Towards Sustainable AI-Enabled Higher Education: A Human-Centred Framework for Student Digital Wellbeing

Dr. Anjali Shokeen[1] & Yoshita Rastogi[2]

[1]Associate Professor, University School of Education, Guru Gobind Singh Indraprastha University

[2]Research Scholar, University School of Education, Guru Gobind Singh Indraprastha University

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ABSTRACT

Artificial intelligence is increasingly being integrated into higher education institutions in the form of adaptive learning platforms and intelligent tutoring systems. These technologies are promoted as they provide personalised learning experiences and enhance students' engagement. However, recent studies have raised some concerns such as digital fatigue, anxiety caused by AI-based systems and stress due to constant digital work. Sustainable higher education in line with Sustainable Development Goal (SDG) 4 should not only focus on academic achievement and technological advancement but also on maintaining students' digital wellbeing. This paper aims to synthesize multidisciplinary literature on AI adoption in higher education and student digital wellbeing. It further identifies and articulates the conceptual gap arising from the field's disproportionate emphasis on technological and pedagogical efficiency in relation to human wellbeing. Lastly, the paper proposes a human-centered AI Framework for Student Digital Wellbeing that guides sustainable and ethical integration of AI in higher education institutions. The paper uses a conceptual research design based on a structured conceptual literature review with systematic search. The recurring themes were identified and synthesised into a conceptual framework rather than being tested empirically. It was found that existing studies mainly focus on AI adoption and learning outcomes and give comparatively less attention to students' digital wellbeing. To address this gap, the paper proposes a human centered conceptual framework for sustainable AI integration in higher education. In conclusion, integrating student digital wellbeing into AI-enabled higher education institutions is essential for creating a more inclusive, ethical, and human-centred learning environment.

Keywords: Artificial Intelligence (AI); Higher Education; Student Digital Wellbeing; Human Centred AI; Sustainable Education; AI Ethics; SDG 4

INTRODUCTION

Artificial Intelligence (AI) has moved from the periphery to the centre of higher education strategy within less than a decade. The usage of generative AI (GenAI) tools such as ChatGPT and Gemini has been described as revolutionary as they are changing the educational landscape. They are prompting scholars to characterize this moment as a potential game changer for society as well as industry (Kurtz et al., 2024). It is observed that many higher education institutions are using AI in different areas of teaching and learning. Learning Management Systems (LMS) use the technology of predictive analysis to monitor students' progress over time. Therefore, AI-powered online proctoring, plagiarism detection tools, adaptive learning platforms, and generative AI applications are used by universities to support learning (Francis et al., 2025; Michel-Villarreal et al., 2023). With the rapid growth of AI in education, governments and international universities are encouraged to develop policies and guidelines for ethical and responsible use of AI. For example, principles given by the OECD on Artificial Intelligence promote the development of AI that is trustworthy, inclusive and most importantly, respects human rights as well as democratic values (OECD, 2019). Similarly, UNESCO has provided some recommendations on the Ethics of Artificial Intelligence. It gives guidance regarding ethical and human-centred use of AI. The United Nations' Sustainable Development Goal (SDG) 4 highlights the importance of ensuring inclusive, equitable and quality education for everyone (United Nations, 2015).

National Education Policy (NEP) 2020 gives importance to the use of AI and other technologies in classrooms to improve access, quality, equality and innovation in higher education. Overall, all these international and national initiatives highlight that AI is an essential tool as it provides many benefits, especially at higher education levels. At the same time, researchers highlighted the negative effects of increasing digital technology use in the field of education. Studies on the use of generative AI (GenAI) in higher education have raised concerns about academic integrity, overdependence on AI, inaccurate or biased outputs and unequal access to AI tools (Kurtz et al., 2024; Michel-Villarreal et al., 2023). Francis et al. (2025) pointed out that GenAI improves personalised learning and makes assessment more efficient but it has some negative effects too. Uncontrolled use of GenAI may reduce the originality of students' work, widen the digital divide and can also increase environmental problems. Research based on 474 students' recommendations was conducted by Černý (2025) has found that students themselves believe AI should be used with some limits.

