

Consistent Improvement in Awareness of Violence Prevention Among Computer Science and Nutrition Students Following Digital Indonesian Language Instruction Based on Outcome-Based Education

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ABSTRACT

Integrating the prevention and management of violence into required university-level coursework requires evidence that the benefits of such learning extend beyond a single disciplinary context. This study aims to analyze the consistency of changes in students' understanding of violence prevention and response among undergraduate students in Computer Science and Nutrition following the use of an Outcome-Based Education digital Indonesian-language textbook. The study employed quantitative secondary analysis of 66 pairs of pre- and post-test scores comprising 15 Computer Science students and 51 Nutrition students. The instrument consisted of a knowledge test with a score range of 0 to 10. Changes within groups were tested using the Wilcoxon signed-rank test. In contrast, differences in changes between groups were tested using the Mann-Whitney U test, Fisher's exact test, and ANCOVA sensitivity analysis with robust standard errors. Scores increased significantly among Computer Science students from 5.87 to 7.87 ($Z = -2.92$; $p = 0.003$) and among Nutrition students from 6.25 to 8.61 ($Z = -6.09$; $p < 0.001$). The average increase for each group was 2.00 and 2.35 points, respectively. The difference in score increases between the groups was not significant ($U = 432.00$; $p = 0.446$; Cliff's delta = 0.129). After controlling for baseline scores, the academic program was also not significantly associated with post-test scores ($b = 0.638$; $p = 0.231$). A total of 52 of 66 students showed an increase in scores, with no decreases. The findings indicate a pattern of improvement in both disciplines. However, they do not yet demonstrate equivalence of effects because the group sizes were unequal and the study did not include a control group. The novelty of this study lies in testing the cross-disciplinary applicability of campus safety literacy integrated into language learning.

Keywords: digital textbooks, violence prevention, Outcome-Based Education, Indonesian language, higher education.

Introduction

Violence in higher education settings, including gender-based violence, cyberviolence, and interpersonal violence, remains a widespread issue among the student population (Esposito et al., 2024). Conventional prevention approaches are often limited by low participant engagement, scalability constraints, and a lack of cultural responsiveness (Córdor et al., 2025). These conditions have spurred the search for an intervention model capable of reaching students across all academic programs equally (Rabuya, 2023). Higher education institutions in Indonesia are subject to regulatory requirements to implement violence prevention and response measures as part of safe campus governance (Suardi et al., 2026).

Digital language instruction is emerging as a promising medium for instilling safety awareness among students (Kristian, 2024). Online modules, educational games, and chatbots have been shown to enhance knowledge, attitudes, and engagement as active bystanders among students (Willard et al., 2025). Interactive elements such as simulations and role-playing strengthen engagement and retention of learning material (Bosworth et al., 1996). However, evidence of sustained behavioral change remains limited in the absence of institutional reinforcement (Jouriles et al., 2018).

The effectiveness of digital interventions is greatly influenced by cultural adaptation to the user's context. Interventions tailored to cultural values enhance acceptance and learning outcomes, particularly in collectivist societies (Albor et al., 2024). Programs aligned with community experiences can address the unique needs of target groups (de Heer et al., 2026). Andragogical principles that link learning to participants' life experiences further enhance the relevance and retention of the material (Hannon, 2025).

The use of artificial intelligence and gamification strengthens motivation and engagement in language learning (Mi & Fan, 2026). Integrating gamification elements boosts motivation and encourages changes in learning behavior (Liu,

2025). A supportive blended learning environment reduces language anxiety while increasing participation (Ghosh, 2024). Emotional intelligence training incorporated into digital instruction improves attitudes toward violence prevention and emotional regulation skills (Chen et al., 2026).

A review of the existing literature shows that the majority of evaluations focus on knowledge and attitudes (Aragon et al., 2023), rather than on direct measurements of behavior (Anderson & Whiston, 2005). Most studies also rely on short follow-up periods and self-report measures (DeGue et al., 2014). The cross-disciplinary applicability of safety literacy interventions integrated into language learning has not been extensively tested empirically. This gap becomes more pronounced when prevention programs are embedded in required courses taken by students from diverse academic disciplines.

Violence prevention content embedded in Indonesian-language courses presents an opportunity to reach all students, regardless of their major. There is currently insufficient evidence regarding whether the resulting shifts in attitudes are consistent across different disciplinary backgrounds. Research comparing patterns of change between the exact and computational sciences and the health sciences remains scarce. This lack of evidence regarding cross-disciplinary applicability constitutes an empirical gap that needs to be addressed systematically (Bucci & Trantham, 2014).

