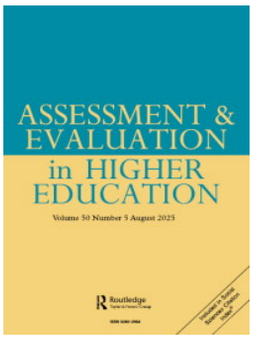

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Self-assessment design in a digital world: centring student agency

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ABSTRACT

Digital technologies allow student self-assessment to be adaptive, scalable and multimodal. Despite such technological advances, digital self-assessment practices have largely reinforced the existing norms around student roles, leaving the fundamentals of self-assessment design untouched. Digital self-assessment has centred on learning outcomes and self-regulation with less attention to students' own initiatives, aspirations and roles – their agency. Ironically, the 'self' has remained at the margins of digital self-assessment work. In this conceptual study, we propose 'the digital' as a catalyst to rethink the student role in self-assessment. This way, the digital could address fundamental issues with self-assessment already present in the pre-digital age. We explore three ways in which digital self-assessment could promote student agency. By reviewing critical examples of literature on self-assessment and digital technologies, we propose that the digital in self-assessment may be seen: (1) as a tool for promoting students' self-regulation, as understood in individualistic terms; (2) as a means to develop students' digital agency; and (3) as a means to provide students with agency over their identity formation in the digital world. These three ideas may guide future work to ensure self-assessment design is relevant for students' increasingly digital futures, particularly in an era of Artificial Intelligence.

KEYWORDS

Self-assessment; online assessment; self-reflection; generative AI (GenAI)

Introduction

The ongoing transformation of digital societies has challenged educational institutions to rethink their approaches to assessment. It is becoming increasingly difficult to separate 'the digital' and 'the non-digital' from each other, which is also true for assessment: most assessment is at least partly digital now. However, digital assessment practices have tended to reproduce existing practices while leaving the fundamentals of assessment untouched (Timmis et al. 2016; Bearman, Nieminen, and Ajjawi 2023). Digital technologies are used mainly to enhance the scalability and efficiency of non-digital tasks rather than to radically rethink assessment amid the requirements of the digital world.

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Perhaps the most uncontested aspect of assessment reproduced by digital technologies is the assumed role of students. Way before the digital revolution, students were seen primarily as objects of assessment, with little agency over assessment policies, practices and research (e.g. Adie, Willis, and Van der Kleij 2018; Nieminen et al. 2023). The rise of the Assessment for Learning movement has seemingly paved the way for 'student-centred' practices. However, the same issue prevails: in student-centred assessment, students respond to tasks designed by others, for the purposes defined by others (McDonald and Boud 2003). Put simply, students rarely have their voices heard in matters of assessment, which is ironically an issue for the so-called 'student-centred' assessment practices, too (Nieminen et al. 2023). The rise of digital technologies has not necessarily challenged this idea. As an apt example, Timmis et al. (2016) listed ways in which assessment could be rethought in the digital age, covering inspiring ideas such as learning analytics, increased feedback and automatisation. Yet, the students' own agency over 'rethinking' assessment design was not considered.

In this article, we focus on student self-assessment (hereafter self-assessment), which refers to assessment practices in which students make judgments about their own work, products or learning processes (Panadero, Brown, and Strijbos 2016). According to Yan and Carless (2022), self-assessment includes the elements of assessment criteria, feedback on the self-assessment process and self-reflection and training for students on making and calibrating self-assessment judgements. On paper, self-assessment seems like a perfect candidate for promoting students' active role in assessment. After all, self-assessment is the one assessment practice that supposedly centres on the 'self' – the students themselves (Yan 2022). Self-assessment is commonly claimed as a student-centred practice that connects with the ideals of lifelong learning, autonomy and empowerment. Self-assessment is increasingly digital and innovative: it is commonly facilitated in online learning management systems, often coupled with digital tools for feedback, reflection, learning analytics, scoreboards and learning progressions. Digital technologies can indeed enhance students' active role in self-assessment. Research has indicated positive effects of digital self-assessment practices on self-regulation (Yan, Chiu, and Ko 2020), motivation (Nikou and Economides 2016) and 21st-century skills (Miliou et al. 2024).

Nevertheless, while self-assessment has drawn on this idea of 'student-centeredness' in policy and curriculum rhetoric, self-assessment remains a teacher-centred idea in practice (Nieminen and Boud 2024). Self-assessment practices tend to be fully designed by educators and leave students with no role other than to respond to prompts they are given concerning standards and criteria defined by others, benefiting from self-assessment in ways defined by others (McDonald and Boud 2003). This discrepancy is exemplified in the vast literature on how digital tools could help students provide accurate, *correct* self-assessment judgments (León, Panadero, and García-Martínez 2023). In many ways, self-assessment contradicts the ideas of student agency that emphasises students' own voices, initiatives and goals. Likewise, students remain the objects of policymakers' intentions to digitise self-assessment. Digital technologies might then replicate rather than challenge the prevailing positioning of students in self-assessment.