However, some research also shows that digital wellbeing can be improved if proper educational practices are followed in the right manner. For example, if social-emotional learning activities are added to hybrid learning platforms, then it was found that it improves students emotional wellbeing, stress management and sense of social connection among individuals (Nuriyeva et al., 2024). Overall, all these studies suggest that digital wellbeing is not a fixed situation. It is a balance between the benefits of technology and psychological challenges. This view is consistent with Vanden Abeele's (2021) idea of digital wellbeing as a dynamic concept which was later applied to technology-enhanced learning in higher education by Adomaitienė and Volungevičienė (2024).

Sustainable education as promoted under the Sustainable Development Goal (SDG) 4 is not only about introducing new technologies into the classrooms. It is about ensuring that students learn in environments that support all three dimensions including psychological, social and ethical wellbeing (United Nations, 2015). In other words, a truly sustainable AI-enabled higher education system should support both learning and the wellbeing of students. This same idea is reflected in the ethical guidelines provided by UNESCO (2021) and OECD (2019). It gives importance to the fact that AI in education should always include human oversight, accessibility as well as transparency. Similarly, the National Education Policy (2020) highlights that technology should promote equity, inclusion and the holistic development of learners rather than being adopted simply because it is available. This paper argues that there are many discussions on AI in higher education that focus on technology but less attention has been given to students' digital wellbeing. When digital wellbeing is discussed, it is usually seen as a secondary issue and is usually addressed through digital literacy programmes, counselling services or policies introduced after problems arise including digital fatigue (Murugan & Rashadh, 2024; Adomaitienė & Volungevičienė, 2024). However, digital wellbeing should be considered from the beginning when designing, implementing and managing AI systems in higher education.

Objectives of the study

The main aim of this paper is to propose a human-centered conceptual framework that positions student digital wellbeing at the center rather than as a peripheral dimension of sustainable AI-enabled higher education. As a result, the paper focused on the following specific objectives:

- To synthesize multidisciplinary literature on AI adoption in higher education with a focus on student digital wellbeing including teaching, psychological, equality, and governance aspects.
- To identify the major themes and gaps in the existing literature on AI and student digital wellbeing.
- To develop and propose a conceptual framework called the Human-Centred AI Framework for Student Digital Wellbeing by integrating theoretical perspectives.
- To discuss the practical implications of the proposed framework and provide suggestions for future research and empirical testing.

Methodology of the study

This is a conceptual paper and does not seek to test any hypothesis through primary data collection. Instead the study follows an established tradition in management, education as well as information systems scholarship of theory building using analysis of existing literature.

Research Design

The paper is positioned within the conceptual paper research design. It prioritizes argumentation, synthesis and model building over statistical inference. Existing theories like self-determination theory, capability approach, human-centred AI, and sociotechnical systems theory are combined together and a new framework applicable to higher education is produced. The study included secondary data analysis. Peer reviewed literature and policy documents are analysed qualitatively rather than statistically.

Data sources

The paper includes both academic and policy literature to ensure credibility. Sources are mentioned below:

- Dimensions-indexed literature is used to cross verify citation reach and identify additional relevant sources.
- ERIC (Education Resources Information Center) records are collected particularly for pedagogy, curriculum and student experience focused studies.
- UNESCO reports that include AI in education guidance and the recommendation on the Ethics of Artificial Intelligence.
- OECD reports on AI principles, AI and the future of skills, and digital education outlooks.
- The World Economic Forum reports on the future of jobs, education 4.0, and AI governance.
- European Commission AI policy documents that include ethical guidelines for educators on the use of AI and data, and AI Act-related guidance materials.
- National Education Policy (NEP) 2020, as a national sustainability- and technology-oriented policy benchmark.
- University Grants Commission (UGC) AI related initiatives and guidelines for Indian higher education institutions.
- SDG 4 (Quality Education) documentation and associated UN sustainability reporting, used as the normative sustainability lens for the paper.

Search Strategy

A structured search strategy that is not formally registered was used to identify relevant literature across different databases and repositories listed above.

Search terms and combinations

("artificial intelligence" OR "generative AI") AND ("higher education" OR university OR universities) AND ("digital wellbeing" OR "digital well-being" OR "student wellbeing" OR "student well-being" OR "digital fatigue")

Besides this, relevant policy and institutional documents were also identified. The official websites of UNESCO, OECD, the World Economic Forum, the European Commission, UGC, and the United Nations were used for analysing data.

