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Teachers' Readiness to Integrate Generative AI into Lesson Planning and Classroom Instruction

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Abstract—Generative artificial intelligence (GenAI) has entered school systems faster than teacher preparation structures have been able to respond, creating a gap between institutional enthusiasm and classroom-level capability. This study examines the determinants of secondary school teachers' readiness to integrate GenAI into lesson planning and classroom instruction. A cross-sectional survey design was employed with 412 in-service secondary teachers recruited through multi-stage stratified random sampling across 18 school districts. A 38-item instrument measuring AI literacy, perceived usefulness, perceived ease of use, facilitating conditions, AI-related anxiety, ethical concern, and readiness to integrate was validated through confirmatory factor analysis and analysed using hierarchical multiple regression. Results indicate moderate overall readiness ($M = 3.36$, $SD = 0.79$) alongside high perceived usefulness ($M = 3.92$, $SD = 0.71$) but weak facilitating conditions ($M = 2.87$, $SD = 0.88$). The predictor block explained an additional 46% of variance beyond demographic controls ($\Delta R^2 = .46$, $p < .001$), with perceived usefulness ($\beta = .34$) and AI literacy ($\beta = .31$) emerging as the strongest positive predictors and AI-related anxiety ($\beta = -.17$) as a significant negative predictor. Ethical concern did not predict readiness once other factors were controlled. Teachers who had received formal GenAI training reported substantially higher readiness than untrained peers ($t(410) = 8.02$, $p < .001$, $d = 0.87$). Task-level analysis revealed a steep gradient: teachers felt ready for preparatory tasks such as drafting lesson outlines but markedly unready for evaluative and live classroom use. The findings suggest that readiness is constrained less by attitude than by competence and infrastructure, and that professional development should be task-differentiated rather than tool-generic.

Keywords—generative artificial intelligence, teacher readiness, lesson planning, AI literacy, technology integration, professional development

Introduction

The public release of large language model chatbots in late 2022 altered the conditions of teachers' professional work more abruptly than any educational technology of the preceding two decades. Unlike learning management systems or interactive whiteboards, which entered schools through procurement cycles and institutional training, GenAI tools arrived through individual discovery, often in advance of any school policy governing their use. Teachers consequently found themselves improvising: some adopted these tools privately for lesson preparation, others waited for guidance that had not yet been drafted, and a substantial proportion remained uncertain whether use was permitted at all.

Lesson planning is the point at which this ambiguity becomes most consequential. It is simultaneously the most time-intensive and least visible component of teachers' workload, and therefore the function where automation promises the greatest relief. It is also the site where pedagogical judgement is exercised most densely — decisions about sequencing, prior knowledge, misconception anticipation, and differentiation are encoded into plans before any instruction occurs. Delegating parts of this process to a generative system raises questions that extend well beyond efficiency.

Readiness, in this context, is not reducible to willingness. A teacher may be enthusiastic about GenAI and still lack the prompting skill to obtain a usable output, the subject-matter confidence to detect a fabricated citation, or the institutional permission to use the tool at all. This study therefore treats readiness as a multidimensional construct shaped by competence, perception, infrastructure, and affect, and asks which of these dimensions actually determine whether teachers move from interest to integration.

The study addresses three research questions. First, what is the current level of GenAI readiness among secondary teachers across distinct instructional tasks? Second, which factors predict readiness once demographic characteristics are controlled? Third, does prior formal training differentiate readiness, and to what magnitude?

Literature Review

Research on teachers' engagement with GenAI has accumulated rapidly but remains uneven in method and scope. Early contributions were largely conceptual or review-based. Kohnke, Moorhouse, and Zou (2023) surveyed the affordances of ChatGPT for language teaching, arguing that effective use depends on a set of digital competencies that most teachers had not yet developed. Ng, Leung, Chu, and

Qiao (2021), working before the generative turn, proposed a four-dimensional conceptualisation of AI literacy — knowing and understanding, using and applying, evaluating and creating, and addressing ethical issues — that has since become a common scaffold for teacher-facing instruments.



Empirical work on readiness specifically has produced consistent but qualified findings. Moorhouse (2024), interviewing beginning and first-year English language teachers, found a sharp division: first-year teachers with prior ChatGPT exposure were broadly ready and could articulate professional applications, whereas pre-service teachers without such exposure had limited awareness of the tools' capabilities. Experience with the technology, rather than experience in teaching, appeared to drive the difference. Ozdemir and Mede (2024), studying 27 tertiary-level EFL teachers with a mixed-methods design, reported moderate AI anxiety coexisting with high perceived usefulness and positive attitudes, but mixed confidence in instructional capability and in access to institutional resources — a pattern of favourable attitude constrained by weak enablement.

