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Shifts in Digital Immigrant Educators' Perceived Needs for AI Integration: Evidence from a Professional Development Seminar in Philippine Higher Education

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Abstract. Digital immigrant educators often encounter barriers when integrating artificial intelligence (AI) into teaching. This study investigated their perceived needs for AI integration in assessment and instructional material development, identified priority areas, examined changes following an eight-hour professional development seminar, and explored evolving practices through qualitative interviews. A sequential explanatory mixed-methods design was employed with 30 digital immigrant faculty members from a Philippine higher education institution. All participants completed pre- and post-intervention questionnaires, and five joined semi-structured interviews. Quantitative analysis revealed statistically significant reductions in perceived needs, with large effect sizes (r = 0.59–0.60) across both domains. Qualitative findings explained these shifts: participants moved from initial apprehension involving privacy concerns and self-doubt toward purposeful technology use characterized by efficiency gains, critical validation of AI outputs, and renewed professional confidence. Senior educators redefined their professional identity, shifting from technological deficit to adaptability. These results extend the applicability of the AI-TPACK framework in developing-country contexts, refine deficit-oriented narratives within Digital Immigrant Theory, and provide evidence that teacher self-efficacy can be strengthened across career stages. For institutions, the findings suggest that professional development for digital immigrant educators should explicitly address perceived needs, integrate structured hands-on practice, emphasize

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human oversight, and provide opportunities for identity-affirming reflection.

Keywords: artificial intelligence; digital immigrant educators; assessment; instructional material development; professional development seminar; AI-TPACK

1. Introduction

Artificial Intelligence (AI) has become an increasingly influential component of teaching and learning in higher education, reshaping the ways in which instruction is planned, assessments are designed, and instructional materials are developed (Rao & Suhasini, 2025; Ruiz & Yambao, 2026; Treve, 2024). AI-enabled tools provide opportunities to improve efficiency, generate pedagogically aligned resources, and support adaptive learning experiences (Long et al., 2025; Liang et al., 2025).

Scholars note that AI is not only a technological innovation but also a pedagogical resource that informs instructional decision-making and assessment practices (Holmes et al., 2019; Zawacki-Richter et al., 2019). At the same time, critical perspectives emphasize that AI integration must be examined within broader social and educational contexts, particularly in relation to equity and ethical responsibility (Langeveldt & Pietersen, 2024). As higher education institutions respond to digital transformation and evolving learner expectations, understanding how teachers integrate AI into their professional practice has become a central concern in educational research.

Yet despite growing interest in AI-enhanced pedagogy, adoption remains inconsistent, particularly among digital immigrant educators who entered the profession prior to the widespread adoption of advanced digital technologies (Amigo et al., 2025; Baule, 2025; Prensky, 2001). These educators often encounter challenges related to technological confidence, pedagogical alignment, and sustained access to professional development (Zou et al., 2025). Research consistently shows that teachers' beliefs and competencies strongly influence technology integration, while systematic professional development is essential for supporting technological and pedagogical growth (Çer, 2025). In AI-supported learning environments, these challenges are further intensified by concerns relating to outdatedness, ethical responsibility, and professional relevance, especially among experienced educators transitioning into digitally mediated teaching contexts (Candilas, 2025; De Guzman et al., 2024).

The Philippine higher education landscape presents a distinct context in which AI integration is shaped by institutional resource variability, unequal access to training, and differing levels of digital readiness (Estrellado & Miranda, 2023; Co, 2025). Studies examining AI implementation in Philippine educational settings reveal significant disparities, with higher education institutions—particularly private universities in urban centers—demonstrating substantially more advanced AI integration than other educational sectors (Co, 2025). As AI technologies become increasingly accessible, examining how Filipino educators—

particularly digital immigrants—adapt to these tools is essential for developing context-sensitive and sustainable approaches to technology integration (Cacho, 2024; Jala, 2025).

The Technological Pedagogical Content Knowledge (TPACK) framework provides a useful foundation for understanding teachers' integration of emerging technologies. Originally proposed by Mishra and Koehler (2006), the framework emphasizes the interaction of technological, pedagogical, and content knowledge in supporting effective instruction. Recent extensions emphasize the necessity of AI-specific competencies, often referred to as AI-TPACK, which require educators to critically evaluate and pedagogically apply AI-generated outputs (Ning et al., 2024; Trust et al., 2023). Empirical evidence suggests that professional development programs grounded in the AI-TPACK framework significantly enhance AI competency among teachers, particularly in the domains of AI technological knowledge and AI technological pedagogical knowledge (Ning et al., 2024). However, such interventions remain limited in developing-country contexts, especially among digital immigrant educators.

