From Self-Perception to Demonstrated Competence: Designing a Skills-Based Assessment of Higher Education Teachers' Digital Competence

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***Abstract*— Digital competencies of higher-education teachers are a prerequisite for high-quality, future-ready learning. Yet institutional measurement practices still rely predominantly on self-assessment instruments whose subjectivity limits their value for data-informed professional development and policy. This work-in-progress paper presents the design of a skills-based, performance-oriented assessment aligned with DigCompEdu and contextualized for higher education (HE). We outline the competence matrix, task design principles, scoring and proficiency modelling, and the planned pilot at a Belgian University of Applied Sciences. We argue that observing demonstrated competencies through authentic tasks produces more trustworthy, actionable evidence than self-perception data, while acknowledging the implications for validity, fairness, acceptance, and ethical data governance. The paper concludes with a validation roadmap and institutional embedding strategy that connects measurement to targeted professional learning.**

Keywords—digital competence; HE; DigCompEdu; performance assessment; professional development, digital pedagogy.

I. INTRODUCTION

Digital technologies shape how HE Institutions design teaching, learning, and assessment. Expectations for teachers extend beyond tool use to pedagogically meaningful integration that improves learning processes and student engagement. Consequently, educators' digital competence has become central to educational innovation and quality improvement. The DigCompEdu framework is widely used to conceptualize this competence across six areas and twenty-two descriptors, providing a common language for policy and institutional strategies [3].

In this work, we rely primarily on DigCompEdu [3] as the reference framework, while explicitly extending it with elements from DigComp 3.0 [1] to account for emerging competences related to Generative AI (GenAI), including the ability to critically evaluate AI-generated content, design AI-aware learning activities, and address ethical implications such as bias, transparency, and academic integrity.

Recent developments in digital technologies—particularly the rapid diffusion of generative Artificial Intelligence (AI)—are reshaping expectations for educators' digital competence. The latest update of the European Digital Competence Framework, DigComp 3.0, reflects these developments by integrating AI competence, data awareness, digital rights, and the ability to critically engage with algorithmic systems across the framework [1]. For HE teachers, this implies that digital competence increasingly includes the ability to meaningfully integrate AI-supported tools in teaching, learning design, and assessment, while addressing ethical considerations such as transparency, academic integrity, and responsible data use. Consequently, competence frameworks and assessment approaches must evolve to capture not only technical tool use but also educators' pedagogical judgement in AI-rich learning environments.

Yet despite this shared foundation, measurement practices in HE remain dominated by self-assessment surveys, which are easy to deploy but limited in terms of validity and reliability for actionable decision making [4][5] reception data tend to be inflated, inconsistent, or weakly correlated with demonstrated performance [2]. This limits their usefulness for personalized professional development pathways, onboarding, HR processes, and evidence-based policy. Consequently, researchers call for objective, performance-oriented approaches, especially in complex domains such as digital pedagogy, digital assessment, and technology-supported learning design [5].

At VIVES University of Applied Sciences (Belgium), these limitations motivated the development of a skills-based assessment of digital competence for HE teachers—aligned with DigCompEdu, tailored to HE realities, and embedded in a responsible institutional governance framework. This short paper presents the design science process underlying the instrument, the conceptual blueprint, and the planned validation and implementation roadmap.

This paper aims to present the design and initial validation approach of a skills-based, performance-oriented assessment of HE teachers' digital competence. While the proposed instrument offers a more valid alternative to self-assessment, it remains a work in progress and is currently limited by its early development stage, lack of large-scale validation, and evolving treatment of emerging competences such as Generative AI integration. The remainder of this paper is structured as follows: Section II reviews related work on digital competence frameworks and measurement approaches; Section III outlines the institutional context and design goals; Section IV presents the assessment design; Section V describes the implementation and validation strategy; and Section VII concludes with lessons learned and directions for future work.

II. Related work

This section provides an overview of relevant literature on digital competence frameworks and approaches to measuring digital competence in higher education.

A. Framework for educators' digital competence

Conceptualizations of teachers' digital competence evolved from tool proficiency toward pedagogical orchestration in digitally enriched environments. In Europe, DigCompEdu offers a comprehensive structure spanning professional engagement, digital resources, teaching and learning, assessment, empowering learners, and facilitating learners' digital competence [3].