Studies focused on lesson planning as a distinct activity are fewer. Hsu et al. (2024), in a design-based study of pre-service primary teachers in Ireland, documented both productive uses of GenAI for planning and recurrent difficulties in evaluating generated content against curricular requirements. Moorhouse and Kohnke (2024), examining teacher educators' perceptions, found concern that generative assistance may bypass the deliberative reasoning that lesson planning is meant to cultivate in novices. Kohnke, Zou, and Moorhouse (2024) added a further dimension by documenting technostress associated with the pace of GenAI change, suggesting that affective burden may accumulate even among willing adopters.

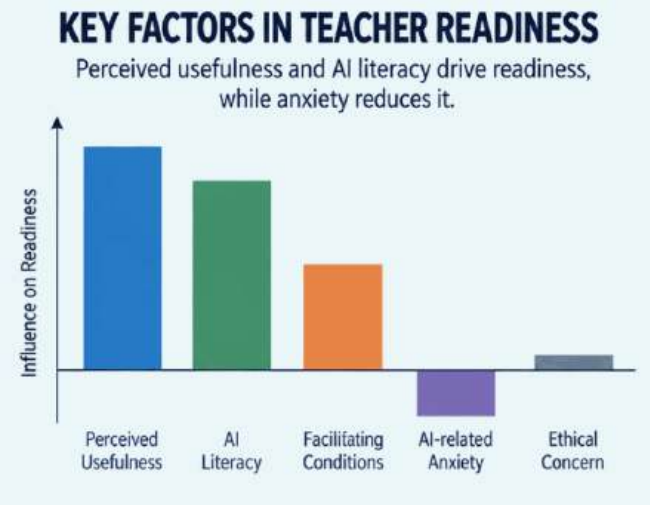
The theoretical scaffolding for this literature draws on established technology acceptance models. Davis (1989) established perceived usefulness and perceived ease of use as proximal determinants of acceptance, while Venkatesh, Morris, Davis, and Davis (2003) added facilitating conditions and social influence in the unified model. Mishra and Koehler (2006) supplied the pedagogical counterweight through TPACK, insisting that technological knowledge is instructionally inert unless integrated with pedagogical and content knowledge. Celik (2023) extended this directly to AI, developing the Intelligent-TPACK framework and demonstrating empirically that technological knowledge alone is insufficient — its contribution to instructional AI use is realised only in combination with pedagogical knowledge, and that ethical assessment capability constitutes a distinct component.

Parallel work has mapped the competency terrain. Ng, Leung, Su, Ng, and Chu (2023) linked teachers' AI digital competencies to twenty-first century skills in post-pandemic settings, and Ng, Wu, Leung, Chiu, and Chu (2024) validated a questionnaire operationalising AI literacy across affective, behavioural, cognitive, and ethical dimensions. Ng, Chan, and Lo (2025) subsequently catalogued school-level strategies for GenAI integration, identifying policy vacuum and uneven access as recurring institutional obstacles. At the policy level, Miao and Cukurova (2024) issued a competency framework for teachers under UNESCO auspices that codifies progression from AI acquisition to creation. Student-side evidence provides a useful contrast: Chan and Hu (2023), surveying 399 university students in Hong Kong, found generally positive attitudes tempered by concerns about accuracy, privacy, and effects on personal development — concerns that closely mirror those voiced by teachers, though students report considerably higher usage rates.

Three gaps emerge. First, the majority of readiness studies are qualitative or small-sample, limiting generalisability and precluding estimation of relative predictor strength. Second, readiness is typically measured as a global disposition rather than differentiated across instructional tasks, obscuring the possibility that teachers are ready for some functions and not others. Third, ethical concern is frequently assumed to inhibit adoption, but this assumption has rarely been tested against competing predictors in a multivariate model. The present study addresses all three.

Hypotheses

Drawing on the reviewed literature, six hypotheses were tested. H1: AI literacy positively predicts readiness to integrate GenAI. H2: Perceived usefulness positively predicts readiness. H3: Perceived ease of use positively predicts readiness. H4: Facilitating conditions positively predict readiness. H5: AI-related anxiety negatively predicts readiness. H6: Ethical concern negatively predicts readiness.



Research Methodology

Research design. A quantitative, cross-sectional survey design was adopted, appropriate for estimating population-level readiness and for modelling relationships among latent constructs at a single point in time.