Inclusion criteria

- The research publications from January 2022 to August 2026 covering the period of rapid development and adoption of AI in education.
- The articles must be peer-reviewed journal articles or reports published by institutions or intergovernmental organizations.
- The articles must be published in the English language.
- The articles should focus on themes related to the adoption of AI, digital wellbeing, sustainability, education, or governance in higher education contexts.

Exclusion criteria

- The articles published in blogs, opinion pages, or unreviewed preprint platforms with no recognized institutional affiliation
- The articles focus exclusively on K–12 education with no consideration for higher-ed contexts.
- The articles focus exclusively on questions pertinent to computer science or AI development with no consideration for education, psychology, or governance issues.
- The duplicates or multiple versions of the same article or report.

Literature Selection Process

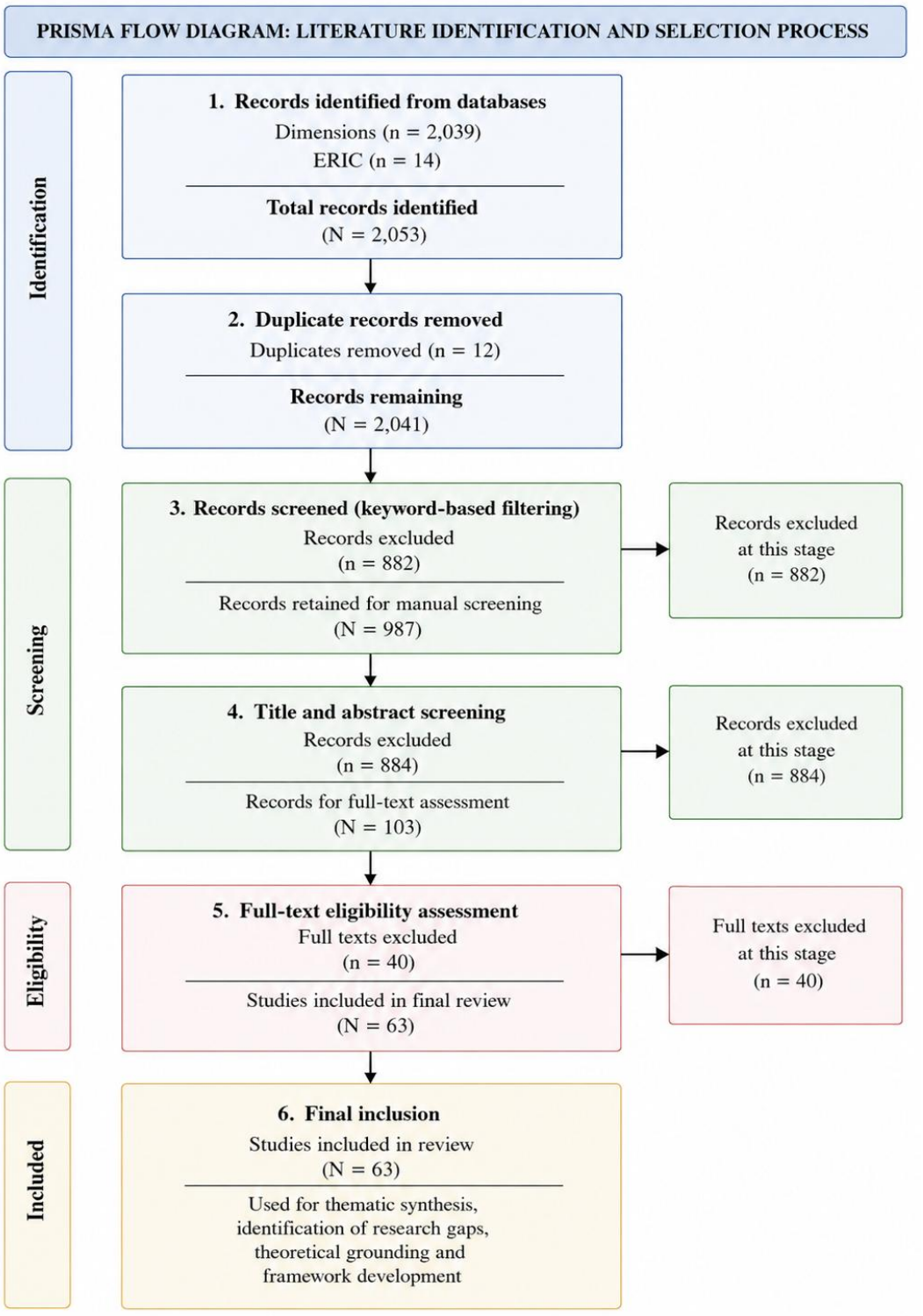

Figure 1. PRISMA-style flow diagram

A structured literature identification and screening process was conducted. Rayyan systematic review software was used for this purpose. It supported deduplication, blinded screening and traceable decision recording at different stages.

- **Database search and record identification-** Systematic searches were conducted across two primary databases. It includes Dimensions and ERIC. The Dimensions search retrieved 2039 records while the ERIC search retrieved an additional 14 records making a total of 2053 records identified for initial consideration.
- **Duplicate removal-** All identified records were imported into Rayyan where automated duplicate detection was done. A total of 24 articles were identified and 12 were removed. This stage left a total of 2041 unique records eligible for further screening.
- **Keyword-based filtering:** The unique records were then filtered using a predefined set of keywords that were created by keeping the paper's core thematic area at the center. Some of these words include artificial intelligence, higher education, digital wellbeing, sustainability and governance. As a result, the remaining 882 records were excluded for falling outside the keyword scope. Some of the excluded criteria keywords include school, primary school, secondary school, elementary school, high school, K-12, pupils, schoolchildren, healthcare, medical, hospital, clinical, patient, agriculture, manufacturing, banking, finance, marketing. Lastly, 987 records were retained for manual screening.