In this conceptual study, we advance the theory and practice of self-assessment by considering how self-assessment could be rethought in the digital age, particularly when it comes to artificial intelligence (AI). We focus on the student's role – their agency – arguing that this idea has received marginal attention in work on digital self-assessment. In doing so, we see 'the digital' as the means to fundamentally reconsider self-assessment for promoting student agency. Following Rashid and Asghar (2016), we argue that while student agency has always been an essential educational consideration, the digital revolution has brought it to the forefront (606). The advent of the digital age prompts us to engage with students in ways we should have already done in the pre-digital world. It demands us to focus on student-centred self-assessment practices that were impossible to envisage before; that are uniquely digital and not only enabled by it.

We first clarify our approach to self-assessment in the digital age. Then, inspired by Bearman et al.'s framework for assessment in the digital world (2023), we explore three ways student agency could be promoted through digital self-assessment.

Setting the scene: self-assessment in a digital world

The role of digital affordances has not been centred in self-assessment research. For example, recent review studies barely mention 'the digital' (e.g. Brown, Andrade, and Chen 2015; Andrade 2019; León, Panadero, and García-Martínez 2023). Notably, Panadero, Brown, and Strijbos (2016) reviewed existing self-assessment models, introducing five frameworks, none explicitly mentioning the digital. This absence may derive from the idea that digital technologies merely provide the format or mode of self-assessment. That said, digital forms of self-assessment have been discussed widely in research on, for example, online self-assessment and self-assessment with mobile technologies. Nevertheless, online tools in self-assessment are predominantly seen as having secondary value: they facilitate self-assessment to reach desirable outcomes (such as student performance) rather than being a meaningful part of self-assessment itself.

There is a need to theorise not just *how* but *why* self-assessment should be designed digitally. In this quest, we rely on the organising framework by Bearman, Nieminen, and Ajjawi (2023) for designing assessment in a digital world. It challenges the instrumental approaches to e-assessment that have typically focused on technical innovations without unpacking the increasingly complex intersections of assessment and digital technologies. This framework connects assessment design to the digital world and provides a way to connect self-assessment with broader societal discourses on the digital revolution. Following Bearman et al. we use the term 'the digital' to reflect the duality of the digital as both a technology and a social practice. As such, designing the digital in self-assessment does not necessarily mean that self-assessment should be 'more digital' or that students should use technology in futuristic ways. Instead, it means students have meaningful opportunities to engage with the digital.

The framework by Bearman, Nieminen, and Ajjawi (2023) outlines three purposes for designing the digital in assessment. First, *digital tools* might be used to improve assessment practices. The digital may enhance non-digital forms of self-assessment, such as by turning a pen-and-paper form for self-assessment into an online format that can be efficiently shared with students. The digital might also transform assessment in fundamentally digital ways. The second purpose considers *developing and credentialing students' digital literacies*. This means that assessment specifically concerns how students engage with digital technologies. The third purpose concerns *human capabilities for a digital world,* which are human contributions to society that cannot be performed by autonomous machines alone. Such capabilities are required for living in a digital world and can be defined as 'those capabilities which can be conceptualised differently from pre-digital times' (Bearman, Nieminen, and Ajjawi 2023, 298). Bearman et al. discuss the uniquely human sense of the self that assessment may foster. Self-assessment could be used to emphasise not only what students have learned but also help them identify who they are becoming. These three purposes explore how self-assessment could better prepare students for the increasingly digital future.

Research objective and contribution

We answer the following question: how could the digital be designed in student self-assessment to promote student agency? We see the digital as a powerful way of transforming self-assessment practices to better address the role of students, the supposed 'selves' of self-assessment. It can help us shift our focus beyond the 'self' that is doing the assessment to the 'self' as the focus of enquiry. Our study promotes a research agenda in self-assessment studies to reach beyond

dependence on the designs of teachers to understand how we could free up strategies that students themselves can enact.

We conduct a theoretical synthesis of earlier studies about digital self-assessment (following Jaakkola 2020). Drawing on various research paradigms and theoretical perspectives – from educational psychology to sociology to digital media studies – we outline the idea of 'self-assessment design in a digital world'. We propose three different conceptualisations of student agency that each have unique implications for self-assessment design.

