

IMPROVING STATISTICAL LITERACY AND THE USE OF ARTIFICIAL INTELLIGENCE IN RESEARCH AMONG NUTRITION STUDENTS THROUGH EDUCATIONAL ACTIVITIES

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Abstract. *The increasing use of artificial intelligence (AI) in health education and research provides opportunities to support learning and statistical understanding, but also raises concerns regarding information accuracy, data privacy, and academic integrity. This community service program aimed to strengthen statistical literacy and responsible AI use in health research among nutrition students through interactive education. The participants were eight undergraduate students with a nutrition specialization from a health education institution in Jakarta. The activity was conducted online on September 19, 2026, through interactive presentations, practical demonstrations, discussions, and question-and-answer sessions covering statistical literacy, AI-assisted research, prompt formulation, statistical output interpretation, information verification, data privacy, and research integrity. Evaluation used a 12-item questionnaire consisting of eight closed-ended and four open-ended questions. Descriptive and thematic analyses identified four main themes: AI as a learning and research support tool, AI-assisted statistical understanding, awareness of AI-related risks, and human responsibility and critical thinking. Participants recognized AI as useful for understanding statistical concepts, interpreting outputs, searching for information, and supporting research activities, while emphasizing verification, data anonymization, and avoiding excessive dependence on AI. The activity strengthened participants' conceptual understanding of statistical literacy and responsible AI use in health research.*

Keywords: *AI literacy, health research, nutrition students, statistical literacy*

Abstrak. Penggunaan artificial intelligence (AI) dalam pendidikan dan penelitian kesehatan memberikan peluang untuk mendukung pembelajaran dan pemahaman statistik, tetapi juga menimbulkan tantangan terkait akurasi informasi, privasi data, dan integritas akademik. Program pengabdian kepada masyarakat ini bertujuan memperkuat literasi statistik dan pemanfaatan AI secara bertanggung jawab dalam penelitian kesehatan pada mahasiswa gizi melalui edukasi interaktif. Peserta terdiri atas delapan mahasiswa dengan peminatan gizi dari institusi pendidikan kesehatan di Jakarta. Kegiatan dilaksanakan secara daring pada 19 September 2026 melalui presentasi interaktif, demonstrasi, diskusi, dan tanya jawab yang mencakup literasi statistik, AI dalam penelitian, penyusunan prompt, interpretasi output statistik, verifikasi informasi, privasi data, dan integritas penelitian. Evaluasi menggunakan kuesioner 12 pertanyaan yang terdiri atas delapan pertanyaan tertutup dan empat pertanyaan terbuka. Analisis deskriptif dan tematik menghasilkan empat tema utama, yaitu AI sebagai pendukung pembelajaran dan penelitian, AI dalam pemahaman statistik, kesadaran terhadap risiko AI, serta tanggung jawab manusia dan berpikir kritis. Peserta mengidentifikasi manfaat AI dalam memahami statistik, menginterpretasikan output, mencari informasi, dan mendukung penelitian, sekaligus menekankan pentingnya verifikasi, anonimisasi data, dan menghindari ketergantungan berlebihan. Kegiatan memperkuat pemahaman konseptual peserta mengenai literasi statistik dan pemanfaatan AI secara bertanggung jawab dalam penelitian kesehatan.

Kata Kunci: literasi AI, literasi statistik, mahasiswa gizi, penelitian kesehatan

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INTRODUCTION

Artificial intelligence (AI), particularly generative artificial intelligence (GenAI) and large language models (LLMs), is increasingly being integrated into health education and research. These technologies can support academic activities such as information retrieval, literature exploration, research planning, scientific writing, and interpretation of complex information. For nutrition students, who are expected to engage with evidence-based nutrition practice and research, AI may provide an additional tool for accessing and understanding scientific knowledge. However, the increasing availability of AI also requires students to develop appropriate AI

literacy so that these technologies are used as supportive tools rather than as substitutes for independent academic reasoning (Colosimo et al., 2021; Montazeri et al., 2026; Sen, 2025).

