Advancing Academic Thriving in the Digital Era Through Human-Centered Artificial Intelligence and Institutional Support

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Abstract: The rapid adoption of artificial intelligence in higher education raises a critical but underexamined question: does digital transformation advance academic thriving equitably, or does it reproduce existing inequalities among students? This paper addresses that question through a narrative integrative review grounded in Self-Determination Theory (SDT). Searches across three databases—Scopus, Google Scholar, and the Sinta portal—identified 36 sources, of which 16 met strict inclusion criteria (Scopus Q1/Q2, SJR above 1.0 or Sinta 1–2; publication years 2017–2026) and were retained as the primary evidence base for thematic synthesis. An additional eight foundational theoretical references were incorporated to strengthen the SDT-based framework and acknowledge the theoretical development of the constructs; these references were not subject to the same systematic screening process because they predate the 2017–2026 search boundary. The total number of references cited in the manuscript is 24. A three-pass thematic coding procedure applied to the 16 selected studies identified three consistent analytical patterns. First, human-centered artificial intelligence supports student engagement by satisfying the SDT needs for autonomy and competence, but only when system design prioritizes human oversight over automation efficiency. Second, institutional support converts AI-enabled engagement into sustained academic perseverance by fulfilling the SDT need for relatedness. Third, socioeconomic status functions as a boundary moderator that determines how equitably both pathways reach different student populations. These literature-derived patterns are distinguished from four propositions newly formulated by the authors.

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Synthesizing both, this study proposes the Human-Centered Digital Academic Thriving Framework (HC-DATF), a formally articulated conceptual model with two antecedents, two sequential mediators, one boundary moderator, and four testable propositions. The framework offers theoretical and practical contributions for universities, policymakers, and educational technology developers committed to equitable digital learning environments.

Keywords: Academic Thriving, Human-Centered Artificial Intelligence, Self-Determination Theory, Institutional Support, Socioeconomic Equity, Digital Transformation, Higher Education

1. Introduction

Higher education systems worldwide are undergoing a digital transformation that touches every part of student life, from lecture delivery to academic advising. Within this shift, artificial intelligence has moved from a peripheral classroom tool to a structural feature of how universities personalize instruction, predict learning risk and allocate institutional support (Crompton & Burke., 2023; Kasneci et al., 2023). The proliferation of generative artificial intelligence tools since 2022 has accelerated this shift further, raising urgent questions about pedagogy, equity, and student wellbeing that existing theoretical frameworks have not yet fully addressed (Chan & Hu., 2023; Bearman & Ajjawi., 2023). Academic thriving offers a useful lens for studying this transformation because it captures more than performance and graduation rates.(Schreiner., 2010) defined academic thriving as a state in which students are intellectually engaged, socially connected, and psychologically well while pursuing their studies. This construct extends earlier work on flourishing (Keyes & Haidt., 2003) and psychological retention (Bean & Eaton., 2000), but goes further by treating student wellbeing and academic performance as inseparable. Despite its conceptual richness, the academic thriving literature has rarely engaged with human-centered artificial intelligence research (Shneiderman., 2020; Riedl., 2019; Xia et al., 2022) or with digital equity scholarship (Van Deursen et al., 2017; Amjad et al., 2024). These streams have developed largely in isolation from one another. Critical evaluation of existing literature reveals three specific unresolved gaps. First, AI adoption studies in higher education consistently examine engagement or performance as proxies for learning but rarely use the multidimensional thriving construct as an outcome (Crompton & Burke., 2023; Labadze et al., 2023), meaning the wellbeing, belonging, and perseverance dimensions of thriving remain underexamined in AI research. Second, institutional support and belonging research has demonstrated strong effects on retention and motivation (Pedler, Willis, & Nieuwoudt., 2022; Gravett & Ajjawi., 2022) but has not been connected to AI-mediated engagement pathways, leaving unclear whether

