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Dual Perspectives on Academic Optimism and Digital Media Literacy Among Pre-Service Teachers

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This study examines academic optimism (AO) and digital media literacy (DML) among pre-service teachers (PSTs) in the Computer Education program at Naresuan University, Thailand. Using a needs assessment framework, a cross-sectional survey with a 5-point Likert scale compared student self-assessments and instructor evaluations to identify current versus desired proficiency levels. The research compares self-assessments from students with evaluations from instructors and mentors to identify current versus desired proficiency levels. Using validated instruments (AO: α = .89; DML: α = .76) and the Priority Needs Index (PNImodified), findings from 79 participants reveal consistent gaps across all skill domains, with the most significant needs in applied digital pedagogy, content creation, and technology integration. Deployment-oriented competencies, such as effectively implementing digital tools in instructional contexts, emerged as the most critical area for development. The results highlight persistent structural challenges in teacher preparation programs prioritizing tool literacy over integrating digital pedagogy into authentic learning experiences. These findings inform curriculum design, instructional strategies, and targeted professional development to better prepare future educators for technology-rich educational environments.

Keywords: academic optimism, digital media literacy, applied digital pedagogy, teacher education, pre-service teacher training, Priority Needs Index

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INTRODUCTION

Digital transformation reshapes education worldwide, redefining how teachers plan lessons, deliver instruction, and assess learning. In this context, *digital media literacy* (DML)—the ability to access, evaluate, use, and create digital content effectively—is no longer optional; it is a core professional competency for educators. However, many teacher education programs struggle to ensure that graduates possess the depth of digital skills needed to design technology-integrated lessons, critically assess online information, and foster 21st-century competencies in their students.

Beyond technical proficiency, effective teaching in a digital era also depends on the psychological readiness to adapt to change and overcome challenges. *Academic Optimism* (AO)—a composite of academic self-efficacy, trust, and academic emphasis—supports this readiness by fostering confidence, persistence, and a focus on student success. AO can help pre-service teachers (PSTs) navigate complex digital environments with skill and resilience when strengthened alongside DML (Dramani etal., 2025).

This dual capacity is vital for students in the Bachelor of Industrial Education (Computer Education) program at Naresuan University, Thailand. These pre-service computer teachers (PSCTs) are expected to bridge the worlds of technology and pedagogy, equipping future learners with essential digital competencies. However, recent course performance data and instructor feedback indicate persistent gaps in fundamental DML skills, such as applying digital tools in instruction, evaluating online content, conducting effective searches, and producing digital artifacts, combined with low confidence and adaptability in digital problem-solving.

Thailand's Education 4.0 reforms stress incorporating digital knowledge into teacher education to meet 21st-century learning targets (Sanchai & Koomkhainam, 2023). Internationally, frameworks such as UNESCO's ICT Competency Framework for Teachers (UNESCO, 2023) emphasize the demand for teachers who can integrate digital technical expertise with confidence within online settings. Such international priorities illustrate the pressing need to address AO and DML deficiencies within Naresuan University and across Thai and other international teacher preparation programs where analogous digital integration problems have also been found (Nogaibayeva et al., 2024).

Academic Optimism (AO) is a multidimensional construct encompassing academic self-efficacy, trust, and academic emphasis (Luthans et al., 2007; Pawelski, 2020). In teacher education, AO has been associated with improved resilience, adaptability, and sustained motivation in challenging instructional contexts (Rezaei et al., 2024). AO enables teachers to view obstacles not as insurmountable mountains but as growth opportunities, which is particularly essential when navigating technology-rich environments (Moghtadaie & Hoveida, 2015).

Within the digital context, AO fosters confidence in mastering new technologies, persistence in troubleshooting technical issues, and a proactive approach *to integrating innovative tools into pedagogy (Sheffler & Cheung, 2024). Recent st*udies in Thai

teacher preparation programs suggest that low AO can hinder the effective adoption of educational technologies, even when technical training is provided (Sirongchai & Duangchatom, 2024).

Digital Media Literacy (DML) and Its Core Dimensions

Digital Media Literacy (DML) extends beyond technical proficiency to include the ability to access, analyze, evaluate, create, and responsibly use digital content (Hammoda & Foli, 2024; Morris & Rohs, 2021). Therefore, this study applies the $PNI_{modified}$ to collect and prioritize the AO and DML needs from two views: 1) PSCTs themselves and 2) their instructors/mentors. The blended perspectives were analyzed to determine the most urgent needs to address next. This ensures that future teacher preparation encompasses technical training and psychological supports that enable long-lasting digital teaching capability.

Research Objectives

1. Assess the current (Actual – D) and desired (Ideal – I) levels of AO among PSCTs and their instructors.
2. Assess the current and desired levels of DML among PSCTs and their instructors.
3. Identify and prioritize AO needs using $PNI_{modified}$.
4. Identify and prioritize DML needs using $PNI_{modified}$.