Our study focuses on self-assessment *design* (Bearman, Nieminen, and Ajjawi 2023), that is, what self-assessment seeks to do and how it does it. Typically, assessment design is undertaken by educators, but we also consider students' agency in these design processes. We do not focus on any particular educational context but synthesise literature from various contexts (e.g. schools and higher education) and disciplines.

Student agency in the digital world: three approaches

In the remainder of the paper, we propose three ways of promoting student agency by designing the digital in self-assessment. These ideas build on differing conceptualisations of 'agency'. The idea of agency follows long philosophical and sociological traditions of mapping the relationship between human action and the surrounding social structures. Contemporary conceptualisations of agency tend to differ regarding how much emphasis they place on individuals' agency amid such structures. We chose to introduce not one but three approaches to agency since this multifaceted idea denies simple definitions. The concept has psychological but also social, cultural, political and indeed digital underpinnings. Traditionally, agency has been seen as students' 'ability and will to positively influence their own lives and the world around them' (OECD 2019, 2). In assessment, agentic students have been portrayed as 'actors who make choices and whose actions shape assessment practices in both anticipated and unexpected ways' (Adie, Willis, and Van der Kleij 2018, 2).

Table 1 outlines our three approaches. The first conceptualisation sees *agency as a personal capability* and digital self-assessment as the means to develop such capability. The second idea builds on *digital agency* and positions self-assessment as a practice that engages students critically with the digital. Thirdly, we discuss students' *reflexive agency* over their own identity formation *via* digitally mediated self-assessment.

Table 1. Overview of the three approaches to designing the digital in self-assessment to promote student agency.

Purpose for designing the digital in self-assessment[a]	Conceptualisation of agency	Implication for self-assessment design	Potential harms
Digital tools enable self-assessment to promote self-regulation	Agency as capability (self-regulation)	The digital may either enhance or transform self-assessment design to promote student agency.	Digital technologies may cause barriers to self-regulation during self-assessment.
Fostering student agency through critical engagement with the digital	Digital agency	Self-assessment may engage students critically with digital technologies. Students may also co-design digital self-assessment practices.	Students may use their digital agency in maladaptive ways.
Developing students' sense of the self in the digital world	Reflexive agency	Self-assessment concerns students' identity formation. It considers students' identities as networked between digital and non-digital spaces.	Asking students to engage with the online world beyond institutional sites is always risky.

[a]Reformulated based on Bearman, Nieminen, and Ajjawi (2023).

Promoting self-regulation through digital self-assessment

The first approach to student agency relies on an individualistic view that understands agency as akin to self-regulation (Darvishi et al. 2024). Agency, in this way, can be understood following the aforementioned definition by the OECD: as an individual capability that may, in turn, promote other desirable factors such as learning outcomes, motivation and well-being (Panadero, Jonsson, and Botella 2017). The quest to promote student agency is seen as a responsibility of educators as it is seen as the teachers' role to design digital elements to ensure that students take more control of their self-assessment (Nieminen and Tuohilampi 2020).

Here, we conceptualise self-assessment as a cyclical process with four phases, according to Yan and Carless (2022), based on the earlier model by Yan and Brown (2017). In the following subsections, we discuss how these phases could be harnessed to promote student agency. According to Yan and Carless, self-assessment is a cyclical process that starts, following Boud (1995), by (1) determining assessment criteria for self-assessment. These criteria might be represented in the form of a rubric or script. This design element differentiates academic self-assessment from everyday versions of self-assessment as it ties education self-assessment to curricular goals. Students also take part in (2) self-reflection by determining the quality of their work or performance against the assessment criteria. Based on this self-reflection, a (3) 'self-assessment judgement is arrived at, and this judgement is subjected to continuous recalibration according to different assessment criteria' (Yan and Carless 2022, 1118). Throughout the process, (4) feedback-seeking serves an enabling role in facilitating each self-assessment step.

To explore how the digital could be designed in these four stages, we must theorise how digital technologies could redesign self-assessment. We address two ideas: digital enhancement and transformation, following the oft-cited substitution, augmentation, modification and redefinition (SAMR) framework (Puentedura 2006). Digital technologies could *enhance* self-assessment by allowing functional improvements, such as digitising self-assessment to make it easier to share with students. However, digital technology may also *transform* self-assessment by enabling functionalities that are inconceivable for pre-digital technologies. We discuss how the four phases of self-assessment can be digitally enhanced and transformed (Table 2). This is not an exhaustive list, but it illustrates what might be possible.

Determining assessment criteria

Self-assessment criteria are traditionally provided in a static form. Instead, rubrics could be enhanced in multimodal ways. Typically, rubrics contain written text, but digital rubrics may also include multimodal materials such as images and videos (see Panadero et al. 2025). For example, a teacher might record a brief video about how students could use a particular criterion in their goal-setting and attach this video to the corresponding cell in the rubric. Similarly, digital rubrics may include exemplars of work with varying levels of quality.