institutional support amplifies or substitutes for AI-enabled engagement. Third, digital equity studies identify socioeconomic status as a stratifier of digital outcomes (Van Deursen et al., 2017; Amjad et al., 2024) without situating that effect within a framework that also includes AI design quality and institutional support. Table 1 summarizes these gaps across construct combinations. These gaps matter particularly in professional higher education contexts in developing countries, where institutional capacity, digital infrastructure, and student socioeconomic diversity vary considerably across programs (Permata Sari et al., 2023; Aini, Kurniawan, & Sulistiyowati., 2024). The purpose of this paper is to fill these gaps by integrating the three streams into a single conceptual account of academic thriving in the digital era. The paper proposes the Human-Centered Digital Academic Thriving Framework (HC-DATF), which names, connects, and theoretically grounds the relationships among human-centered artificial intelligence, institutional support, socioeconomic status, and academic thriving. To establish the novelty of HC-DATF more precisely, it is useful to compare it with three closely related conceptual models. (Schreiner's., 2010) Thriving Quotient identifies individual psychological dimensions of thriving but does not model the technological or institutional antecedents that produce them. (Shneiderman's., 2020) framework for human-centered AI provides design principles for reliable, safe, and trustworthy systems, but its outcome variable is system quality rather than student wellbeing. (Zawacki-Richter et al.'s., 2019) systematic review documents AI applications but does not theorize the mechanism through which AI produces student outcomes via SDT. HC-DATF advances all three by specifying the SDT-based mechanism, connecting IS and AI as jointly necessary antecedents, and formalizing SES as a theoretically justified boundary moderator.

Self-Determination Theory (Ryan & Deci., 2020) is selected as the primary grand theory because it is uniquely suited to predict the wellbeing and sustained motivation outcomes that define academic thriving. Social Cognitive Theory focuses on observational learning and behavioral outcomes but does not predict psychological wellbeing states. Technology Acceptance Theory explains initial adoption decisions but not sustained perseverance. SDT, by contrast, directly predicts that thriving arises from the satisfaction of three basic needs — autonomy, competence, and relatedness — that map naturally onto the three pathways examined in this paper. Table 1 maps the identified research gaps across construct combinations, showing the specific combination that this paper addresses.

Table 1 Research Gap Matrix

Construct	AI Studies	Institutional Support	SES / Digital Equity	Academic Thriving
AI and Engagement	Studied	-	-	-
AI and thriving	Partial	-	-	-

IS and belonging	-	Studied	-	-
SES and Digital Divide	-	-	Studied	-
AI, IS and Equity	-	-	-	GAP

Table 1 summarizes the existing studies that have tended to examine artificial intelligence, institutional support, socioeconomic status, and academic thriving as separate or partially connected constructs. However, little attention is paid to how these factors interact in a unified mechanism of explaining equitable academic thriving. More specifically, the combined pathway linking AI-enabled engagement and institutional support to academic thriving, while considering socioeconomic status as a boundary condition, is still not sufficiently articulated. This gap is the conceptual foundation of the Human-Centered Digital Academic Thriving Framework (HC-DATF) proposed in this study.

Theoretical Foundation: Self-Determination Theory

Self-Determination Theory (SDT; Ryan & Deci., 2020) provides the primary grand theory grounding the HC-DATF. SDT posits that human motivation, wellbeing, and sustained engagement are facilitated when three basic psychological needs are satisfied: autonomy (feeling self-determined and in control of one's learning), competence (feeling capable and effective), and relatedness (feeling connected and cared for by others). When these needs are met, individuals experience intrinsic motivation and psychological flourishing — states that map directly onto (Schreiner's., 2010) dimensions of academic thriving. Applying SDT to the HC-DATF produces three specific theoretical mechanisms. Human-centered artificial intelligence supports the needs for autonomy and competence through personalized feedback, adaptive challenge calibration, and the learner's ability to control the pace and mode of learning (Xia et al., 2022; Chiu., 2024). Institutional support fulfills the need for relatedness through advising relationships, peer community, and mentoring (Gravett & Ajjawi., 2022; Pedler et al., 2022). Socioeconomic status determines whether students have the resources — in terms of device access, digital skill, and institutional fit — to benefit from need-satisfying experiences that both AI and institutional support can offer (Van Deursen et al., 2017; Amjad et al., 2024). The sequential pathway from AI-enabled engagement through institutional perseverance support to academic thriving is therefore not merely an empirical pattern but a theoretically predicted sequence grounded in SDT's need-satisfaction model.

