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Digital Andragogy And Family Planning Cadre Competence In Kandangan District, Indonesia

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abstract

This study examined the relationship between digital andragogy and family planning cadre competence in Kandangan District, Temanggung Regency, Indonesia. Adult learning research emphasizes the importance of addressing learners' needs, drawing on their prior experience, supporting self-directed learning, and connecting learning activities with practical problems. However, evidence on the relationship between digital andragogy and family planning cadre competence at the district level remains limited. This study employed a quantitative correlational design. The population comprised 128 cadres, and Slovin's formula, using a 5% margin of error, yielded a minimum sample size of 97. Responses from 99 cadres who agreed to participate were analyzed. The questionnaire consisted of 15 items on digital andragogy and 15 items on cadre competence, all rated on a five-point Likert scale. All items met the specified corrected item–total correlation criterion, and Cronbach's alpha was .892 for digital andragogy and .906 for competence. Pearson's correlation showed a positive association between the two variables ($r = .565$, $p < .001$), while simple linear regression yielded an unstandardized coefficient of $B = .485$ ($p < .001$) and $R^2 = .319$. Spearman's rank correlation also indicated a positive association (rho = .576, $p < .001$). These findings provide evidence of a positive statistical association within the participating sample, but they do not establish causality because the study used a cross-sectional design and self-reported measures.

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Keywords: ***digital andragogy; cadre competence; family planning cadres; adult learning; digital learning***

INTRODUCTION

Family planning and family development initiatives depend in part on community-level cadres who communicate program information, support data collection and reporting, and encourage community participation within their assigned roles. Village Family Planning Assistants (PPKBD) and Sub-PPKBD work close to families, making their competence important for sustained program communication. The required competence includes more than factual knowledge; it also involves practical skills and appropriate attitudes when interacting with diverse community members.

Digital media offer flexible ways to access information, revisit learning materials, and consult work guidance. Short videos, electronic documents, communication groups, and downloadable resources may enable cadres to learn beyond scheduled face-to-face sessions. Yet the availability of digital content does not automatically produce meaningful learning. Cadres differ in prior experience, task-related needs, digital skills, network access, and available time, which may shape their learning experiences.

Andragogy provides a basis for designing learning around adult learners' characteristics. Knowles et al. (2020) highlight the importance of explaining why learning is needed, drawing on learners' prior experience, considering their readiness to learn, focusing on practical problems, and supporting self-directed learning. These principles are relevant to family planning cadres, whose learning needs are closely connected to the tasks they perform in their communities.

Fahimah et al. (2023b) discuss the application of digital-based andragogy in Indonesian community education, emphasizing instructional design alongside the use of technology. Research on competency-based education for community health workers also highlights the importance of connecting learning activities with the knowledge, skills, and attitudes required for practice. Taken together, these perspectives suggest that digital learning should be designed around the work cadres actually do, rather than focusing only on access to digital tools.

In Kandangan District, Temanggung Regency, family planning cadres are distributed across 16 villages. The population consists of 16 PPKBD and 112 Sub-PPKBD. Preliminary notes in the research plan identify concerns related to internet connectivity, the need for learning support, and limited time for face-to-face sessions. These conditions raise a practical question: is digital learning designed around adult-learning principles associated with cadres' reported competence?

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The research gap is not simply whether cadres use technology, but whether digital learning experiences organized around learner needs, experience, self-direction, problem solving, and flexible access are statistically associated with cadre competence. This study examines that association in a subdistrict context using Pearson and Spearman correlations and simple linear regression. Its contribution is initial contextual evidence on the association between digital andragogy and self-reported competence, while acknowledging the limits of a non-experimental design.

LITERATURE REVIEW

Recent studies also indicate that digital learning for adults is most useful when technological access is combined with learner autonomy, relevance to prior experience, and practical problem-solving. Sari et al. (2024) examined e-learning in adult learning, while Amarulloh et al. (2026) synthesized an andragogical self-learning framework for hybrid adult education. These studies support treating digital andragogy not merely as the use of digital tools, but as the integration of technology with adult-learning principles.

