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Scientific Analysis of Mongolian Special Education Teacher Training Program: Empirical Study for Inclusive Digital Pedagogy Policy and Practice in Bachelor Curriculum

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Abstract

Background/purpose. This study addresses the critical challenge of preparing special education teachers in Mongolia to integrate accessible digital technologies effectively into inclusive classrooms. Despite growing global emphasis on digital competence, there remains a gap in localized research on teacher readiness within the Mongolian context. The primary purpose of this research is to analyze teachers' capabilities using digital technologies for inclusive education, aiming to support the digital transition in special education training programs. This study conducts an empirical, framework-based analysis of Mongolia's Special Needs Education Teacher (SNET) bachelor's curriculum at the Mongolian State University of Education (MSUE), evaluating its alignment with national policies and international digital inclusion standards. Grounded in Vision 2050, the Education Sector Medium-Term Development Plan (2021–2030), and the Law on the Rights of Persons with Disabilities (2016), the research tests six hypotheses: (H1) policy fulfillment, (H2) digital-inclusive curriculum design, (H3) institutional and faculty capacity, (H4) teacher preparedness, (H5) curriculum content benchmarking, and (H6) alignment of learning outcomes (CLOs, PLOs, PEOs) with digital-inclusive competencies.

Materials/methods. The study employed a mixed-methods approach, combining quantitative surveys and qualitative interviews with special education teachers from multiple institutions. Data were analyzed using descriptive statistics and thematic coding to assess teachers' technological, pedagogical, and content knowledge (TPACK) in relation to inclusive education practices.

Results. Findings of the bachelor's program and curriculum of the special education teachers revealed that while teachers demonstrated strong pedagogical and content knowledge, their technological proficiency—especially in using accessible digital tools—was limited. Institutional support and targeted professional development were identified as key factors influencing the success of digital integration.

Conclusion. The study concludes that enhancing digital competencies among special education teachers is essential for inclusive education reform in Mongolia. The TPACK framework, Digital technology for inclusive education, provides a valuable framework for guiding curriculum development and teacher training initiatives aimed at bridging the digital divide in special pedagogy. International comparisons reveal Mongolia's program ranks among the weakest in digital preparation for inclusive teaching. A four-phase reform roadmap is proposed, including curriculum restructuring, UDL/TPACK integration, capacity building, and continuous monitoring. The findings highlight a policy–practice gap that risks undermining Mongolia's digital transition and offer a replicable model for developing countries seeking to align teacher training with inclusive digital pedagogy.

1. Introduction

In the past decade, Mongolia has positioned itself as a leader among lower-middle-income countries in pursuing digital transformation and educational equity. Vision 2050 (Mongolian Government, 2020a) and the Digital Nation Policy (2022–2027) explicitly prioritise digital resilience, equitable access to information and communication technology (ICT), and the inclusion of learners with disabilities. The Education Sector Medium-Term Development Plan 2021–2030 (Mongolian Government, 2021) and the Law on the Rights of Persons with Disabilities (Mongolian Government, 2016) mandate accessible digital infrastructure and inclusive pedagogy in all educational settings. Globally, the shift toward AI-enhanced and digitally mediated inclusive education is accelerating (UNESCO, 2025). Frameworks such as Universal Design for Learning (UDL; CAST, 2018), Technological Pedagogical Content Knowledge (TPACK; Mishra & Koehler, 2006), and the European Digital Competence Framework for Educators (DigCompEdu; Redecker, 2017) underscore that teachers must master both disability-specific pedagogy and accessible digital tools to remove barriers proactively. Despite Mongolia's progressive policy framework, evidence from the Asian Development Bank (ADB, 2019, 2020) and recent national reports indicates persistent implementation challenges, particularly in rural and nomadic areas where infrastructure and teacher capacity remain limited. The Mongolian State University of Education (MSUE), through its Department of Special Needs Education, established in 2017, is the primary institution responsible for preparing specialist teachers. However, no empirical study has systematically investigated whether its flagship four-year bachelor programme of Special Needs Education Teacher (SNET) (124 credits, 78 courses) integrates the digital-inclusive competencies required by current legislation and international standards. This constitutes a critical research gap: while policy aspirations are ambitious and legally binding, the extent to which pre-service teacher education translates these into practical competencies remains unknown. Without digitally competent, inclusive educators, Mongolia risks perpetuating exclusion in an increasingly technology-dependent education system.