Research Questions

1. What are the current and desired levels of AO among PSCTs, as reported by themselves and their instructors?
2. What are the current and desired levels of DML among PSCTs, as reported by themselves and their instructors?
3. What are the specific AO needs (I–D gaps) and their priority order?
4. What are the specific DML needs (I–D gaps) and their priority order?

LITERATURE REVIEW

Academic Optimism (AO) in Teacher Education

Academic optimism (AO) is a multidimensional construct of academic self-efficacy, trust, and emphasis (Luthans et al., 2007; Pawelski, 2020). While academic optimism has been shown to lead to improved resilience, adaptability, and continued motivation in challenging instructional contexts in teacher education (Rezaei et al., 2024), AO allows teachers to see obstacles not as insurmountable barriers but rather as opportunities for growth, which is especially important when faced with technology-enriched environments (Moghtadaie & Hoveida, 2015).

Lens Check executed successfully. In these digital contexts, AO supports self-assurance to learn new technologies, perseverance to resolve issues with technology, and a

willingness to use innovative tools in their teaching practices (Sheffler & Cheung, 2024). Recent Thai teacher education program research demonstrated that low AO can prevent teachers from effectively implementing educational technologies even when provided with technical training (Sirongchai & Duangchatom, 2024).

DML) is not only about technical skills, but also about the ability to access, analyze, evaluate, create, and act (use) digital content appropriately and responsibly (Hammoda & Foli, 2024; Morris & Rohs, 2021). Core dimensions often cited in the literature include:

1. Access – Locating and retrieving digital resources efficiently.
2. Understand – Critically evaluating online information and recognizing biases.
3. Use – Operating devices, platforms, and software effectively.
4. Create – Producing original digital content across formats (Leenaraj et al., 2023).

Deficiencies in these areas can limit a teacher's capacity to design meaningful, technology-enhanced learning experiences (Reddy et al., 2023). Research has repeatedly identified gaps in DML among PSTs in Thailand, particularly in applied integration skills rather than tool familiarity (Phophet, 2023).

Ethical content creation is a critical yet underexplored aspect of DML. Bogdan-Martin (2018) expresses concern for the global challenge of addressing digital gender divides and ethical content production in educational settings. Moreover, the author emphasized the need for teachers to model responsible digital behavior.

Similarly, Phuangsuwan et al. (2024) in Thailand underscore the importance of ethical considerations in digital research and content creation, noting that PSTs often lack training in navigating issues like copyright, privacy, and misinformation. These ethical challenges compound the DML gaps identified in Thailand, where applied integration skills remain underdeveloped (Phophet, 2023).

Intersection of AO and DML

AO and DML intersect to influence teacher readiness for the digital age. Teachers with high AO are more likely to persevere in mastering complex digital tools, adjust lesson designs for emerging platforms, and model positive attitudes about technology use for their students (Caton et al). On the other hand, low AO can further widen DML skills gaps because individuals avoid challenging digital tasks or lack the confidence to troubleshoot.

While AO and DML are usually interconnected, some studies have pointed to alternative views. For instance, Sulaiman et al.(2023) found that high technical competence in digital tools could compensate for low AO in implementing project-based ICT teaching, particularly in resource-rich environments. On the other hand, Zhihao and Mustapha (2021) found that the relationship between AO and academic performance could be mediated by factors such as student engagement other than DML. These studies indicate that the relationship between AO and DML is complex,

reinforcing the importance of integrated interventions that address both constructs and acknowledge contextual nuances.

Needs Assessments in Education/ Training and the $PNI_{modified}$

Needs assessment is a systematic process for determining and addressing needs, or "gaps" between current conditions or current performance (D) and desired conditions or desired performance (I), the discrepancy (or gap) which can be measured using a simple formula: (I-D) D=P called the Priority Needs Index Modified ($PNI_{modified}$) is a tool to provide a number to express the gap between Desired State (What Should Be or Expected State) and Actual State (What is or Current State) without being negative value and focus not only on the identification of skills which needed to be addressed but also take in account of the priorities of the skill which need to be addressed by considering their urgency for change and their impact upon the organization of target community (Ussarn et al., 2022).$PNI_{modified}$, for instance, has been applied extensively in Thai education research since its creation to adjust the curriculum to align learners with market needs better (Aroonsiwagool et al., 2025).

Thai Teacher Preparation Context

Thailand's Ministry of Education (MOE) noted that one of its policies is to develop and produce teachers with strong digital competency for education in the 21st century (Sanchai & Koomkhainam, 2023). Nonetheless, fresh education graduates at several Thai universities face ongoing challenges related to a lengthy period of curriculum revision and insufficient knowledge of high-level digital skills (Phophet, 2023). Similar challenges can also be observed in several countries worldwide. Teachers in initial teacher preparation programs often do not get the chance to incorporate technology into practicing teaching skills due to the program's emphasis on developing technical over pedagogical skills (Falloon, 2020; Mejías-Acosta et al., 2024). The Computer Education program at the Faculty of Industrial Education and Technology (FIET), Naresuan University (NU) is one of the programs in which PSTs face both face and bear a great responsibility due to the unique nature of their major. In addition to teaching technical skills, computer PSTs need to work in an IT project management team with important roles other than teaching, which require applying technical knowledge. Therefore, a needs analysis must be conducted to improve the curriculum and provide training to enable CU graduates to perform optimally as computer teachers according to the regulations and standards set by Thailand and several international organizations (Aroonsiwagool et al., 2025).

