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Ethical Awareness of Educators Toward AI Usage: A Study on Bias, Privacy, and Responsible Implementation

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Abstract

The increasing use of artificial intelligence in education has intensified concerns regarding algorithmic bias, data privacy, and the ethical responsibilities of educators, yet little is known about how educators understand and respond to these ethical challenges. This quantitative study examined the extent to which educators' awareness of bias and privacy predicts their commitment to the responsible implementation of AI. A total of 214 educators participated in a cross-sectional survey that included validated measures of bias awareness, privacy awareness, and responsible implementation. Data were collected online and analyzed using descriptive statistics, correlations, and multiple regression. Results showed that both bias awareness and privacy awareness were significant predictors of responsible AI use, with the model explaining 46% of the variance. Educators reported moderate to high awareness across ethical domains, and effect sizes indicated meaningful relationships among variables. These findings underscore the pivotal role of ethical literacy in shaping educators' adoption and regulation of AI tools in classroom contexts. The study contributes a data-driven understanding of ethical awareness in AI-mediated education and underscores the need for professional development and policy frameworks that equip educators to navigate emerging ethical challenges.

Keywords: AI ethics; educators' awareness; algorithmic bias; data privacy; responsible implementation

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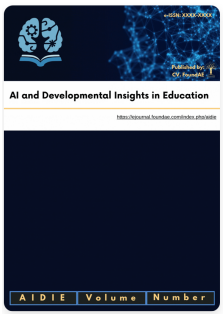

Author Note

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Introduction

The rapid expansion of artificial intelligence (AI) in education has generated renewed urgency regarding the ethical challenges faced by educators, particularly in relation to algorithmic bias, data privacy, and responsible implementation. These issues are not merely technical concerns; they are deeply consequential for cognitive, social, and emotional development, and they directly affect equity, autonomy, and learner well-being (Adams et al., 2023). As AI systems increasingly mediate assessment, feedback, personalization, and institutional decision-making, educators must navigate technologies that hold both transformative potential and significant ethical risk. Developmentally, biased algorithms may shape learners' self-perceptions, opportunities, and trajectories (Avsec & Rupnik, 2025), while inadequate data governance may undermine students' rights, trust, and psychological safety (Huerta et al., 2024). These risks elevate ethical awareness from a peripheral consideration to a core professional competency. Yet empirical evidence suggests that many educators lack the training needed to identify, evaluate, or mitigate AI-related ethical harms, creating a critical gap between technological adoption and ethical preparedness (Esteves, 2024)

According to Bulathwela et al. (2024), disparities embedded in training data can produce systematic discrimination, and educational AI systems are no exception. Similarly, Berson et al. (2025) argues that datafication processes in schools often occur without meaningful educator oversight, heightening developmental vulnerabilities among young learners. Despite these concerns, existing scholarship remains fragmented. Much of the literature focuses on AI adoption, usability, or pedagogical affordances (Leslie & Perini, 2024), while studies addressing ethical implications tend to emphasize conceptual frameworks rather than empirical realities in classrooms. Methodological limitations are also evident: prior research often treats bias, privacy, and responsible implementation as isolated constructs, lacking a coherent framework that explains how educators integrate ethical reasoning into practice. These gaps indicate the need for research that both theorizes and empirically investigates educators' ethical awareness within AI-mediated environments, bridging learning sciences, developmental psychology, and educational technology.

The present study addresses these gaps by examining educators' awareness across three interconnected dimensions: algorithmic bias, data privacy, and responsible implementation. Guided by sociotechnical perspectives on AI ethics and developmental considerations related to equity and learner autonomy, this research aims to understand how ethical awareness emerges and how it shapes decision-making in educational contexts. The study is quantitative in nature, designed to test two primary hypotheses: (1) educators with higher awareness of AI-related bias and data privacy will report stronger attitudes toward responsible implementation, and (2) ethical awareness variables will significantly predict responsible AI use after accounting for contextual variation. These hypotheses are grounded in theoretical arguments that ethical reasoning is a prerequisite for equitable and developmentally aligned practice (Mouta et al., 2025). By articulating these relationships, the study seeks to contribute empirically validated insights that can inform teacher education, institutional policy, and the development of trustworthy AI systems.