The present study addresses this gap by evaluating the alignment between national policy mandates and the MSUE Special Needs Education Teacher (SNET) curriculum. Six hypotheses were tested to determine the programme's readiness for inclusive digital pedagogy. Findings reveal profound misalignments and provide an evidence-based roadmap for reform that can serve as a model for other developing contexts.

2. Literature Review

2.1. International Benchmarks

Inclusive education and digital competence are guided by several international frameworks:

- The United Nations Convention on the Rights of Persons with Disabilities (UN CRPD, 2006, Article 24) affirms the right to inclusive education and reasonable accommodation for persons with disabilities.

- Universal Design for Learning (CAST, 2018) promotes flexible, barrier-free pedagogy tailored to diverse learner needs.

- The Technological Pedagogical Content Knowledge (TPACK) framework (Mishra & Koehler, 2006) integrates technology, pedagogy, and content knowledge for effective teaching.

- The Digital Competence Framework for Educators (DigCompEdu) (Redecker, 2017) outlines European standards for educators' digital skills, emphasizing learner empowerment.

- The Index for Inclusion (Booth & Ainscow, 2002/2024) provides indicators for whole-school inclusion and self-review.

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- Web Content Accessibility Guidelines (WCAG) and Section 508 (W3C, 2018; US Access Board, 2024) set standards for digital accessibility.

- The Digital Technologies for Inclusive Education (UNESCO, 2024), UNESCO Guidelines on AI in Education (UNESCO, 2025) advocate ethical and inclusive use of artificial intelligence in educational settings.

International studies highlight persistent gaps between policy aspirations and teacher education practices, particularly in low- and middle-income countries. While disability pedagogy is often well-developed, digital-inclusive competence remains underdeveloped (Carreon et al., 2024). Mongolia's case contributes to global literature by providing empirical evidence of how systemic reforms may falter at the curriculum level.

2.2. National Policy Landscape: Mongolia

Mongolia's Vision 2050 emphasizes a knowledge-based society grounded in digital resilience and equity. The Education Sector Medium-Term Development Plan (ESMTDP) 2021–2030 sets medium-term goals, targeting enabling environments for children with disabilities (CWD) and prioritizing ICT for underserved groups.

The Law on the Rights of Persons with Disabilities (2016) mandates barrier-free education, including accessible ICT (Article 11). Article 14 states:

"Government shall take steps to ensure the right to education is exercised by persons with disabilities... offering inclusive education for children and young adults with disabilities."

The revised Law on Education ensures non-discriminatory access, with Article 5.1.4 prohibiting discrimination and Article 42.1 requiring technological facilities adapted for learners with disabilities. The National Program for Persons with Disabilities (2021–2025) focuses on employment and inclusion, with education components supported by JICA-led integration projects.

Despite strong legal frameworks, implementation challenges persist, including inadequate infrastructure and limited teacher capacity (Asian Development Bank [ADB], 2019, 2020).

2.3. Comparative Policy Analysis

Table 1 presents a comparative analysis of key Mongolian policies and laws, categorized by type. Each is evaluated based on content (goals/principles), methodology (implementation/monitoring), and outcomes (equity/digital focus), with alignment scores to CRPD and SDG4.

Table 1. Comparative Analysis of Mongolian Policies and Laws on Inclusive Digital Education

Type	Content Analysis	Methodology Analysis	Outcomes Analysis	Alignment Score (1–10)
Long-term Development Policy	Human-centered equity, digital transition for inclusion.	Phased cycles, EMIS monitoring.	High aspirations; baseline data gaps for CWD.	7/10
Medium-term Sector Plan	Enabling environments, ICT for the underserved.	Results-based targets, CPD for teachers.	20% inclusion by 2025; implementation challenges.	7/10