- **Title and abstract screening-** The 987 records were subjected to manual title and abstract screening within Rayyan against the inclusion and exclusion criteria as specified in section 3.3. This stage helped exclude 884 records that were excluded based on non-peer-reviewed, non-English, K-12 focused, or clearly outside the scope of AI education wellbeing and governance criteria. This elimination stage left 103 records for full-text screening.
- **Full-text eligibility assessment-** The remaining 103 records were retrieved in full text and assessed in detail against the eligibility criteria with particular attention to each source's conceptual relevance to the paper's main theme. Of these, 40 full-text records were excluded due to insufficient thematic depth or exclusive focus on technical AI development without educational or governance relevance or duplication of content already captured by an included source.
- **Final corpus-** This process finally led to the final corpus of 63 articles and reports which constitute the literature base for underpinning thematic synthesis. This process helped in theoretical grounding as well as framework development.

Analytical Approach

The study is conceptual and qualitative in its nature. The analysis did not involve any statistical procedures. Instead, the reviewed literature was examined through three analytical procedures mentioned below:

Thematic Synthesis: all recurring concepts, issues and concerns across the literature that were reviewed by the researcher through screening were identified and organized into broader themes. Through this process, four themes were identified. These are:

- AI-Driven Pedagogical Transformation,
- Psychological and Emotional Safety,
- Equity and Inclusion, and
- Institutional Governance and Accountability.

The above mentioned themes were conceptually interpreted. Later, they were refined into the four dimensions of the proposed HCAI-SDW framework.

Conceptual synthesis: concepts and perspectives emerging from different disciplinary traditions were identified. For developing conceptual understanding of human centred and sustainable AI adoption in higher education, perspectives from education, psychology, information systems and public policy were compared.

Comparative policy analysis: all relevant international and national policy frameworks and guidelines including those of UNESCO, the OECD, the European Union and higher education policy of India such as NEP 2020 and UGC initiatives were examined. This process helped in identifying areas of convergence and convergence concerning AI adoption, human wellbeing, equity, ethical governance and educational quality.