Statistical literacy is equally important for nutrition students because nutrition research frequently involves quantitative measurements, dietary assessment, anthropometric indicators, epidemiological measures, and statistical analysis. Generative AI has the potential to support statistics education by explaining statistical concepts, providing examples, assisting with statistical programming, and helping learners understand analytical procedures. Nevertheless, AI-generated statistical recommendations may be inappropriate when the research design, variable characteristics, assumptions, or analytical objectives are not adequately considered. Therefore, students need sufficient statistical knowledge to critically evaluate AI-generated explanations and distinguish appropriate statistical reasoning from potentially misleading outputs (Vilakati, 2026).

AI may also contribute to different stages of the research process, from developing research questions and searching the literature to data analysis and scientific communication. Effective interaction with AI depends substantially on the ability to formulate clear and context-specific prompts. Structured prompt engineering has therefore been proposed as an important competency for researchers using generative AI, particularly in health and medical research. At the same time, the use of AI in academic research requires attention to methodological validity, transparency, and human oversight. AI-generated content should be evaluated against original scientific sources and should not be accepted solely because it is presented in fluent or authoritative language (Alhowaish et al., 2026; J. Y. Ng, 2026).

Despite the rapid development of AI applications in education and health research, a practical educational gap remains regarding interventions that simultaneously address AI literacy and statistical literacy among nutrition students. Existing educational activities and learning practices have predominantly focused on the use of AI for information retrieval, research support, scientific writing, or individual research tasks, while relatively limited attention has been given to short educational programs specifically designed to teach nutrition students how to use AI responsibly alongside basic statistical reasoning. Concerns regarding inaccurate AI-generated information and unreliable citations further reinforce the need for critical verification skills and appropriate guidance in using AI for academic and research activities (Linardon et al., 2025; Thakur et al., 2024). Therefore, this community service activity aimed to provide an integrated educational intervention on statistical literacy and responsible AI utilization in health research among nutrition students and to explore participants' perceptions and understanding following the educational activity.

METHOD

The community service activity was conducted online on 19 September 2026 and involved eight undergraduate students from the Bachelor of Nutrition Study Program at a health polytechnic institution in Jakarta, Indonesia. The participants were recruited from nutrition students who had received basic statistics training but had limited experience applying statistical concepts and AI tools in health research. The eight participants were selected based on availability and the capacity for intensive interaction during the online activity. The activity consisted of three stages: preparation, implementation, and evaluation. The intervention was delivered through an interactive online presentation using Zoom for approximately 60 minutes, incorporating practical examples, AI-assisted research demonstrations, guided discussions, and question-and-answer sessions. The materials covered basic statistics, AI as a research co-pilot, prompt formulation, literature exploration, statistical analysis and SPSS interpretation, AI hallucination, information verification, and research ethics. ChatGPT and SPSS version 27 were demonstrated using a health research dataset. The evaluation explored participants' perceptions and understanding following the educational activity through a questionnaire. An example of the educational material presented to participants is shown in Figure 1.

The educational activity was evaluated using a mixed-format questionnaire comprising 12 questions: eight closed-ended and four open-ended. The questionnaire was developed based on the educational objectives and reviewed for content relevance. The closed-ended questions assessed understanding of AI use, statistical interpretation, data privacy, anonymization, information verification, and research integrity, while the open-ended questions explored participants' AI experience, perceived benefits and risks, and views on responsible AI use. Open-ended responses were descriptively grouped into recurring themes, while closed-ended responses were used to describe participants' understanding of the educational content. Participation was voluntary, and informed consent was obtained from all participants before the activity and questionnaire completion.



Figure 1. Educational material on the use of artificial intelligence in health research

RESULTS AND DISCUSSION

The educational intervention involved eight undergraduate students with a nutrition specialization from a health education institution in Jakarta. All participants reported previous experience using artificial intelligence (AI), particularly for academic activities such as searching for references, summarizing learning materials, obtaining explanations of difficult concepts, preparing assignments, and supporting examination preparation. This finding indicates that AI was already familiar to the participants before the intervention. However, their previous use was predominantly task-oriented, suggesting that familiarity with AI tools does not necessarily represent the ability to use AI critically and responsibly within the research process. Documentation of the educational process and participant engagement is presented in Figure 2.