Research Method

This paper employs a narrative integrative review approach following (Torraco's., 2005) framework for integrative conceptual papers. Unlike systematic reviews that aggregate effect

sizes, integrative reviews produce conceptual frameworks by synthesizing, interpreting, and critically evaluating existing literature across multiple streams. This method is appropriate for studies aiming to identify gaps, build theory, and propose frameworks for future empirical investigation. A structured search was conducted in three databases selected for complementary coverage: Scopus was selected as the primary international database covering the full range of Q1/Q2 journals specified in our inclusion criteria; Google Scholar was included as a supplementary search engine to capture relevant sources not indexed in Scopus, including Indonesian higher education studies; and the Sinta portal was included as the authoritative Indonesian national academic database for identifying peer-reviewed domestic sources indexed at Sinta 1 or Sinta 2. Searches across these three databases Search strings were constructed using Boolean operators combining controlled vocabulary from each construct. Illustrative strings include: ("academic thriving" OR "student thriving" OR "student flourishing") AND ("artificial intelligence" OR "human-centered AI" OR "adaptive learning") AND ("higher education" OR "university"); and ("institutional support" OR "sense of belonging" OR "student retention") AND ("digital equity" OR "socioeconomic status" OR "digital divide") AND ("academic outcomes"). Each string was run with AND combinations across construct pairs and triplets. Literature collection was conducted between January 2026 and July 2026.

Inclusion criteria were: (1) international journals indexed in Scopus Q1 or Q2 with a SCImago Journal Rank above 1.0; (2) Indonesian journals indexed at Sinta 1 or Sinta 2; (3) publication years 2017 to 2026, with a limited exception for pre-2017 foundational theoretical works; (4) direct relevance to at least one of the four constructs. Sources were not excluded on the basis of publisher identity; instead, the SJR threshold was applied consistently, which permitted inclusion of high-quality sources from any qualifying outlet. Screening proceeded in two stages documented in Figure 1. In Stage 1, titles and abstracts of 36 identified sources were screened for construct relevance. In Stage 2, 22 sources that passed Stage 1 were read in full and assessed against the quality criteria. Sixteen sources met all criteria and were retained. Thematic coding followed a three-pass procedure: (1) coding each source for primary construct focus; (2) coding the theoretical lens and level of analysis; and (3) coding the quality and type of evidence. Codes were then compared across sources within each thematic cluster to identify patterns of convergence, divergence, and theoretical implications, providing the basis for the subsequent thematic synthesis.

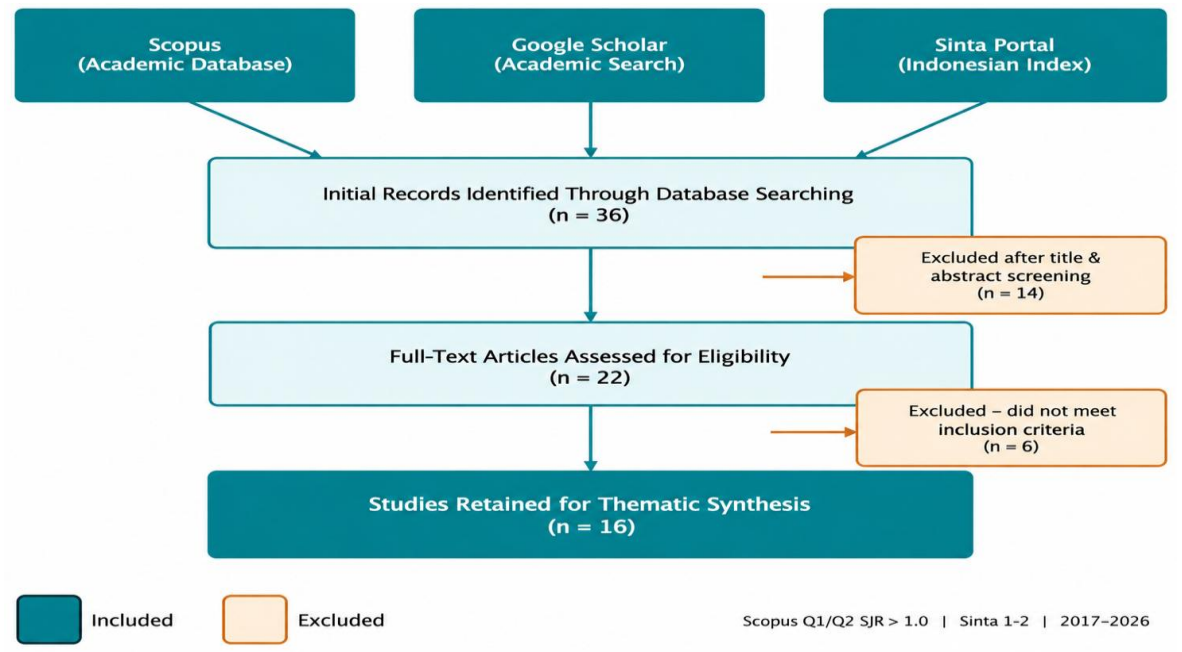

Figure 1 Literature Screening and Selection Flow (Narrative Integrative Review, 2017–2026)

The systematic search and screening process is illustrated in Figure 1. Sixteen studies met the predefined inclusion criteria and were retained for thematic synthesis.