Literature-derived theme	Key concerns identified	HCAI-SDW framework dimension
AI-Driven Pedagogical Transformation	Personalisation, AI-supported learning, dependence, independent learning	**Pedagogical Agency**
Psychological and Emotional Risks	Anxiety, digital fatigue, burnout, psychological wellbeing	**Psychological and Emotional Safety**
Equity, Access and Inclusion	AI literacy, digital competence, access, fairness and inclusion	**Equity and Inclusion**
Institutional Governance and Accountability	AI policies, ethics, privacy, risk management and transparency	**Institutional Governance and Accountability**

Table 1. Mapping of Literature Themes to HCAI-SDW Framework Dimensions

Theoretical Grounding

The proposed Human-Centred AI Framework for Student Digital Wellbeing (HCAI-SDW) is based upon four complementary theoretical traditions that are supported by broader sustainability and policy perspectives. These traditions were selected as they addressed psychological wellbeing and interaction between technological and social systems. Most importantly, they provided a multidimensional foundation for examining how AI can be integrated into higher education while maintaining focus on students' wellbeing, agency, equity and sustainable educational development.

Self-Determination Theory (SDT)

Self-Determination Theory (SDT) was developed by Edward Deci and Richard Ryan. This theory proposes that psychological well-being and intrinsic motivation are very closely linked with the fulfillment of three basic psychological needs. These are autonomy, competence, and relatedness. Within AI-enabled higher education this perspective is particularly relevant because the design and use of AI systems can either support or constrain these needs. Therefore, it is observed that AI tools that provide excessive structure encourage dependency or rely heavily on surveillance may improve short-term efficiency while reducing students' sense of autonomy and control.

The Capability Approach

The Capability Approach is linked with Amartya Sen and Martha Nussbaum. According to this theory, education is not about skill acquisition but also about helping people develop the freedom and ability to make meaningful choices in life. This lens reframes the concept of digital wellbeing not as an optional add on but as a capability that AI-enabled education systems can either explain or constrain. It mainly depends on whether students retain meaningful choice, voice and agency over their AI-mediated learning experiences.

Human-Centred Artificial Intelligence (HCAI)

Human-centred AI design that is articulated in Shneiderman's work. It is also reflected in UNESCO and OECD AI principles. It holds that AI systems should be designed to amplify human capability and preserve human control. HCAI places human needs, values, safety, and agency at the centre of AI system design and use.

Sociotechnical Systems Theory

Sociotechnical systems theory conceptualizes technology adoption as inseparable from different systems. These systems include social, organizational and cultural systems within which it is included. It highlights that AI's effects on student wellbeing can not be understood by examining algorithms in isolation. It was emphasized that they must be understood as emergent properties arising from the interaction between technical design, institutional policy, pedagogical practice and student agency.

SDG 4 and the Sustainability Perspective

Finally, SDG 4' emphasis on inclusive, equitable and quality education, along with lifelong learning opportunities for all provides the sustainability frame. Within this frame, the four theories are integrated. Accordingly, sustainable AI enabled higher education is conceptualised as an educational system in which technological innovation is aligned with other aspects. These aspects include learning quality, accessibility, equity, student agency, psychological wellbeing, ethical governance, and human development. Overall, SDG 4 provides the normative context through which the insights from SDT, Capability Approach, HCAI, and Sociotechnical Systems Theory are integrated into the proposed HCAI-SDW framework.

Thematic Literature Review

The 63 studies included after the systematic screening process were thematically synthesised to identify major dimensions of AI-enabled higher education. Four major interconnected themes emerged from the reviewed literature. All themes are explained below:

Theme One: AI-Driven Pedagogical Transformation

The reviewed literature shows that there is growing use of AI for personalised learning, AI-supported learning, feedback, student engagement and academic support. Several studies also examine AI literacy, self-regulated learning as well as active use of AI tools by students. Overall, the research literature suggests that AI supports flexible and personalised learning.

Theme Two: Psychological and Emotional Risk

Several studies examined the relationship between AI use and student wellbeing. The studies catered to different areas. It includes mental health, learning anxiety, burnout, digital wellbeing, motivation and social experiences. The literature indicates that AI can provide learning as well as emotional support but it is important to understand that inappropriate use may lead to some concerns like anxiety, digital fatigue, burnout, dependence and concerns about reduced human interaction. In a nutshell, these findings indicate that psychological and emotional wellbeing should be considered along with the educational benefits of AI.

Theme Three: Equity, Access, and Inclusion

The reviewed studies highlight the importance of equitable and inclusive AI adoption. But there exists some issues related to AI literacy, digital capabilities, unequal access, inclusive learning environments, and fairness appear across the literature.