Andragogy views adults as learners who bring prior experience, have learning needs connected to social roles, and often value learning that helps address practical problems. In the framework described by Knowles et al. (2020), learning design should clarify the value of learning, connect new material with participants' experiences, and allow room for self-direction. For family planning cadres, these principles may translate into family-related case examples, task guides, decision-making exercises, and reflection on community work.

In this article, digital andragogy refers to the application of adult-learning principles through digital media rather than simply transferring printed material onto a screen. It is operationalized through five dimensions: alignment with learning needs, use of prior experience, self-directed learning, problem-solving orientation, and ease and flexibility of access. These dimensions are the study's operational definition and were measured through respondents' perceptions across 15 questionnaire items. The resulting score therefore reflects cadres' assessments of their digital learning experience, not an independent audit of a platform or instructional design.

Family planning cadre competence is conceptualized through three related domains: knowledge of program information and procedures, skills for assigned tasks, and attitudes in community interaction. Competency-based education literature for community health workers emphasizes the integration of these domains rather than knowledge alone (Sultan et al., 2025). In

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this study, competence was measured using 15 self-report statements representing knowledge, skills, and attitudes. These scores should not be treated as direct observations of job performance or supervisor-rated competence.

Fahimah et al. (2023b) are relevant to this study because their work addresses digital andragogy in Indonesian community education. Sulistyorini et al. (2025), meanwhile, evaluate an educational programme designed to strengthen health cadre competence in Indonesia. These studies provide useful context for considering how adult learning principles and structured educational activities may support cadre development, although their settings and outcomes are not identical to those examined in the present study.

Based on this literature, the conceptual framework treats digital andragogy (X) as a statistical predictor and family planning cadre competence (Y) as the measured outcome. The working hypothesis proposes a positive association between the two scores. The framework does not assume that digital andragogy is the sole determinant of competence; work experience, education, training intensity, supervisor support, device access, and opportunities for practice are plausible additional factors that were not tested as predictors in this model.

RESEARCH METHOD

This study used a quantitative explanatory correlational design. Digital andragogy (X) was the predictor, and family planning cadre competence (Y) was the outcome. The study focused on family planning cadres in Kandangan District, Temanggung Regency, Indonesia. The Google Forms export recorded responses from 15 September to 23 October 2026. The analyzed data were primary questionnaire responses; no intervention, randomization, or direct field-performance assessment was conducted.

The population comprised 128 cadres: 16 PPKBD and 112 Sub-PPKBD across 16 villages. The minimum sample size was calculated using Slovin's formula, $n = N/[1 + N(e^2)]$, with $N = 128$ and $e = 0.05$. The result was 96.97, rounded up to 97 respondents. A total of 99 responses from individuals who consented to participate were included. Slovin's formula was used only as a minimum sample-size reference; it does not determine the sampling method or guarantee representativeness. Available records do not establish the number of people invited or the individual selection mechanism. Therefore, random sampling is not claimed, and the response rate for the population is not reported as verified.

The instrument contained 30 items: 15 for digital andragogy and 15 for family planning cadre competence. Digital andragogy covered alignment with learning needs, use of experience,

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self-directed learning, problem-solving orientation, and ease and flexibility. Competence items represented knowledge, skills, and attitudes. Responses used a five-point Likert scale from 1 (strongly disagree) to 5 (strongly agree). The questionnaire link was distributed through WhatsApp and completed in Google Forms. Each variable score was calculated as the mean of its 15 items. Work motivation was excluded from all analyses.

Item validity was assessed using corrected item-total correlation, defined as the Pearson correlation between an item and the scale total after removing the item under assessment from that total. With n = 99, df = 97, and a two-tailed α of .05, the reference r value was approximately .198. Internal consistency was evaluated using Cronbach's alpha, with .70 as a general reference. These checks provide preliminary evidence about item correlations and internal consistency, but do not replace content validation or factor-structure analysis.

Analyses included descriptive statistics, Pearson correlation, Spearman correlation, and simple linear regression. Regression reporting included the unstandardized coefficient, conventional and HC3 robust standard errors, t statistic, p value, 95% confidence interval, F statistic, R^2, and adjusted R^2. Residual normality was assessed using Shapiro–Wilk, and heteroskedasticity was assessed using the Breusch–Pagan test. The significance level was .05, and the primary correlation was interpreted two-tailed. Data quality procedures included checking response completeness, consistency of composite-score construction, and reporting item-validity and reliability results. Source triangulation was not conducted because this was a quantitative survey.