Result and Discussion

Human-Centered AI, SDT Autonomy-Competence, and the Engagement Pathway

A consistent message across the human-centered artificial intelligence literature is that technology earns its educational value through design choices rather than through computing power alone. (Shneiderman., 2020) argues that AI systems must remain reliable, safe, and trustworthy, keeping human judgment central — a principle that (Riedl., 2019) frames as augmentation rather than replacement. Within the SDT framework adopted in this paper, these design qualities map onto the need for autonomy: a system that respects human oversight and provides meaningful choice supports students' sense of self-determination, while a system optimized for automation efficiency risks undermining it.

(Xia, Chiu, Lee, Sanusi, Dai, and Chai., 2022), writing in Computers & Education, provide the most direct theoretical linkage between AI design and SDT. Their study demonstrates that an SDT-informed AI design approach — one that deliberately builds autonomy support, competence scaffolding, and relational features into the platform — produces significantly stronger and more equitable engagement outcomes than a design-neutral approach. This finding is theoretically important because it specifies the mechanism: AI does not improve engagement in general; it improves engagement through specific SDT pathways.

Cross-study synthesis of the empirical literature supports this conditional account but also reveals important tensions. (Crompton and Burke., 2023) report the strongest engagement gains from adaptive platforms, consistent with the competence-support pathway. (Labadze, Grigolia, and Machaidze., 2023) document clear benefits for AI chatbots in homework assistance but simultaneously raise concerns about reliability and assessment fairness — precisely the conditions under which autonomy support fails. These findings are not contradictory. They reflect the theoretical prediction that AI supports thriving only when both autonomy and competence needs are satisfied, and that unreliable or unfair systems violate autonomy support regardless of their technical capability. (Chiu., 2024) extends this reasoning to generative AI, showing that ChatGPT can promote self-regulated learning when framed within an SDT-based classification tool, but risks promoting surface-level compliance when introduced without pedagogical scaffolding.

Institutional Support, SDT Relatedness, and the Persistence Pathway

If human-centered AI satisfies autonomy and competence needs, institutional support satisfies the third SDT need: relatedness. (Bean and Eaton., 2000) proposed that student retention depends on psychological fit between student and institution — the sense that one belongs and is valued. (Pedler, Willis, and Nieuwoudt., 2022) empirically tested this relationship among university students and confirmed that a stronger sense of belonging directly predicts retention, motivation, and academic enjoyment. These findings are consistent with SDT's prediction that relatedness satisfaction produces intrinsic motivation and wellbeing rather than merely compliance. (Gravett and Ajjawi., 2022) contribute the critical theoretical insight that belonging is not a fixed trait but a situated practice — something institutions produce through everyday acts of advising, inclusive course design, and mentoring. This reframing has two important implications. First, it means institutions can actively increase belonging rather than passively observing which students feel included. Second, it means belonging is contingent on institutional investment, which makes socioeconomic equity relevant: students at better-resourced institutions receive more of the everyday belonging practices that produce relatedness. The critical synthesis of this section reveals a pattern not visible in individual studies: institutional support and AI-enabled engagement are not independent pathways but complementary need-satisfying mechanisms that together address all three SDT needs. A student who experiences autonomy and competence support through AI-based learning but lacks relatedness support through institutional engagement will not sustain the motivation required for academic thriving. Conversely, a student with strong institutional belonging who has no access to personalized learning tools lacks the autonomy and competence support that AI can provide. The HC-DATF

framework positions these two pathways as jointly necessary conditions rather than substitutes.