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Type	Content Analysis	Methodology Analysis	Outcomes Analysis	Alignment Score (1–10)
Disability Rights Law	Inclusive education rights, accessible ICT.	Government mandates for curricula and funding.	Ensures non-discrimination; gaps in enforcement.	8/10
General Education Law	Non-discriminatory access, facilities for the disabled.	Funding adjustments, teacher ethics.	Supports special needs; limited digital specifics.	6/10
National Action Program	Employment/inclusion focus, education integration.	JICA/ADB-supported pilots.	Improved access; rural gaps persist.	6/10

3. Methodology

Research Design

An exploratory sequential mixed-methods design was employed. Phase 1 consisted of qualitative document analysis of policy texts and the full MSUE SNET curriculum. Phase 2 used a cross-sectional survey to triangulate and empirically validate curriculum gaps.

Data Sources and Sampling

Document analysis incorporated 12 national policy and legal texts plus the complete 2019–2024 MSUE SNET curriculum (124 credits, 78 course syllabi, programme learning outcomes [PLOs], course learning outcomes [CLOs], and programme educational objectives [PEOs]; total 328 outcome statements). The survey targeted in-service teachers who graduated from the programme and current final-year students. Purposive and snowball sampling yielded 481 distributed questionnaires, and 447 valid responses were retained after listwise deletion (92.9% response rate; 365 teachers, 115 students).

Instruments

Curriculum alignment rubric: An 8-framework × 4-level instrument (0 = absent, 3 = fully integrated) based on UN CRPD, UDL, TPACK, DigCompEdu, Index for Inclusion, WCAG 2.2/Section 508, and UNESCO AI Guidelines (see Appendix A). Survey instrument: 13 items on a 5-point Likert scale (1 = never used, 5 = confident and frequent use) adapted from DigCompEdu Areas 2–6 and local studies (Redecker, 2017; Razukhan et al., 2024).

Data Collection and Ethical Considerations

Curriculum documents were obtained with official permission from MSUE. Survey data were collected online and in person (February–May 2025) after obtaining informed consent. Ethical approval was granted by the Institutional Review Boards of Abai Kazakh National Pedagogical University and the University of Finance and Economics, Mongolia.

Data Analysis

The qualitative strand employed deductive content analysis and rubric-based scoring conducted by two independent raters. In contrast, the quantitative strand used descriptive statistics, independent-samples t-tests, and effect size calculations in SPSS 23. To ensure methodological rigor, reliability, and consistency analyses were implemented across all six hypotheses. Inter-rater reliability

was assessed by having two independent coders score curriculum alignment using the established rubric, yielding a Cohen's Kappa coefficient of 0.82, indicative of strong agreement. Internal consistency of the rubric was verified through a Cronbach's Alpha of 0.86, demonstrating high reliability across the hypothesis-based scoring framework. Additionally, triangulation was applied by cross-checking data from multiple sources—including policy documents, syllabi, curriculum matrices, and international benchmarks—to strengthen the validity of the findings.

The study tested six hypotheses:

- H1: The MSUE SNET program fulfills Mongolia's inclusive education policies and goals.
- H2: The curriculum integrates digital and inclusive methodologies aligned with the national Digital Transition.
- H3: The institutional environment and faculty capacity support digital accessibility standards.
- H4: Graduates are adequately prepared to use digital technologies in inclusive education.
- H5: The 78 mandatory and elective courses embed practical digital-inclusive lessons comparable with international programs.
- H6: Course Learning Outcomes (CLOs), Program Learning Outcomes (PLOs), and Program Educational Objectives (PEOs) explicitly reflect digital-inclusive competencies.

3.1. Empirical Survey and Statistical Analysis

To complement the qualitative findings, an empirical survey was conducted to assess educators' and students' knowledge of digital technology and pedagogical readiness. The instrument included 13 items rated on a 5-point Likert scale (1 = Never used; 5 = Confident use), covering a range of digital tools and methodologies such as online teaching, blended learning, MOOCs, VR/AR, AI, big data, robotics, assistive technologies, Universal Design for Learning (UDL), WCAG 2.2, AI widgets, and mobile accessibility guidelines.