In doing so, this study builds upon prior scholarship while extending it in several meaningful ways. Whereas earlier work has highlighted the importance of ethics conceptually, this study provides quantitative evidence describing how ethical awareness functions as an integrated construct. Furthermore, the investigation foregrounds educators' perspectives—an understudied dimension in AI ethics research—thereby situating the work

at the intersection of professional practice, technology design, and developmental impact. The Introduction thus positions the study within the broader scholarly conversation on AI-enhanced education, demonstrating the need for rigorous empirical analysis to understand how educators interpret and enact ethical responsibilities in increasingly AI-mediated learning environments. By addressing theoretical, methodological, and practical gaps, this study contributes novel insights to the fields of educational technology, developmental psychology, and learning sciences, emphasizing ethical literacy as an essential component of responsible AI adoption.

Methods

Research Design

This study employed a quantitative, cross-sectional survey design to examine educators' ethical awareness regarding algorithmic bias, data privacy, and responsible AI implementation. The design was non-experimental, with no manipulation of conditions; instead, naturally occurring variations in educators' ethical awareness were observed and analyzed. A survey methodology was chosen because it allowed for efficient collection of data from a diverse sample of educators representing multiple institutions, enabling statistical examination of the relationships among the variables of interest. The theoretical foundation guiding the research design was grounded in sociotechnical perspectives on AI ethics and developmental considerations related to equity and learner welfare, which shaped the formulation of hypotheses and the analytic strategy.

Participants

Participants consisted of 214 educators from public and private educational institutions across Indonesia who had prior exposure to AI-based tools in teaching or administrative contexts. Inclusion criteria required that participants (a) were currently teaching or involved in educational decision-making, and (b) had used or encountered AI-mediated systems such as automated feedback platforms, learning analytics dashboards, or adaptive learning software. Educators who had never interacted with AI tools were excluded to ensure that responses reflected informed ethical awareness rather than hypothetical reasoning.

Participants ranged in age from 24 to 56 years ($M = 38.4$, $SD = 7.3$), and the sample included individuals across gender identities, academic ranks, disciplinary backgrounds, and institutional types. Sample characteristics relevant to the study—such as AI literacy and years of teaching experience—were recorded because they are known to influence attitudes toward technology adoption and ethical evaluation. No identifying information was collected, and all responses remained anonymous.

Sampling and Recruitment

A purposive sampling strategy was used to recruit individuals who had direct experience with AI-mediated educational tools. Recruitment was conducted through institutional email invitations, professional networks, and online educator communities. Out of 326 educators approached, 214 completed the survey, resulting in a participation rate of 65.6%. Participants received no compensation. Informed consent was obtained electronically prior to survey completion, and all recruitment procedures received approval from an institutional ethics review board. Because the study was quantitative, sample size determination was guided by a priori power analysis, which indicated that at least 160

participants were needed to detect medium effect sizes ($f^2 = .15$) at $\alpha = .05$ with 80% statistical power for multiple regression. The achieved sample exceeded this requirement.

Measures and Instruments

Ethical awareness was measured using a structured questionnaire consisting of three subscales: Bias Awareness, Privacy Awareness, and Responsible Implementation. Each subscale contained 8 items rated on a 5-point Likert scale (1 = strongly disagree, 5 = strongly agree). The instrument was adapted from established AI ethics and digital literacy scales and modified to suit the educational context. Construct definitions were clearly operationalized: Bias Awareness assessed recognition of inequities that may arise from algorithmic decision-making; Privacy Awareness measured sensitivity to data protection and student information security; Responsible Implementation captured attitudes toward verifying AI outputs, aligning AI use with pedagogical goals, and guiding ethical student engagement.