The findings reveal that providing access to AI technologies alone is not sufficient. Students also need digital and appropriate AI competencies, institutional support as well as fair opportunities to benefit maximum from AI enabled education.

Theme Four: Institutional Governance and Accountability

The fourth theme is related to ethical and institutional conditions that are surrounded with AI adoption. The reviewed literature addresses institutional AI policies, ethical decision making, risk management and several

other aspects. There are some studies that examine institutional approaches to generative AI, emphasizing the need for clearer guidelines and responsible governance.

Cross-Cutting Observation

Across all the four themes , the literature shows that AI enabled higher education is based on different dimensions including pedagogical, psychological, social and institutional areas. But these dimensions are often studied separately. In particular, student wellbeing is not integrated with questions of AI design, pedagogical practices , equity and institutional governance. This fragmentation provides the basis for the proposed framework named as Human-Centred AI Framework for Student Digital Wellbeing (HCAI-SDW). This brings these four dimensions together around the central theme of sustainable and human-centred AI-enabled higher education.

Proposed Conceptual Framework: The Human-Centred AI Framework for Student Digital Wellbeing (HCAI-SDW)

The human-centred AI framework for student Digital Wellbeing is the main conceptual contribution of this paper. The framework is developed from the themes identified in the review of 63 studies. It places student digital wellbeing at the center and connects to the other four dimensions as shown in the figure below.