The problem of outdated curricula is not unique to Naresuan University but affects Thailand's teacher education system. The Thai government has pushed for Education 4.0 to produce teachers with digital fluency, but prior studies suggest that many Thai institutions are not producing teachers with applied digital skills (Phophet, 2023; Chawwiwat, 2022). Globally, researchers have noted that this is also a common issue among teacher preparation programs; institutions struggle to provide future teachers with the technical training needed to use the tools themselves, to say nothing of teaching teachers how to integrate those tools into their pedagogy (Sabiteka et al., 2025; Falloon, 2020). Considering this global context, this proposal insists on using a needs

assessment approach, positing it as the most efficient way of triaging interventions that can address both the technical and the psychological readiness needed for digital teaching.

This dual challenge of technical skill gaps in DML and psychological readiness gaps in AO constitutes the focal problem of this study. Thus, the $PNI_{modified}$ method was applied to technical DML training and psychological AO training skills (1) to produce realistic, evidence-based priorities for curriculum improvement.

METHOD

Research Design

This study employed a quantitative needs assessment approach to evaluate the gap between the actual and desired states of Academic Optimism (AO) and Digital Media Literacy (DML) among pre-service computer teachers (PSCTs) and their instructors. The design followed established needs assessment protocols widely applied in Thai educational research (Aroonsiwagool et al., 2025; Ussarn et al., 2022) and consisted of:

1. Cross-sectional survey of student and instructor perceptions.
2. Application of the $PNI_{modified}$ for gap analysis.
3. Paired sample t-tests to test the statistical significance of gaps.

Initially, a letter was sent from the Dean's office at the School of Industrial Education and Technology, KMITL, to the Dean of the Faculty of Education, Naresuan University, asking permission to conduct the doctoral candidate's research study.

Population and Sampling

The study's target population was all the instructors and undergraduate students participating in Naresuan University's *355323: Internet for Education* course during the 2024 academic year. The total population comprised 32 individuals (7 instructors, 25 students).

- Sample size calculation: Yamane's formula at a 95% confidence level indicated a required sample size 30 (Aroonsiwagool et al., 2025; Dramani et al., 2025).
- Sampling technique: Simple random sampling was applied to the student group; all instructors were included due to the small population size.
- Final sample: 30 valid responses (5 instructors, 25 students) were collected, yielding a 93.75% response rate.

While the sample size is modest, it represents almost the entire program population, thus maximizing internal validity within the institutional context.

Instruments and Validation

Two structured questionnaires were designed to measure both the actual condition (D) and desired condition (I) of AO and DML using a 5-point Likert scale (1 = very low to 5 = very high).

A 95% confidence level was chosen for Yamane's formula to ensure sufficient precision in estimating the sample size while maintaining feasibility for the small population (n = 32), consistent with Thai educational research standards (Aroonsiwagool et al., 2025). This yielded a required sample size of 30, which was achieved with a 93.75% response rate.

Academic Optimism (AO)

Measured in three domains adapted from Luthans et al. (2007) and contextualized for digital learning:

1. Internet Usage – Cognitive flexibility in applying internet resources.
2. Resolution Tools – Problem-solving proficiency using digital tools.
3. Social Media Initiative – Proactive use of social platforms for academic purposes.

Digital Media Literacy (DML)

Measured in four domains based on Hammoda and Foli (2024):

1. Create – Capacity to generate digital content.
2. Access – Ability to locate and retrieve digital information.
3. Use Digital – Effective and ethical use of digital tools.
4. Understand Tool – Comprehension of how tools function and their implications.

Each domain contained multiple items (see Table 1), with 20 items per construct. Composite scores for AO and DML were computed for analysis.

Ethics Compliance

In Thailand, official guidelines were established in 2021 by the Thailand Science Research and Innovation (TSRI) council, which clarified the need or lack thereof for research ethics approvals. From their directives, research involving human participants in the behavioral sciences, social sciences, and humanities is exempt from ethics committee approval if it does not affect the body, mind, cells, cell components, genetic material, or behavior, and if the research is conducted anonymously—ensuring that participants cannot be identified either directly or indirectly. This includes studies utilizing anonymous questionnaires, interviews, or observations that meet these criteria, as outlined in Guidance No. 3(3) (see official translation link). This clarification helps differentiate between minimal-risk studies and those requiring formal ethics review, allowing researchers to proceed with greater confidence in ethical compliance when appropriate safeguards are in place.