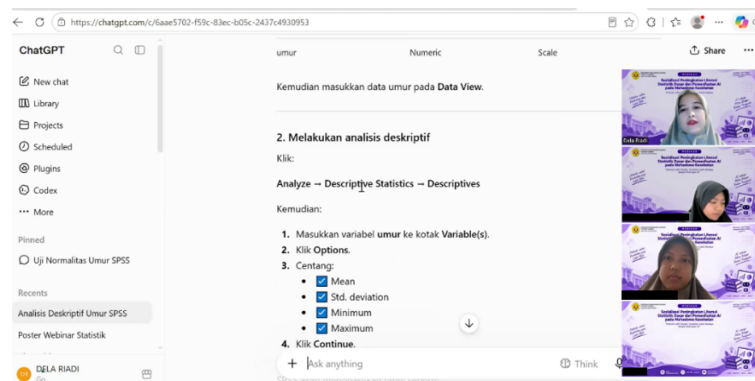


Figure 2. Implementation of interactive education on statistical literacy and responsible use of artificial intelligence in health research

After the educational activity, all eight participants (8/8; 100%) recognized AI as a useful tool for learning and research, including understanding academic materials, generating research ideas, and interpreting statistical outputs using simpler explanations. All participants also recognized the importance of effective prompting, verification of AI-generated information using reliable sources, protection of sensitive information, data anonymization, and avoiding the fabrication or manipulation of research data. Responses to the open-ended questions indicated that participants had used AI for finding references, completing academic assignments, summarizing learning materials, preparing for examinations, and explaining difficult concepts. Participants perceived AI as useful for simplifying statistical concepts, supporting statistical interpretation, literature exploration, and data analysis, while identifying inaccurate information, bias, data privacy and confidentiality, plagiarism, and excessive dependence as key risks. Participants emphasized that AI should serve as a supporting tool rather than replace independent thinking, analysis, validation, decision-making, and academic responsibility. These findings indicate that participants expressed awareness of AI as a supportive resource for statistical learning and research rather than as an autonomous source of methodological decisions.

The participants also demonstrated awareness of several principles of responsible AI use in health research. All participants identified patient names and medical record numbers as information that should not be entered into publicly accessible AI systems and recognized anonymization as a necessary measure for protecting individual identity. Participants further acknowledged that AI-generated information may be inaccurate and therefore requires verification. In addition, all participants identified data fabrication or manipulation as inappropriate uses of AI in research. These responses indicate that participants expressed awareness of privacy, verification, and research integrity as essential components of AI-assisted research. However, the uniformly positive responses should be interpreted cautiously, as they may reflect a ceiling effect or social desirability bias resulting from the use of relatively straightforward items and the immediate post-activity evaluation conducted by the activity organizers.

The qualitative responses were grouped into four interrelated themes: AI as a learning and research support tool, AI-assisted statistical understanding, awareness of AI-related risks, and human responsibility and critical thinking. In response to the questions regarding previous AI use and its potential role in learning and research, participants described AI as useful for simplifying statistical explanations, providing step-by-step guidance for statistical software, supporting literature searches, and assisting with the interpretation of research findings, with one participant stating that AI could “membantu menjelaskan konsep statistik yang rumit secara intuitif” (help explain complex statistical concepts intuitively). In response to the question regarding risks associated with AI use in health research, participants identified inaccurate information, data leakage, biased or fabricated information, plagiarism, and excessive dependence on AI; one participant noted the risks of “bias atau informasi palsu, pelanggaran kerahasiaan data pasien/subjek, serta potensi plagiarisme” (bias or false information, breaches of patient/subject data confidentiality, and potential plagiarism). In response to the question concerning the use of AI without replacing students' critical thinking and responsibility, participants emphasized the need to use AI as a discussion partner or reference tool while retaining independent verification, interpretation, and decision-making; one participant stated that AI should be used “sebagai mitra diskusi, pembanding ide, atau alat efisiensi kerja” (as a discussion partner, idea comparator, or work-efficiency tool), while validation, interpretation, decision-making, and research ethics should remain the student's responsibility. Collectively, these findings indicate that participants expressed awareness of the potential benefits, risks, and responsible use of AI in health research, rather than demonstrating a measurable conceptual shift, as no baseline assessment was conducted.