Mixed-methods approaches have been recommended to capture the complexity of educational innovations. Creswell and Plano Clark (2018) argue that integrating quantitative trends with qualitative insights provides a more comprehensive understanding of teacher practices. However, much of the existing research on AI in education relies primarily on surveys or descriptive case studies, leaving limited empirical work that systematically links teachers' self-reported needs with detailed accounts of their evolving practices (Zawacki-Richter et al., 2019; Liang et al., 2025). A systematic review of research between 2015 and 2024 reveals a significant imbalance in focus, with the majority of studies examining AI applications in teaching, while far fewer teachers' professional development needs related to AI integration (Liang et al., 2025). This gap is especially pronounced among digital immigrant educators in developing-country higher education contexts (Co, 2025; Amigo et al., 2025).

In response to these gaps, this study examines shifts in digital immigrant educators' perceived needs and practices in integrating AI into assessment and instructional materials in Philippine higher education. Guided by the AI-TPACK framework and employing a sequential explanatory mixed-methods design, this study addresses the following research questions:

1. What are the levels of perceived needs of digital immigrant educators for AI integration prior to the professional development seminar in terms of:
   a) assessment and
   b) instructional material development?
2. Which areas of AI integration are identified as priority needs by digital immigrant educators prior to the professional development seminar in terms of:
   a) assessment and
   b) instructional material development?

3. To what extent do digital immigrant educators' perceived needs for AI integration change following the professional development seminar across the domains of assessment and instructional material development?
4. What experiences and evolving practices emerge among digital immigrant educators as they integrate digital tools into their teaching following the professional development seminar?

Quantitatively, the study tests the null hypothesis that no statistically significant difference exists in perceived needs across assessment and instructional material development before and after the seminar.

2. Literature Review

Artificial Intelligence (AI) integration in higher education has progressed from isolated experimentation to systemic influence across curriculum reform, assessment practices, instructional material development, and faculty training (Williams, 2025; Yan & Qianjun, 2025). Adoption is shaped not only by technological innovation but also by broader processes of digital transformation, teachers' pedagogical knowledge, institutional conditions, and professional development opportunities (Mekheimer, 2025; Zhang, 2025). This review examines five strands of scholarship: digital transformation and AI integration; digital immigrant teachers and competence barriers; AI use in instructional materials and assessment; professional development models; and theoretical lenses framing AI integration. Particular attention is given to the perceived needs of digital immigrant teachers, who remain underrepresented yet are heavily impacted by the pressures associated with AI adoption.

2.1 Digital Transformation and AI Integration

Digital transformation in higher education is increasingly understood as systemic rather than linear. Nguyen et al. (2025) describe it as encompassing curriculum redesign, evolving faculty roles, and governance arrangements, although they highlight a persistent "readiness–practice gap" in which limited pedagogical guidance and weak institutional alignment constrain sustained integration. Mouta et al. (2024) demonstrates that AI-enhanced learning environments improve instruction only when they are supported by teacher preparation, ethical awareness, and institutional coordination. Dinçer (2024) adds that "pedagogical fragility" persists, as teachers often possess strong disciplinary knowledge but underdeveloped technological–pedagogical integration. Collectively, these studies portray digital transformation as being contingent on governance structures, policy alignment, and sustained capacity-building, rather than on technology alone.

2.2 Digital Immigrant Educators and Competence Barriers

Generational differences strongly influence technological readiness. Ibragimov et al. (2025) and Šabić et al. (2022) report that age predicts AI-TPACK performance, with older teachers demonstrating lower confidence and less integrated use of AI tools, despite comparable content expertise. In the Philippines, Bautista et al. (2024) show that even pre-service teachers are not equally prepared to apply TPACK, suggesting that experienced teachers who are less familiar with

technology may find it more difficult to acquire AI skills while managing their regular teaching responsibilities. Mehdaoui (2024) further identifies barriers such as inadequate training, teacher hesitation, concerns about academic fraud, unreliable AI outputs, and ambiguous legal frameworks. For digital immigrants, these barriers reinforce perceptions of AI as opaque and risky, emphasizing the necessity of examining their specific perceived needs for designing targeted interventions.

2.3 AI in Instructional Material and Assessment

AI adoption in instructional material development and assessment reflects an ongoing tension between productivity gains and pedagogical innovation.

2.3.1 Instructional materials

Almuqayteeb (2025) notes that perceived usefulness and ease of use encourage adoption, yet deeper integration requires structured, hands-on training. Sun et al. (2025) show that TPACK-oriented professional development enables teachers to align AI-generated outputs with learning objectives, while Mohammadipour (2025) demonstrate that prompt-design tasks can scaffold gaps in teachers' TPACK. These findings suggest that digital immigrant educators must develop both AI literacy and pedagogical design confidence in order to move beyond automation-driven uses of AI. Moreover**,** Ruiz and Yambao (2026) found that AI literacy was the strongest predictor of mathematics teachers' readiness for AI-enhanced instruction, while professional development engagement also made a smaller but significant contribution, emphasizing the necessity of flexible and relevant training.