Table 2. Examples of how to enhance and transform self-assessment to promote student agency.

	Enhancement: enhancing the self-assessment process for students and teachers alike	Transformation: rethinking the student role in self-assessment
Determining assessment criteria	Digital, easily adaptable rubrics	Annotated rubrics
Self-reflection	Reflective essays can be easily stored in a Learning Management System	Multimodal forms of self-reflection beyond text
Calibration	Digital systems for revising self-assessment judgements according to feedback inputs	Learning analytics Adaptive self-assessment tasks Co-regulation with digital technologies
Feedback processes	Convenient ways to provide digital feedback information on students' self-assessments	Automatic feedback dialogues with Artificial Intelligence

Digital technologies may also transform the setting of assessment criteria by allowing students to choose their own goals and criteria. For example, annotated rubrics allow students to comment on and edit rubrics through online platforms. Depending on the extent of modification permitted, this could be transformative. Digital rubrics are not only static learning materials but shared artefacts that allow students to exercise agency.

Self-reflection

In the self-reflection phase, students consider the assessment criteria and the feedback they have engaged with and produce a reflective synthesis.

Learning management systems may facilitate the self-reflection phase by providing easily accessible digital storage for the whole self-assessment process, containing student work, assessment criteria, and potential feedback comments. This enhancement eases students' self-regulatory process. Digital systems also allow students to easily store feedback from various sources to provide a synthesis and an uptake plan based on these comments.

The self-reflection phase may be digitally transformed by enabling students to express their self-reflections in multimodal formats beyond written text. Newcomb, Burton, and Edwards (2018) reported that students engaged with self-assessment more deeply when they could record their reflections digitally in audio and video formats since this was considered more authentic. Other examples of multimodal forms of reflection are images, e-portfolios, and formats that follow students' own choices and aspirations (Yeo and Rowley 2020). Creative forms of reflection may promote student agency by allowing students to choose how they provide their self-assessment judgments. Moreover, students' sense of agency may increase as they can express their reflections fully rather than in restricted text formats (see Nieminen and Boud 2024).

Calibration

Self-assessment is not a one-off activity but a continuous calibration process (Boud, Lawson, and Thompson 2013). Self-assessment design could be enhanced by easing the calibration process, meaning that digital technologies enable students to engage in multiple iterations of self-assessment. The self-assessment process can be calibrated by allowing students to make multiple comparisons between their work, feedback and assessment criteria, potentially revising their self-reflections until they appear consistent and coherent (Boud, Lawson, and Thompson 2013). The calibration process requires plentiful self-regulation resources as it is a high-order cognitive process. Thus, designing the digital process as simple and accessible as possible may positively contribute to students' self-regulation processes. For example, digital systems may enable students to compare their self-assessment reflections easily with the ones by their teachers, peers and AI technologies. Likewise, digital systems may enable multiple rounds of calibrations so that students can return to the previous cycle of reflection, making the development of their self-regulation skills visible.

Digital technologies also have the potential to transform calibration processes. First, learning analytics may allow students to draw on multimodal datasets regarding their learning and studying behaviour as they calibrate their learning. Unlike many other sources of feedback, learning analytics can afford to draw on all the information recorded about a student's performance and access resources over time. They present affordances for continuous calibration processes as students self-assess. Learning analytic dashboards provide 'real-time information about their learning process, performance, and feedback through multiple representations' (Park, Ifenthaler, and Clariana 2023, 100–101).

Second, digital technologies may adapt self-assessment tasks to meet the needs of individual students (Huang, Lin, and Cheng 2009). Ifenthaler, Schumacher, and Kuzilek (2023) explain that

learning analytics could help identify students with different self-assessment behaviours. Digital systems may automatically adapt to situations where students do not continuously and successfully calibrate their self-assessment process. For example, after a lesson, a student may check her understanding through a digital platform. Based on the student's answer to previous questions, the platform uses an adaptive testing algorithm to ask her the next challenging but do-able question. After the student finishes answering the questions, the platform instantly summarises her answers and provides feedback on the incorrect answers. Adaptive learning analytics dashboards have also been found to promote students' self-regulation (Park, Ifenthaler, and Clariana 2023). While 'research on pedagogical-driven perspectives on self-assessments associated with learning analytics approaches are scarce' (Ifenthaler, Schumacher, and Kuzilek 2023, 257), these ideas warrant future investigations.

