

From Digital Competence To Transformative Professional Practice: A Sociotechnical Model For Special Educators In Ai-Mediated Inclusive Education.

Dr. Rajpawan¹, Bobby Mathew², Pardeep Chauhan³, Anuradha Thakur⁴

¹ Associate Professor, School of Education (Special Education), MIER College of Education (Autonomous), Jammu, India.

ORCID: 0009-0001-0952-3479

Email: aj.pawan@miercollege.in

² Principal, DSWSC, Okhla Centre, New Delhi, India.

³ Assistant Professor, Shree Khushal Das University, Hanumangarh, Rajasthan, India.

ORCID: 0009-0008-2095-6487

⁴ Assistant Professor, School of Education (Special Education), MIER College of Education (Autonomous), Jammu, India.

Abstract

Artificial intelligence (AI) is entering special education through generative systems, adaptive technologies, assistive applications, automated documentation, and tools for personalized learning. Because special-education practice depends on individualized assessment, instructional adaptation, accessibility, and context-sensitive judgment, this development raises a question that existing competency frameworks do not fully resolve: how does digital-AI competence become sustained, agentic, and institutionally supported professional practice? This conceptual paper addresses that question by proposing the Digital Professional Transformation Continuum (DPTC), a sociotechnical model of professional transformation for special educators working in AI-mediated inclusive education. The model explains transformation through the interaction of four dimensions – digital-AI competence, professional identity, professional agency, and institutional recognition and enablement – across four analytically distinct, non-linear stages: Digital Exposure, Digital Adaptation, Digital Integration, and Transformative Professional Practice. It further introduces the Digital Professional Recognition Gap, the situation in which educators' digital competence and agency outpace institutional recognition of their emerging expertise. Drawing on digital-competence scholarship, AI-competency frameworks, ecological theories of teacher agency, and sociotechnical perspectives, the paper develops eight theoretical propositions for future empirical testing. The DPTC redirects attention from whether special educators use AI toward how they exercise professional judgment, agency, and responsibility within AI-mediated systems...

Keywords: artificial intelligence, digital competence, special education, transformative professional practice, professional agency, professional identity, inclusive education

Introduction

Artificial intelligence is no longer a distant possibility for education. It has entered everyday professional life through generative text systems, adaptive learning platforms, automated feedback, assistive applications, and tools that can produce instructional materials within seconds. This has generated enthusiasm about personalization and efficiency, but it has also raised a harder professional question: what happens to educational expertise when tasks once performed through professional judgment can be supported, accelerated, or partly automated by AI?

This question is especially consequential in special education, where practice is not the delivery of a fixed curriculum but the interpretation of individual learner characteristics, the identification of barriers to participation, and decision making in circumstances where standardized solutions are often inadequate. The introduction of AI therefore cannot be treated as simply another digital tool; it potentially changes the conditions under which professional knowledge is exercised.

Recent frameworks illustrate the scale of this shift. UNESCO's AI Competency Framework for Teachers identifies fifteen competencies spanning human-centred thinking, ethics, AI foundations, AI pedagogy, and professional learning, and situates progression through the levels of Acquire, Deepen, and Create (UNESCO, 2024). Within inclusive education, Ancillotti's (2025) DigCompEdu 4 Inclusion extends the European digital-competence framework toward personalization, accessibility, and learner autonomy. Such work is valuable, but a conceptual problem remains: knowing how to use a digital or AI technology is not the same as being able to transform professional practice through it.

The distinction is easy to overlook. An educator may generate differentiated instructional material, summarize information, or draft an individualized goal using AI, yet these abilities do not by themselves indicate whether the educator can judge if the output is pedagogically appropriate, whether it reflects the learner's actual needs, whether

it contains bias, or whether AI should be used at all in a given situation. Recent evidence reinforces this distinction: among 314 special education teachers, Naatz and Ruppert (2026) found generative-AI use remained largely exploratory, with fewer than 15% reporting weekly use and fewer than 5% reporting daily use, and with attitudes, training, administrative support, and age associated with frequency of use. Goldman et al. (2025) similarly reported that special educators' preparedness to integrate AI into writing instruction remained an open concern despite the technology's potential.

These findings suggest a relationship more complex than simple technology access producing technology use. Professional transformation depends on what educators know, but also on how they understand their professional role, whether they can exercise judgment, whether they can influence technology-related decisions, and whether their institutions recognize and support that participation. This paper therefore begins from a different premise: digital competence is a foundation for professional transformation, not evidence that transformation has already occurred. That distinction is the starting point for the Digital Professional Transformation Continuum (DPTC) developed here.

The DPTC deliberately differs from a conventional competency framework. It does not catalogue technological skills, nor does it assume that greater technology use represents professional advancement. Instead, it examines how digital-AI competence becomes embedded in professional identity, professional agency, and institutionally supported practice. Competence describes what an educator is capable of doing; agency concerns what the educator is able and willing to decide, question, or change – a distinction that matters once AI produces recommendations that appear authoritative but remain subject to professional interpretation. Institutional conditions matter equally: an educator may develop substantial AI competence while working in an institution that offers little time for experimentation, no clear AI policy, or no voice in technology-related decisions.

Accordingly, the DPTC conceptualizes transformation through the interaction of digital-AI competence, professional identity, professional agency, and institutional recognition and enablement. Because these dimensions need not develop at the same pace, an educator may become highly competent while remaining professionally constrained, or may possess strong agency with limited institutional recognition – configurations that a single "digital-readiness" score cannot represent. The model further proposes four patterns of professional engagement (Digital Exposure, Digital Adaptation, Digital Integration, and Transformative Professional Practice) and introduces the Digital Professional Recognition Gap to describe situations in which competence and agency outpace institutional recognition.