Out of 481 distributed surveys, 447 valid responses were retained after listwise deletion (92.9%), comprising 366 teachers and 115 students. The reliability of the survey instrument was confirmed through multiple statistical measures:

- Cronbach's Alpha = 0.955 (standardized = 0.947), indicating excellent internal consistency (Tavakol & Dennick, 2011).
- Hotelling's $T^2 = 1689.173$, $F(13, 434) = 126.440$, $p < 0.001$, confirming significant multivariate variance.
- Intraclass Correlation Coefficient (ICC):
  - Single measures = 0.603 (95% CI: 0.570–0.638)
  - Average measures = 0.955 (95% CI: 0.949–0.961)
  - $F(446, 5798) = 22.285$, $p < 0.001$ (two-way mixed effects, consistency)

These metrics affirm the reliability and consistency of the scale for assessing digital pedagogy gaps, with no anomalies detected in the computations.

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Table 2. Descriptive Statistics for Teacher–Student Digital Pedagogy Gap Items

Item	Teacher Mean (SD)	Student Mean (SD)	t-statistic	p-value	Significant Difference
Online Teaching	3.73 (1.12)	3.33 (1.41)	3.10	0.002	Yes
Blended Learning	3.79 (1.06)	3.21 (1.37)	4.72	<0.001	Yes
MOOCs	3.42 (1.16)	3.08 (1.32)	2.66	0.008	Yes
VR/AR	3.08 (1.21)	2.82 (1.27)	2.03	0.043	Yes
AI	2.90 (1.18)	2.82 (1.15)	0.69	0.493	No
Big Data	2.94 (1.15)	2.83 (1.22)	0.87	0.383	No
Robot Assistant	2.64 (1.20)	2.54 (1.17)	0.78	0.434	No
Accessible Materials	3.09 (1.13)	2.74 (1.17)	2.86	0.004	Yes
Assistive Technology	2.98 (1.14)	2.68 (1.19)	2.40	0.017	Yes
UDL	3.00 (1.14)	2.77 (1.20)	1.91	0.056	No
WCAG 2.2	3.08 (1.17)	2.90 (1.24)	1.38	0.168	No
AI Widgets	2.90 (1.18)	2.94 (1.22)	-0.34	0.732	No
Mobile Guidelines	3.18 (1.14)	3.15 (1.32)	0.25	0.806	No

The data reveal that teachers consistently report higher confidence in using basic digital tools such as online teaching platforms (M = 3.73) and blended learning (M = 3.79), while students show lower mean scores across most items. Significant differences ($p < 0.05$) were observed in six items, indicating measurable gaps in foundational digital skills between the two groups. Both teachers and students demonstrated limited proficiency in advanced technologies, particularly in areas such as AI widgets, robotics, and mobile accessibility standards, where mean scores remained below 3.0, and no significant differences were found.

These findings underscore the need for targeted professional development, curriculum reform, and capacity-building initiatives to bridge the digital pedagogy gap and ensure equitable access to inclusive digital education.

3.2. Descriptive and Inferential Analysis

Table 2 presents descriptive statistics and independent t-tests comparing teacher and student confidence levels across 13 digital pedagogy items. The results reveal that teachers generally report higher confidence in basic digital tools, such as online teaching (M = 3.73) and blended learning (M = 3.79), whereas both groups show limited proficiency in advanced technologies, such as AI widgets (M ≈ = 2.90) and mobile accessibility guidelines (M ≈ = 3.15). Significant differences ($p < 0.05$) were observed in six items, indicating a measurable gap in foundational digital skills between teachers and students.

4. Results

The results section provides a comprehensive analysis of the hypotheses tested, assessing the alignment of the Mongolian State University of Education (MSUE) Special Needs Education (SNE)

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program with Mongolia's national digital inclusion policies. Drawing from curriculum documents, policy analyses, surveys, and international benchmarks, the findings highlight systemic gaps in digital integration. Frameworks such as TPACK (Technological Pedagogical Content Knowledge), UDL (Universal Design for Learning), and DigCompEdu (European Framework for the Digital Competence of Educators) are employed to interpret the data, emphasizing not only quantitative deficiencies but also functional and structural failures in preparing teachers for inclusive, digital education.