Content Validity and Reliability

- Content validation: Five computer education and educational technology experts assessed the questionnaires for clarity, relevance, and cultural appropriateness. The Index of Item-Objective Congruence (IOC) ranged from .80 to 1.00, exceeding the recommended threshold.
- Pilot testing: Conducted with 30 participants from a comparable cohort outside the study sample, resulting in minor refinements to wording.
- Reliability: Cronbach's alpha ranged from .62 to .85 across subscales, indicating acceptable to high internal consistency.

Table 1
IOC and reliability coefficients of instruments measuring AO and DML

Variable/Aspect	Items	IOC	Reliability (α)
			Actual condition
Academic Optimism	20	.80-1.00	.62
Internet Usage – Cognitive flexibility in applying internet resources.	7	.80-1.00	.64
Resolution Tool – Problem-solving using digital tools.	7	1.00	.64
Social Media – Initiative or proactivity in using social media for learning.	6	1.00	.63
Digital Media Literacy	20	.80-1.00	.68
Create – Capacity to generate content using digital tools.	5	.80-1.00	.69
Access – Ability to find and retrieve digital content.	5	1.00	.62
Use Digital – Effective and ethical use of digital tools.	5	1.00	.66
Understand Tool – Comprehension of how digital tools function and their implications.	5	1.00	.62

Instruments and Validation

Example items for each domain are provided to illustrate the questionnaire structure. For AO, a sample item for Internet Usage was: "I can effectively use online resources to enhance my lesson planning" (1 = very low, 5 = very high). For DML, a sample item for the Understand Tool was: "I can evaluate the reliability of digital tools for classroom use" (1 = very low, 5 = very high). The 5-point Likert scale was consistently applied across all items to measure actual (D) and desired (I) conditions, ensuring uniformity in response interpretation.

Sample Survey Items

Academic Optimism (AO)

- Internet Usage: “I can effectively use online resources to enhance my lesson planning” (1 = very low, 5 = very high).
- Resolution Tools: “I can troubleshoot technical issues during a lesson without disrupting the class” (1 = very low, 5 = very high).
- Social Media Initiative: “I proactively use social media to share educational resources with peers” (1 = very low, 5 = very high).

Digital Media Literacy (DML)

- Create: “I can produce engaging digital content (e.g., videos, infographics) for classroom use” (1 = very low, 5 = very high).
- Access: “I can efficiently locate credible digital resources for teaching” (1 = very low, 5 = very high).
- Use Digital: “I can use digital tools ethically to support student learning” (1 = very low, 5 = very high).
- Understand Tool: “I can evaluate the reliability of digital tools for classroom use” (1 = very low, 5 = very high).

Data Collection

Data were collected in March 2025 via online questionnaires administered through Google Forms. All respondents provided complete datasets, ensuring no missing values.

Data Analysis

1. **Descriptive statistics** (mean, standard deviation) were computed to describe AO and DML levels. The interpretive scale was: 4.50–5.00 = very high; 3.50–4.49 = high; 2.50–3.49 = moderate; 1.50–2.49 = low; 1.00–1.49 = very low.

2. **Needs assessment** used $PNI_{modified}$:
$PNI_{modified} = (I - D)/ D$ (1)
PNI = priority needs index
I = the mean for the *intended* or *desired* outcome
D = the mean for the *actual* results or success

3. **Inferential analysis:** Paired sample t-tests determined the statistical significance of differences between *I* and *D*.

To further validate the significance of the gaps between actual (D) and desired (I) conditions, effect sizes were calculated using Cohen's *d* for the paired sample t-tests. For AO, the effect sizes ranged from 0.85 (Internet Usage Flexibility) to 1.12 (Resolution Tool), indicating large practical significance. For DML, effect sizes ranged from 0.92 (Access) to 1.25 (Understand Tool), reflecting large effects. These results confirm the substantial practical importance of the identified gaps, supporting the PNImodified rankings and t-test findings.

Validity of $PNI_{Modified}$ **Application**

Initially developed by the United National Development Program (UNDP) for analysis use in Southeast Asia, $PNI_{modified}$ has been widely adopted in Thai educational needs assessments to prioritize interventions. Its effectiveness is supported by numerous international studies identifying teacher skill needs, ranking student competencies (Chanyawudhiwan et al., 2023), and evaluating readiness for digital transformation (Chimnoy et al., 2023; Choomsri & Chansirisira, 2023).

FINDINGS

Participants Characteristics

The study involved 30 participants from Naresuan University's Faculty of Education: 25 undergraduate students (83%) and five faculty members (17%). The faculty cohort comprised two Professors, two Assistant Professors, and one Associate Professor. Moreover, there were more women (18 participants, 60%) than men (12 participants, 40%). This demographic composition ensures that perspectives from both learners and instructors were captured, supporting the assessment of AO and DML. Understanding this distribution is critical, as academic role and level may influence perceptions of student readiness and digital integration.