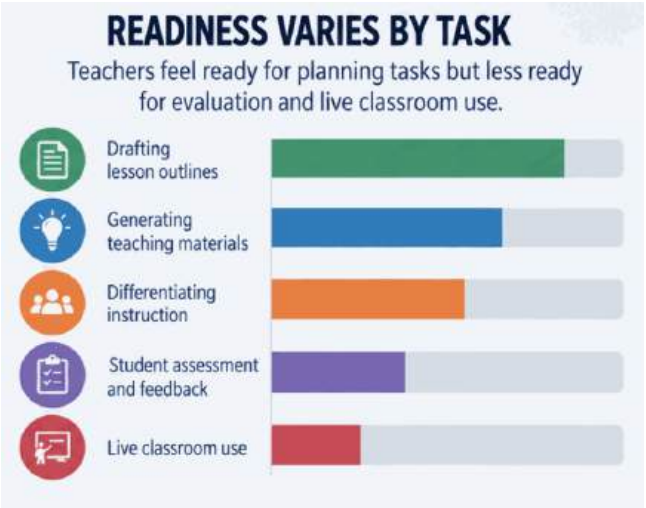
Participants and sampling. Multi-stage stratified random sampling was used across 18 school districts. Districts were stratified by urbanisation (urban, peri-urban, rural); schools were then randomly selected within strata proportional to size; within selected schools, teachers were randomly drawn from staff rosters. Questionnaires were distributed to 520 teachers; 441 were returned (84.8%) and 412 retained after removal of incomplete responses and straight-line response patterns, yielding a usable response rate of 79.2%. Sample characteristics are reported in Table 1.



Table 1. Participant characteristics (N = 412)

Characteristic	Category	n	%
Gender	Female	236	57.3
	Male	176	42.7
Age	Under 30	78	18.9
	30–39	149	36.2
	40–49	115	27.9
	50 and above	70	17.0
Teaching experience	5 years or fewer	96	23.3
	6–15 years	171	41.5
	More than 15 years	145	35.2
Subject area	STEM	158	38.3
	Languages and humanities	147	35.7
	Commerce and social sciences	107	26.0
School type	Public	224	54.4
	Private	188	45.6
Prior formal GenAI training	Yes	121	29.4
	No	291	70.6

Instrument. The questionnaire comprised four demographic items and 38 substantive items measured on five-point Likert scales (1 = strongly disagree, 5 = strongly agree). AI literacy items were adapted from Ng, Wu, Leung, Chiu, and Chu (2024); perceived usefulness, perceived ease of use, and facilitating conditions items were adapted from Davis (1989) and Venkatesh et al. (2003); ethical concern items drew on the ethical dimension of Celik's (2023) Intelligent-TPACK instrument. All adapted items were reworded to reference GenAI in lesson planning and instruction. Content validity was established by five expert reviewers (two educational technologists, three senior teacher educators), with an item-level content validity index of .92. A pilot with 48 teachers not included in the main sample produced acceptable reliability for all subscales ($\alpha > .80$). A separate seven-item task inventory asked respondents to rate readiness for specific instructional functions and to indicate current use.



Procedure. Data were collected over nine weeks. Participation was voluntary and anonymous, with written informed consent obtained and institutional ethics approval secured prior to fieldwork.

Analysis. Data were analysed in SPSS 29 and AMOS 29. Confirmatory factor analysis assessed measurement quality; composite reliability and average variance extracted evaluated convergent validity; the Fornell–Larcker criterion

evaluated discriminant validity. Hierarchical multiple regression tested the hypotheses, entering demographic controls at Step 1 and the six predictors at Step 2. Independent-samples *t*-tests and one-way ANOVA examined group differences. Assumptions of normality, linearity, homoscedasticity, and independence of residuals were verified; all skewness and kurtosis values fell within ±1.2, and Durbin–Watson was 1.94.

Results

Measurement model. The seven-factor CFA achieved acceptable fit: $\chi^2/df = 2.14$, CFI = .946, TLI = .938, RMSEA = .053, SRMR = .047. All standardised loadings exceeded .64. Descriptive statistics and reliability indices appear in Table 2. Composite reliability exceeded .85 and AVE exceeded .50 for every construct, confirming convergent validity.