While frameworks are conceptually mature, operationalization into valid measures that capture enacted practice is non-trivial—particularly in HE where roles, autonomy, scale, and disciplinary specificity complicate "one-size-fits-all" metrics. Moreover, emerging technologies such as generative AI introduce new layers of digital competence for educators. Teachers increasingly need to evaluate AI-generated content, design learning activities that account for AI-assisted student work, and critically assess the pedagogical and ethical implications of algorithmic systems. These developments reinforce the need for assessment approaches that capture enacted pedagogical decision making rather than static knowledge of digital tools.

B. Measuring digital competence in HE

Systematic reviews consistently report that self-report instruments dominate the field but often lack rigorous validation, psychometric transparency, or demonstrated construct alignment [4][5]. Importantly, discrepancies between perceived and demonstrated digital competence are well documented, particularly in tasks that require procedural or pedagogical decision making [2]. These limitations reduce the interpretability of results for institutional decision making and risk misalignment between teacher needs and professional development offerings.

Beyond measurement challenges, institutional conditions significantly influence the development of digital competence. While higher education institutions increasingly expect teachers to adopt advanced digital and AI-supported practices, they do not always provide sufficient support in terms of training, infrastructure, or aligned systems. Budget constraints further exacerbate this issue, as investments in digital competence development are often deprioritized. This mismatch between expectations and available support can limit both motivation and actual competence development among educators.

Objective or mixed-method assessments allow for observation of actual behavior, process data, and demonstrable task outcomes. In digital-competence research, performance-based approaches show stronger alignment with pedagogical quality indicators and provide more trustworthy inputs for personalized learning pathways and policy [2]. However, such instruments require careful blueprinting, infrastructure, validation, and teacher acceptance—elements that form the core of the VIVES project.

III. Institutional context and design goals

VIVES identified several strategic needs:

More accurate identification of teachers' digital strengths and development needs;

- Personalized professionalization linked to a curated learning offer;
- High-quality data to support data-informed policy, including aggregated insights at programme or faculty level;
- Trustworthy, ethical assessment, with clear boundaries to avoid misuse (e.g., ranking, punitive evaluation).

A design-science methodology was adopted to develop an instrument that is pedagogically meaningful, psychometrically robust, feasible within the institutional ecosystem, and ethically acceptable to staff.

Design requirements included:

- Framework alignment with DigCompEdu
- Authentic tasks contextualized to higher-education practice (e.g., Learning Management System workflows, digital assessment, accessibility);
- Observable, skills-based evidence rather than self-reported perceptions;
- Actionable feedback connecting results to professional learning opportunities;
- Psychometric defensibility, including planned studies on validity, reliability, and fairness;
- Data governance compliant with GDPR and respectful of teacher autonomy.

IV. Design of the digital competence assessment instrument

This section outlines the design of the digital competence assessment instrument, including the competence framework, task design, and underlying scoring model.

A. Competence framework and HE specfic MatrixAuthors and Affiliations

We developed a competence matrix through co-creation with the educational technology expertise group, mapping DigCompEdu areas to HE-specific practices. Examples include: designing technology-enhanced learning sequences; selecting/adapting digital resources (incl. licensing); implementing digital assessment with formative feedback; fostering inclusive and accessible learning environments; and integrating disciplinary digital literacy. For each competence, we articulated three proficiency levels (beginner → proficient → advanced) with evidence descriptors that later support scoring and feedback. Particular attention is given to competences related to GenAI, such as prompt design, critical evaluation of AI-generated outputs, and the integration of AI tools in discipline-specific teaching practices.

B. Perfomance based tasks and evidence model

Within the Performance-based tasks and evidence model, the focus is on whether teachers can demonstrate digital competence through the application of knowledge in diverse, authentic task formats. The instrument is designed to assess

not only declarative knowledge but also its application across a range of question types, including scenario-based and in-app tasks embedded in digital environments.

Scoring is primarily based on product evidence, i.e., the quality and correctness of the final outcome. This allows the model to go beyond isolated technical skills and capture performance outcomes that reflect pedagogical decision-making, ethical awareness (including data protection and academic integrity), and effective technical execution in context.

C. *Proficiency model*

A three-level proficiency scale (beginner → proficient → advanced) is aligned with institutional descriptors. After the pilot, item and task calibrations using IRT/GRM will locate task difficulty along a latent continuum, enabling more efficient assessment in future adaptive versions.