Socioeconomic Status as the SDT Need-Satisfaction Boundary

The two pathways described above operate within an inequality context that SDT itself does not address directly. (Van Deursen, Helsper, Eynon, and Van Dijk., 2017) describe digital inequality as compound and sequential — access gaps cascade into skill gaps, which cascade into outcome gaps. This structural account means that the same SDT need-satisfying resource (an AI platform or an advising relationship) will not produce equal need satisfaction across students who differ in their access to the conditions required to benefit from it. Recent scholarship reinforces and updates this account. (Amjad et al., 2024), publishing in the European Journal of Education, synthesize evidence showing that combined institutional and policy efforts toward digital equity significantly improve educational outcomes for marginalized students, but that ad hoc technology adoption without equity planning tends to reproduce rather than close gaps. This finding directly addresses one of the key gaps identified in the Introduction: equity-oriented institutional support interacts with AI adoption in determining who actually benefits from digital transformation. The Indonesia-specific evidence supports this account at the national level. (Permata Sari et al., 2023) found that pharmacy students' competency development depended heavily on whether their institution provided structured digital health curricula rather than mere technology access. (Aini, Kurniawan, and Sulistiyowati., 2024) documented uneven digital platform adoption across Indonesian institutions, with differences in capacity, infrastructure, and pedagogical preparation determining the distribution of digital learning benefits. Taken together, these studies confirm that SES operates not only through individual resource constraints but through institutional and structural pathways — making it a boundary moderator on both the AI engagement pathway and the institutional support pathway simultaneously.

The HC-DATF: Formal Model and Propositions

Integrating the three analytical sections above produces the Human-Centered Digital Academic Thriving Framework (HC-DATF), presented formally in Figure 2. The model specifies two antecedent variables (Human-Centered AI and Institutional Support), two sequential mediators (Academic Engagement as M1 and Academic Perseverance as M2), one boundary moderator (Socioeconomic Status), and one distal outcome (Academic Thriving). The theoretical mechanism across all pathways is SDT need satisfaction: AI satisfies autonomy and competence needs to produce Academic Engagement (M1); Institutional Support satisfies relatedness needs to convert Academic Engagement into Academic Perseverance (M2); and Academic Perseverance, sustained over time, produces the intellectual, social, and

psychological dimensions of Academic Thriving (Y). Socioeconomic Status moderates the strength of this mechanism at two points: at the AI-Engagement link (because lower-SES students face greater barriers to benefiting from AI autonomy and competence support) and at the Perseverance-Thriving link (because lower-SES students face additional structural barriers to converting perseverance into thriving outcomes). The HC-DATF advances Academic Thriving Theory in three ways not captured by existing models. First, it connects thriving to antecedent conditions through a theoretically grounded mechanism rather than treating thriving as an individual psychological state independent of institutional and technological context. Second, it identifies the sequential mediation pathway from engagement to perseverance to thriving — a configuration that existing thriving research has not formally modeled. Third, it introduces socioeconomic status as a moderated boundary condition rather than a covariate, shifting the framing from 'SES affects thriving' to 'SES determines how much of the AI-institutional support pathway actually reaches any given student.' The framework also advances the human-centered AI literature by connecting AI design principles to a multidimensional student wellbeing outcome rather than the more proximal learning performance metrics that dominate this field, and by embedding AI's educational role within a broader theoretical account that includes institutional and structural factors.

1. Operational Definitions of Key Constructs:

a. Human-Centered AI (X1): The degree to which a learning technology platform satisfies (Shneiderman's., 2020) criteria of reliability, safety, and human oversight, operationalizable through domain-specific human-centered design rubrics or validated AI literacy scales (e.g., AI Literacy Scale; Wang et al., 2022).

b. Academic Engagement (M1): The composite of behavioral engagement (participation, effort), cognitive engagement (deep processing, goal setting), and emotional engagement (interest, belonging in learning contexts), following Fredricks, Blumenfeld, and Paris (2004); measurable through the Student Engagement Instrument (Appleton et al., 2006).

c. Academic Perseverance (M2): Sustained effort and interest toward long-term academic goals despite setbacks and obstacles, as defined by Duckworth and Quinn (2009), measurable through the Short Grit Scale (Grit-S).

d. Academic Thriving (Y): A composite of engaged learning, academic self-efficacy, social connectedness, positive affect, and psychological wellbeing, following (Schreiner's.,2010) Thriving Quotient; measurable through the validated 24-item Thriving Quotient instrument.