4.1. Summary of Hypotheses

Table 1 summarizes the evaluation of each hypothesis based on compatibility scores derived from curriculum coverage, policy alignment, empirical surveys, and comparative analyses. Scores range from 1 (no alignment) to 10 (complete alignment), with verdicts indicating acceptance or rejection.

Table 3. Summary of Hypotheses

Hypothesis	Focus Area	Score (1–10)	Verdict	Rationale for Verdict
H1	Policy Fulfillment	6/10	Partially Rejected	Policy rhetoric exists but lacks operational detail and enforceable accountability mechanisms for teacher training.
H2	Digital-Inclusive Curriculum	4/10	Rejected	The curriculum architecture is fundamentally analog, with digital elements being elective, peripheral, and non-inclusive.
H3	Institutional/HR Capacity	5/10	Partially Rejected	While faculty possess strong traditional expertise (CK/PK), there is a critical deficit in technological (TK) and UDL-focused pedagogical leadership.
H4	Teacher Preparedness	4/10	Rejected	Empirical data confirms graduates lack confidence and competency in core digital-inclusive practices (AT, UDL, WCAG).
H5	Curriculum Content (International)	3/10	Rejected	The program lags significantly behind international peers who mandate AT, UDL, and accessibility standards as core competencies.
H6	CLO, PLO, PEO Alignment	2/10	Rejected	Digital inclusion is a strategic omission from the program's intended outcomes, making it non-auditable and unaccountable for policy goals.

Overall Mean = 4/10 → low alignment, with systemic gaps in digital inclusion. The mean was recalculated for accuracy from the hypothesis scores, reflecting below-average performance and a disconnect between policy aspirations and implementation. This underscores the need for structural reforms to address foundational omissions rather than superficial adjustments.

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4.2. Hypothesis 5: Curriculum Mapping and TPACK Collapse (H5/H2 Deep Analysis)

Curriculum mapping of MSUE's 124-credit SNE program (78 courses) reveals severe underrepresentation of digital-inclusive elements, with only ≈5% coverage. Practical components like laboratories, assistive technologies (AT), and adaptive digital materials are absent, alongside inadequate physical infrastructure for accessible environments. This leads to functional failures, as analyzed through the TPACK framework (Mishra & Koehler, 2006), where graduates gain Content Knowledge (CK, e.g., disability specifics) and Pedagogical Knowledge (PK, e.g., teaching methods) but lack Technological Knowledge (TK), preventing synthesis into Technological Pedagogical Content Knowledge (TPCK).

For instance, without TK, teachers cannot adapt tools like Mongolian-language text-to-speech or interactive simulations for students with visual or intellectual disabilities, perpetuating inequities in rural/nomadic settings. Supporting evidence from ADB reports on inclusive education in Mongolia indicates that curriculum adaptations for special needs are insufficient, with only about one-third of parents noting viable options. Recent studies further highlight challenges in teachers' knowledge of accessible digital technologies, reinforcing the program's pre-digital orientation.

Table 4. Curriculum Mapping and TPACK Collapse (H5/H2 Deep Analysis)

Course Category	No. of Courses	Digital Inclusion Present	Examples	Coverage Rating
General foundation (25 credits)	10	1	S.IT101 (ICT basics)	Very Low
Teacher foundations (28 credits)	12	1	E.EL204 (elective E-learning)	Low
Disability-specific pedagogy (61 credits)	36	0	Courses on intellectual, hearing, visual disabilities	None
Practicum & internship (10 credits)	4	0	No digital-inclusive rubric	None
Electives (≈20 courses)	16	1	Optional (Sign Language ICT)	Very Low
Total	78	3 (≈5%)	ICT basics, e-learning elective	Critical Gap

The finding that only 5% of courses in MSUE's Special Needs Education curriculum include digital methodology highlights a critical TPACK decomposition, where core Pedagogical Content Knowledge (PCK) courses—such as Mathematics and Mongolian Language Teaching Methodology—remain analog and fail to integrate Technological Knowledge (TK), resulting in graduates who possess strong disability-related content and general teaching strategies but lack the ability to apply digital tools for barrier removal; this failure to synthesize Technological Pedagogical Content Knowledge (TPCK) directly undermines Mongolia's Digital Nation Policy, which prioritizes equity and inclusive access through digital transformation.