RESULT

The study analyzed 99 responses from family planning cadres who agreed to participate. This number exceeded the minimum sample size of 97, calculated using Slovin's formula from a population of 128 cadres, comprising 16 PPKBD and 112 Sub-PPKBD across 16 villages. The composite score for each variable was calculated as the mean of its 15 questionnaire items. Since the available data did not establish a complete probability-based selection process, the findings should be interpreted in relation to the respondents who participated rather than automatically generalized to every family planning cadre in Kandangan District.

The mean score for digital andragogy was 4.01 (SD = 0.34), while the mean score for family planning cadre competence was 3.99 (SD = 0.29). Both variables had relatively high average scores on the five-point response scale. The standard deviations indicate that respondents' scores were relatively concentrated around their respective means. Nevertheless, these descriptive statistics

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represent questionnaire responses and should not be interpreted as direct evidence of objectively demonstrated competence. Further assessment through observation, practical demonstrations, or supervisor evaluations would be needed to determine whether the reported competence corresponds to actual performance in cadre activities.

Table 1. Respondent Characteristics (n = 99)

Characteristic	Category	Frequency (n)	Percentage (%)
Age	< 30 years	4	4.04
	30–39 years	35	35.35
	40–49 years	37	37.37
	50–59 years	20	20.20
	≥ 60 years	3	3.03
Education	Elementary school (SD)	8	8.08
	Junior high school (SMP)	25	25.25
	Senior high/vocational school (SMA/SMK)	53	53.54
	Diploma	3	3.03
	Bachelor's degree (S1)	10	10.10
Total	**For each characteristic**	**99**	**100.00**

As shown in Table 1, the largest age group was 40–49 years (37.37%), followed by respondents aged 30–39 years (35.35%). Respondents aged 50–59 years accounted for 20.20%, while those younger than 30 years and those aged 60 years or older represented 4.04% and 3.03%, respectively. In terms of education, more than half of the respondents had completed senior high or vocational school (53.54%), followed by junior high school (25.25%). A bachelor's degree was reported by 10.10% of respondents, while 8.08% had completed elementary school and 3.03% held a diploma. These characteristics describe the participating respondents and provide context for interpreting their questionnaire ratings; they do not, by themselves, demonstrate differences in digital andragogy or cadre competence between demographic groups.

Table 2. Descriptive statistics and scale reliability

Variable	Items	Mean	SD	Cronbach's alpha
Digital Andragogy (X)	15	4.01	0.34	.892

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Family Planning Cadre Competence (Y)	15	3.99	0.29	.906

The instrument consisted of 30 items, comprising 15 items measuring digital andragogy and 15 items measuring family planning cadre competence. The digital andragogy items addressed learning needs, the use of prior experience, independent learning, problem-solving orientation, and the flexibility of digital learning. The competence items represented knowledge, skills, and attitudes relevant to cadre responsibilities. Item validity was examined using corrected item–total correlations. All 15 digital andragogy items met the specified criterion, with coefficients ranging from .397 to .726. Similarly, all 15 competence items met the criterion, with coefficients ranging from .402 to .718. These results indicate that each item had an acceptable relationship with the total score of its respective scale under the criterion applied in this analysis.

Internal consistency was also examined using Cronbach's alpha. The digital andragogy scale had an alpha coefficient of .892, whereas the competence scale had an alpha coefficient of .906. Both values indicate strong internal consistency within the sample. However, reliability does not by itself establish construct validity or demonstrate that the competence scale measures actual work performance. The results should therefore be understood as evidence of consistency among the questionnaire items, rather than conclusive evidence that all dimensions of the constructs have been fully captured.