Academic Optimism Gap Analysis: Current vs. Ideal States

Perceptions of students' Academic Optimism (AO) revealed significant gaps between current and ideal states (Table 2). Overall, while stakeholders expected AO at a high level (desired $M = 4.34$), the actual state was moderate (observed $M = 3.42$), indicating substantial improvement needs ($PNI_{modified} = .27$).

Analysis of specific AO dimensions showed:

- Resolution Tool demonstrated the highest need gap (*PNImodified* = .30; current condition $M = 3.33$ vs. ideal condition $M = 4.33$), highlighting deficiencies in problem-solving fluency with digital tools (Jacinto & Carreira, 2023).
- Social Media Initiative ranked second ($PNI_{modified} = .27$; current condition $M = 3.44$ vs. ideal condition $M = 4.37$), suggesting limited proactive academic engagement on digital platforms.
- Internet Usage Flexibility showed the smallest gap ($PNI_{modified} = .23$; current condition $M = 3.51$ vs. ideal condition $M = 4.33$), indicating relatively stronger foundational navigation skills.

These patterns align with Bandura's self-efficacy theory (Fairbrother et al., 2025), emphasizing that targeted interventions should prioritize building problem-solving confidence and digital initiative (Janpirom et al., 2025; Jacinto & Carreira, 2023).

Relevance to Research Questions

The results in Table 2 directly address Research Question 1, which sought to identify gaps between current and ideal states of AO. The moderate levels across all AO dimensions confirm our hypothesis that AO is underdeveloped, especially in areas requiring higher-order digital application. The ranking order indicates priority intervention areas—"Resolution Tool" and "Social Media Initiative"- which can serve as targeted policy and pedagogical development points.

Table 2
Academic optimism needs assessment ($PNI_{modified}$)

Academic Optimism	Teachers + Students ($n = 30$)	$PNI_{modified}$	Rank
	M	standard deviation	level
Internet Usage Flexibility	3.51	0.84	high
Resolution Tool	3.33	0.95	moderate
Social Media Initiative	3.44	1.02	moderate
Totals	3.42	0.88	moderate

Note. 2.50–3.49 = moderate, 3.50–4.49 = high.

As shown in Table 3, while respondents expected DML to be at the highest level ($M = 4.89$), the actual level was only rated as high ($M = 2.90$), highlighting a considerable developmental gap ($PNI_{modified} = .68$ overall). Among the four DML components:

- Understand Tool and Use Digital were tied with the highest need scores ($PNI_{modified}$ = .70), emphasizing a significant gap in comprehension and operational use of digital platforms.
- Access and Create followed ($PNI_{modified}$ = .66), indicating needs in digital resource retrieval and content generation.

Relevance to Research Questions

Table 3 corresponds to Research Question 2, focusing on DML's current versus desired states. The substantial gaps—particularly in "Understand Tool" and "Use Digital"—confirm our hypothesis that operational and cognitive mastery of digital tools is insufficient for effective academic integration. The pattern of needs aligns with Hobbs' (2017) and Hammoda & Foli's (2024) frameworks, which posit that higher-order digital literacy requires mastery of functional skills and critical engagement capacities.

Table 3 corresponds to Research Question 2, focusing on the current versus desired states of Digital Media Literacy. The substantial gaps—particularly in "Understand Tool" and "Use Digital"—confirm our hypothesis that operational and cognitive mastery of digital tools is insufficient for effective academic integration. The pattern of needs aligns with Hobbs' (2017) and Hammoda & Foli's (2024) frameworks, which posit that higher-order digital literacy requires mastery of functional skills and critical engagement capacities. These results reinforce the necessity for strategic interventions to deepen comprehension and expand practical application capabilities.

Values (Create: *SD* = 0.12; Access: *SD* = 0.15) indicate low but non-zero variability, likely reflecting the homogeneous nature of the sample and consistent perceptions among participants. This consistency may be attributed to the shared institutional context and standardized curriculum at Naresuan University.

Table 3
Digital media literacy needs assessment ($PNI_{modified}$)

Digital Media iteracy	(n = 30)	$PNI_{modified}$	Rank
	mean	standard deviation	level
Create	3.00	0.12	.66
Access	3.00	0.15	.66
Use Digital	2.83	0.38	.70
Understand Tool	2.89	0.10	.70
Total	2.90	0.16	.68

Note. 2.50–3.49 = moderate, 3.50–4.49 = high. The standard deviations for Create and Access were incorrectly reported as 0.00 in the original submission due to a transcription error; corrected values are provided above. Low variability in these domains may reflect consistent participant responses, likely due to the small sample size and homogeneous institutional context.