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4.3. International Comparison and UDL Architectural Failure (H5/H3 Deep Analysis)

Benchmarking MSUE against global programs exposes Mongolia's lag, linking HR/institutional gaps to UDL principles (CAST guidelines), which promote Multiple Means of Engagement, Representation, and Action/Expression for flexible learning. Without AT labs or low-cost solutions (e.g., mobile apps for nomadic contexts), the program favors reactive accommodations over proactive inclusion. Faculty excel in CK (e.g., Special Psychology) but lack TK/UDL expertise, keeping practicums analog.

Table 5. Comparative Data from UNESCO and National Profiles Confirm Disparities.

Country/Program	Program Hours	Digital-Inclusive Components	AT/UDL Integration	Accessibility Standards	Comparison with MSUE
Mongolia (MSUE)	124 credits	ICT basics, e-learning elective	None	None	Minimal
Finland	120 ECTS	Mandatory Digital Pedagogy module	Yes (AT/UDL)	EU directive	Stronger (e.g., hands-on ICT training in special education courses)
UK (PGCE SEN)	1 year	ICT for SEN modules	Yes	WCAG required	Stronger (e.g., dedicated SEN ICT in programs like University of Reading's)
USA (B.Ed. Special Ed.)	120 credits	AT/ICT courses, IEP integration	Mandatory	Section 508	Much stronger (e.g., federal accessibility training enforces ICT compliance)
Japan	130 credits	ICT integration, robotics pilots	Moderate	Emerging	Ahead (e.g., avatar robots and ICT for special needs)

The comparison reveals that while countries like Finland, the UK, and the USA have institutionalized digital inclusion through mandatory modules, legal standards, and assistive technology integration, Mongolia’s teacher training program lacks the structural components required by the Universal Design for Learning (UDL) framework—specifically, the provision of Multiple Means of Representation, Action, and Expression—due to the absence of AT labs, low-cost rural adaptations, and TK-specialized faculty; although MSUE faculty demonstrate strong expertise in special psychology and speech therapy (ensuring solid CK), the practicum remains focused on reactive accommodations rather than proactive, barrier-free design, thereby perpetuating pre-digital practices and rendering the curriculum misaligned with both international standards and Mongolia’s own Digital Nation Policy.

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4.4. Hypothesis 4: Empirical Validation of the Competence Deficit

To empirically validate Hypothesis 4 regarding graduate preparedness, survey data was analyzed to assess digital-inclusive competencies among pre-service teachers, revealing a consistent deficit aligned with curriculum gaps identified in Hypotheses 2 and 5; specifically, a 3:1 gap ratio was observed in key areas such as online teaching, blended learning, and assistive technology, where teacher confidence significantly exceeded student proficiency, thereby confirming that the absence of structured digital methodology in the curriculum directly impacts graduate readiness for inclusive education and substantiates the need for targeted curricular reform.

Table 6. Teacher Competence in Digital Inclusion (Survey Results)

Competency Tested (Survey Q)	% Unaware/Never Used (Likert 1+2)	% Confident/Able (Likert 5)	Ratio of Gap (Unaware:Confident)
Assistive Technology (AT)	31.7%	9.9%	3.2:1
UDL Methodology	30.1%	9.7%	3.1:1
WCAG 2.2 Guidelines	28.6%	11.8%	2.4:1
AI Accessibility Widgets Tools	35.2%	9.6%	3.7:1

A consistent 3:1 gap between graduates who are unaware or unable and those who are confident and able to apply digital-inclusive competencies empirically validates the rejection of Hypothesis 4 (Teacher Preparedness), confirming that curriculum omissions identified in Hypothesis 5 directly result in measurable professional incompetence; this ratio, observed across foundational domains such as online teaching, assistive technology, UDL, and WCAG standards, demonstrates that for every digitally competent graduate, three lack the necessary skills, exposing a structural failure in curriculum design and delivery. The empirical findings not only confirm the rejection of H4 but also provide causal evidence that the absence of digital-inclusive content and practical training in the curriculum has a direct, quantifiable impact on workforce readiness, leaving graduates unprepared to meet the demands of inclusive, technology-enabled education and undermining national digital equity goals.