Table 2. Descriptive statistics and reliability of constructs

Construct	Items	M	SD	α	CR	AVE
AI literacy	6	3.14	0.82	.89	.91	.63
Perceived usefulness	6	3.92	0.71	.91	.93	.69
Perceived ease of use	5	3.61	0.76	.87	.90	.65
Facilitating conditions	5	2.87	0.88	.86	.89	.62
AI-related anxiety	5	3.05	0.91	.88	.91	.67
Ethical concern	5	3.78	0.74	.84	.88	.60
Readiness to integrate	6	3.36	0.79	.92	.94	.71

The descriptive pattern is itself informative. Teachers rated perceived usefulness highest and facilitating conditions lowest, a 1.05-point gap indicating that belief in value substantially outpaces institutional support. Readiness sat near the scale midpoint.

Discriminant validity and correlations. Table 3 reports inter-construct correlations with the square root of AVE on the diagonal. Every diagonal value exceeds the corresponding off-diagonal correlations, satisfying the Fornell–Larcker criterion.

Table 3. Correlation matrix (square root of AVE on diagonal)

	AIL	PU	PEOU	FC	ANX	EC	RTI
AIL	**.79**						
PU	.41	**.83**					
PEOU	.52	.45	**.81**				
FC	.33	.30	.36	**.79**			
ANX	−.47	−.28	−.39	−.25	**.82**		
EC	−.12	−.08	−.11	−.06	.21	**.77**	
RTI	.58	.61	.49	.44	−.42	−.19	**.84**

Note. All correlations $|r| \geq .12$ significant at $p < .05$; $|r| \geq .16$ at $p < .001$.

Hierarchical regression. Model 1, containing demographic controls, explained 11% of variance in readiness, $F(4, 407) = 12.58$, $p < .001$. Adding the six predictors in Model 2 raised explained variance to 57%, $\Delta R^2 = .46$, $\Delta F(6, 401) = 71.48$, $p < .001$; overall $F(10, 401) = 53.16$, $p < .001$. Variance inflation factors ranged from 1.14 to 2.37, indicating no multicollinearity problem.

Table 4. Hierarchical regression predicting readiness to integrate GenAI

Predictor	Model 1 β	Model 2 β	t	p	VIF
Age	−.16	−.04	−0.91	.361	2.37
Teaching experience	−.19	−.09	−2.32	.021	2.28
Subject area (STEM = 1)	.11	.06	1.57	.118	1.14
Prior GenAI training	.24	.13	3.11	.002	1.31
AI literacy		.31	6.92	< .001	1.72
Perceived usefulness		.34	7.81	< .001	1.41
Perceived ease of use		.12	2.64	.009	1.68
Facilitating conditions		.19	4.47	< .001	1.26
AI-related anxiety		−.17	−3.95	< .001	1.53
Ethical concern		−.05	−1.21	.227	1.09
R^2	.11	.57			
Adjusted R^2	.10	.56			

H1 through H5 were supported; H6 was not. Ethical concern, though rated high in absolute terms (M = 3.78), did not independently predict readiness once competence and enablement variables were controlled.

Group differences. Teachers with prior formal GenAI training reported significantly higher readiness (M = 3.81, SD = 0.68) than untrained teachers (M = 3.17, SD = 0.76), $t(410) = 8.02$, $p < .001$, $d = 0.87$. Readiness declined monotonically with teaching experience, $F(2, 409) = 8.14$, $p < .001$, $\eta^2 = .038$, with Tukey post-hoc tests confirming a significant difference between the least and most experienced groups ($p < .001$).

Table 5. Readiness by training status and teaching experience

Grouping	Category	n	M	SD	Test statistic	p	Effect size
Prior training	Yes	121	3.81	0.68	t(410) = 8.02	< .001	d = 0.87
	No	291	3.17	0.76			
Experience	≤ 5 years	96	3.58	0.74	F(2, 409) = 8.14	< .001	η^2 = .038
	6–15 years	171	3.39	0.77			
	> 15 years	145	3.16	0.81			

Task-level readiness. The task inventory revealed a pronounced gradient (Table 6). Readiness was highest for generative preparatory tasks and lowest for evaluative and live instructional tasks.

Table 6. Readiness and current use by instructional task

Instructional task	M	SD	Currently using, n (%)
Drafting lesson-plan outlines	3.71	0.81	185 (44.9)
Creating practice questions and worksheets	3.66	0.84	171 (41.5)
Generating explanations and analogies	3.44	0.86	136 (33.0)
Differentiating materials for mixed-ability groups	3.28	0.89	108 (26.2)
Designing formative assessment rubrics	3.09	0.92	81 (19.7)
Providing feedback on student work	2.86	0.95	60 (14.6)
Real-time use with students during class	2.61	0.98	39 (9.5)

Discussion

The results describe a workforce that is favourably disposed toward GenAI but only partially equipped to use it. Perceived usefulness was the strongest predictor of readiness, consistent with Davis (1989) and with the attitudinal findings of Ozdemir and Mede (2024), yet usefulness beliefs alone did not translate into high readiness — the readiness mean sat more than half a point below the usefulness mean. AI literacy contributed almost equally, supporting Celik's (2023) argument that instructional AI use rests on knowledge rather than enthusiasm, and echoing Moorhouse's (2024) observation that prior hands-on exposure distinguished ready from unready teachers more reliably than career stage.