The contribution of this paper is therefore not another argument for increasing AI adoption among special educators, but a theoretical reframing of what professional development means in an AI-mediated environment. The more consequential questions are whether educators can critically evaluate AI outputs, retain responsibility for professional decisions, integrate AI without weakening individualized and relational practice, exercise agency in technology-related decisions, and work within institutions prepared to recognize their emerging expertise. Accordingly, the paper (a) critically examines scholarship on digital and AI competence, professional identity, and agency; (b) identifies the limitation of treating competence and adoption as proxies for transformation; (c) develops the DPTC as an integrative sociotechnical model; and (d) derives theoretical propositions to guide future empirical research. The paper is intentionally conceptual: its purpose is to offer a theoretically coherent model for subsequent operationalization and testing, not to claim that the DPTC has already been validated.

2. Literature Review

Scholarships on digital transformation in education has developed rapidly but unevenly. Earlier work concentrated on teachers' ability to use digital technologies; more recent work has moved toward AI literacy, ethical use, human agency, and the changing relationship between teachers and intelligent systems. For special education, this shift is important because technology-mediated decisions intersect with individualized instruction, accessibility, and learner rights. The review below therefore asks not only whether technology matters, but what current scholarship explains well and where a stronger theoretical account is still required.

2.1 From Digital Competence to AI Competence

The Technological Pedagogical Content Knowledge (TPACK) framework (Mishra & Koehler, 2006) challenged the assumption that effective technology integration depends primarily on technical knowledge, proposing instead that meaningful use emerges through the interaction of technological, pedagogical, and content knowledge. The European Framework for the Digital Competence of Educators (DigCompEdu) extended this by conceptualizing competence across professional engagement, digital resources, teaching and learning, assessment, and learner empowerment (Redecker, 2017). These frameworks establish that digital competence is multidimensional and pedagogically situated, but they answer what educators should know and do more fully than what happens once competence has been acquired – particularly whether educators gain the professional influence to reshape practice. A teacher may know how to use a digital assessment system without having authority over how its data are interpreted; this is a different analytical problem from the one addressed by the DPTC.

Generative and predictive AI sharpens this distinction because AI performs tasks closer to professional cognitive work – generating explanations, producing materials, and supporting decisions – rather than simply helping teachers access or present information. UNESCO's AI Competency Framework for Teachers responds to this shift by embedding human agency, accountability, and ethics alongside technical proficiency, and by explicitly cautioning that AI can weaken teachers' autonomous decision making when treated as a substitute for professional judgment (UNESCO, 2024). Frøsig and Romero (2024) similarly conceptualize teacher–AI interaction through a hybrid-intelligence lens, arguing that generative AI can extend idea generation while simultaneously constraining teachers' capacity to act and take professional positions. The distinction can be stated simply: digital competence asks whether an educator can use technology; AI competence asks whether the educator can use it responsibly; professional agency asks whether the educator can exercise judgment and influence in relation to it. The third question remains comparatively underdeveloped in existing frameworks.

2.2 Digital and AI Transformation in Special and Inclusive Education

Digital technologies have long supported accessibility, assistive communication, and differentiated instruction, and AI potentially extends these possibilities through more adaptive and automated forms of support. The OECD's (2025) review of AI for students with special educational needs argues that educators need sufficient knowledge to critically evaluate AI outputs and make informed, ethical decisions about their use – placing professional judgment, not technical sophistication, at the centre of appropriate use. Emerging empirical work reinforces this: Naatz and Ruppar (2026) found generative-AI adoption among special educators remained limited and exploratory, and Goldman et al. (2025) highlighted educator preparedness as a persistent constraint on meaningful integration for students with disabilities.

Ancillotti's (2025) DigCompEdu 4 Inclusion extends digital-competence scholarship toward personalization, accessibility, and learner autonomy, clarifying that digital competence must be interpreted in relation to learner diversity. This advance also sharpens the remaining theoretical problem: the question is no longer simply whether an inclusion-appropriate competence framework exists, but how inclusive digital competence becomes sustained, agentic, and institutionally recognized practice. This is important because inappropriate AI-generated recommendations can affect access, accommodations, and individualized planning in ways that carry consequences beyond ordinary instructional inconvenience – which is why special educators need more than technical familiarity; they need the professional capacity to judge when AI is appropriate, when it requires modification, and when it should not be used at all.

2.3 Professional Identity and Agency in an AI-Mediated Environment

Professional identity concerns how educators understand their roles, values, and expertise, and is not equivalent to competence: a person can acquire a skill without changing how they understand their professional role. Because AI can now assist with lesson planning, summarization, and documentation, it raises an identity question that competence frameworks do not directly address. Lan (2024) identifies tensions of humanity and technology, continuity and openness, and individual identity and technological change in AI-enhanced teacher training, suggesting that AI adoption may require educators to reconsider what constitutes professional expertise rather than simply acquiring a new skill. For special educators – whose work is grounded in individualized, relational, and advocacy-oriented practice – the same observable action (for example, generating an instructional activity with AI) can represent simple task completion, experimentation, deliberate pedagogical integration, or participation in broader professional transformation, depending on the underlying professional orientation. This implies that frequency of technology use is an inadequate proxy for professional transformation.

Professional agency provides the strongest conceptual bridge between competence and transformative practice. AI can extend professional capacity by reducing routine workload and offering alternative ideas, while simultaneously constraining agency if educators become dependent on automated recommendations or if institutions impose AI use without consultation. UNESCO (2024) explicitly frames the protection of teacher agency as central to responsible AI adoption. The relationship can be expressed conceptually: competence provides capability, identity provides professional meaning, agency converts capability into intentional action, and institutional recognition enables that action to become sustained practice – a formulation that prevents the DPTC from collapsing into another competency framework, since an educator may know how to use AI without feeling authorized to challenge its recommendations, or may exercise considerable agency informally while receiving no institutional recognition.