This study aims to analyze the consistency of changes in perspectives on the prevention and management of violence among Computer Science and Nutrition students after using a digital Indonesian language textbook based on *Outcome-Based Education*. The main research question is whether these changes in perspectives are consistent across the two different disciplinary backgrounds. The scientific contribution offered here is not product development, but rather preliminary evidence regarding the interdisciplinary applicability of campus safety literacy. The novelty of this study lies in testing patterns of change in violence

prevention content across two academic disciplines with distinct characteristics.

2. Methodology

2.1 Research Design

This study employs a quantitative secondary analysis of paired pre- and post-test data collected during the summative evaluation phase of the development of an *Outcome-Based Education* digital Indonesian language textbook focused on the prevention and management of violence. This secondary analysis does not re-examine the product's validity or practicality. The analysis focuses on comparing patterns of score changes by academic program. Participants were not randomly assigned, and all received the same instruction; therefore, the design is classified as an exploratory comparative analysis rather than a causal-comparative experiment.

2.2 Participants and Data Sources

The dataset comprised 66 students with complete paired scores: 15 Computer Science undergraduates and 51 Nutrition undergraduates. All pre-test, post-test, and academic program data were available with no missing values. A check of identification numbers in the source files revealed no duplicates. Personal identifiers were not used in the analysis and are not included in the main text or the article's appendices.

2.3 Intervention and Instruments

Participants took part in Indonesian-language instruction using a digital textbook based on Outcome-Based Education, which integrated violence-prevention material into the context of academic communication. Scores were derived from 10 multiple-choice questions measuring recognition of verbal violence, support for victims, *victim blaming*, bystander intervention, privacy protection, the role of the academic community, reporting, the basis of prevention policies, ethical awareness, and the confidentiality of victims' identities. Each correct answer is worth 1 point, so the total score ranges from

0 to 10. The available data file contains only total scores, not item-by-item responses.

2.4 Research Variables

The main variables of the study were the pre-test and post-test scores on violence prevention awareness. The grouping variable was the academic program, namely the Bachelor of Computer Science and the Bachelor of Nutrition. The indicators of change included the difference between post-test and pre-test scores, whether the status improved or remained the same, individual N-gain, and N-gain relative to the class average.

2.5 Data Analysis Techniques

The analysis began with an examination of data completeness, duplicates, score ranges, and the distribution of score differences. Means, standard deviations, medians, interquartile ranges, and 95% bootstrap confidence intervals were used to describe the changes. The Shapiro-Wilk test indicated that the score differences were not normally distributed; therefore, changes within groups were tested using the Wilcoxon signed-rank test with a correction for zero differences.

Differences in score differences and N-gain between groups were tested using the Mann-Whitney U test. The magnitude of the differences was reported using Cliff's delta. Differences in the proportions of students who improved versus those who remained the same were tested using Fisher's exact test due to several small cell counts. As a sensitivity analysis, post-test scores were regressed on pre-test scores and major using ANCOVA with HC3 as the standard error. The relationship between initial scores and changes was evaluated exploratorily using Spearman's correlation. All tests were two-tailed with a significance level of 0.05.

Individual N-gain is calculated using the formula: $\text{posttest score} - \text{pretest score} \div 10$ minus the pretest score. Categories are defined as low for values below 0.30, moderate for values between

0.30 and just under 0.70, and high for values of 0.70 or above. Class N-gain is calculated as the average difference divided by the maximum score minus the average pretest score. Both values are reported separately to avoid confusion.

3. Results

3.1 Data Completeness and Distribution

A total of 66 data pairs were analyzed without missing values, comprising 51 Nutrition undergraduate students (77.27%) and 15 Computer Science undergraduate students (22.73%). Pre-test scores ranged from 3 to 9, while post-test scores ranged from 5 to 10. The score differences were not normally distributed in the overall data ($W = 0.918$; $p < 0.001$), the Nutrition group ($W = 0.922$; $p = 0.002$), or the Computer Science group ($W = 0.848$; $p = 0.016$). Therefore, the test for significant changes used a nonparametric procedure.

Table 1 presents the changes in scores overall and by program of study. The data in the table show a positive trend across all analysis groups.