2.3.2 Assessment and feedback

AI use in assessment is shaped by concerns about validity, transparency, and ethics. Perante et al. (2025) report that Filipino teachers primarily employ AI for grading support and learning analytics, reducing workload without substantially altering their assessment philosophies. Lee and Moore (2024) argue that AI can enhance the timeliness of feedback but cannot replace human judgment in interpretive tasks. Castillo-Cuesta et al., (2025) warns that generative AI may foster student overreliance, undermining authentic learning. Ethical issues such as academic dishonesty and inequitable access, highlighted by Saz-Pérez and Pizà-Mir (2024), further complicate adoption. For digital immigrant teachers, limited AI literacy intensifies these challenges, making professional development in assessment essential for building technical competence, ethical reasoning, and confidence.

2.4 Professional Development and Institutional Support

Across studies, a recurring misalignment emerges between teachers' awareness of AI and their classroom practices. Cordero et al. (2025) and Saz-Pérez and Pizà-Mir (2024) emphasize that sustainable integration requires contextualized training, legal guidance, shared resources, and policy-backed governance. Hands-on learning consistently proves most effective: Almuqayteeb (2025), Rahayu et al. (2025), and Sun et al. (2022) show that task-based workshops increase both adoption and confidence, while Mohammadipour (2025) and Tan et al. (2025) demonstrate that TPACK-oriented training shifts AI use toward pedagogically

aligned applications. Furthermore, Serra and Oliveira (2025) advocate for prompt design grounded in contextual variables, enabling educators to internalize AI-TPACK through active design processes.

Nevertheless, existing intervention models remain largely short-term, offering limited evidence of long-term retention or transfer into classroom practice. They rarely provide scaffolded competence pathways, mentoring structures, or communities of practice to support ongoing adaptation. Institutionalization therefore remains weak, leaving implementation fragmented and dependent on individual initiative. Critically, few models explicitly foreground the perceived needs of digital immigrant teachers, a gap this study directly addresses.

2.5 Theoretical Framework

This study is guided by an integrated framework centered on AI-TPACK, teacher self-efficacy, AI literacy, and Digital Immigrant Theory. The primary lens is AI-TPACK (Ning et al., 2024), which extends Mishra and Koehler's (2006) TPACK framework by incorporating competencies specific to AI-supported teaching. AI-TPACK emphasizes teachers' ability to critically evaluate AI outputs and align them with pedagogical goals. Supporting constructs include the Technology Acceptance Model (perceived usefulness and ease of use), teacher self-efficacy (confidence in using AI tools), and AI literacy (the critical, ethical, and pedagogical use of AI). Digital Immigrant Theory (Mironiuk, 2022) further explains generational differences in technological confidence and readiness. Together, these lenses provide the basis for examining how professional development interventions support digital immigrant educators in integrating AI into assessment and instructional material design.

3. Methodology

3.1 Research Design

This study employed a sequential explanatory mixed-methods design (Creswell & Plano Clark, 2018) to examine changes in perceived needs and practices following a structured professional development intervention. Quantitative data were collected first (pretest-posttest design), followed by qualitative interviews to explain and contextualize the quantitative results.

The intervention consisted of a one-day professional development seminar (8 hours). The seminar was designed around participants' priority needs identified in the pre-assessment rankings (Tables 5 and 6) and delivered through four sequential modules.

Module 1: Conceptual Orientation (1 hour). Participants explored AI applications in higher education, examined ethical considerations (privacy, academic integrity, and hallucination risks), and were introduced to basic prompt design principles (input specificity, output format specification, and iterative refinement).

Module 2: Tool Demonstration (1.5 hours). Facilitators demonstrated four AI platforms: ChatGPT-4o (text generation and refinement), Gemini Flash (multimodal content creation), Grok (real-time information synthesis), and

Gamma (presentation and document design). Demonstrations also addressed common errors (hallucinations and misalignment) as well as detection strategies.

Module 3: Guided Practice (4 hours). Participants completed tasks integrating the four platforms:

> Task 1: Design assessments that incorporate AI-based learning platforms (2 hours). Output: Complete AI-based assessment.
>
> Task 2: Design interactive worksheets and digital modules using AI (2 hours). Output: Interactive worksheets and a digital module.

Module 4: Reflection and Peer Feedback (1.5 hours). Participants presented one completed output (assessment or instructional material) for peer critique, discussed validation strategies (e.g. detecting AI hallucinations, ensuring alignment with learning objectives), and developed individual action plans for integrating AI into their upcoming courses.

In contrast to traditional one-time workshops, this seminar emphasized iterative application, as participants drafted, revised, and finalized materials within the session, receiving immediate feedback. This practice-oriented approach aligned with the AI-TPACK framework by supporting the development of both technical skills and pedagogical reasoning.

3.2 Participants and Research Context

This study involved 30 faculty members from a higher education institution in Iloilo Province, Philippines, purposively selected to align with the study's focus on digital immigrant educators. Participants represented the disciplines of education, agriculture and fisheries, and social sciences, ensuring disciplinary diversity. Inclusion criteria required faculty members to be at least 40 years old, self-identify as digital immigrants, and complete both pre- and post-intervention phases. Participation was voluntary.