2.4 The Institutional and Sociotechnical Dimension

Professional practice is embedded in institutions that allocate resources, define roles, and determine which forms of innovation are considered legitimate, which makes AI adoption fundamentally sociotechnical: outcomes emerge through interactions among people, technologies, organizational structures, and institutional decisions rather than through technology acting as an independent force. An educator with strong AI competence may be unable to implement meaningful innovation where infrastructure is inadequate, policy is unclear, or technology decisions exclude teachers, while institutions that provide professional learning, collaborative decision making, and clear ethical guidance can help translate individual competence into broader practice. Because recent evidence

associates administrative support specifically with AI adoption among special educators (Naatz & Ruppar, 2026), the DPTC treats institutional recognition and enablement as a distinct analytic dimension rather than a background variable.

2.5 The Unresolved Theoretical Gap

Taken together, this literature has moved well beyond the idea that teachers need only basic digital skills: TPACK established technological–pedagogical integration, DigCompEdu and its inclusion-specific extensions mapped competence domains relevant to accessibility, and AI-competency and teacher-agency scholarship have added ethics, human-centredness, and the protection of professional judgment. These strands, however, remain organized around four largely separate conversations – what educators should know, whether and why they adopt particular technologies, how technological change affects professional identity, and how institutions shape practice – without a shared account of what connects them. The unresolved question is what explains the transition from digital-AI competence to transformative professional practice among special educators. The DPTC integrates these conversations by proposing that transformation is not technology exposure → adoption → integration, but digital-AI competence → professional identity → professional agency → institutionally enabled transformative practice, a sequence that need not be strictly linear and can become misaligned – a possibility captured by the Digital Professional Recognition Gap introduced in Section 5.

3. Theoretical Foundations

The DPTC requires a foundation capable of explaining more than technology use: how does an educator’s digital-AI capability become meaningful professional action within a particular institutional environment? This requires accounting for individual knowledge, professional meaning, agency, and institutional conditions together. The model therefore draws on three complementary perspectives, summarized in Table 1: ecological theories of professional agency, sociotechnical perspectives on technology and work, and theories of professional identity and expertise.

Table 1

Theoretical Perspectives Underlying the DPTC

Theoretical perspective	Central question	Contribution to the DPTC
Ecological professional agency (Priestley et al., 2015; Biesta et al., 2015)	Can the educator act meaningfully within the professional environment?	Explains agency as situated and relational rather than a fixed personal trait
Sociotechnical perspective	How do people, technology, and institutions mutually shape practice?	Prevents technology-deterministic explanations of transformation
Professional identity and expertise	How does technological change alter the meaning of professional expertise?	Explains the professional meaning of transformation

Note. Adapted from the conceptual synthesis developed in this paper.

3.1 Ecological Theory of Professional Agency

Priestley, Biesta, and Robinson (2015) challenge the view that agency is simply an individual psychological trait, proposing instead that agency is achieved through the interaction between an individual and the social, cultural, structural, and temporal conditions in which professional action occurs. A conventional competency perspective might assume that an educator with sufficient AI knowledge will use it effectively; the ecological perspective does not, because capacity to act is shaped by prior experience, institutional expectations, and relationships with colleagues. This explains why two educators with comparable training can diverge sharply in practice: one may use AI only as institutionally directed, while another evaluates outputs critically, modifies them for individual learners, and challenges institutional assumptions about appropriate use – a difference in agency, not competence. Biesta, Priestley, and Robinson (2015) add that agency has temporal and relational dimensions, shaped by past experience, present conditions, and orientations toward future possibility. For the DPTC, the implication is direct: transformation cannot be reduced to an individual’s AI competence, because competence becomes consequential only when educators have the capacity and opportunity to exercise judgment.

3.2 Sociotechnical Perspective

AI is not simply an object educators operate; it participates in professional workflows and can redistribute responsibility between humans and systems. Practice is therefore better represented as educator ↔ AI system ↔ professional environment ↔ learner/context than as a linear educator → technology → outcome chain. The same

AI-generated recommendation may be appropriate for one learner, inappropriate for another, or ethically unacceptable in a particular circumstance – a judgment the technology itself cannot make. Frøsig and Romero (2024) reinforce this by showing that generative AI can support learning-design activity while simultaneously constraining agency when teachers have limited power to influence decisions. The implication for the DPTC is that technology integration should not be equated with transformation: an educator who uses AI frequently but only to automate existing routines may remain at an adaptive level, while an educator who uses AI selectively but changes how differentiation or assessment is conceptualized may be operating transformatively.

3.3 Professional Identity and the Reconfiguration of Expertise

Because AI can now assist with planning, summarization, and documentation, professional expertise may shift from producing every instructional artefact independently toward evaluating, contextualizing, and ethically authorizing AI-supported outputs – a reconfiguration rather than a reduction of expertise. This is especially significant in special education, where learners differ in communication, cognition, and participation needs, so AI-generated recommendations require professional interpretation before they are educationally meaningful. The DPTC therefore distinguishes technical production (what an AI system can generate) from professional authorization (what the educator is prepared to accept, modify, reject, and take responsibility for) – a distinction that safeguards against technological determinism by keeping questions such as “does this fit the learner?” and “when should AI not be used?” within professional, not technical, jurisdiction.

3.4 Integrating the Perspectives

Together, these perspectives yield the relationship: digital-AI competence × professional identity × professional agency × institutional enablement → transformative professional practice. The multiplication is deliberate: the framework does not treat high competence as compensating for the complete absence of agency or institutional support, but treats the dimensions as interdependent. High competence with low agency yields technically capable but professionally constrained practice; high competence and agency with weak institutional support yields isolated innovation; moderate competence with strong identity and agency yields selective, critically oriented use; and alignment across all four dimensions yields the greatest potential for transformation – configurations a purely competency-based model cannot represent. This leads to three assumptions underlying the DPTC: competence is foundational but insufficient; agency is contextual rather than purely individual; and transformation is relational, evaluated through changes in professional decision making and influence rather than technology adoption alone. The combination is especially apt for special education, where practice is simultaneously individualized, relational, and ethically consequential, so the defining future capability is not the ability to use AI but the ability to work intelligently with AI without surrendering professional judgment to it.