Third, AI technologies open up the possibility of enabling students to co-regulate their learning with AI responses. Humans are already widely co-regulating their actions with technology, such as using their phones. This idea could be applied to self-assessment by implementing AI technologies in all phases of self-assessment to allow co-regulation. As Järvelä, Nguyen, and Hadwin (2023) note, as AI technologies continue developing, they provide more and more affordances for co-regulation. An example of this is intelligent AI agents who might follow students throughout their educational careers to help them better calibrate their self-assessment processes.

Feedback processes

Feedback is an essential element of student self-assessment, as self-assessment considers inputs from various sources stemming from the students themselves, their teachers, peers and digital technologies (Yan and Carless 2022). Feedback may happen throughout the self-assessment process and facilitate each step.

Digital platforms permit the sharing of work with others and receiving inputs on that work. They allow teachers to provide higher-quality feedback inputs on students' self-generated rubrics, self-reflection processes or judgments more efficiently than pen-and-paper self-assessments. This may help students better self-regulate their learning. For example, rather than writing down comments for students, teachers may utilise more efficient ways such as digital comment banks and video or screencast files. Likewise, students may seek feedback asynchronously in online systems to regulate their learning when needed. Students might also initiate self-assessment cycles themselves at a time that best suits their needs. All these elements promote student agency by easing the self-assessment process, enabling students to use their self-regulation skills to learn rather than expend effort in managing the self-assessment process itself.

Novel digital technologies provide affordances for transforming feedback processes. Generative Artificial Intelligence (GenAI) allows students to access feedback dialogues at any time of the day or night, providing 'more detailed feedback in a shorter amount of time for each individual learner' (Escalante, Pack, and Barrett 2023, 13) and assist students' assessment and calibration of their own learning.

Potential harms and limitations

Digital technologies may hinder students from regulating their learning, which is exemplified in global debates about whether or not to ban phones from classrooms. Digital technologies may hinder self-assessment if students do not know how to obtain useful feedback from the digital and evaluate the validity of it, or they rely on technologies to get an answer without deeper reflection on their part (Bearman et al. 2024). Students may become dependent on the prompts they get from learning analytics or AI and fail to develop capabilities for themselves.

This is the same dilemma that occurs with structured teaching: it has benefits to meeting immediate learning outcomes but may not train students to make judgements for the longer term.

Fostering digital agency through self-assessment

The second purpose concerns developing and credentialing digital literacies. Here, we conceptualise student agency in accordance with *digital agency*. This idea surfaces from considerations of technological determinism: whether technology controls us or whether we control technology. Overall, digital agency refers to students' capacity to shape the digital circumstances they live in and 'to control and adapt to a digital world' (Passey et al. 2018, 426). While definitions vary (Siddiq et al. 2024), the notion of digital agency is separate from students' digital literacies. Digital agency takes a societal approach by investigating student influence on the digitalisation of education.

Passey et al. (2018) critically contest the view of students as non-agentic 'consumers' of digital platforms and tools designed by technological companies; digital teaching practices designed by teachers; and digital assessment practices orchestrated by politicians, policymakers and educators (see also Stenalt 2021). Self-assessment may be seen as 'a way of empowering people to deal with new technologies' so that they 'have roles in how they adopt, adapt to and use them wisely and responsibly' (Passey et al. 2018, 427).

Fostering digital literacies

In order to wield digital agency, students require a certain level of digital literacy, namely, the necessary skills for engaging with the digital technology used in self-assessment (Siddiq et al. 2024). There has been much written about digital literacies that need not be rehearsed here. Suffice it to say that students must develop substantial critical faculties to ensure that they can use the digital for their own ends, rather than being used by it to follow the agendas of others. Students must know what the given technology cannot do, that it might appear to be able to do, just as much as what it can do. The distracting effects of the outputs of GenAI provide a good illustration of this.

Typically, digital forms of self-assessment do not challenge students to develop their digital literacies: students simply use technology for self-assessment. However, it is possible to ask students to self-assess in ways that also develop their digital literacies. One potential approach arises from asking students to produce multimodal self-reflection artefacts. By learning how to use specific technologies to produce self-reflections in the format of, say, video, images and digital journals, students may learn to express themselves in digital forms. This might be particularly important in contexts where students must learn to reflect upon their own actions in authentic ways. An example might be a university context where students must master the technologies used in authentic work reflections (see Nieminen and Boud 2024).

Student partnership in self-assessment design

At the core of digital agency is the idea that students are not only consumers of digital technology but active agents who shape these technologies and how they are used. Digital agency could be promoted by allowing students to have their say over how, why and when self-assessment is conducted through student partnership in assessment (Chan and Chen 2023). Student partnership emphasises student empowerment and democratic values by reminding us about the ethical imperative to hear students about matters that concern themselves (Deeley and Bovill 2017). Given that self-assessment is inherently about the students themselves, we see it crucial that

students' voices are heard in self-assessment design. This stance contradicts the idea that teachers are the sole designers and initiators of self-assessment.

