, 2020). Similar to earlier studies on students' perceptions of leaning environments, Ryan (2020) noted that digital learning environments enable effective learner-centered feedback processes, thus helping students to make sense of the information they receive and giving

them a sense of agency in the learning process. Aforementioned findings have the potential to lessen the worry of AI overriding the human agency and individuality in digital learning contexts. All of these findings also encourage the idea that digital learning environments can support students' holistic well-being and make digital learning individually and socially more meaningful and emotionally rewarding.

Students' agency was also closely related to the third research question: how is students' academic well-being supported through online assessment? In this context, research by Troussas et al. (2020) and Kim and Rosenheck (2020) suggested benefits of summative gamified assessment methods in supporting students' agency in digital learning environments, further supporting the theory that students gain agency through summative self-assessment in traditional learning environments (Tan, 2007, 2009; Boud & Falchikov, 2006; Nieminen & Tuohilampi, 2020).

The findings of current research also support previous studies that concluded that digital assessment in higher education is often portrayed as technology-enhanced formative assessment, but it is moving toward AI- and game-based or gamified assessment. Additionally, other, previously studied assessment method that emerged in the current study that is useful in supporting students' academic well-being and individualized perceptions of digital learning environments was digital peer-feedback (Ryan, 2020; Kim & Rosenheck, 2020; Entwistle et al., 2003; Herrmann et al., 2016) and AI-based feedback (Arity & Vesty, 2020; Tempelaar, 2020; Schiff, 2021; Luckin, 2017; Luckin et al., 2016; Zawacki-Richter et al., 2019; Popenici & Kerr, 2017). These findings, together with the notion of digital learning environments providing socially engaging and empathy enforcing collaborative platforms, encourage further research on the potential of artificial intelligence, gamification and digital communities in learning processes.

Limitations

This study does have some limitations. First, it was rather challenging to examine the concept "digital learning environments" as there is no clear consensus on how this is conceptualized in previous studies (Luckin, 2018). However, this systematic review included all the articles examining the "digital learning environment," and published during the last ten years, despite the used digital form, which might provide a good understanding of the topical and diverse research in the field of digital university pedagogy. However, along with the current study, future research still needs to understand how to approach different digital learning environments as it is clear that they differ in their capacity to, for e.g., provide meaningful learning experiences for students and thus support their academic well-being. To sum up, the present study thus suggests that it is important to consider digital learning environments as a completely new branch of educational transformation in higher education and examine the different pedagogical phenomena from philosophical to technological perspectives, using the understanding

gained from centuries of studies on technology, educational psychology, and pedagogy in higher education.

Implications

Understanding university students' study-related burnout and how academic well-being can be supported and assessed in digital learning environments provides important information for educators worldwide and makes holistic and equal education more accessible for everyone. The frameworks of the current study provide guidelines for assessing and supporting student's digital well-being by identifying how they experience study-related burnout and academic well-being in different digital learning environments. This also provides the possibility of supporting students' overall academic performance and the planning of ethically sustainable digital university pedagogy.

The findings encourage the designing of the digital university pedagogy that includes easily accessible digital learning environments in the curricula, thus enforcing students' positive academic emotions and well-being and perceptions of digital teaching learning environments (Tempelaar et al., 2012; Entwistle et al., 2003; Herrmann et al., 2016 Parpala et al., 2010; Harvey, 2003; Richardson, 2005; Parpala et al., 2021; Subhash & Cudney, 2018). Other, noteworthy finding, considering digital assessment, also encourages asking whether game-based or gamified summative assessment or AI-based summative assessment could be considered as further supporting students' agency and self-efficacy in digital learning environments (Troussas et al., 2020; Kim & Rosenheck, 2020; Nieminen et al., 2021).

As digitalization becomes an increasingly central part of people's lives and as technology is constantly evolving, digital learning has become an ever-changing pedagogical phenomenon that creates links between leisure, study, and working life, thus affecting the overall well-being of technology users to an increasing extent (Holmes et al., 2019). This also encourages the consideration of possible future research topics. Moreover, as sustainable development goals continue to be at the center of future research in both higher education and working life, it is imperative to understand how digital university pedagogy should be planned in such manner so that it can provide more meaningful and empowering learning experiences and support the well-being, agency, and globally sustainable endeavors of academic future-makers. Thus, due to the implications clarified above, more research is needed on the topic.

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