4. Methodological Approach to Theory Development

This paper adopts a conceptual theory-development approach rather than an empirical design: its purpose is to construct a theoretically coherent explanation of how digital-AI competence may develop into transformative professional practice, not to test AI's effectiveness or estimate relationships among predefined variables. The DPTC is a new model and is presented as such – theoretical construction now, with empirical validation as a subsequent task. The approach follows Jabareen's (2009) account of conceptual-framework development as a network of interrelated concepts built through systematic engagement with multidisciplinary literature, which is appropriate when a phenomenon spans several knowledge domains that individually explain parts of it without integrating them into one explanatory structure.

The analysis proceeded from a problem–concept–relationship–proposition logic rather than from predefined variables. The starting problem, established in Sections 1–2, is that existing competency and adoption frameworks explain what educators should know and why they use particular technologies, but not how competence becomes agentic, institutionally supported practice. Four concepts emerged as central: digital-AI competence (the knowledge, skills, and critical understanding required to engage with AI-supported technologies); professional identity (educators' understanding of their expertise and changing role); professional agency (the capacity to exercise judgment and influence AI-mediated practice); and institutional recognition and enablement (the organizational conditions that allow capability and agency to become sustained, legitimate practice).

These concepts were examined relationally through three iterative operations. Identification drew relevant concepts from digital-competence, AI-competence, professional-identity, teacher-agency, inclusive-education, and sociotechnical scholarship. Differentiation separated concepts that appear similar but occupy different analytical levels – competence from agency, and technology adoption from professional transformation, since frequent use may simply automate existing routines without changing professional reasoning. Integration then arranged the remaining concepts relationally: competence enables capability, identity gives it professional meaning, agency converts it into intentional action, and institutional recognition sustains and legitimizes that action, with the interaction among all four creating the potential for transformative practice. This process was iterative rather than linear, consistent with Jabareen's (2009) description of conceptual-framework development.

The final stage translated these integrated concepts into the developmental model presented in Section 5, and derived the eight theoretical propositions presented in Section 6. The propositions are intended as empirically testable statements bridging the conceptual framework and future research, not as findings. This establishes an important boundary on the paper's claims: the DPTC is conceptually derived and theoretically reasoned, not empirically validated here, and its present contribution is a coherent conceptual vocabulary, an integrated explanation of transformation, theoretically grounded relationships among constructs, and a set of testable propositions – a foundation for future measurement and mixed-method research rather than an established finding.

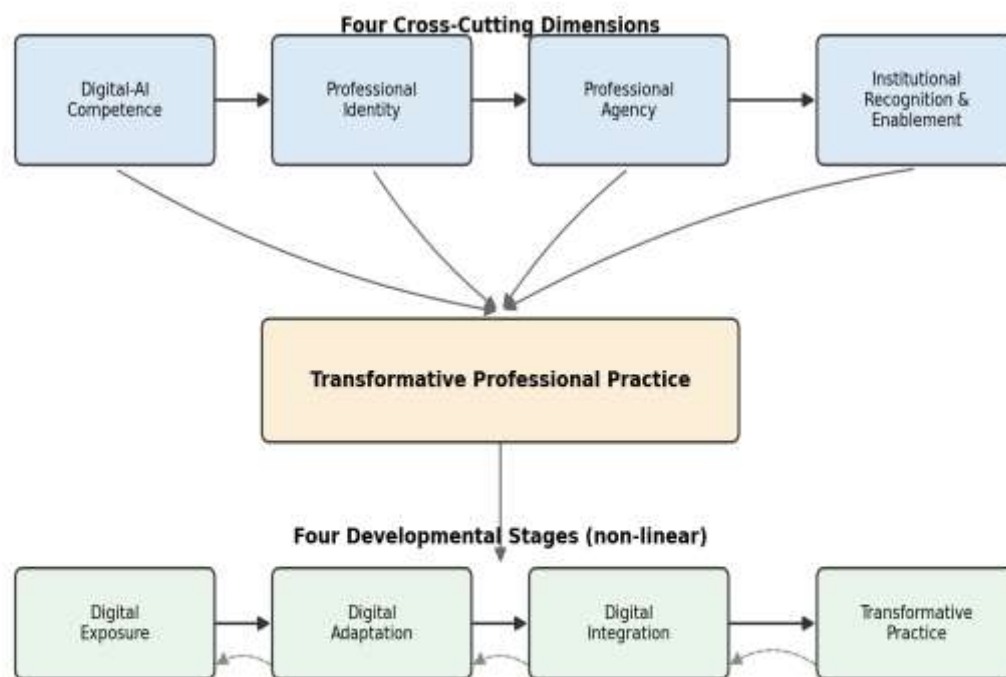
5. The Digital Professional Transformation Continuum (DPTC)

The preceding sections established that digital-AI competence is necessary but insufficient to explain professional transformation. The DPTC is proposed as a sociotechnical developmental model explaining how digital-AI capability can become progressively embedded within professional practice. It does not assume that all educators should reach the highest level of AI use, nor does it equate greater frequency of use with professional advancement; transformation is instead defined by the depth, intentionality, criticality, agency, and institutional embeddedness of practice.

The model consists of four developmental stages – Digital Exposure, Digital Adaptation, Digital Integration, and Transformative Professional Practice – and four cross-cutting dimensions – digital-AI competence, professional identity, professional agency, and institutional recognition and enablement. The stages describe the depth of transformation; the dimensions explain what makes movement across stages possible or difficult. Figure 1 depicts this architecture, which should not be read as a linear causal equation: an educator may have high competence but limited agency, strong agency but inadequate institutional support, or substantial institutional support but underdeveloped critical understanding of AI.

Figure 1

Conceptual Architecture of the Digital Professional Transformation Continuum



Note. The four cross-cutting dimensions jointly shape transformative professional practice, which in turn is expressed through movement across the four developmental stages. Dashed arrows indicate that movement between stages can regress as well as progress.