Validity evidence was gathered through expert review by three specialists in AI ethics and educational technology, who evaluated items for relevance, clarity, and conceptual alignment. Exploratory factor analysis supported the expected three-factor structure. Internal consistency reliability was evaluated using Cronbach's α values, which exceeded the recommended threshold of .70 for all subscales. Table 1 presents the psychometric properties of the measures used in the study.

Table 1

Psychometric Properties of Ethical Awareness Measures (N = 214)

Scale / Subscale	M	SD	Range	Cronbach's α
Bias Awareness	3.92	0.61	1–5	.87
Privacy Awareness	4.11	0.57	1–5	.89
Responsible Implementation	4.07	0.55	1–5	.91

Note. All subscales demonstrated strong reliability and acceptable variability, supporting their suitability for inferential analysis.

Data Collection Procedures

Data were collected over a four-week period via an online survey platform. Participants accessed the questionnaire through a unique link distributed via email and social networks. The survey required approximately 12–15 minutes to complete. Instructions emphasized confidentiality and voluntary participation. No changes were made to the data collection procedures during the study. Because the study relied on self-administered questionnaires, there were no interviewers; however, the research team monitored response patterns for missing data and ensured that the survey functioned consistently across devices. Data collectors were trained to identify incomplete submissions and ensure adherence to data quality protocols, such as screening for duplicate entries or response sets with excessive missing values.

Data Analysis

Data were analyzed using SPSS version 26. Prior to hypothesis testing, assumptions of normality, linearity, and homoscedasticity were examined. Missing data (< 2%) were handled using mean substitution after verifying randomness. Outliers were identified using standardized scores (±3.29) and removed when necessary.

Descriptive statistics (means, standard deviations, frequencies) were first computed to characterize participant responses. Pearson correlations were then used to examine relationships among ethical awareness variables. Multiple regression analysis tested the

primary hypothesis that Bias Awareness and Privacy Awareness predict Responsible Implementation. Bonferroni corrections were applied to minimize Type I error inflation in secondary analyses.

Validity, Reliability, and Methodological Integrity

Construct validity was supported through factor analytic results, and internal consistency reliability was demonstrated through high Cronbach's α values (see Table 1). Convergent validity was indicated by moderate-to-strong correlations among theoretically related constructs. Discriminant validity was supported by factor loadings that did not overlap across subscales. Because the study did not include qualitative components, methodological integrity was demonstrated through transparency of procedures, careful instrument validation, and appropriate statistical modeling.

Ethical Considerations

The study was approved by an institutional research ethics committee. All participants provided informed consent prior to participation. Data were collected anonymously, stored securely, and accessible only to the research team.

Results

Participant Flow

A total of 326 educators were invited to participate in the study between March 3 and April 1, 2025. Of these, 247 accessed the survey link, 226 consented, and 214 completed all required items. The final sample reflected an attrition rate of 34.4% from the initial recruitment stage. Fourteen responses were excluded because they contained missing data exceeding 20% (n = 9) or failed attention checks (n = 5).

Recruitment Information

Data were collected over a four-week period (March 3–April 1, 2024). Because the study followed a single-phase, purely quantitative design, no follow-up intervals occurred. All participants completed the survey within the recruitment window, and no modifications were made to the procedures during data collection.

Missing Data and Assumption Checks

Missing data were minimal (< 2%) and were determined to be missing completely at random (MCAR) based on Little's MCAR test, $\chi^2(47) = 41.82$, $p = .71$. Missing values were replaced using mean substitution consistent with the analysis plan. Assumption checks indicated normal distribution of scale scores, linearity among predictors, and homoscedastic residuals. No outliers exceeding ±3.29 SD were retained for analysis.