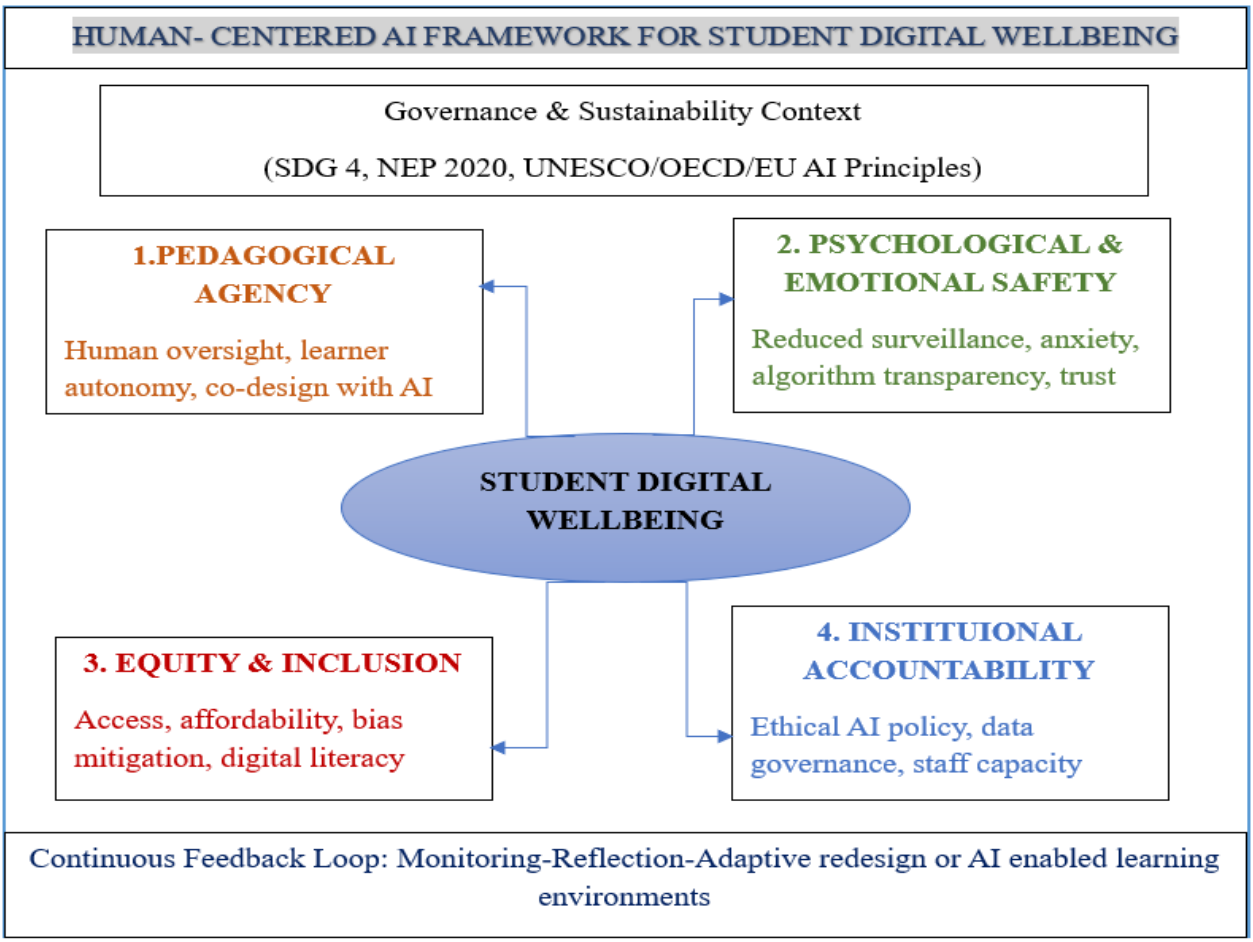

Figure 1. The Human-Centred AI Framework for Student Digital Wellbeing (HCAI-SDW)

Core Construct: Student Digital Wellbeing

Student digital wellbeing is the central element of the framework. It refers to students' ability to engage with digital and AI-based learning technologies in ways that support their learning, psychological wellbeing, social interaction and sense of control. The reviewed literature shows that digital wellbeing is becoming an important concern in higher education. Mohd Bahar et al. (2026) examined digital wellbeing among higher education

learners while on the other hand, Shi et al. (2025) explored the relationship between AI literacy, self-regulated learning, academic performance and wellbeing in generative AI-supported higher education. Jukiewicz (2025) also examined how generative AI can influence both teacher and student wellbeing. Overall, these studies support the need to place students' wellbeing at the centre of AI enabled educational development.

Dimension 1: AI-Driven Pedagogical Transformation

This dimension focuses on how AI changes teaching and learning. The reviewed studies highlight that personalized learning, generative AI supported learning and various other aspects. For example, Fortuna et al. (2025) examined the development of AI in personalised learning. Griche and Bennis (2026) reviewed generative AI integration in higher education language education. However, AI should support students and their independent learning rather than only encouraging excessive dependence on technology (Shi et al., 2025; Wang et al., 2026; Jiang et al., 2026).

Dimension 2: Psychological and Emotional Safety

This dimension mainly focuses on psychological as well as emotional effects of AI use on students. The reviewed literature identified concerns related to digital wellbeing, learning anxiety, burnout, mental health and other aspects. For example, Zhang et al. (2026) investigated generative AI use in relation to learning anxiety. On the other hand, Benchallal (2026) examined the influence of AI on students' learning and psychological wellbeing. Therefore, the framework does not assume that AI is positive or negative. Instead, it focuses on the need to create AI supported learning environments for students. This environment will enable institutions to promote educational benefits while also reducing psychological and emotional risks.

Dimension 3: Equity and Inclusion

The Equity and Inclusion dimension addressed an important concern. It includes whether students have fair opportunities to benefit from AI enabled education. The reviewed literature highlights AI literacy, digital competence, inclusive learning environments, access and fairness. For example, Kaplan and Meylani (2026) identified different dimensions of AI literacy and the competencies required for meaningful engagement with AI. Similarly, Hsu (2026) examined AI literacy and competency in pre-service teacher education. These studies show that responsible AI adoption needs more than just technological implementation.

Dimension 4: Institutional Governance and Accountability

This dimension mainly focuses on the institutional structures that are required for responsible AI usage. The reviewed literature highlights AI policies, ethical decision making, risk management and other areas. Some researchers such as Bacalso et al. (2026) studied how institutions are managing generative AI and highlighted the importance of institutional strategies. Humble (2024) focused on risk management strategies for generative AI in computing education. Hence, research shows that responsible AI adoption requires more than technological implementation.