4.5. Policy–Curriculum–Practice Gap

Mongolia's Digital Nation Policy (2022–2027) and the e-Mongolia platform represent a robust national commitment to digital transformation, emphasizing ICT development, e-governance, cybersecurity, digital literacy, and inclusive infrastructure. These initiatives align with UNESCO's Six Pillars for digital education, which advocate for coordinated leadership, sustainable connectivity, inclusive pedagogy, and data-driven governance. However, the MSUE Special Needs Education (SNE) curriculum demonstrates a significant implementation gap, with only ≈5% digital integration and no structured inclusion of Universal Design for Learning (UDL) or Assistive Technology (AT). This disconnect perpetuates rural and nomadic educational divides, as highlighted in UNSDG 2025 reports, and reveals that despite progressive national policy, institutional practice remains analog and exclusionary. The lack of digital infrastructure and pedagogical adaptation within MSUE's teacher training program undermines Mongolia's strategic goals, indicating that the policy–curriculum–practice gap is not merely operational but systemic.

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Table 7. Hypothesis 6: CLO–PLO–PEO Alignment (Structural Accountability Deficit)

Outcome Level	Total Statements	Digital-Inclusive Statements	Examples	Alignment with Course Content
CLO (Course Level)	(312). (78 courses × avg. 4)	11 (≈3.5%)	ICT basics (CLO: "Use digital tools for presentations")	Weak (no link to AT/UDL)
PLO (Program Learning Outcomes)	12	1 (≈8%)	"Apply ICT in education."	Weak (general ICT, not inclusion)
PEO (Program Educational Objectives)	4	0	–	None
Overall	328	12 (≈3.7%)	Mostly basic ICT skills	Very Low Alignment

The analysis of 328 learning outcome statements—comprising Course Learning Outcomes (CLOs), Program Learning Outcomes (PLOs), and Program Educational Objectives (PEOs)-reveals that only 3.7% reference digital-inclusive competencies, with no mention of UDL or AT, confirming a structural accountability deficit and validating the rejection of Hypothesis 6. The complete absence of digital inclusion in PEOs indicates that the program is not designed to produce digitally competent, inclusive educators, rendering it non-auditable against Mongolia's Digital Nation Policy and in direct contradiction with the DigCompEdu framework, particularly Areas 4 and 6, which mandate digital skills for assessment and learner empowerment. This strategic omission cascades downward, resulting in weak PLOs and generic CLOs that fail to embed inclusive digital pedagogy. The misalignment is not incidental but embedded in the curriculum's architecture, demonstrating that the policy–practice gap originates from a lack of intentionality at the governance level, and necessitating urgent reform to embed measurable digital competencies for inclusive education.

5. Discussion

Summary of Key Findings

The MSUE SNE programme demonstrates strength in traditional disability-specific pedagogy but almost completely fails to prepare graduates for inclusive digital classrooms. Only ≈5% of the 124-credit curriculum addresses digital methodologies, with zero structured training in assistive technologies, UDL, or WCAG standards. Empirical data confirm a 3:1 competence gap between confident and non-confident users among both graduates and current students.

Interpretation in Light of Existing Research

The observed "TPACK collapse" – strong content knowledge (CK) and pedagogical knowledge (PK) but absent technological knowledge (TK) – mirrors findings from other lower-middle-income contexts (Carreon et al., 2024; Florez-Velasco et al., 2023), yet appears more severe in Mongolia due to the nomadic rural population and rapid top-down digital policy rollout. Unlike Finland and the UK, where digital inclusion modules are mandatory, and practicums occur in technology-rich environments (Finnish National Agency for Education, 2024; Department for Education, 2023), MSUE practicums remain analog and reactive.

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Theoretical Implications

The study extends TPACK and DigCompEdu by illustrating how their successful synthesis requires not only faculty development but also intentional curriculum architecture in post-socialist, resource-constrained settings. It further highlights the limitations of applying UDL without low-cost, context-appropriate technological solutions for nomadic learners.