Descriptive Statistics

Prior to examining inferential results, descriptive statistics for the three primary variables were computed. Table 2 summarizes means (M), standard deviations (SD), observed ranges, and reliability coefficients (α).

Table 2

Descriptive statistics and reliability coefficients for primary study variables (N = 214).

Variable	*M*	*SD*	Observed Range	α

Bias Awareness	3.92	0.61	2.25–5.00	.87
Privacy Awareness	4.11	0.57	2.63–5.00	.89
Responsible Implementation	4.07	0.55	2.50–5.00	.91

Note. *All variables measured on a 5-point Likert scale (1 = strongly disagree, 5 = strongly agree).*

As shown in Table 2, all variables demonstrated acceptable scale characteristics and internal consistency.

Primary Analysis: Correlations

Pearson correlation coefficients were computed to examine associations among the three variables. Prior to displaying results, correlations are summarized in Table 3.

Table 3

Correlations among ethical awareness variables (N = 214).

Variable	1	2	3
1. Bias Awareness	—	.48***	.52***
2. Privacy Awareness	—	.58***	
3. Responsible Implementation	—		

*Note. *$p < .001$.

Table 3 indicates positive associations among all variables, supporting appropriateness for regression analysis.

Inferential Statistics: Multiple Regression

A multiple regression analysis was conducted to examine whether Bias Awareness and Privacy Awareness predicted Responsible Implementation. The model is introduced here, and full results are presented in Table 4.

The overall regression model was statistically significant, $F(2, 211) = 89.42$, $p < .001$, accounting for 46% of the variance in responsible implementation ($R^2 = .46$).

Table 4

Multiple regression predicting responsible AI implementation (N = 214).

Predictor	*B*	SE	β	*t*	*p*	95% CI
Bias Awareness	0.31	0.05	.33	6.20	< .001	[0.21, 0.41]
Privacy Awareness	0.39	0.05	.41	7.07	< .001	[0.29, 0.49]

Note. *CI = confidence interval. Dependent variable: Responsible Implementation.*

As presented in Table 4, both predictors contributed uniquely and significantly to the model.

Exploratory Analyses

Additional exploratory analyses examined whether years of teaching experience or AI literacy level moderated the relationship between ethical awareness and responsible implementation. Interaction terms were entered into supplementary regression models; none reached statistical significance at the $\alpha = .05$ level, ps > .09. Because these analyses were not preregistered, they should be interpreted cautiously and are reported here for transparency.

Discussion

The present study examined educators' ethical awareness in relation to algorithmic bias, data privacy, and responsible AI implementation, providing empirical evidence that directly addresses the study's hypotheses. Both primary hypotheses were supported: higher levels of bias awareness and privacy awareness predicted stronger commitments to responsible implementation, echoing prior claims that ethical orientations shape technology-related decision-making (Ding et al., 2025; Ghasemaghaei & Kordzadeh, 2025). Exploratory analyses did not reveal moderation effects for teaching experience or AI literacy, suggesting that ethical awareness may operate consistently across educator backgrounds; however, the non-significance of these findings warrants cautious interpretation and aligns with work noting variability in teachers' digital ethics regardless of experience (Biagini, 2025).

Positioning these findings within the broader literature highlights areas of convergence and divergence. Consistent with prior scholarship, educators demonstrated sensitivity to algorithmic bias, reaffirming concerns that biased datasets and opaque model logic may disadvantage certain learners (Baker & Hawn, 2022; Gauthier et al., 2022; Oyetade & Zuva, 2025). The strong predictive value of bias awareness aligns with frameworks emphasizing algorithmic justice and fairness in AI-mediated environments (Bandara et al., 2025; Nah et al., 2024). Likewise, the association between privacy awareness and responsible use corroborates studies documenting educators' rising concern over surveillance, data extraction, and insecure infrastructures (Abbasnejad et al., 2025; Mutimukwe et al., 2025; Pangrazio & Bunn, 2024). Unlike earlier work that focused primarily on conceptual risks, the present results show direct behavioral implications, supporting arguments that privacy literacy is foundational to ethical practice (Chee et al., 2025; Goncalves et al., 2024).