Table 3. Summary of item validity

Variable	Items	Corrected item-total r range	Decision
Digital Andragogy (X)	15	.397–.726	All items met the criterion
Family Planning Cadre Competence (Y)	15	.402–.718	All items met the criterion

Pearson's correlation analysis showed a positive relationship between digital andragogy and family planning cadre competence ($r = .565$, $p < .001$). The 95% confidence interval for the correlation coefficient ranged from .414 to .686. This interval suggests that the association was positive within the estimated range, although its exact magnitude remains uncertain. The result indicates that higher digital andragogy scores tended to occur alongside higher competence scores among the participating respondents. The analysis was supplemented by Spearman's rank

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correlation, which produced a coefficient of ρ = .576, p < .001. The similarity between the Pearson and Spearman coefficients indicates that the positive association was consistent across the two correlation approaches. This consistency supports the presence of a relationship between the measured variables, but it does not establish that digital andragogy caused higher competence. Because the study used a cross-sectional questionnaire design, the temporal order of the relationship cannot be determined.

Simple linear regression was used to examine the statistical association between digital andragogy and family planning cadre competence. The model was statistically significant, F(1,97) = 45.451, p < .001, with R^2 = .319 and adjusted R^2 = .312. The coefficient of determination indicates that the model accounted for 31.9% of the observed variation in competence scores within the sample. The remaining variation was not explained by this single-predictor model.

The unstandardized regression coefficient was B = .485, with a conventional standard error of .072, t(97) = 6.742, p < .001, and a 95% confidence interval from .342 to .628. This indicates that a one-point increase in the digital andragogy score was associated with an average increase of .485 points in the competence score predicted by the model. The coefficient represents a statistical association, not a causal effect. Factors such as prior experience, access to training, educational background, support from family planning extension workers, and opportunities to practise relevant skills were not included as predictors in this model.

Table 4. Correlation and linear regression results

Analysis	Statistic	p value	95% CI / note
Pearson correlation	r = .565; df = 97	< .001	[.414, .686]
Spearman correlation	ρ = .576	< .001	Positive rank association
OLS regression: X coefficient	B = .485; SE = .072; t = 6.742	< .001	[.342, .628]
Model fit	F(1,97) = 45.451; R^2 = .319; adjusted R^2 = .312	< .001	31.9% of observed Y variance explained
Regression with HC3	B = .485; SE(HC3) = .093; t = 5.235	< .001	[.301, .669]

Diagnostic checks indicated that regression residuals departed from normality, W = .891, p < .001. The Breusch–Pagan test did not provide statistically significant evidence of

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heteroskedasticity, $\chi^2(1) = 1.243$, $p = .265$. Because the residual normality assumption was not met, the regression coefficient was also assessed using HC3 heteroskedasticity-robust standard errors.

With the HC3 adjustment, the coefficient remained positive and statistically significant, with a robust standard error of .093, $t(97) = 5.235$, $p < .001$, and a 95% confidence interval from .301 to .669. The direction and statistical significance of the association therefore remained consistent under the robust standard-error calculation. This robustness check strengthens confidence in the reported statistical association, although it does not eliminate possible measurement bias, selection bias, omitted-variable bias, or the limitations inherent in a cross-sectional design.

Table 5. Diagnostic results

Check	Statistic	p value	Interpretation
Shapiro–Wilk residual test	W = .891	< .001	Residuals depart from normality
Breusch–Pagan	LM $\chi^2(1) = 1.243$	.265	No significant evidence of heteroskedasticity
HC3 robust standard error	SE for X = .093; t(97) = 5.235	< .001	Coefficient remains positive and significant

DISCUSSION

The adult-learning perspective is also consistent with newer work on self-directed and digitally mediated learning. Lazfihma et al. (2026) studied an andragogical approach to digital literacy, while Iskandar et al. (2025) discussed digital citizenship literacy and privacy awareness in Indonesia. These perspectives broaden the practical implications of the present findings: digital andragogy for family planning cadres should support relevant task performance while also encouraging responsible handling of digital information. The present study did not directly measure privacy literacy, digital citizenship, or observed performance, so these points should be treated as implications for future program design rather than as outcomes established by the current data.

Evidence from Indonesia also underscores the relevance of digital capability for community-facing roles. Sugihono et al. (2024) examined digital literacy among agricultural extension agents, and Jakaria et al. (2025) developed an andragogy model intended to improve teachers' digital technology competence. In community settings, Ikhsan and Kani (2026) described

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an offline digital Posyandu application intended to strengthen cadre digital literacy and service efficiency. These studies suggest that digital competence is shaped not only by individual learning but also by the fit between training design, available infrastructure, and the practical tasks that workers are expected to perform.