5.1 Stage 1: Digital Exposure

Digital Exposure is the initial condition in which digital or AI technologies become visible within an educator's environment but remain peripheral to established practice. Educators encounter AI through demonstrations, professional development, colleagues, or informal experimentation, and the dominant orientation is awareness and exploration – the question is “what can this technology do?” This stage does not imply technological

incompetence; an educator may have considerable general digital literacy while having little understanding of how AI can appropriately be incorporated into special education. Because generating a lesson plan with AI is relatively easy while judging its appropriateness for a learner with complex communication or behavioural needs is considerably harder, early exposure can create either a foundation for professional learning or an illusion of competence. The defining characteristic of this stage is contact with technology without substantial restructuring of professional reasoning; the transition out of it occurs when educators move from experimentation to using AI intentionally for identifiable professional needs.

5.2 Stage 2: Digital Adaptation

At Digital Adaptation, educators use AI to modify or improve existing activities, and the guiding question shifts to “how can this help me perform this task more efficiently?” AI may generate differentiated activities, adapt language, or support documentation, producing genuine gains in efficiency and accessibility – but the technology generally remains subordinate to existing routines rather than prompting their redesign. If an educator uses generative AI to produce differentiated worksheets faster, the underlying approach to assessment and instructional decision making may remain unchanged; professional judgment is exercised mainly after the AI system produces an output, through review and editing. The transition toward Digital Integration occurs when judgment increasingly enters the process before and during AI interaction, not only after it.

5.3 Stage 3: Digital Integration

Digital Integration marks a qualitative shift: AI is no longer simply a productivity tool but becomes incorporated into pedagogical reasoning, assessment, and collaboration, guided by the question “how can digital-AI capability be deliberately integrated with my professional knowledge and the learner’s needs?” The educator actively frames the problem, evaluates the AI response, and decides whether implementation is justified rather than accepting outputs at face value. In special education this is decisive: an AI-generated communication activity still requires the educator to judge whether it matches the learner’s communication mode, and responsibility for a learner’s actual goals in an individualized plan cannot be transferred to a system. A mature digital professional at this stage does not necessarily use AI more often; rather, the educator becomes better able to determine when AI adds value and when practice should remain predominantly human-led.

5.4 Stage 4: Transformative Professional Practice

The fourth stage is the central contribution of the DPTC. Transformation occurs when digital-AI competence and agency extend beyond individual task improvement to influence how professional practice is organized, evaluated, and improved. The educator moves from asking “how can AI help me teach?” to asking how professional practice should change in an AI-mediated environment, what forms of expertise should be retained or redefined, and what safeguards are necessary for learners with disabilities. At this stage, educators may mentor colleagues, contribute to AI-related policy, or advocate for accessibility and privacy safeguards; the distinguishing feature is professional influence, not technological sophistication. Importantly, transformation includes the capacity to refuse or modify technology – if an institutional requirement to use AI would compromise learner privacy or individualized decision making, a transformative professional should be able to question it. Professional transformation should therefore not be confused with technological enthusiasm: a highly transformed professional may sometimes use less technology because judgment indicates that a better outcome requires less of it.

5.5 The Four Cross-Cutting Dimensions

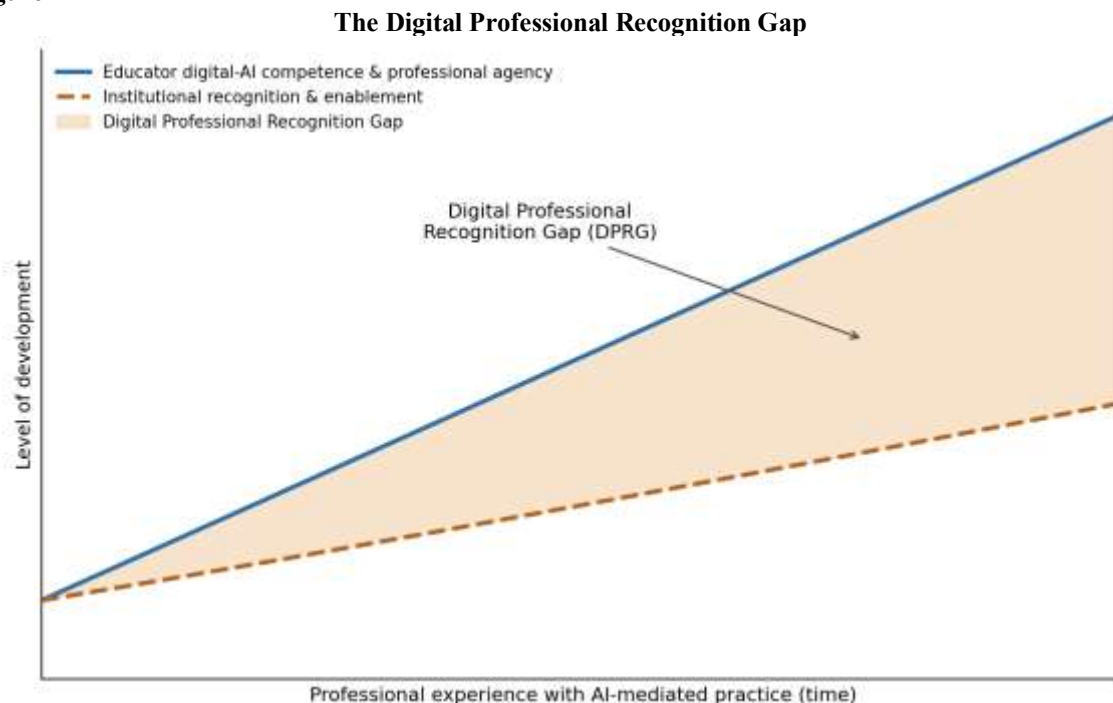
Digital-AI competence, in the DPTC’s broader sense, includes understanding of AI functions and limitations, evaluative skill, pedagogical application, accessibility and ethical awareness, and the ability to integrate AI with professional knowledge, consistent with the inclusion-specific emphasis of DigCompEdu 4 Inclusion (Ancillotti, 2025). Professional identity concerns how educators understand their role once AI enters the professional environment; the DPTC proposes a movement from an identity centred on “I am someone who knows how to use AI” toward one centred on “I am a professional who can determine how, when, why, and whether AI should be used in relation to learner needs” – a shift that keeps technology subordinate to professional purpose. Professional agency is the mechanism converting competence into intentional action: the capacity to make independent judgments, adapt or question AI outputs, negotiate institutional expectations, and reject inappropriate uses. Institutional recognition and enablement comprise leadership, policy, professional development, infrastructure, time, and recognition of digital expertise; because recent evidence links administrative support specifically to AI adoption among special educators (Naatz & Ruppar, 2026), this dimension is treated as part of the transformation process itself rather than as background context.