Chan and Chen (2023) note that students could take the roles of consultants or decision-makers in assessment co-design processes. Students are the end-users of self-assessment, meaning that they hold essential knowledge about what works for them in self-assessment, what does not, and why. This is crucially important for digital agency as students must have a justifiable belief that their views matter for self-assessment; otherwise, self-assessment might be conducted for the sake of 'jumping through the hoops'. For example, students may be consulted about the perceived authenticity of self-assessment in digital environments. If students find the medium of self-assessment inauthentic and 'fake', they may not engage with self-assessment critically (Newcomb, Burton, and Edwards 2018; Nieminen and Boud 2024). It is thus imperative to hear students' perceptions about occasions when self-assessment *fails*. Self-assessment is typically framed as an individualistic problem, seeing the student as someone who requires further interventions in the case of inaccurate or biased self-assessments. However, consulting students might reveal that potential inconsistencies may also derive from unmotivating and inauthentic self-assessment practices.

Students could be portrayed as co-designers in digital self-assessment. This means that students are afforded *real* agency over the digital: they can critically shape and transform the digital technologies used in self-assessment. As students gain agency over digital self-assessment design, they may engage with self-assessment more deeply. This empowers students to self-assess after their graduation, too. In self-assessment, students could co-design the assessment criteria and the self-reflection practices. Rather than providing traditional, written self-assessment prompts, students may co-design reflective practices that better suit their needs and aspirations. While it may be tricky to implement partnership practices in high-stakes assessments such as examinations, digital agency could be promoted in classroom assessment by harnessing self-assessment for this purpose. The teacher's role, then, is to help students calibrate the digital self-assessment process and intervene as needed.

Data use in self-assessment

An essential aspect of digital agency is students' opportunity to have their say over the data collected regarding their learning (Stenalt 2021). As Stenalt explains, learning data is typically collected from students in ways entirely determined by educators, with tools and platforms designed by private industries. To promote digital agency, self-assessment must use learning data in collaboration with students.

Self-assessment could foster students' critical awareness of how learning data is collected, used and acted upon. Fostering such a critical stance does not necessarily have to involve engagement with digital technologies, but instead, it can rely on critical conversations and activities related to the digital platforms and tools of self-assessment. Here, Pangrazio and Selwyn (2019) framework for data literacy helps unpack how self-assessment could be designed to foster students' digital agency (11). This framework includes five elements, each of which could be considered in self-assessment. *Data identification* relates to determining what kind of personal data is used in self-assessment. *Data understanding* refers to students' knowledge of how learning data is generated, stored and managed. *Data reflexivity* refers to a critical stance towards how data collection affects individuals and communities. For example, students could be asked to critically reflect upon how private companies manage self-assessment platforms and how students themselves rarely have their say over these platforms. Finally, *data use* and *data tactics* refer to how students could be trained to generate, manage and control meaningful self-assessment data themselves. Students may use their digital agency to redetermine the purposes and practices of self-assessment by employing 'tactics of resistance and obfuscation' (Pangrazio and Selwyn 2019, 429).

Students could be seen as partners while the data usage in self-assessment processes is designed by enabling them real digital agency over these processes. This would mean respectful conversations and decision-making over why self-assessment is conducted, what kind of data is used in self-assessment, how this data is used, and by whom. We see particular value in partnering with students to design digital calibration processes for self-assessment. Here, we could learn from the literature on the co-design of learning analytics (Dollinger et al. 2019). When students co-design the data structures around self-assessment, self-assessment may be reconceptualised as a service, not a product. This issue points to the importance of digital tools being able to be modified to meet the needs of all users.

Potential harms and limitations

When students gain digital agency in self-assessment, they may use digital technologies in maladaptive ways. For example, students might use GenAI tools to efficiently produce the performance of reflection rather than critically engaging in the self-assessment process (Bearman et al. 2024). Particularly in situations in which students have a high sense of digital agency yet inadequate digital literacies, students might use digital technologies in inappropriate ways.

On the other hand, there may be an even more considerable risk of reducing students' agency via digital forms of self-assessment. Such a situation occurs when students often have no agency over the choices in digital self-assessment design, such as which digital platforms are used in self-assessment. This represents a situation where 'technologies are developed and managed by specific individuals, companies or corporations and then 'given to' and used by other individuals' (Passey et al. 2018, 426). Moreover, digital technologies can undermine student agency and create new forms of dependency – not on teachers but on digital tools.