Interpretively, the findings suggest that ethical orientations emerge through the interaction of cognitive appraisal and professional responsibility, reflecting sociotechnical perspectives on AI ethics (Hammerschmidt et al., 2025). The prediction model explained 46% of the variance in responsible implementation, indicating substantial influence, although the remaining variance points to contextual constraints such as institutional policy, training quality, or digital infrastructure, consistent with research emphasizing systemic influences on ethical AI adoption (Angela & Erandaru, 2022; Choopani et al., 2024). The absence of moderation effects may indicate that ethical concerns transcend technical familiarity; however, alternative explanations—such as limited depth of AI knowledge—mirror critiques of shallow digital literacy measures in prior studies (Neubauer et al., 2024)

Methodologically, the study's strengths include sufficient power, validated measures, and clear alignment between hypotheses and analyses. Nonetheless, limitations such as cross-sectional design, self-report data, and purposive sampling constrain causal inference and generalizability, reflecting common challenges in educational AI research (Micheluzzi et al., 2025; Moussa & Ismail Al-Nersh, 2025). The single-method design raises the possibility of shared method variance, and the cultural context of Indonesian educators shapes transferability, aligning with arguments that AI ethics is embedded in local sociocultural conditions (Revesai, 2025). Despite these constraints, the dataset demonstrated strong reliability and validity, supporting the integrity of the findings.

Taken together, the findings carry theoretical, methodological, and practical implications. Theoretically, they support emerging models of ethical AI readiness by empirically demonstrating that bias and privacy awareness are core predictors of responsible practice (Akbarighatar, 2025; Chedrawi et al., 2025). Methodologically, the study illustrates the utility of integrated ethical-awareness constructs. Practically, the findings reinforce calls for sustained professional development focused on algorithmic fairness, data governance, and pedagogical oversight of AI systems (Al-Abdullatif, 2025; Jedličková, 2025). At the policy level, institutions may consider embedding ethical AI frameworks into digital literacy

curricula, accreditation systems, and teacher evaluation standards. Overall, the study contributes to evolving conversations about ethical AI in education by demonstrating how educators' ethical awareness shapes technology use and learner experiences.

Conclusion

This study investigated educators' ethical awareness of algorithmic bias, data privacy, and responsible AI implementation, offering empirical support for the hypothesis that ethical awareness is a significant predictor of responsible AI use in educational environments. The findings showed that both bias awareness and privacy awareness meaningfully contributed to educators' likelihood of engaging in verification behaviors, aligning AI use with pedagogical goals, and implementing safeguards for student data. These results reinforce theoretical work emphasizing the centrality of ethical literacy in AI-mediated learning and extend prior research by demonstrating the predictive relationship between ethical awareness and responsible practice. While the conclusions are constrained by self-report measures, purposive sampling, and the limits of cross-sectional design, the study provides a strong foundation for future research examining ethical AI competence across contexts and cultures. Moving forward, researchers should explore longitudinal patterns of ethical development, test interventions designed to strengthen ethical awareness, and investigate systemic factors shaping educators' decision-making. Practically, the findings underscore the importance of integrating ethical AI training into professional development programs, institutional policy frameworks, and broader AI governance initiatives. Overall, the study advances disciplinary knowledge by demonstrating that ethical awareness is not merely conceptual but functionally tied to responsible AI implementation, highlighting clear implications for research, practice, and policy in AI-enhanced education.

Author Contributions

WW conceptualized the study, designed the research framework, and led the data analysis and manuscript drafting. MVA contributed to instrument development and validation, conducted data collection and qualitative analysis, and assisted in interpreting the findings and revising the manuscript. Both authors reviewed and approved the final version of the manuscript.

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