D. *Adaptive delivery and efficiency*

To optimize test time and user experience, we foresee adaptive routing at block-level (rule-based in the pilot; model-based after calibration). Adaptive presentation reduces burden while maintaining measurement precision, a key requirement for voluntary participation and sustainable institutional use.

V. Institutional Implementation and Validation

A. *Pilot: calibration of items, usability and acceptance*

The first implementation step consists of a voluntary pilot involving approximately 50–80 teachers across multiple departments. While usability and acceptance (e.g., clarity of instructions, perceived fairness, workload) remain important considerations, the primary purpose of the pilot is item calibration. Because the instrument consists of newly developed, performance-based items, it is essential to collect empirical data to estimate item difficulty, discrimination, and functioning across competence levels.

This calibration phase is crucial for enabling adaptive testing in later iterations of the instrument. Adaptive routing—initially rule-based and later model-based—requires that items be placed accurately on a latent proficiency scale. Without robust calibration data, adaptive delivery cannot produce reliable or efficient measurement.

To support this process, the pilot will use the Test of Skills and Abilities (TOSA platform (Isograd), an established environment for performance-based digital skills assessment that integrates authentic task execution, process logging, and adaptive test delivery. TOSA is internationally used for scalable, task-based evaluation of digital competences and provides a structured environment for task calibration, scoring, and psychometric analysis. The platform's proven capacity for adaptive testing and item tokenisation supports the later transition to a more efficient, personalised assessment model.

Thus, the pilot simultaneously (a) delivers insight into teacher experience and feasibility, and (b) generates the item-level data necessary to transition from a fixed-form test to an adaptive, evidence-based assessment system.

B. *Ethical and governance considerations*

Trust and responsible use are central to the instrument's design and implementation. The project adheres to principles of voluntariness, transparency, and privacy-by-design. Individual teacher results are used exclusively for professional development and are not shared with management for evaluative or performance-related purposes. Aggregated and anonymized data may support institutional insights into digital competence development and inform strategic planning, but will never be used for ranking or monitoring individuals.

Any potential future extension toward HR-related applications (e.g., onboarding, role transitions) would require:

- new and explicit consent,
- co-governance with HR and teacher representatives, and
- additional validation to ensure fairness, accuracy, and ethical appropriateness.

This governance framework is essential for maintaining teacher trust—particularly given the shift from self-perception to demonstrated performance, which carries inherently higher stakes and must therefore be managed responsibly.

VI. Discussion

This section summarizes the main findings of the study and outlines directions for future research and implementation.

This work addresses a well-documented gap: the overreliance on subjective self-assessment in digital-competence measurement. By proposing a framework-aligned, skills-based instrument tailored to higher-education contexts, the project contributes to the evolution of more trustworthy forms of digital-competence assessment. In addition, the rapid integration of generative AI into HE amplifies the need for reliable insights into teachers' digital competence. As educators experiment with AI-supported feedback, content generation, and learning analytics, institutions require assessment approaches that capture teachers' ability to critically and pedagogically integrate such technologies rather than merely adopt them.

The design responds to calls in the literature for authentic, reliable, and pedagogically meaningful measures that can support both micro-level (teacher professionalization) and macro-level (institutional policy) needs. Key challenges ahead include managing workload, ensuring user-friendly task delivery environments, maintaining teacher trust, and conducting rigorous psychometric validation.

VII. Conclusion and Future Work

This work-in-progress outlines the rationale, conceptual design, and validation plan for a higher-education–specific, skills-based assessment of digital competence. Early design insights highlight the importance of balancing psychometric robustness with feasibility and teacher acceptance, as well as the need to carefully manage perceived stakes associated with performance-based assessment.

Key challenges include ensuring scalability, minimizing workload, achieving reliable task calibration, and maintaining trust through transparent governance. Limitations of the current work include the absence of large-scale validation data, the early-stage integration of GenAI-related competences, and the need for further refinement of adaptive testing mechanisms.

Future work will focus on pilot evaluation, iterative task refinement, and psychometric validation, including reliability,

fairness, and construct validity analyses. Technical developments will explore model-based adaptive testing, integration with institutional systems, and enhanced process data analysis. Additionally, future research will examine teacher perceptions of the assessment approach and its impact on professional development engagement.

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