2. Proposition-to-Pathway Correspondence:

a. P1: Corresponds to the arrow from Human-Centered AI → Academic Engagement (M1). Mechanism: HC-AI satisfies SDT autonomy and competence needs.

b. P2a: Corresponds to the arrow from Institutional Support → Academic Perseverance (M2). Mechanism: IS satisfies SDT relatedness needs, sustaining motivation.
c. P2b: Corresponds to the dashed arrow from Institutional Support → Academic Engagement (M1). Mechanism: IS also enhances engagement through relatedness (secondary pathway), labeled distinctly from the primary P2a relationship.
d. P3: Corresponds to the sequential mediation chain: M1 (Engagement) → M2 (Perseverance) → Y (Thriving). Mechanism: engaged students develop perseverance, which produces thriving.
e. P4 (W): Corresponds to the moderation arrows from SES (W) to both the P1 and P2a pathways. Mechanism: lower SES constrains access to both AI-enabled engagement and institutional support benefits.

Four formal propositions follow from the HC-DATF framework, following the convention for conceptual papers in management and education research:

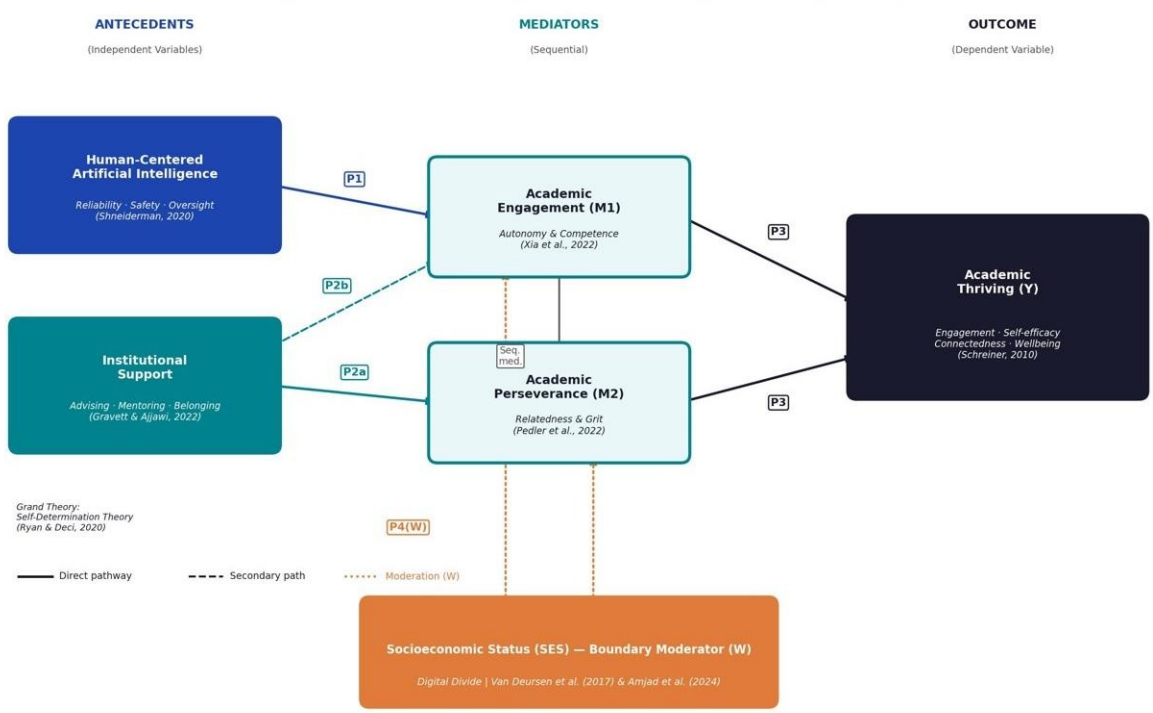

Figure 2 Human-Centered Digital Academic Thriving Framework (HC-DATF)

a. Proposition P1: Human-centered artificial intelligence positively influences Academic Engagement through satisfaction of SDT autonomy and competence needs, and this relationship is moderated by Socioeconomic Status such that the positive effect is weaker for lower-SES students.
b. Proposition P2: Institutional Support positively influences Academic Perseverance (M2) through satisfaction of the SDT relatedness need (P2a: primary pathway). Institutional Support also positively influences Academic Engagement (M1) through the SDT

relatedness need (P2b: secondary pathway), given that feeling socially connected and cared for enhances students' motivation to engage actively in learning.

c. Proposition P3: Academic Engagement (M1) mediates the relationship between Human-Centered AI and Academic Perseverance (M2), and Academic Perseverance (M2) mediates the relationship between Institutional Support and Academic Thriving, forming a sequential double mediation pathway.
d. Proposition P4: Socioeconomic Status moderates the relationship between Academic Perseverance and Academic Thriving such that the positive effect of perseverance on thriving is weaker for lower-SES students who face additional structural barriers to translating academic effort into thriving outcomes.