The facilitating conditions result is the most actionable finding. This construct recorded the lowest mean of any variable (M = 2.87) while significantly predicting readiness (β = .19). Teachers are, in effect, being asked to adopt a technology for which the institutional preconditions — device access, licensed tools, sanctioned usage policy, technical support — are largely absent. This mirrors the policy vacuum documented by Ng, Chan, and Lo (2025) and suggests that individual-level interventions will deliver limited returns without parallel institutional investment.

The non-significance of ethical concern warrants careful interpretation. Teachers reported high ethical concern, and it correlated negatively with readiness at the bivariate level (r = −.19), but this relationship dissolved under multivariate control. The most plausible reading is that ethical concern is not a deterrent but a condition of thoughtful adoption: teachers who worry about accuracy, attribution, and student dependence are not thereby less ready, they are ready differently. Interventions that attempt to allay ethical concern in order to accelerate adoption may therefore be addressing the wrong obstacle, and may erode precisely the critical stance that Ng et al. (2021) identify as constitutive of AI literacy.

The inverse relationship between teaching experience and readiness deserves comment given its modest effect size (η^2 = .038). Experience was significant in Model 1 but weakened substantially once literacy and anxiety entered the model, suggesting that the apparent experience effect operates largely through differential AI literacy and anxiety rather than through career stage as such. This is consistent with Moorhouse's (2024) finding that exposure, not seniority, governs readiness.

Finally, the task gradient may be the study's most practically significant result. The 1.10-point spread between the highest and lowest task means, and the corresponding drop in reported use from 44.9% to 9.5%, indicates that readiness is task-specific rather than global. Teachers are comfortable delegating divergent, low-stakes generation and increasingly reluctant as tasks become evaluative or occur in the presence of students. This aligns with the concerns raised by Hsu et al. (2024) regarding teachers' difficulty evaluating generated content against curricular standards, and with Moorhouse and Kohnke's (2024) caution about delegating deliberative pedagogical reasoning.

Implications

For school leaders, the findings argue for sequencing investment toward enablement before exhortation: sanctioned tool access and explicit usage policy address the weakest measured link in the readiness chain. For professional development designers, the large training effect (d = 0.87) combined with the low training prevalence (29.4%) identifies an unusually high-leverage intervention, provided programmes are differentiated by task. Generic tool orientation will not close the gap at the evaluative end of the

gradient, where the required competence is critical appraisal of generated output rather than prompt construction. For teacher education institutions, the Intelligent-TPACK formulation (Celik, 2023) and the UNESCO competency framework (Miao & Cukurova, 2024) offer ready scaffolds for embedding AI-specific pedagogical knowledge into initial preparation rather than treating it as in-service remediation.

Limitations and Future Research

Four limitations qualify these findings. The cross-sectional design precludes causal inference; the training–readiness association in particular may reflect self-selection, as motivated teachers plausibly seek out training. All measures were self-reported, raising the possibility of common method variance, although Harman's single-factor test attributed only 28.4% of variance to a single factor. The sample was drawn from one national secondary school system, limiting generalisability across policy environments. Finally, readiness was measured as a disposition rather than as observed instructional behaviour. Longitudinal designs tracking teachers through training cycles, and classroom observation studies linking readiness scores to actual integration quality, would address these constraints. Research disaggregating readiness by subject discipline would also be valuable, given that generative assistance carries different epistemic risks in mathematics than in literature.

Conclusion

Teachers in this sample are not resistant to generative AI; they are under-supported in using it. High perceived usefulness coexists with moderate readiness, weak institutional enablement, and a sharply uneven profile of task-specific confidence. Competence and infrastructure, not attitude or ethical reservation, are the binding constraints. Ethical concern proved compatible with readiness rather than opposed to it, suggesting that critical caution and capable adoption can develop together. The policy implication is direct: if integration is a goal, the investment belongs in task-differentiated professional development and in the provision of sanctioned tools and clear institutional guidance, rather than in persuading a workforce that is already largely persuaded.

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