All 30 participants completed the pre- and post-intervention questionnaires, while five volunteered to participate in semi-structured interviews for the qualitative strand. These interviewees were purposively chosen to reflect variation in age, discipline, and prior familiarity with AI, thereby enriching the dataset with diverse perspectives. Although participants were drawn from a single institution, the mixed-methods design enabled qualitative narratives to contextualize statistical trends and illustrate how digital immigrant educators experienced and adapted to AI integration in practice.

Digital immigrant educators were defined as professionals who had entered the teaching profession prior to the widespread normalization of advanced digital technologies and later adopted digital tools during their careers (Prensky, 2001). This operationalization captured the perspectives of long-serving educators navigating the transition from analog to AI-mediated practices. who entered the profession prior to the widespread adoption of advanced digital technologies

The sample reflected balanced gender representation (53.3% female, 46.7% male) and an age distribution consistent with the digital immigrant profile, with most participants aged 41–55. Educational attainment was high, with nearly half holding master's degrees and the remainder being evenly split between bachelor's and doctoral qualifications. Teaching experience further underscored the seasoned nature of the group: 70% had more than a decade of classroom practice. Together, these characteristics highlight the relevance of the sample for examining how experienced educators with varied disciplinary backgrounds and technological readiness perceive and adapt to AI integration.

Table 1 presents the complete demographic profile of the participants (n = 30).

Table 1: Profile of the participants (n = 30)

Variable	Category	Frequency	Percentage (%)
Gender	Male	14	46.70
	Female	16	53.30
Age Group	40	4	13.30
	41–45	6	20.00
	46–50	7	23.30
	51–55	6	20.00
	56–60	5	16.70
	61–65	2	6.70
Field of Specialization	Education	11	36.67
	Agriculture and Fisheries	9	30.00
	Social Sciences	10	33.33
Highest Educational Attainment	Bachelor's Degree	8	26.70
	Master's Degree	14	46.70
	Doctorate Degree	8	26.70
Years of Teaching Experience	1–5 years	3	10.00
	6–10 years	6	20.00
	11–15 years	7	23.30
	16–20 years	8	26.70
	21 years and above	6	20.00
Familiarity with AI	None	5	16.70
	Beginner	11	36.70
	Moderate	9	30.00
	Advanced	5	16.70

3.3 Instruments

Data collection employed complementary quantitative and qualitative instruments, consistent with the study's sequential explanatory mixed-methods design (Creswell & Plano Clark, 2018).

The primary quantitative instrument was a researcher-developed needs assessment questionnaire consisting of two domains—AI-assisted assessment and AI-supported instructional material development—with items grounded in AI-TPACK competency literature (Ning et al., 2024). Responses were measured using a five-point Likert-type scale ranging from 1 (*Not Needed*) to 5 (*Extremely Needed*). Mean scores were interpreted according to the scale presented in Table 2.

Prior to administration, the instrument underwent pilot testing with faculty members who were not part of the study sample, after which minor revisions were incorporated. Reliability analysis yielded strong internal consistency coefficients: overall $\alpha = .91$, AI-assisted assessment subscale $\alpha = .89$, and instructional material development subscale $\alpha = .87$. The questionnaire was administered as both a pretest and posttest in order to capture shifts in participants' perceived needs before and after the professional development intervention.

The qualitative instrument consisted of a semi-structured interview guide designed to explore participants' reflective experiences, perceived learning gains, and evolving AI integration practices following the intervention. Interview questions were aligned with the research questions, allowing sufficient flexibility for thematic elaboration while maintaining focus on the study's objectives.

Table 2: Interpretation of mean scores

Scale	Description
4.51 – 5.00	Extremely Needed
3.51 – 4.50	Highly Needed
2.51 – 3.50	Moderately Needed
1.51 – 2.50	Slightly Needed
1.00 – 1.50	Not Needed

3.4 Data Collection Procedure

Data collection was conducted in sequential phases, consistent with the study's sequential explanatory mixed-methods design. In the first phase, the validated needs assessment questionnaire was administered online via Google Forms to all eligible faculty members prior to the professional development intervention. A descriptive analysis of the pre-assessment data was then conducted to identify priority needs, and these findings directly informed the design and content of the AI-focused professional development seminar.

In the second phase, participants completed the post-assessment questionnaire immediately after the seminar, using the same instrument and administration procedure to ensure comparability between pretest and posttest data. In the third phase, semi-structured interviews were conducted with purposively selected participants to obtain in-depth, reflective accounts of their experiences during the professional development seminar and their perceived changes in assessment and instructional practices. All interviews were audio-recorded with prior informed consent and transcribed verbatim to ensure accuracy and analytical rigor.