Implications for Professional Higher Education in Developing Contexts

The HC-DATF carries practical implications across multiple stakeholder groups beyond pharmacy education. For university leaders across all disciplines, the framework implies that AI procurement decisions should evaluate platforms on human-centered design criteria — reliability, autonomy support, competence scaffolding — rather than on technical sophistication alone, consistent with (Shneiderman's., 2020) framework. AI investment should be accompanied by simultaneous investment in advising systems, mentoring programs, and belonging initiatives that address the relatedness pathway that AI alone cannot satisfy. For national policymakers, particularly in developing country contexts, the moderating role of SES implies that digital transformation programs that provide technology access without addressing underlying socioeconomic barriers will produce unequal thriving outcomes. Policy frameworks should incorporate equity monitoring dashboards that track how digital learning benefits are distributed across student populations stratified by socioeconomic status, geographic region, and program type — not only aggregate performance metrics. For educational technology developers, the SDT mechanism in the HC-DATF implies that the next generation of learning AI should be designed to support autonomy (learner choice and control), competence (adaptive challenge and feedback), and relatedness (peer connection and instructor presence) as explicit design goals. (Bearman and Ajjawi's., 2023) pedagogy framework for AI-integrated learning and (Xia et al.'s., 2022) SDT design approach provides practical starting points. Generative AI tools in particular — which students are already adopting independently of institutional deployment (Chan & Hu., 2023) — should be integrated into structured pedagogical designs that amplify their autonomy and competence-support potential rather than leaving their use unscaffolded.

Conclusions

This paper set out to fill three gaps in the academic thriving, human-centered AI, and digital equity literatures by proposing an integrative conceptual framework grounded in Self-Determination Theory. The narrative integrative review of 26 internationally indexed sources identified three consistent analytical patterns. Human-centered artificial intelligence strengthens academic engagement by satisfying SDT autonomy and competence needs, but only when system design keeps human oversight and learner control central. Institutional support converts that engagement into academic perseverance by fulfilling SDT relatedness needs through advising, mentoring, and belonging practices. Socioeconomic status acts as a boundary moderator that determines how much of both need-satisfying pathways actually reaches any individual student, making equity a structural precondition for thriving rather than an afterthought. The theoretical contribution of this paper is the HC-DATF, which advances Academic Thriving Theory by specifying the mechanism through which institutional and technological antecedents produce multidimensional student flourishing, advances Human-Centered AI research by connecting AI design principles to wellbeing outcomes beyond performance and contributes to the digital equity literature by formalizing SES as a boundary moderator within a theory-driven framework. Four formal propositions provide testable statements that define the research agenda for empirical validation. The practical implication for universities and policymakers is that technology investment and institutional support investment must move together, and that equity monitoring must be built into digital transformation planning from the outset. For educational technology developers, the HC-DATF provides SDT-based design criteria that can guide the next generation of human-centered learning AI. This paper carries several limitations that future research should address. As a narrative integrative review, it synthesizes conceptual patterns rather than testing causal relationships against primary data. The evidence base is bounded by the quality thresholds applied (Scopus Q1/Q2 and Sinta 1–2), which may have excluded relevant research published in lower-indexed or non-English language journals. The temporal boundary of 2017–2026 necessarily excludes earlier work, and the relatively small final sample of 26 sources reflects the application of strict quality criteria. The absence of empirical validation means the proposed mediating and moderating relationships remain theoretically posited rather than empirically confirmed. Future research should address these limitations through a five-stage program. The immediate empirical priority is Stage 1: a cross-sectional SEM study testing the core sequential mediation pathway (HC-AI, engagement, perseverance, thriving) within a single professionally oriented program, using the Student Engagement Instrument for M1, the Grit-S Scale for M2, and Thriving Quotient for Y. Once the baseline mediation is confirmed, Stage 2 tests SES moderation using multi-group SEM. Stage 3 involves

longitudinal tracking; Stage 4 cross-country comparison in ASEAN contexts; and Stage 5 experimental designs testing AI interventions with and without structured institutional support.

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