Developing students' sense of the self in the digital world

Our third approach to student agency examines agency with respect to students' personal and professional identities in the digital context. The question we seek to answer is: How could digital self-assessment provide students agency over their identity formation? We argue that this question is essential in self-assessment, given that self-assessment ontologically centres on 'the self' (Yan 2022).

Self-assessment provides intriguing yet underutilised affordances for developing students' sense of the self in the digital world. Student agency can be understood as students' *reflexive agency over their own identity formation*. As Nieminen and Yang (2024) discuss, assessment predominantly diminishes such agency as it determines students' lives and identities from afar. Assessment is most commonly designed by educators to meet the goals of curriculum documents, professional bodies and assessment policies, all of which are artefacts whose design processes rarely hear the voices of students themselves. Some studies have discussed the role of self-assessment in making students more aware of their identity formation (e.g. Bourke 2018). However, to date, the role of the digital has been neglected in these discussions.

Focus on human capabilities in a digital world

Self-assessment could focus on those uniquely human capabilities specific to the digital world that machines or AI cannot handle (Bearman, Nieminen, and Ajjawi 2023). Our call here is not to argue that self-assessment of cognitively simplistic abilities should be neglected (e.g. self-assessment of basic calculus skills in mathematics) since such tasks may be excellent in scaffolding students towards more complex forms of self-assessment. Instead, the final goal of self-assessment activities at all levels of education should align more closely with the ability to

self-assess more complex human activities. Overall, self-assessment has been noted as a vital pedagogical practice for developing students' evaluative judgments (Bearman et al. 2024), which is why we see great potential in self-assessment in developing students' human capabilities in a digital world. Promoting evaluative judgement through digital self-assessment may prepare students to live in an AI-mediated world as 'it shifts the focus from being successful (yes or no), to coming to understand how success is constituted' (Bearman and Luckin 2020, 57).

One timely example of this is the design of tasks that develop students' evaluative judgement through AI interactions, as discussed by Bearman and Ajjawi (2023) and Bearman et al. (2024). Consider that students were asked to evaluate the quality of their critical essay in collaboration with GenAI. Assessing the quality of such work is a topic of much debate in 2024 as this text is written; we do not have rigorous standards for assessing GenAI-assisted critical texts in many contexts (Bearman et al. 2024). In such a situation, students could be asked to discuss the quality of their text with each other, perhaps reflecting upon a rubric, to 'grasp how their work meets the broader societal notion of quality' regarding AI-assisted texts (Bearman and Ajjawi 2023, 1168). Students could discuss whether, and under what circumstances, the use of GenAI technologies may simply be considered cheating (such as in the case of copy-pasting material from GenAI); and how GenAI could be prompted in longer dialogues to legitimately brainstorm one's own, original ideas for the critical essay.

Self-assessment of distributed abilities

Self-assessment research has paid little attention to the question of where students' skills and abilities reside. It is a common assumption that when students self-assess, they self-assess their *own* abilities. However, in the digital world, students' abilities can be seen as not simply residing within the students themselves. Instead, students' abilities are intertwined with digital extensions and are distributed in complex and networked spaces – both online and offline. Drawing a boundary between our abilities and our abilities when enhanced by technology is becoming increasingly problematic. A prominent example of this is the availability of computers in our everyday lives in ways that make it easy to externalise memorisation tasks to these machines, which could be called cognitive offloading. Another timely example is the use of GenAI technologies and the location of 'abilities' and 'originality' of one's ideas. Of course, this is not the first time in history that human capabilities have been combined with those of machines. However, there are new functionalities of digital technology in the digital world that must be considered in self-assessment.

Self-assessment may therefore reach out to incorporate judgements of our digital extensions. Such assignments could consist of students participating in educational activities while using AI technologies, after which they could provide a self-reflection upon the abilities of *the student-AI assemblage*. With the concept of an assemblage, we refer to a hybrid of a human and a machine in which the abilities of neither can be easily determined from the other (McKnight 2021). Focusing students' attention in their self-assessment process on these assemblages provides intriguing affordances for self-assessment that better prepare students for their futures in the digital world. These assemblages may improve the quality of self-assessment, an example of how human-non-human assemblages may improve 'students' abilities. Ideally, with AI, students could produce self-assessment reflections that 'stimulate divergent, rather than convergent, thinking, through, for example, effusion, juxtaposition and surprise' (McKnight 2021, 11).

Networked self

In the digital world, it is not only students' abilities that are networked but their very selves, too. The 'self' in self-assessment is increasingly divided into digital and non-digital spaces; this is how

human-technology hybrids are created (Darvishi et al. 2024, 12). The argument here is that if self-assessment aims to address 'the self', this practice must understand the networked nature of the self in the digital world. In doing so, self-assessment may equip students with reflexive agency over their digital identities.