Table 1. Changes in violence prevention scores overall and by academic program

Group	n	Pre-test M (SD)	Post-test Mean (SD)	Mean Increase (SD)	Median Increase [IQR]	Wilcoxon Z
Overall	66	6.17 (1.37)	8.44 (1.54)	2.27 (1.78)	2.00 [1.00-3.00]	$Z = -6.78$
Bachelor of Science in Computer Science	15	5.87 (1.19)	7.87 (1.81)	2.00 (2.10)	1.00 [0.00-3.50]	$Z = -2.92$
Bachelor of Science in Nutrition	51	6.25 (1.41)	8.61 (1.43)	2.35 (1.68)	2.00 [1.00-3.00]	$Z = -6.09$

Note: IQR = interquartile range. No participants in either group showed a decrease in scores.

The data in Table 1 confirm that all groups experienced a significant increase in mean scores as determined by the Wilcoxon test. No participants showed a decrease in scores,

indicating that the direction of change was uniform. The differences in the magnitude of the increase between groups were relatively small at the descriptive level.

3.2 Score Changes in Each Academic Program

For undergraduate Computer Science students, the average score increased from 5.87 (SD = 1.19) to 7.87 (SD = 1.81). The average increase was 2.00 points, with a 95% bootstrap confidence interval ranging from 1.00 to 3.07. The Wilcoxon test indicated a significant change ($Z = -2.92$; $p = 0.003$). Nine students (60.00%) showed an increase, while six students (40.00%) remained unchanged.

Among Nutrition undergraduate students, the average score increased from 6.25 (SD = 1.41) to 8.61 (SD = 1.43). The average increase was 2.35 points, with a 95% bootstrap confidence interval ranging from 1.90 to 2.82. This change was statistically significant based on the Wilcoxon test ($Z = -6.09$; $p < 0.001$). A total of 43 students (84.31%) showed an improvement, while eight students (15.69%) remained unchanged.

3.3 Comparison of Changes Between Groups

The average difference in score between the Nutrition and Computer Science groups was 0.35 points. The 95% bootstrap confidence interval ranges from -0.79 to 1.46, thus including zero. The Mann-Whitney test did not show a significant difference in the increase ($U = 432.00$; $p = 0.446$). The delta value of 0.129 indicates a small effect size. The proportion of students who showed improvement was greater in the Nutrition group (84.31%) than in the Computer Science group (60.00%). The odds ratio was 3.58, but Fisher's exact test result was not significant ($p = 0.069$). This finding is treated as a trend requiring a larger sample size in the Computer Science group, rather than as evidence of a difference between disciplines.

A sensitivity analysis controlling for pre-test scores also found no significant association between program of study and post-test scores (b

= 0.638; SE-HC3 = 0.528; 95% CI [-0.417; 1.692]; p = 0.231). The data do not provide sufficient statistical evidence that Nutrition and Computer Science students achieved different changes after accounting for baseline scores. This statement is not equivalent to proving that the two groups are equivalent.

3.4 Distribution of N-gain Categories

Table 2 presents the distribution of N-gain categories by major. The distribution of categories shows a predominance of moderate-to-high categories across the overall data.

Table 2. Distribution of N-gain categories by major

Group	Individual N-gain M (SD)	Class N-gain
Overall	0.604 (0.402)	0.593
Bachelor of Science in Computer Science	0.460 (0.454)	0.484
Bachelor's Degree in Nutrition	0.646 (0.380)	0.628

The difference in individual N-gain between the two study programs was not significant (U=471.50; p=0.156). In the overall data, the N-gain based on the class average was 0.593, while the average individual N-gain was 0.604. Both values fall into the moderate category but are considered two distinct measures.

3.5 Relationship Between Initial Scores and Score Increases

Initial scores were negatively correlated with score gains (rho = -0.467; p < 0.001). Participants with lower initial scores tended to have greater room for improvement. These results should be interpreted with caution because the maximum score is only 10; thus, ceiling effects and the mathematical relationship between the initial score and the score difference may amplify the negative correlation. These findings are presented as an exploratory analysis,

not as evidence that prior knowledge determines the magnitude of improvement.

4. Discussion

4.1 Consistency of Attitudinal Changes Across Two Disciplinary Backgrounds

The integration of violence prevention content into the Indonesian Language course demonstrated simultaneous changes in perspectives across two disciplinary backgrounds. This finding reinforces the idea that required courses can serve as a cross-disciplinary vehicle for campus safety literacy. These results align with evidence that digital language-based interventions enhance students' knowledge and engagement as active bystanders (Willard et al., 2025). The consistency in the direction of change across the Computer Science and Nutrition groups indicates that the approach is applicable beyond a single academic discipline.