5.6 The Digital Professional Recognition Gap

One of the more distinctive contributions of the DPTC is the Digital Professional Recognition Gap (DPRG), which occurs when an educator’s digital-AI competence and professional agency develop more rapidly than the institution’s recognition, support, or formalization of that expertise (Figure 2). This can arise when an educator independently develops sophisticated AI practice but has no institutional opportunity to share it, identifies risks in an institutional AI initiative but has no role in decision making, or develops innovative inclusive applications while continuing to be evaluated by criteria that do not recognize digital innovation. The result is professional

under-recognition, and the DPRG is theoretically important because it helps explain why individual competence does not automatically produce organizational transformation, distinguishing professional capability from professional legitimacy: an educator may be capable of leading digital transformation without being institutionally recognized as someone who should influence it.

Figure 2



Note. The shaded region represents the widening divergence between educators' growing digital-AI competence and agency and the institution's slower recognition and enablement of that expertise. The trajectories are illustrative rather than measured quantities.

5.7 Non-Linear Movement and Feedback

The term continuum should not be read as a rigid staircase. An educator may move from Digital Integration back toward Digital Adaptation when an AI system changes substantially, institutional policy becomes restrictive, or ethical concerns emerge, and may move rapidly from Exposure to Integration given strong prior digital experience or supportive leadership. The DPTC therefore allows progression, stagnation, regression, and re-entry, which makes it more realistic than stage models assuming universal upward movement. Transformation is also recursive: successful AI-supported practice can strengthen confidence, which can strengthen agency, encourage experimentation, and influence institutional recognition, which in turn provides further professional-learning opportunity (competence → agency → practice → recognition → further competence). A negative loop is equally possible – institutional pressure can reduce autonomy, producing compliance-based use, weak professional ownership, and superficial integration – which is why two educators exposed to the same technology can follow markedly different trajectories.

6. Theoretical Propositions

The propositions below are theoretically derived statements, not empirical findings; their purpose is to make the DPTC precise enough for future quantitative, qualitative, and mixed-method investigation. A central premise is that transformation cannot be adequately predicted from technology competence alone, but emerges through the interaction of competence, identity, agency, and institutional conditions.

P1. Competence as a foundational but insufficient condition

Higher digital-AI competence increases an educator's potential for transformative practice, but competence alone is insufficient to produce it, consistent with the movement from TPACK toward contemporary AI-competency frameworks that treat technical knowledge as necessary but not sufficient (Mishra & Koehler, 2006; UNESCO, 2024). An educator with high competence may still use AI only for routine administration, while one with moderate competence may exercise stronger judgment and use AI more strategically – competence creates

possibility; it does not guarantee transformation. This suggests future studies should test whether competence predicts transformative practice once identity, agency, and institutional support are controlled.

P2. Professional identity shapes the meaning of AI use

Educators with a professional identity centred on learner advocacy, judgment, and individualized practice are more likely to interpret AI as an augmentation of expertise rather than a substitute for it. Competence answers what an educator can do; identity shapes what the educator believes should be done, which is especially important in special education, where an educator whose identity is grounded in individualized judgment is more likely to use AI to generate possibilities while retaining responsibility for interpretation and final decisions.

P3. Professional agency mediates competence and transformation

Professional agency mediates the relationship between digital-AI competence and transformative practice: knowledge does not automatically produce action, and educators must also be able to exercise judgment, initiate change, and adapt technology to context, consistent with the ecological view of agency as an interactional achievement (Priestley et al., 2015). An educator who merely follows institutional instructions may achieve adaptation but not transformation; one who critically evaluates outputs, redesigns process, and shares practice with colleagues has converted competence into agency and then into transformation – a pathway testable through mediation analysis of digital-AI competence → professional agency → transformative practice.

P4. Institutional enablement moderates transformation

Institutional recognition and enablement strengthen the relationship between professional agency and transformative practice. An educator with strong competence and agency but facing restrictive policy, inadequate infrastructure, or exclusion from decision making may see innovation remain isolated, while institutions that provide resources, professional learning, and recognition can convert individual agency into sustained change – professional agency × institutional enablement → transformative practice, testable via moderation or hierarchical regression.

P5. Alignment across dimensions produces stronger transformation

Transformative practice is more likely when competence, identity, agency, and institutional enablement are mutually aligned rather than developing at the same rate independently. Different misalignments predict different outcomes: high competence with low agency predicts compliance-oriented practice; high competence and agency with weak institutional support predicts isolated innovation; strong institutional support with low competence predicts superficial or inappropriate adoption; and strong identity with low competence predicts principled but limited integration. Latent profile analysis could test whether profiles high on all four dimensions show significantly greater transformative practice than uneven profiles.

P6. Critical use, not frequency, indicates transformation

The depth of critical, pedagogically purposeful AI use is a stronger indicator of transformation than frequency of use, which may instead reflect administrative dependence or convenience. An educator who uses AI once weekly to critically redesign an individualized process may show greater transformation than one who uses it daily for routine generation, so future research should distinguish frequency from breadth, critical evaluation, and learner-centred adaptation rather than treating frequency as a proxy for integration.