The findings demonstrate that prior exposure to artificial intelligence (AI) does not necessarily indicate adequate AI literacy for research purposes. Although all participants had previously used AI for assignments, summarizing learning materials, and academic support, their responses highlighted the distinction between familiarity with AI tools and the ability to use them

critically and responsibly. In the context of health education, AI literacy extends beyond the technical ability to interact with AI systems and includes the capacity to understand AI concepts, evaluate AI-generated information, recognize system limitations, and maintain independent judgment (Long & Magerko, 2020; D. T. K. Ng et al., 2021). The increasing integration of AI into higher education has created opportunities for personalized learning, academic support, and improved access to educational resources, while simultaneously requiring appropriate pedagogical guidance and critical engagement (Tlili et al., 2023; Zawacki-Richter et al., 2019). These findings suggest that AI education for health students should move beyond tool-oriented training toward an integrated approach that develops AI literacy, critical evaluation, research reasoning, and ethical awareness.

The participants' reflections further indicate that AI can function as a cognitive scaffold for understanding statistical concepts and research procedures. Participants perceived AI as useful for simplifying statistical explanations, interpreting statistical outputs, providing step-by-step guidance, and supporting literature searches. Generative AI can facilitate explanation and learning support, but its educational value depends substantially on how learners evaluate and engage with its outputs (Kasneci et al., 2023; Lo, 2023). Nevertheless, these benefits should not be interpreted as evidence that AI can replace statistical reasoning. Appropriate statistical interpretation still depends on the research question, study design, variable characteristics, statistical assumptions, effect estimates, and uncertainty. AI-generated explanations may facilitate conceptual learning, but reliance on ready-made answers may encourage superficial understanding and reduce independent reasoning. This concern is particularly relevant because generative AI systems can produce fluent and plausible responses that contain factual inaccuracies or unsupported information (Ji et al., 2023). Furthermore, the use of AI in research requires researchers to retain responsibility for evaluating information and making methodological decisions rather than delegating these decisions to AI systems (van Dis et al., 2023). Therefore, AI should be positioned as a learning support mechanism that assists students in understanding complex concepts while maintaining their active role in evaluating evidence and making methodological decisions.

Responsible AI use in health research also requires explicit attention to privacy, academic integrity, and human accountability (Riadi & Sari, 2026). Participants demonstrated awareness that identifiable patient information, such as names and medical record numbers, should not be entered into publicly accessible AI systems and recognized anonymization as an important protective measure. This awareness is particularly important because health data may contain sensitive personal information and therefore require careful governance throughout the research process. Consistent with the ethical principles outlined by the World Health Organization, Wang et al. (2024) emphasized that the use of AI in health should be guided by principles including human autonomy, transparency, accountability, and protection of privacy (Wang et al., 2024). Participants also identified data fabrication and manipulation as inappropriate uses of AI and expressed concern about excessive dependence on AI and reduced critical thinking. These findings support the view that AI should function as a co-pilot rather than a decision-maker, with researchers retaining responsibility for methodological choices, interpretation, and scientific conclusions. From a community-engagement perspective, the activity therefore provides an initial educational model that connects statistical literacy with responsible AI use, although the findings remain exploratory because the intervention involved only eight participants, used self-reported evaluation, and did not include an objective pre-post assessment. Future community service activities should involve larger participant groups and longitudinal or pre-post evaluation designs to determine whether the conceptual understanding developed during the activity is sustained and translated into actual research practice.

CONCLUSION AND RECOMMENDATIONS

The educational activity demonstrated that participants showed conceptual understanding of statistical literacy and responsible use of artificial intelligence in health

research, particularly in statistical interpretation, information verification, data privacy, and research integrity. AI was perceived as a useful research and learning support tool, but participants also recognized the risks of inaccurate information and excessive dependence on AI. The activity also encouraged participants to approach AI-generated information critically and to retain independent judgment when making research-related decisions. Future community service activities should involve larger participant groups and pre-post assessment designs, supported by follow-up mentoring, practical learning modules, and continued collaboration with partner institutions to facilitate the sustained application of statistical literacy and responsible AI use in health research.

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