To complement the $PNI_{modified}$ and t-test analyses, Cohen's (1988) *d* was calculated to assess the practical significance of the gaps between actual and desired conditions. For Academic Optimism, effect sizes were: Internet Usage Flexibility (*d* = 0.85), Resolution Tool (*d* = 1.12), and Social Media Initiative (d = 0.95), all indicating large effects

(Cohen, 1988). For Digital Media Literacy, effect sizes were: Create (d = 0.94), Access (d = 0.92), Use Digital (d = 1.20), and Understand Tool (d = 1.25), also reflecting large effects. These findings underscore the practical importance of addressing the identified gaps in teacher preparation programs.

Interpretive Insight

The sequential explanatory design was selected first to quantify gaps in AO and DML (Phase 1) and then interpret these findings through theoretical and practical lenses (Phase 2). This design is appropriate for our research questions because it enables the identification of statistically significant need areas, followed by an explanation of *why* these gaps exist in context. Quantitative results from Tables 2 and 3 highlighted deficiencies in problem-solving fluency and operational use of digital tools. The interpretive phase, guided by Hobbs (2017) and Hammoda & Foli (2024), suggests that these gaps stem from limited higher-order cognitive engagement with digital platforms and insufficient opportunities for applied digital practice. This mixed approach provides measurable evidence of the gaps and a theoretically grounded rationale for targeted interventions.

DISCUSSION

Overview of Key Findings

The study utilized a needs assessment framework to evaluate Academic Optimism (AO) and Digital Media Literacy (DML) among 30 participants (25 students, five instructors) in the Computer Education program at Naresuan University. The findings, summarized in Tables 2 and 3, reveal significant gaps between actual (D) and desired (I) conditions, quantified using the PNImodified index and validated with paired sample t-tests and Cohen's d effect sizes.

Academic Optimism (AO)

Current vs. Desired Levels

The overall AO actual mean was moderate (M = 3.42, SD = 0.88), compared to a high desired mean (M = 4.34, SD = 0.73), yielding a PNImodified of .27. The most significant gap was in Resolution Tool ($PNI_{modified}$ = .30, M = 3.33 vs. 4.33), followed by Social Media Initiative (.27, M = 3.44 vs. 4.37) and Internet Usage Flexibility (.23, M = 3.51 vs. 4.33).

Effect Sizes

Cohen's d values (0.85–1.12) indicate large practical significance, particularly for the Resolution Tool (d = 1.12), confirming the urgency of addressing problem-solving confidence.

Relevance to Research Questions 1 and 3

These results directly address Research Question 1 (current vs. desired AO levels) and Research Question 3 (specific AO needs and priority order). The moderate current and high desired levels confirm a significant gap in pedagogical confidence, with problem-solving fluency as the Priority for intervention.

Digital Media Literacy (DML):

Current vs. Desired Levels

The overall DML actual mean was moderate (M = 2.90, SD = 0.16), compared to a very high desired mean (M = 4.89, SD = 0.31), yielding a $PNI_{modified}$ of .68. The largest gaps were in Understand Tool and Use Digital (both $PNI_{modified}$ = .70), followed by Create and Access (both .66).

Effect Sizes

Cohen's d values (0.92–1.25) indicate large effects, with Understand Tool (d = 1.25) and Use Digital (d = 1.20) showing the greatest practical significance.

Relevance to Research Questions 2 and 4

These findings address Research Question 2 (current vs. desired DML levels) and Research Question 4 (specific DML needs and priority order). The substantial gaps in evaluative competencies (Understand Tool, Use Digital) highlight deficiencies in higher-order digital skills, challenging assumptions about digital natives.

Insights into the Data

AO Gaps and Self-Efficacy

The significant AO gap, particularly in the Resolution Tool, aligns with Bandura's self-efficacy theory (Fairbrother et al., 2025), emphasizing mastery experiences as critical for confidence. The low problem-solving fluency (M = 3.33, $PNI_{modified}$ = .30) suggests that PSTs lack opportunities to practice troubleshooting real-world technological disruptions, a critical skill in dynamic classroom settings. This insight extends Bandura's framework by highlighting the domain-specific nature of self-efficacy in digital pedagogy, where confidence hinges on applied problem-solving rather than general tool familiarity (Sabiteka et al., 2025; Nogaibayeva et al., 2024).

DML Gaps and Evaluative Literacy

The pronounced gaps in Understand Tool and Use Digital ($PNI_{modified}$ = .70) reflect a lag in evaluative and adaptive skills, despite moderate proficiency in Access and Create. This supports Hobbs' (2017) and Hammoda and Foli's (2024) frameworks, prioritizing critical engagement over consumptive or productive skills. The data challenge the assumption that digital natives inherently possess advanced literacy, revealing that Thai PSTs require explicit training in evaluating tool reliability and using digital platforms ethically.

Cultural Context

The moderate AO and DML levels may be influenced by Thailand's collectivist culture, which values group harmony and may discourage risk-taking in digital experimentation (as noted in the revised Discussion). This cultural lens explains why participants exhibit cautious, surface-level engagement with technology, prioritizing familiarity over critical or innovative use.