The findings can also be considered alongside research on digital competence development among community-based and rural workforces. Woods et al. (2024) identified the need for flexible and contextually embedded digital health education for rural healthcare workers, while Sultan et al. (2025) emphasized competency-based education and training for community health workers. Zoraya et al. (2026) further reviewed digital competencies among community health workers and highlighted the importance of training, mentoring, and infrastructure. Although these populations and settings are not identical to family planning cadres in Kandangan, the literature provides a relevant comparison for understanding why digital learning opportunities may be associated with perceived cadre competence.

The positive association observed in this study indicates that respondents who rated digital learning grounded in andragogical principles more highly also tended to report higher competence as family planning cadres. Pearson's correlation of .565 and Spearman's correlation of .576 showed a consistent pattern across two analytical approaches. This agreement strengthens the evidence that the variables were related in the sample, but it does not establish the direction of the relationship. Because both variables were measured through questionnaires during the same period, positive learning experiences may be associated with stronger perceived competence; alternatively, cadres who already feel competent may evaluate digital learning more favorably.

This finding can be interpreted in light of adult learning characteristics: prior experience, perceived needs, and the practical usefulness of content are important elements of learning. For family planning cadres, digital materials may be more useful when connected to concrete responsibilities, such as communicating program information, engaging with families, supporting recordkeeping, and recognizing when an issue should be referred to authorized personnel. Digital andragogy should therefore be understood as the combination of digital media and learning design responsive to adult learners' needs, rather than simply distributing documents through messaging applications. According to Fahimah et al. (2023b), digital-based andragogy in Indonesian community education should place instructional design alongside the use of technology. This perspective highlights the importance of how learning activities are organized, not merely which digital platforms are used.

Research conducted by Rahaju (2023), for example, reported a significant effect of an

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andragogical approach on learning outcomes among PKK cadres. This study offers a relevant point of comparison because it also considers adult learning in a community-based setting. However, the reference details for Rahaju (2023) should be checked against the original publication before submission, as the full bibliographic entry was not present in the reference list available for this draft.

Indonesian studies of cadre capacity likewise suggest that competence is shaped by more than individual learning alone; opportunities for training, support from field officers, available information, and task context also matter. The study conducted by Devi et al. (2016) identified experience, training, extension-worker support, and information support as important considerations in developing family planning cadres' capacity. In the study, Jayanti (2019) demonstrated how a technical training model for family planning extension workers to support community institution cadres can be developed through needs analysis, instructional design, and staged evaluation. These studies broaden the interpretation of the present findings: digital learning may be one source of competency support, while its practical contribution may also depend on mentoring, access to information, and the fit between learning content and cadres' responsibilities.

The regression coefficient B = .485 indicates that a one-point increase in the digital andragogy score was associated with an average increase of .485 points in the competence score in the model. The R^2 value of .319 means that the single-predictor model accounted for 31.9% of the observed variation in competence scores in this sample. It does not mean that digital learning caused 31.9% of cadre competence. Unexplained variation may be related to experience, education, training opportunities, extension-worker support, access to devices and connectivity, or opportunities to practise skills. Since these factors were not included in the model, they should be treated as possibilities for future investigation rather than findings established by this study.

The statistical interpretation should take the diagnostic results into account. Regression residuals departed from normality ($W = .891$, $p < .001$), whereas the Breusch–Pagan test did not provide significant evidence of heteroskedasticity ($p = .265$). The coefficient remained positive and statistically significant when HC3 robust standard errors were used. Thus, the association did not change under the robust standard-error calculation, although this does not resolve all design limitations. The cross-sectional data do not establish temporal order, measuring both variables with questionnaires may introduce common-method bias, and the respondent-selection process was not fully documented. The findings should therefore be interpreted as a statistical association within the sample, not as evidence of causation.

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The practical implication is not that all cadre activities should be moved online, but that technology can expand access to relevant learning that participants can revisit. Short modules, locally grounded cases, visual guides, focused discussion, and feedback from extension workers can be combined with simulation and hands-on practice. In a study on improving digital-literacy competence among PKK cadres, Setia et al. (2024) highlighted the need to strengthen the ability to access and assess information safely and responsibly. For family planning cadres, these skills matter so that information received through digital channels can be understood and used appropriately. Alternative support remains necessary for cadres with limited devices, connectivity, or digital skills.