Governance and Sustainability Context

All four dimensions operate within a broader governance and sustainability context. The literature suggests that sustainable AI adoption needs attention not only to technological innovation and learning outcomes but also to students' wellbeing, equity, ethical responsibility, and long-term educational quality. The framework places all four dimensions within a broader context of inclusive, equitable and sustainable education. In this context, this framework can be connected with NEP 2020, while SDG 4 provides a broader reference for maintaining quality, inclusion and equitable education.

Feedback Loop

The framework is designed as a continuous process rather than a one-time model. AI systems and practice should be regularly evaluated based on students' learning experiences, wellbeing, access and feedback.

Continuous monitoring can therefore help institutions in identifying emerging risks, assessing educational benefits, and adapting AI-supported practices and policies accordingly.

DISCUSSION

The HCAI-SDW framework connects with four important debates in AI enabled education.

- First is **efficiency and human-centered education.** AI can improve learning and provide numerous benefits but it also needs to be considered alongside student wellbeing and learning risks (Fortuna et al., 2025; Jukiewicz, 2025).

- Second is **datafication and student wellbeing.** The increasing use of AI and digital technologies in education raises some concerns about anxiety, burnout, digital fatigue and students' psychological experience as stated by researchers like Mohd Bahar et al., 2026; Jiang et al., 2026; Zhang et al., 2026. This framework highlights that educational technologies should not be evaluated only through measurable performance outcomes.
- Third is **governance and responsible implementation.** Recent research highlights that there is the need for institutional policies, risk management, ethical decision and several other factors for responsible AI implementation in higher education as researched by Bacalso et al., 2026; Humble, 2024; Karakuş et al., 2025.
- Fourth is **generative AI, learning autonomy and cognitive dependence.** Research on AI literacy, self-regulated learning and learning anxiety suggests that the educational value of generative AI depends on how students use and regulate the technology (Shi et al., 2025; Wang et al., 2025; Zhang et al., 2026). The pedagogical agency dimension emphasises that using AI to support independent thinking and learning is essential rather than replacing it.

Practical and Policy Implications

- **Institutions-** Universities should incorporate student wellbeing into AI governance. AI policies should address psychological safety, transparency, privacy, and equity alongside other aspects including academic integrity and data security. Periodic digital wellbeing reviews can help institutions identify future emerging risks.

- **Educators-** Faculty should use AI as a learning scaffold rather than a replacement for independent thinking. Assessments should encourage appropriate and transparent AI use. Faculty development should strengthen teachers' ability to evaluate AI output.

- **Policymakers-** AI policies for higher education should consider wellbeing and equity alongside innovation and data protection. National and institutional strategies should also support research and capacity building so that less resourced institutions and students are not excluded from the benefits of AI.

Limitations

As this is a conceptual paper, this study has several limitations. First, the framework is based on secondary literature. Theoretical reasoning is used rather than primary empirical data. Therefore, its constructs have not yet been empirically tested or operationalised. Second, although the literature search followed proper structured inclusion and screening procedures, it does not formally include a systematic review and may not capture all relevant studies. Third, the four dimensions proposed in the framework may require further refinement. Future empirical research is therefore needed to test, validate and strengthen the framework.

Future Research Directions

Future research should first empirically validate the HCAI-SDW framework. Researchers in future therefore validate through survey based or mixed methods studies examining student digital wellbeing across its four

dimensions. Second, a Student Digital Wellbeing Index could be developed and psychometrically tested to operationalise the framework. Third, comparative studies across different national and institutional contexts can be done. The studies can examine how the framework operates under different conditions. Finally, longitudinal research could examine how constant AI use influences student wellbeing over time.

CONCLUSION

This paper argues that student digital wellbeing is not sufficiently integrated into discussions of AI enabled higher education. The paper proposes a framework named the Human-Centred AI Framework for Student Digital Wellbeing (HCAI-SDW) that is drawn upon self-determination theory, the capability approach, human-centred AI, sociotechnical systems theory, and SDG 4. Most importantly, the framework places student wellbeing at the centre of AI enabled education and connects it to four dimensions. Emphasis is given on the fact that sustainable AI options should not only focus on efficiency, innovation, or learning outcomes rather it must ensure that students can engage with AI in ways that support their wellbeing, agency, equitable participation, and trust. In a nutshell, the HCAI-SDW framework provides a beneficial starting point for future empirical research. Researchers can test and refine the framework across diverse higher education contexts.

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