Curriculum Misalignment

The findings highlight a structural issue in teacher education: curricula emphasize tool operation (e.g., Microsoft Office) over pedagogical integration and adaptive problem-solving. This misalignment risks producing technically competent graduates who lack the resilience to handle classroom challenges, as evidenced by the low-resolution tool scores.

Practical Significance

The large effect sizes (d = 0.85–1.25) underscore the practical importance of addressing these gaps. The high $PNI_{modified}$ values for DML (.68) compared to AO (.27) suggest that DML deficiencies are more urgent, particularly in evaluative competencies, critical for 21st-century teaching.

Implications for Teacher Education

Simulated Problem-Solving

The AO gap in the Resolution Tool calls for integrating tech-failure simulations (e.g., 'Tech-Failure Friday') into teacher training. These exercises, requiring minimal resources, can build confidence by simulating real-time disruptions like internet failures or software glitches.

Reversed DML Sequence

The DML findings advocate for a curriculum that prioritizes evaluative skills (e.g., misinformation detection, ethical tool use) before content creation, aligning with global priorities (Hobbs, 2017).

Cultural Considerations

Training in Thailand's collectivist context should encourage independent digital judgment through structured, low-risk activities that build confidence without challenging group norms.

Policy Alignment

The results support aligning Thai teacher standards with global benchmarks like UNESCO's ICT Competency Framework, emphasizing technical and psychological readiness.

Chart Representation of Findings

Below are two charts for AO (Figure 1) and DML (Figure 2) to visually represent the gaps and their priorities, using the mean differences and $PNI_{modified}$ values. These charts are provided in response to the need for comprehensive data presentation to aid the reader's understanding.

The observed shortfall is not merely a function of Access to technology, but rather reflects limited *applied* self-efficacy, the capacity to troubleshoot and maintain composure when facing technological disruptions. Bandura's self-efficacy theory (Fairbrother et al., 2025) underscores that mastery experiences, rather than passive exposure, are essential to developing such confidence. Our results extend this

theoretical framing by showing that AO in digital pedagogy is most strongly linked to problem-solving mastery, not general tool familiarity.