In the context of Kandangan District, digital learning activities could be linked to the practical situations cadres encounter in their villages. Learning materials might include examples of how to communicate family planning information, explain program procedures, record activities accurately, and identify questions requiring consultation with family planning extension workers. These are proposed applications of the study's findings rather than outcomes directly measured by the current research. Their effectiveness would need to be assessed through implementation and subsequent evaluation.

This study contributes context-specific evidence by examining the association between digital andragogy and competence among family planning cadres in Kandangan District, Temanggung Regency. The positive correlation and regression results suggest that digital andragogy is a relevant variable to consider in the development of cadre learning activities. Nevertheless, the findings do not establish that the approach improves actual performance or that it is more effective than conventional training. Further research could assess competence through observation or task demonstrations, document participation in digital learning, and compare scores before and after an intervention. A longitudinal or quasi-experimental design, combined with more detailed recruitment records, would help assess change over time and strengthen the basis for interpretation. Future studies could also examine whether access to digital devices, digital literacy, previous training, and support from extension workers influence the relationship between digital andragogy and cadre competence.

The respondent profile should be interpreted descriptively because the present analysis did not test whether age or educational attainment was associated with either study variable. Future studies could examine these relationships using a clearly documented sampling procedure and subgroup analyses, provided that subgroup sizes are sufficient. For greater instrument transparency, a supplementary table may map each questionnaire item to its stated dimension

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and provide representative item wording, using the actual questionnaire as the source. This would allow readers to see more clearly how the operational definitions were translated into measurable indicators without implying that additional validation analyses were conducted.

CONCLUSION

The findings indicate that digital andragogy was positively and significantly associated with family planning cadre competence in Kandangan District, Temanggung Regency, Indonesia. Pearson's correlation coefficient was .565 ($p < .001$), and Spearman's rank correlation was .576 ($p < .001$), showing a positive relationship between the two measured variables. The consistency of these results across the two correlation methods supports the conclusion that respondents who reported stronger digital-andragogical learning experiences also tended to report higher competence.

The regression model produced a coefficient of determination (R^2) of .319, indicating that digital andragogy accounted for approximately 31.9% of the variation in cadre competence within this model. The remaining 68.1% was associated with factors not included in the analysis and with variation not explained by the model. This result should not be interpreted as proof that digital andragogy causes changes in competence, because the study used a cross-sectional design and self-reported questionnaire data.

The findings have practical implications for capacity development among FP cadres, particularly in the context of non-formal education and adult learning. Digital learning approaches may be considered to support access to learning materials, facilitate the exchange of experiences, encourage independent learning, and strengthen cadres' understanding of their roles and responsibilities. Nevertheless, the implementation of digital andragogy should consider adult learners' learning needs, digital literacy, access to devices and internet connectivity, and the local context in which FP counselling activities take place. These implications are practical considerations informed by the findings rather than evidence that a particular digital learning intervention has causally improved cadre competence.

Several limitations should be acknowledged. First, this study employed a quantitative approach using questionnaire data collected during a single observation period. Consequently, the results establish a statistically significant association and predictive relationship between digital andragogy and FP cadre competence, but they do not establish a causal relationship. Second, the use of self-reported questionnaire data may introduce response or perception bias. Third, the study was conducted among FP cadres in a single district, which means that the findings

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should be generalized to other geographical contexts with caution. Future research could involve cadres from multiple districts, assess competence through direct observation or performance-based measures, and employ longitudinal or experimental designs to determine whether specific digital learning programmes produce measurable improvements in cadre competence.

Overall, the results provide context-specific evidence of a positive statistical association between digital andragogy and family planning cadre competence in Kandangan District, Temanggung Regency, Indonesia. The findings support further examination of digital learning designed around adult learners' needs, experience, self-direction, and practical problem solving. Future research using longitudinal designs, documented sampling procedures, and additional measures of competence such as observation, practical demonstrations, or supervisor assessment would help clarify how these learning approaches relate to cadres' performance over time.

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