3.5 Data Analysis

Quantitative data were analyzed using descriptive and inferential statistical techniques through IBM SPSS Statistics (Version 23). Means, standard deviations, frequencies, percentages, and ranks were computed to describe participant demographics and baseline perceived needs and to identify priority areas for AI integration. The Wilcoxon signed-rank test, a non-parametric paired comparison test appropriate for ordinal Likert-scale data (Field, 2018), was used to determine whether statistically significant differences existed between pre- and post-intervention perceived needs scores. Effect sizes were calculated using the *r* statistic, with values of .10, .30, and .50 interpreted as small, medium, and large effects, respectively (Cohen, 1988), to assess the practical significance of observed changes beyond statistical significance alone.

To explore participants' experiences, they were asked, "*What are your experiences in using AI in assessment and instructional material development?*" Qualitative data were analyzed through thematic analysis following the six-phase framework of Braun and Clarke (2006): familiarization with the data, generating initial codes through manual line-by-line coding, searching for themes, reviewing themes, defining and naming themes, and producing the report.

To enhance trustworthiness, all analytic decisions were documented to maintain a clear audit trail, and member checking was conducted with a subset of participants to confirm the accuracy and credibility of emerging interpretations (Ahmed, 2024). The qualitative findings were subsequently used to contextualize and explain the quantitative results, consistent with the explanatory sequential mixed-methods design (Creswell & Plano Clark, 2018). This integrated approach ensured a theoretically grounded interpretation of changes in educators' perceived needs and AI-TPACK competency development.

3.6 Ethical Considerations

This study adhered to accepted ethical standards in educational research throughout all phases of data collection and reporting. Prior to participation, all participants provided written informed consent, acknowledging their voluntary involvement in both the study and the professional development seminar, with the explicit understanding that withdrawal at any point would carry no professional consequences.

Confidentiality was maintained through the systematic anonymization of all responses and the assignment of participant codes in place of identifying information. All data were securely stored in password-protected digital files that were accessible exclusively to the research team. Findings were reported in aggregate form to ensure that no individual participant could be identified in any publication or presentation arising from the study.

4. Results and Findings

The results of this study are presented according to the research questions.

4.1 Perceived Needs of Digital Immigrant Educators

4.1.1 Assessment

Table 3 presents participants' needs assessment regarding the use of AI for assessment prior to the intervention.

The overall mean score (M = 3.26, SD = 1.18) indicates that teachers moderately needed artificial intelligence (AI) integration in their assessment practices. This finding suggests that while respondents recognized AI's potential to enhance assessment design, delivery, and feedback, additional training and institutional support remain necessary for effective integration.

Among the indicators, the highest mean score was obtained for designing assessments that incorporate AI-based learning platforms (M = 3.35, SD = 1.00), indicating a strong interest in using AI to support more adaptive and efficient assessment practices. Respondents also reported moderately needing support in aligning assessments with learning objectives (M = 3.30, SD = 1.05), exploring AI tools for formative assessment and real-time feedback (M = 3.31, SD = 1.01), generating test items using AI (M = 3.27, SD = 1.17), and creating rubrics and scoring guides with AI support (M = 3.33, SD = 1.12).

Table 3: Needs assessment in terms of AI for assessment

Category	n	*SD*	M	Description
Overall	30	1.18	3.26	Moderately Needed
1. Use AI to ensure that my assessments are aligned with my learning objectives.	30	1.05	3.30	Moderately Needed
2. Design assessments that incorporate AI-based learning platforms (e.g. adaptive quizzes, midterm and final examinations).	30	1.00	3.35	Moderately Needed
3. Generate test items (multiple choice, essay, and performance tasks) using AI tools.	30	1.17	3.27	Moderately Needed
4. Create rubrics and scoring guides with the help of AI.	30	1.12	3.33	Moderately Needed
5. Explore AI tools for formative assessment and real-time feedback.	30	1.01	3.31	Moderately Needed

Note: The scale is based on the following: Extremely Needed (4.51–5.00); Highly Needed (3.51–4.50); Moderately Needed (2.51–3.50); Slightly Needed (1.51–2.50); Not Needed (1.00–1.50)

4.1.2 Instructional Material Development

Table 4 presents participants' perceived needs related to AI use in instructional material development prior to the intervention.

The overall mean score (M = 3.30, SD = 1.19) indicates that teachers moderately needed AI support for instructional material development. This suggests that while teachers recognize the potential of AI tools to enhance the preparation of instructional resources, they still require additional training and support to integrate AI effectively into instructional design.

Designing interactive worksheets and digital modules obtained the highest mean score (M = 3.43, SD = 1.29), indicating a relatively higher level of perceived need compared with the other indicators. This finding suggests that while teachers may already possess basic skills in preparing presentations and visual aids, they perceive greater difficulty in creating interactive and digitally sophisticated instructional materials.