This consistent pattern of improvement can be explained by the principles of andragogy, which link new material to participants' academic experiences (Hannon, 2025). Incorporating the context of academic communication into violence prevention material allows students from different disciplinary backgrounds to relate the knowledge to campus situations they recognize (Zahiro et al., 2026). An *Outcome-Based Education* design provides explicit learning outcomes, ensuring that the learning process is directed toward measurable indicators of understanding (Mufanti et al., 2024).

4.2 Absence of Differences Between Groups as Initial Consistency

The absence of significant differences in improvement between groups is interpreted as initial consistency, not as evidence of equivalence or non-inferiority. The Computer Science group size of only 15 students is too small to support a conclusion of equivalence. The small Cliff's delta value and the confidence interval that includes zero

confirm that the data are not yet sufficient to statistically distinguish the two groups. This finding is consistent with warnings in the literature that sample-size limitations constrain the power of inference in campus intervention evaluations (Fielding-Miller et al., 2025).

The results for the Nutrition group appeared higher at the descriptive level, but the margin of measurement uncertainty remains wide. The larger proportion of improvement in the Nutrition group, accompanied by an odds ratio of 3.58, did not reach statistical significance in Fisher's exact test. These findings should be treated as a trend that requires replication with a more balanced sample. Follow-up research should involve several study programs with an equivalent number of participants to strengthen the comparison.

4.3 Limits of Interpretation Between Knowledge and Behavior

The increase in scores in this study reflects changes in knowledge and situational responses, rather than changes in attitudes or actual reporting behavior. The 10-item instrument measures factual understanding and recognition of appropriate actions, but does not capture actual behavior in the field. The literature confirms that most prevention program evaluations focus on knowledge and attitudes rather than behavior (Anderson & Whiston, 2005). Sustained behavioral change generally requires institutional reinforcement and a longer follow-up period (Jouriles et al., 2018).

The sustainability of digital interventions' impact heavily depends on embedding the program within institutional policies (Suardi et al., 2026). Campus governance that provides reporting mechanisms and victim protection reinforces the benefits of learning about prevention. Integrating the material into required courses is one step, but it must be complemented by systemic support to ensure that insights translate into action (Cahyanti et al., 2025). Cultural adaptation to

the Indonesian campus context also determines the material's relevance to students (de Heer et al., 2026).

4.4 Implications, Limitations, and Directions for Future Research

The theoretical implications of this study lie in providing preliminary evidence of the interdisciplinary applicability of safety literacy integrated into language learning. The practical implications point to using the Indonesian Language course as a channel to convey insights into violence prevention to students across various academic programs. Policy implications suggest incorporating prevention content into the required curriculum, with support from institutional governance (Córdor et al., 2025).

The main limitations of the study include the absence of a control group, an imbalance in group sizes, and reliance on short-term self-report data. The lack of randomization precludes claims of causation, so the findings are presented as associations and post-intervention changes. The instrument, which includes only total scores, limits analysis to the item level. The short follow-up period also limits the assessment of sustained changes (DeGue et al., 2014).

5. Conclusion

This study found that the use of digital Indonesian language textbooks based on *Outcome-Based Education* with a focus on violence prevention was associated with a significant increase in scores among both Computer Science and Nutrition students, with no detectable difference in the increase between the groups. The consistent pattern of improvement across these two disciplinary backgrounds provides preliminary evidence of the cross-disciplinary applicability of campus safety literacy integrated into language learning. The originality of this study lies in testing the consistency of change patterns across academic disciplines, rather than in product development. These findings underscore the potential of required courses

as a vehicle for conveying violence-prevention insights to students uniformly.

Strategic recommendations focus on incorporating violence-prevention content into the required curriculum, with support from institutional governance and clear reporting mechanisms. Further research is recommended to use a design with a control group, balance sample sizes across study

programs, and involve more academic disciplines to strengthen the conclusions regarding applicability. Future studies should extend the follow-up period and include measures of attitudes and reporting behavior to complement the knowledge measures. The development of instruments that record item-by-item responses will enrich the analysis at the level of specific competencies.

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8. Author Declaration

The author declares that this manuscript is an original work that has not been published elsewhere. The author declares that there are no conflicts of interest in the research or in the writing of this article.