P7. The recognition gap constrains organizational transformation

When competence and agency develop faster than institutional recognition, a Digital Professional Recognition Gap emerges that reduces the likelihood that individual innovation becomes sustained organizational change, and may explain why professional-development effects sometimes prove short-lived: training can raise competence, but without recognition and structural uptake the new competence may not become embedded in institutional practice. Interviews, case studies, and a future validated scale could examine recognition, decision-making participation, and organizational uptake of educator-led innovation.

P8. Augmentation is more sustainable than substitution

Transformation is more sustainable when AI augments educator judgment than when it substitutes for educator responsibility. The DPTC does not reject automation, which can usefully reduce repetitive workload, but AI-generated recommendations cannot independently account for a learner's complete relational and contextual circumstances, so responsibility for educational judgment must remain with the human professional – an augmentation principle consistent with UNESCO's (2024) emphasis on human-centred AI. Future studies could compare educators operating under substitutive versus augmentative orientations and test whether the latter predicts stronger long-term transformation.

Table 2

Summary of the Eight Theoretical Propositions

Proposition	Core relationship	Theoretical role
P1	Digital-AI competence → transformation	Foundational capability

Proposition	Core relationship	Theoretical role
P2	Professional identity → AI orientation	Interpretive mechanism
P3	Competence → agency → transformation	Mediating mechanism
P4	Agency × institutional enablement → transformation	Contextual moderation
P5	Alignment of four dimensions → transformation	System-level condition
P6	Critical AI use → transformation	Qualitative indicator
P7	Recognition gap → reduced transformation	Explanatory constraint
P8	AI augmentation → sustainable transformation	Professional/ethical boundary

Note. P = Proposition. The eight propositions collectively argue that digital-AI competence provides the foundation for transformation, but transformation occurs only when competence is interpreted through professional identity, converted into action through agency, and supported by institutional recognition and enablement.

7. Discussion and Implications

The DPTC was developed from the observation that acquiring digital-AI competence does not, by itself, constitute professional transformation. Its contribution is not another list of AI skills but an explanation of what happens between acquiring competence and achieving transformative practice, and this has consequences for how the field trains educators, evaluates institutions, and sets policy.

7.1 From Competence to Agency-Centred Development

The framework implies a shift in professional development from “what AI competencies does an educator possess?” toward “how are those competencies converted into professionally responsible action?” Training programmes should not stop at demonstrating that educators can operate AI systems; they should create opportunities to exercise judgment, question outputs, and participate in technology-related decisions, and should include scenarios in which educators must decide whether AI should be used at all, what information can safely be entered into a system, and when professional judgment should override an AI recommendation. For special educators, such training should be embedded within disability-specific pedagogical knowledge rather than delivered as generic technology instruction, following a rough progression from awareness, to guided application, to critical integration, to professional transformation.

7.2 Institutional Leadership and the Recognition Gap

Because professional agency does not operate in an institutional vacuum, leaders cannot treat AI adoption as a procurement decision alone. Reducing the Digital Professional Recognition Gap requires mechanisms such as AI professional learning communities, peer mentoring, digital-innovation teams, or advisory roles through which educators who have developed advanced expertise can contribute formally to institutional practice; without such mechanisms, individual innovation is likely to remain informal and fragile. Institutional AI-readiness should therefore be evaluated across competence, identity, agency, recognition, and enablement rather than through infrastructure availability alone – an institution can be technologically well equipped while remaining professionally unprepared for AI-mediated transformation. Evaluation of professional development should similarly move beyond training-attendance or self-reported usage toward evidence of knowledge, application, judgment, and transformation.

7.3 Practice, Governance, and Policy Implications

In special and inclusive education, the relevant evaluative questions are not primarily about technological performance but about educational consequence: does the technology improve access and meaningful participation, does it strengthen rather than weaken professional judgment, and can the educator explain and justify the resulting decision? Because AI systems increasingly influence assessment, individualized planning, and behavioural interpretation, educators should be recognized as stakeholders in AI governance rather than positioned only as end users, and AI policy for special education should explicitly address human oversight, accessibility, data protection, transparency, and sustained – rather than one-time – professional learning. For the Indian special-education context specifically, the DPTC offers a useful lens for examining how AI initiatives interact with teacher preparation and inclusive-education policy, but the framework should not be assumed transferable without contextual validation given substantial variation across infrastructure, language, and institutional resources; India’s multilingual and culturally diverse educational environment means that AI-

generated resources judged technically appropriate may still be unsuitable once linguistic and cultural context is considered.

8. Limitations and Directions for Future Research

The DPTC should be interpreted within the boundaries of its conceptual status. As a theory-development contribution rather than an empirical validation study, it does not yet provide evidence that all educators pass through the four proposed stages in sequence, that movement between stages is measurable, or that the proposed relationships hold with statistically significant effects; describing it as a proposed model rather than a validated developmental scale is therefore important for how it should be read and reviewed.

Several further limitations deserve explicit acknowledgment. First, the four-dimensional architecture intentionally simplifies a complex phenomenon and may underrepresent influences such as workload, prior teaching experience, institutional culture, and national policy, and future research may identify additional dimensions or require subdivision of existing ones. Second, although termed a continuum, the boundaries between adjacent stages – particularly Digital Adaptation and Digital Integration, and Digital Integration and Transformative Practice – are not always immediately observable and will require a behavioural rubric rather than simple categorical classification. Third, the framework's constructs present real measurement challenges: digital-AI competence and professional agency involve both perceived capacity and actual opportunity for action, and self-reported competence may diverge from demonstrated competence, particularly because fluent interaction with generative AI can create a false sense of reliability. A stronger measurement strategy would combine self-report with performance-based tasks, interviews, and institutional evidence rather than relying on Likert-scale self-report alone.