Table 4: Needs assessment in terms of AI for instructional material development

Category		n	*SD*	M	Description
Overall		30	1.19	3.30	Moderately Needed
1.	Make presentations with the use of AI	30	1.29	3.28	Moderately Needed
2.	Generate visual aids, infographics, and posters using AI tools	30	1.30	3.27	Moderately Needed
3.	Design interactive worksheets and digital modules using AI	30	1.29	3.43	Moderately Needed
4.	Translate and adapt instructional materials for local contexts using AI	30	1.23	3.35	Moderately Needed
5.	Co-create interdisciplinary instructional design with AI that integrate Filipino	30	1.37	3.18	Moderately Needed

Note: The scale is based on the following: Extremely Needed (4.51–5.00); Highly Needed (3.51–4.50); Moderately Needed (2.51–3.50); Slightly Needed (1.51–2.50); Not Needed (1.00-1.50)

4.2 Ranking of AI Needs

4.2.1 Assessment

Table 5 presents the ranking of teachers' needs related to AI use in assessments prior to the intervention.

The highest-ranked need was designing assessments that incorporate AI-based learning platforms (Rank 1), followed by creating rubrics and scoring guides with AI support (Rank 2). Needs related to aligning assessments with learning objectives and using AI tools for providing formative feedback were ranked third, while generating test items using AI ranked fifth.

Table 5: Ranking of AI needs in assessment

Category	n	*SD*	M	Rank
1. Use AI to ensure that my assessments are aligned with my learning objectives.	30	1.05	3.30	3.5
2. Design assessments that incorporate AI-based learning platforms (e.g. adaptive quizzes, midterm and final examinations).	30	1.00	3.35	1
3. Generate test items (multiple choice, essay, and performance tasks) using AI tools.	30	1.17	3.27	5
4. Create rubrics and scoring guides with the help of AI.	30	1.12	3.33	2
5. Explore AI tools for formative assessment and real-time feedback.	30	1.01	3.31	3.5

4.2.2 Instructional Material Development

Table 6 presents the ranking of participants' needs related to AI use in instructional material development prior to the intervention.

Designing interactive worksheets and digital modules emerged as the highest-ranked need, followed by translating and adapting instructional materials for local contexts. Tasks such as creating presentations and visual aids ranked lower, suggesting that teachers prioritize more advanced and pedagogically demanding applications of artificial intelligence.

Table 6: Ranking of AI needs for instructional material development

Category	n	*SD*	M	Rank
1. Make presentations with the use of AI	30	1.29	3.28	3
2. Generate visual aids, infographics, and posters using AI tools	30	1.30	3.27	4
3. Design interactive worksheets and digital modules using AI	30	1.29	3.43	1
4. Translate and adapt instructional materials for local contexts using AI	30	1.23	3.35	2
5. Co-create interdisciplinary instructional design with AI that integrate Filipino	30	1.37	3.18	5

4.3 Comparison of Pretest and Posttest Needs Assessments

Table 7 presents the Wilcoxon signed-rank test results comparing pretest and posttest needs assessments across AI for assessment and instructional material development.

The results reveal statistically significant reductions in perceived needs for both AI-assisted assessment ($Z = -6.58$, $p < .001$, $r = 0.60$) and AI-supported instructional material development ($Z = -6.42$, $p < .001$, $r = 0.59$). These large effect sizes indicate substantial improvements in teachers' competence and confidence following the intervention. Overall, the findings demonstrate that the professional development seminar was effective in reducing perceived needs by strengthening teachers' AI-related skills and pedagogical readiness.

Table 7: Wilcoxon signed-rank test results comparing pretest and posttest needs assessments across AI for assessment and instructional material development

Domain	Pretest M	Posttest M	Mean Difference	Z	Sig.	Effect Size (r)
AI for Assessment	3.26	2.14	1.12	−6.58	.000*	0.60
AI for Instructional Material Development	3.30	2.22	1.08	−6.42	.000*	0.59

*Note. *Significant at a = .05. Effect size r interpreted as small (.10), medium (.30), large (.50).*

4.4 Experiences and Evolving Practices of Digital Immigrant Educators

4.4.1 Theme 1: Initial Apprehension toward AI Integration

Subtheme 1.1: Fear of Privacy, Ethics, and Misuse

This subtheme highlights participants' initial apprehension toward artificial intelligence, particularly regarding data privacy, ethical implications, and potential misuse. These concerns were expressed as caution rather than outright rejection, indicating openness to engagement when proper guidance is provided. As one participant stated, "*We were hesitant… especially about our privacy. They said AI might copy your appearance*" (Participant 1), reflecting fears of data compromise and identity replication. Concerns about reliability further reinforced this apprehension, with participants noting that "*Sometimes ChatGPT seems to hallucinate*" (Participant 5), emphasizing the necessity of ethically responsible academic use.

Subtheme 1.2: Perceived Digital Inadequacy and Self-Doubt

This subtheme captures participants' perceived digital inadequacy and self-doubt, particularly when comparing themselves with more technologically proficient colleagues. Several teachers described feelings of being left behind, which undermined their confidence in adopting AI tools. As one participant admitted, "*I admired my colleagues… while I was struggling*" (Participant 1), illustrating how social comparison within professional environments can intensify perceptions of incompetence. For senior faculty members, this self-doubt was further compounded by age and proximity to retirement, as reflected in the

statement, "*I thought I'm already old and nearing retirement – what use would this be?*" (Participant 5).