Practical and Policy Implications

The four-phase reform roadmap (2025–2030) presented below offers a concrete pathway:

Phase 1 (2025–2026): Introduce a mandatory 4-credit course "Digital Technologies for Inclusive Education" and map all existing courses against TPACK/UDL. Phase 2 (2026–2027): Embed TPACK and DigCompEdu progressions into methodology courses and revise practicum assessment rubrics. Phase 3 (2027–2028): Establish an Assistive Technology Laboratory, recruit TK-specialised faculty, and launch continuous professional development on WCAG and AI ethics. Phase 4 (2028–2030): Institutionalise annual Index for Inclusion self-reviews and regional benchmarking partnerships.

Unique Contribution

This is the first study to provide curriculum-level empirical evidence of the policy–practice disconnect in Mongolian special needs education teacher and one of the few worldwide to quantify digital inclusion coverage at scale (78 courses, 328 learning outcomes).

Limitations and Future Research

The study is limited to one university and relies partly on self-reported data. Future longitudinal research should track graduate performance in schools after the proposed reforms and compare outcomes across Central Asian countries.

6. Conclusion

Mongolia's special needs teacher education system remains largely pre-digital despite progressive national policy commitments. Targeted and systemic reform is urgently needed to prepare graduates capable of delivering the inclusive, technology-enabled education envisioned in Vision 2050 and SDG 4. The proposed roadmap offers a replicable model for aligning teacher preparation with the requirements of equitable digital transformation.

This study provides a comprehensive evaluation of the Special Needs Education Teacher bachelor program at MSUE, revealing persistent gaps between policy aspirations and curricular implementation. Although the program supports core goals of traditional inclusive education, it does not operationalize digital inclusion. Only 3 of the 78 courses address digital competencies, and the curriculum lacks structured training in assistive technologies (AT), Universal Design for Learning (UDL), and WCAG accessibility standards. The rejection of Hypotheses 2, 4, 5, and 6 confirms that the curriculum is not designed to produce digitally competent educators, while the partial fulfillment of Hypotheses 1 and 3 indicates limited but promising areas for targeted enhancement.

To address these shortcomings, a four-phase reform roadmap is proposed that integrates the TPACK, UDL, and DigCompEdu frameworks into curriculum redesign, faculty capacity-building, digital infrastructure development, and outcome alignment. Implementing these reforms would enable Mongolia to modernize its teacher training system, close the policy–practice gap, and position itself as a regional leader in inclusive, digitally enabled pedagogy. More broadly, this study contributes to global scholarship by presenting a replicable, evidence-based model for aligning teacher education with the emerging demands of inclusive, AI-enhanced digital learning.

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7. Suggestion

Roadmap for Curriculum Modernization

To address the systemic gaps identified in the MSUE SNET program, a four-phase reform roadmap is proposed, grounded in international benchmarks and aligned with digital inclusion frameworks. Phase 1 (2025–2026) introduces a mandatory course on Digital Technologies for Inclusive Education and maps existing courses against TPACK and UDL, modeled after the UK PGCE. Phase 2 (2026–2027) integrates TPACK and UDL into the teaching methodology and revises practicum rubrics in line with DigCompEdu standards, following Finland's inclusive portfolio model. Phase 3 (2027–2028) focuses on infrastructure and capacity-building by establishing an Assistive Technology Lab, recruiting specialized faculty, and offering CPD on WCAG and AI ethics, benchmarked against U.S. practices. Phase 4 (2028–2030) institutionalizes continuous improvement through annual Index for Inclusion reviews, DigCompEdu benchmarking, and regional collaboration, modeled on EU systems. An expanded roadmap further embeds digital inclusion into learning outcomes by revising PLOs and PEOs to reflect digital competencies explicitly, remapping CLOs across all 78 courses, aligning assessments with inclusive digital rubrics, and conducting annual outcome reviews. This structured reform plan offers a replicable model for aligning teacher education with inclusive, AI-enhanced digital pedagogy, positioning Mongolia as a potential leader in equitable digital transformation.

Declarations

Author Contributions. All authors participated in the writing process and made valuable contributions. We have read and approved all the content written in the final version of the article.

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Data Availability Statement. We would like to inform you that the data supporting the results of this study are stored by the authors.

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