Fourth, the model has been developed within an international literature on digital education and teacher agency, but professional agency and institutional recognition are likely to vary by institutional culture, professional hierarchy, and national education system, so the DPTC should not be assumed to operate identically across countries, and the present framework does not yet differentiate sufficiently among disability groups or educational settings. Fifth, the Digital Professional Recognition Gap is itself a novel theoretical construct requiring empirical investigation – beginning with qualitative interviews and case studies – before a validated DPRG scale could be developed. Sixth, because AI technologies are evolving rapidly, a framework built around current generative systems may lose precision as AI becomes more autonomous and embedded, though the DPTC's emphasis on relatively stable professional constructs (identity, agency, judgment, recognition) rather than specific tools offers some durability. Finally, not every form of institutionally labelled "transformation" should be considered desirable; institutions may describe increased AI-based surveillance or automated evaluation as transformation, but from the DPTC's perspective such change qualifies as transformative professional practice only if it remains connected to agency, ethical responsibility, and learner-centred practice.

These limitations point toward a structured research agenda: exploratory qualitative work on how educators experience AI-mediated professional change; development and psychometric validation of measures for each dimension and for the DPRG; structural equation modelling to test the proposed mediation and moderation pathways; longitudinal research to examine whether educators actually move between stages over time and what predicts progression or regression; and comparative research across special and general educators, rural and urban institutions, and different national contexts. This sequence – from qualitative exploration to construct refinement, instrument development, psychometric and structural validation, and longitudinal and cross-context testing – is intended to prevent premature claims about the model's validity.

9. Conclusion

The increasing presence of AI in education is changing not only the tools available to educators but the conditions under which professional knowledge and responsibility are exercised. For special and inclusive education, this matters because AI-supported decisions can influence individualized learning, accessibility, assessment, and participation, so the central issue is not whether educators will encounter AI but how they will incorporate it without compromising professional judgment and learner-centred responsibility.

This paper proposed the Digital Professional Transformation Continuum (DPTC) as a response to that challenge, integrating digital-AI competence, professional identity, professional agency, and institutional recognition and enablement across four non-linear developmental stages. The framework distinguishes technological capability from professional transformation: an educator may know how to operate AI tools without exercising meaningful agency, and frequent AI use does not by itself indicate sophisticated professional practice. Transformation, in this account, is characterized by the ability to critically interpret AI, contextualize its outputs, make professionally responsible decisions, and contribute to institutional improvement – and, where necessary, to constrain or decline AI use when professional judgment indicates that this better serves the learner.

A particular contribution of the paper is the Digital Professional Recognition Gap, which draws attention to situations in which educators develop digital-AI competence and agency faster than their institutions recognize or

support that expertise, shifting part of the responsibility for AI readiness from individual educators toward institutional structures and leadership. The eight propositions developed here provide a basis for the mediation, moderation, and profile-based testing that future empirical research will need to undertake; the framework's value will ultimately depend on whether that research can show its constructs are empirically distinguishable and its proposed relationships observable in practice.

The broader argument can be stated in one principle: AI does not transform professional practice simply because educators acquire AI skills; transformation occurs when competence becomes professionally meaningful, is exercised through agency, and is supported by institutions that recognize educators as active participants in AI-mediated change. For special and inclusive education, the goal is therefore not to create professionals who use more AI, but professionals who can determine when, why, how, and to what extent AI should be used in the service of learners – a movement toward more critically capable, professionally agentic, and institutionally empowered educators working alongside intelligent technologies..

References

1. Ancillotti, I. (2025). DigCompEdu 4 Inclusion: A framework for promoting teachers' digital competences for inclusion. *Formazione & Insegnamento*, 23(3), 103–114. https://doi.org/10.7346/-fei-XXIII-03-25_13
2. Biesta, G., Priestley, M., & Robinson, S. (2015). The role of beliefs in teacher agency. *Teachers and Teaching: Theory and Practice*, 21(6), 624–640. <https://doi.org/10.1080/13540602.2015.1044325>
3. Frøsig, T. B., & Romero, M. (2024). Teacher agency in the age of generative AI: Towards a framework of hybrid intelligence for learning design. *arXiv*. <https://arxiv.org/abs/2407.06655>
4. Goldman, S. R., Smith, S. J., & Carreon, A. (2025). Special education teachers' use of AI to support students with disabilities in writing. *Frontiers in Education*, 10, Article 1710974. <https://doi.org/10.3389/feduc.2025.1710974>
5. Jabareen, Y. (2009). Building a conceptual framework: Philosophy, definitions, and procedure. *International Journal of Qualitative Methods*, 8(4), 49–62. <https://doi.org/10.1177/160940690900800406>
6. Lan, Y. (2024). Through tensions to identity-based motivations: Exploring teacher professional identity in artificial intelligence-enhanced teacher training. *Teaching and Teacher Education*, 151, 104736.
7. Mishra, P., & Koehler, M. J. (2006). Technological pedagogical content knowledge: A framework for teacher knowledge. *Teachers College Record*, 108(6), 1017–1054. <https://doi.org/10.1111/j.1467-9620.2006.00684.x>
8. Naatz, A. J., & Rupp, A. (2026). Special education teachers' use of generative artificial intelligence (AI): An exploratory survey of frequency and factors influencing adoption. *Journal of Special Education Technology*, 41(2), 227–239. <https://doi.org/10.1177/01626434251379800>
9. OECD. (2025). Leveraging artificial intelligence to support students with special education needs. OECD Publishing.
10. Priestley, M., Biesta, G. J. J., & Robinson, S. (2015). Teacher agency: An ecological approach. Bloomsbury Academic. <https://doi.org/10.5040/9781474219426>
11. Redecker, C. (2017). European framework for the digital competence of educators: DigCompEdu (Y. Punie, Ed.). Publications Office of the European Union. <https://doi.org/10.2760/159770>
12. UNESCO. (2024). AI competency framework for teachers. UNESCO. <https://doi.org/10.54675/ZJTE2084>.

..