4.4.2 Theme 2: AI as a Tool for Instructional and Assessment Efficiency

Subtheme 2.1: Reduction of Time and Cognitive Load

This subtheme highlights the way in which AI reduces the time and mental effort required for assessment and instructional preparation. Participants consistently reported that AI substantially accelerated tasks that were previously labor-intensive and cognitively demanding. As one teacher shared, "*Before, ma'am, I really struggled with making tests because it took me a long time to finish them. Now, it turns out that it can be done quickly and completely*" (Participant 4). Beyond test construction, AI's ability to generate aligned tables of specifications and answer keys further reduced cognitive burden, allowing teachers to concentrate on reviewing and refining outputs instead of starting from the beginning. Another participant summarized this experience succinctly: "*We discovered that AI can make our lives easier"* (Participant 3), framing efficiency as professional relief rather than simple convenience.

Subtheme 2.2: Streamlining Instructional Material Development.

This subtheme highlights AI's role in streamlining instructional material development, particularly in generating structured presentations and digital modules that support systematic lesson organization. Participants emphasized that AI-assisted content creation improved efficiency and instructional planning. As one participant noted, "*ChatGPT is very helpful in making instructional materials*" (Participant 2), while another explained how AI-supported slides enhanced pacing and content management: "*One slide is good for a 15-minute lecture… with ten slides, we can already use them for several sessions*" (Participant 3). These accounts suggest that AI-enabled structuring helped teachers better manage content scope and reduced the excessive slide preparation that had previously characterized their practice.

4.4.3 Theme 3: Preservation of Teacher Agency through Reflective AI Use

Subtheme 3.1: Human Oversight and Critical Validation

This subtheme underscores teachers' strong insistence on retaining professional judgment when using AI-generated outputs. Participants consistently positioned AI as a supportive aid rather than an authoritative source, emphasizing that the responsibility for accuracy and pedagogical appropriateness remains with the teacher. As one participant stated, "*We are still the captain of our own ship,*" while another noted, "*Even though I use ChatGPT, I still reread and edit everything*" (Participant 2). These accounts indicate that AI was primarily used for initial drafting and structuring, with final validation firmly grounded in human expertise.

Subtheme 3.2: Awareness of AI Limitations and Hallucinations

This subtheme highlights participants' growing awareness of AI limitations, including hallucinations, reflecting the development of critical AI literacy. Teachers explicitly recognized that AI-generated content is not inherently reliable and must be carefully verified prior to classroom use. As one participant noted, "*Sometimes ChatGPT seems to hallucinate*" (Participant 1), while others emphasized

the need to recheck AI-generated tests and answer keys to ensure accuracy. These reflections suggest a shift from initial trust toward a more cautious and evaluative stance.

4.4.4 Theme 4: Professional Empowerment and Lifelong Learning

Subtheme 4.1: Renewed Confidence among Senior Teachers

This subtheme highlights renewed confidence among senior and near-retirement teachers following their exposure to AI tools. Participants who had initially doubted their ability to adapt to new technologies reported a clear shift toward confidence and self-efficacy. One participant reflected, "*At first, I didn't know why I was chosen… I thought I'm already old and nearing retirement. But I am truly thankful that I am here now. I learned so many things*" (Participant 5). Another emphasized the practical impact of this learning, stating, "*I can now update my lectures and lessons*" (Participant 5), suggesting that AI-enabled skills restored a sense of professional relevance and usefulness. These accounts indicate that structured and supportive training can counteract the feelings of professional obsolescence often experienced by senior educators in rapidly digitizing academic environments.

Subtheme 4.2: Openness to Continuous Professional Growth

This subtheme reflects participants' willingness to sustain engagement in AI-related learning beyond their initial training. Teachers expressed a clear desire for continuity, as shown in remarks such as, "*Hopefully, in the next session, it will still be us*" (Participant 1) and "*I hope that the attendees today will be the same next time so that what we've learned can be enhanced*" (Participant 3). These statements indicate a shift from one-off skill acquisition toward a lifelong learning orientation, in which AI competence is viewed as an evolving professional responsibility.

5. Discussion

This study found that digital immigrant educators reported significant reductions in perceived needs for AI integration after an 8-hour professional development seminar. Quantitative results showed large effect sizes (r = 0.59–0.60) for reduced needs in both assessment and instructional material development. Qualitative findings explained these changes: participants moved from apprehension (privacy concerns and self-doubt) toward purposeful technology use characterized by efficiency gains, critical validation of AI outputs, and renewed professional confidence. Senior educators notably redefined their professional identity from a technological "deficit" to one of adaptability.