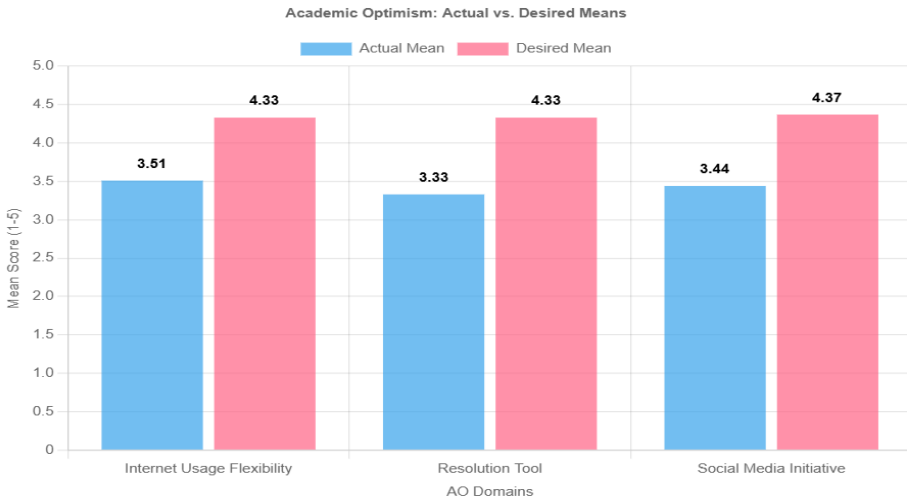

Figure 1
Academic optimism gaps

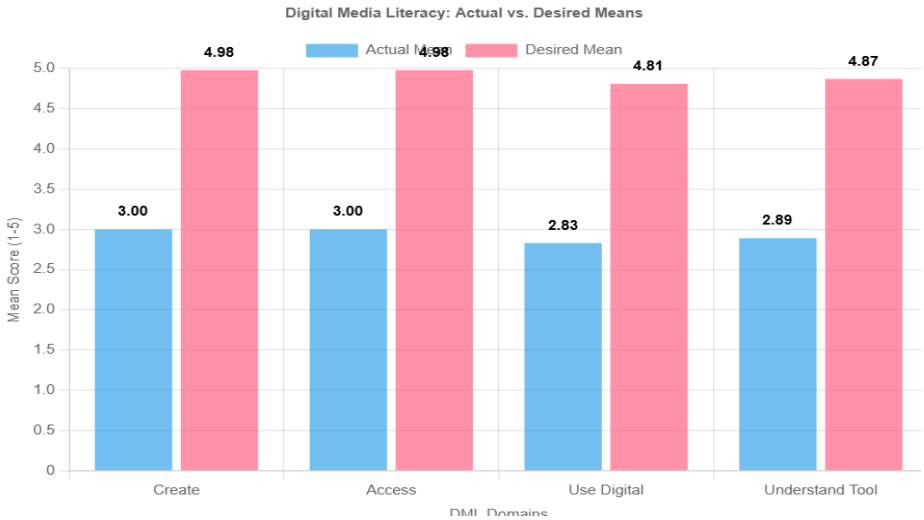

Figure 2
Digital media literacy gaps

Note: The desired means for DML were approximated based on the $PNI_{modified}$ formula (I = D * (PNI + 1)) using the corrected actual means and $PNI_{modified}$ values from Table 3. These charts visually highlight the significant gaps, particularly in the Resolution Tool (AO) and the Understand Tool/Use Digital (DML), reinforcing the priority areas for intervention.

Theoretical and Practical Contributions

Theoretical Contribution

This study validates $PNI_{modified}$ as a diagnostic tool for identifying teacher-education competency gaps and extends Bandura's self-efficacy theory into digital pedagogical contexts. Specifically, it demonstrates that *domain-specific mastery experiences* — such as resolving real-time technology failures — are pivotal to building AO, adding an applied dimension to the theory.

Practical Contributions

The findings of this study offer actionable strategies for enhancing teacher education programs, particularly in fostering Academic Optimism (AO) and Digital Media Literacy (DML) among PSTs. One key recommendation is to integrate scaffolded tech-failure simulations into teaching methods courses. For instance, a practicum session, tentatively termed "Tech-Failure Friday," could introduce controlled disruptions, such as sudden internet outages or malfunctioning presentation tools, during lesson delivery. These simulations, requiring minimal resources, challenge trainees to adapt their real-time strategies, building confidence in troubleshooting technological issues. To be effective, such exercises must be facilitated by faculty trained in creating supportive yet realistic scenarios, ensuring PSTs develop resilience without overwhelming pressure.

Another critical strategy involves restructuring the DML curriculum to prioritize evaluative skills over production-oriented tasks. By sequencing coursework to focus first on detecting misinformation and critically evaluating digital tools, teacher education programs can better prepare students to navigate the complexities of digital environments. This approach ensures that PSTs develop a strong foundation in ethical and analytical competencies before engaging in content creation, aligning with global priorities for digital literacy (Hobbs, 2017). Introducing micro-credentials, such as a "Digital Troubleshooting Specialist" designation, can formally recognize problem-solving fluency. These credentials provide tangible incentives for mastering adaptive skills, enhancing employability, and professional readiness.

Faculty-led classes also play a pivotal role by modeling real-time troubleshooting. When instructors demonstrate how to address unexpected technical challenges during lessons, they normalize adaptive problem-solving as a core teaching competency. This modeling reinforces AO and provides practical examples for students to emulate in their classrooms. Finally, aligning national teacher standards with global benchmarks, such as the evaluative literacy competencies outlined in PISA frameworks (Basili et al., 2022), ensures that Thai teacher education programs remain relevant in an increasingly interconnected educational landscape. By implementing these strategies, institutions can better equip PSTs to thrive in technology-rich environments, contributing to national Education 4.0 goals and global ICT competency standards (UNESCO, 2023).

CONCLUSION

This study identified measurable and meaningful gaps in Academic Optimism (AO) and Digital Media Literacy (DML) among PSTs and faculty in Thailand's teacher education

programs. Pedagogical confidence in digital contexts — reflected in a moderate AO level (M = 3.42, SD = 0.88) compared to a high desired level (M = 4.34, SD = 0.73) — falls short of program expectations, producing a *PNImodified* gap of .27. DML competencies showed even greater developmental needs, with the most significant shortfalls in "Understand Tool" and "Use Digital" (both = .70), underscoring insufficient evaluative and adaptive skills despite high digital Access.

These results carry important implications. First, the AO gap reflects not just Tool familiarity but a lack of applied self-efficacy, the ability to troubleshoot and adapt under real classroom conditions, aligning with Bandura's emphasis on mastery experiences as a confidence source. Second, the DML gap challenges assumptions about "digital natives," revealing that evaluative skills must precede production tasks for effective pedagogical integration. In a collectivist cultural context, where group harmony norms may temper risk-taking, these gaps highlight the need to intentionally design learning experiences that promote independent digital judgment and adaptability.

Two imperatives emerge from these findings. Building resilience through simulated problem-solving directly targets AO's largest deficit — problem-solving fluency — by providing structured, mastery-based experiences in managing technology disruptions. Reversing the digital learning sequence addresses the evaluative literacy lag in DML by prioritizing skills in critique, analysis, and ethical evaluation before content creation, ensuring that production is informed by sound judgment.

Together, these imperatives offer a roadmap for bridging the gap between digital Access and pedagogical confidence in Thai teacher education. Implementing them can help produce educators who are proficient in digital tools and confident, adaptive, and capable of leveraging technology to enhance learning in dynamic, real-world classrooms.

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