To demonstrate how self-assessment could address students' networked selves, we rely on the work by Ross (2011, 2014), who writes about online self-reflection in higher education. While these texts appear somewhat outdated today regarding technology, the message has become even more critical in today's context, in which students spend increasing amounts of time engaging with digital technologies. As they do so, they constantly construct their networked selves in digital and non-digital spaces. The boundaries of these spaces have become extremely blurred. In the postdigital world, 'the online' is constantly present in daily life in education. As Ross (2011) phrased it, the self has become fragmented and destabilised in liquid ways: it is 'always in motion (editable, nonmaterial), but often leaving permanent traces (archives)' (121). In the digital world, self-assessment must be able to capture this fluidity of the self. Traditional self-assessment tasks that ask students to produce judgments about their learning rarely consider this networked and fluid nature of the self. One possibility arises from asking students to pinpoint the online traces students leave behind during their everyday interactions online (Ross 2014).

Another opportunity relates to public self-assessment tasks. For example, Ross (2014) considered blogging as a form of public reflection; nowadays, authentic and digital self-assessment might occur through other social media platforms, too. Asking students to provide public self-assessment artefacts such as blogs, portfolios and social media posts, provides affordances for discussing the various roles we take in online spaces. Such practices could promote the plurality of selves and representations of the self, public personas that are, at times, highly strategic: 'Rather than revealing and developing a true and unitary self, reflecting online and for assessment produces fragmented, performing, cautious, strategic selves. As a result, it offers an opportunity to work with an awareness of the audience and the development of professional and academic voices' (Ross 2014, 124). We see particular value in digital self-assessment artefacts with intrinsic value as aesthetic objects (Ross 2014). These artefacts – such as portfolios or artistic representations of one's networked selves – may be remixed and revised in students' future work. This would train students to develop their continuous albeit fragmented digital selves and, in doing so, develop their agency in the process.

Potential harms and limitations

If self-assessment does not consider students' authentic, digital and networked selves, students may well consider this practice as something inauthentic and separate from their daily experiences as commonplace users of digital technology (Nieminen and Boud 2024). There is an ethical imperative for educational institutions to train students to take agency over their networked selves. Otherwise, students may be vulnerable to the risks of the online world. However, there are considerable risks when students are asked to engage with the online world beyond the 'safe borders' of educational institutions, such as the university-validated learning management system sites. Online bullying and trolling are only some of the most prominent examples of such risks (see Bearman, Nieminen, and Ajjawi 2023). While networked selves necessarily reach beyond the boundaries of formal education institutions, there are ethical considerations in asking students to reflect on these digital 'traces'. Not all students may be willing to reflect on their personal characteristics, particularly when self-assessment is done for an external audience (namely, teachers). There may be a need to incorporate private self-assessment opportunities for students as they reflect on their networked and distributed selves.

Conclusion

In this theoretical synthesis, we have discussed what meaningful self-assessment design might look like in the digital world from the viewpoint of student agency. We have proposed that the digital could be seen as a catalyst needed to rethink the student role in self-assessment. By reviewing critical examples of literature on self-assessment and digital technologies, we propose that the digital in self-assessment may be seen (1) as a tool for promoting students' self-regulation; (2) as a means to develop students' digital agency; and (3) as a means to provide students with more agency over their identity formation. These three ideas for promoting student agency may guide future work to ensure self-assessment becomes more relevant for students' increasingly digital futures.

Finally, we briefly reflect on the role of educators in digital self-assessment design that centres on the students. Even when student agency is emphasised, the role of instructors, assessment designers and policymakers is not eradicated – quite the opposite, as these stakeholders are responsible for designing the means for student agency to be nurtured. Promoting student agency in self-assessment does not mean they should be seen as the sole drivers of assessment but as meaningful agents whose role reaches beyond being seen as 'objects' moulded by others (see Nieminen and Yang 2024).

The three conceptualisations of agency may help educators design self-assessment that builds students' self- and co-regulation skills in digital ways (agency as capability), see students as meaningful collaborators in digital self-assessment design (digital agency), and support students in becoming future citizens in digital societies (reflexive agency). To do this well calls for assessment and grading policies that position self-assessment as a crucial part of the increasingly digital ecosystems of assessment. To provide an example, as higher education institutions are now constructing and revising their AI policies, these policymaking processes could ensure that students are trained to use AI for co-regulating their learning and reflection (agency as capability), are seen as co-designers of such policies (digital agency), and are provided with adequate opportunities to self-assess their networked selves and abilities in collaboration with AI (reflexive agency). This way, self-assessment could be brought to the centre of digital assessment policies and practices.

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