These findings align with previous studies that show intensive, practice-oriented professional development can improve teachers' technology skills (Almuqayteeb, 2025; Çer, 2025; Mohammadipour, 2025; Ruiz & Yambao, 2026; Rahayu et al., 2025; Sun et al., 2022; Tan et al., 2025). The trajectory from apprehension to purposeful use mirrors Amigo et al. (2025) and Lacuna (2025), who found that structured support helps educators overcome initial resistance to emerging technologies. The emphasis on human oversight and validation reflects growing recognition that effective AI integration requires critical digital literacy, not merely technical proficiency (Floridi et al., 2018; Heng et al., 2026; Holmes et al., 2019).

The large effect sizes after a single 8-hour session may be explained by three design features. First, the intervention explicitly targeted participants' highest-ranked priority needs: "*Design assessments that incorporate AI-based learning platforms (e.g. adaptive quizzes, midterm and final examinations)*" and "*Design interactive worksheets and digital modules using AI*" (Tables 5 and 6). This needs-responsive approach likely increased motivation and perceived relevance. Second, the iterative, hands-on format allowed participants to draft, revise, and finalize outputs within the session, providing immediate mastery experiences. Third, all four AI platforms were integrated (ChatGPT-4o, Gemini Flash, Grok, and Gamma), enabling flexible and transferable skill development.

This study supports the applicability of the AI-TPACK framework in Philippine higher education contexts (Mishra & Koehler, 2006; Ning et al., 2024). While TPACK has been extensively validated in Western settings, this study demonstrates its utility for understanding AI integration among experienced educators in resource-constrained, developing-country contexts. The findings also provide evidence of the malleability of teacher self-efficacy (Hu et al., 2025; Šabić et al., 2022). Participants' "renewed confidence" suggests that self-efficacy is not fixed by career stage but can respond to guided, hands-on learning experiences. Regarding Digital Immigrant Theory (Prensky, 2001; Mironiuk, 2022), the results suggest refinements to the deficit-oriented narrative. These educators demonstrated rapid adaptation when training explicitly addressed their perceived needs. However, this result should not be interpreted as refuting generational differences; rather, situationally responsive instructional design can moderate these differences.

For institutions, these findings suggest that professional development for AI integration should be differentiated by career stage and should explicitly address perceived needs rather than being delivered as generic technical training. Specifically, programs for digital immigrants should (a) address privacy and ethics concerns early; (b) provide structured and repeated hands-on practice with immediate feedback; (c) emphasize human oversight to maintain professional agency; and (d) create opportunities for identity-affirming reflection. These principles may help institutions to navigate digital transformation without marginalizing experienced faculty members.

6. Conclusion

This study examined changes in digital immigrant educators' perceived needs for AI integration following an intensive professional development seminar in Philippine higher education. Prior to the intervention, faculty members reported moderate needs, with their highest priorities being "*Design assessments that incorporate AI-based learning platforms (e.g. adaptive quizzes, midterm and final examinations)*" and "*Design interactive worksheets and digital modules using AI.*" Quantitative analysis revealed statistically significant reductions in these needs after the seminar, with large effect sizes, while qualitative findings showed participants moving from initial apprehension toward purposeful technology use. They emphasized efficiency gains, critical validation of outputs, and renewed professional confidence. Senior educators shifted their professional identity from

technological deficit to adaptability, highlighting how teacher self-efficacy can be strengthened when training is responsive to priority needs. These results suggest that structured, practice-oriented professional development can effectively build competence among educators who may initially lack technological confidence.

For institutions, discipline-sensitive program design is recommended, as appropriate technology tools differ across teaching contexts, such as generative writing support for humanities faculty and adaptive assessment platforms for those in STEM fields. Training on responsible and ethical technology use, including concerns around academic integrity and bias, should be embedded in faculty development to ensure that growing competence is matched by critical judgment. Establishing shared repositories of discipline-organized instructional materials and implementing peer mentorship programs that pair technologically proficient faculty with less experienced colleagues would sustain development beyond formal seminar settings.

Future research should begin with small longitudinal follow-ups to examine retention and classroom transfer, expand to larger and more geographically diverse samples across Philippine universities, and explore blended formats that combine intensive workshops with ongoing mentoring or online modules. Such approaches can clarify the lasting impact of observed changes and identify practical pathways for scaling professional development to broader faculty populations.

7. Limitations

This study has several limitations. The small sample (n = 30) from a single institution restricts generalizability, emphasizing the necessity of replication across Philippine universities. The condensed 8-hour seminar may have intensified effects through immersion; however, longer-term retention and classroom transfer remain unexamined. The absence of a control group limits causal inference, as changes may partly reflect Hawthorne or novelty effects. The short follow-up precludes conclusions about the sustainability of these outcomes. Finally, the purposive sampling of volunteers may overrepresent educators who were already open to adopting new technologies.

8. AI Tool Declaration

Microsoft Copilot and ChatGPT were used in the preparation of this manuscript to improve coherence, clarity, and grammar. Its role was limited to language refinement and did not extend to research design, data collection, statistical analysis, or theoretical interpretation. All data, analyses, and conclusions were verified by the authors. The authors take full responsibility for the accuracy, integrity, and originality of the work.

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