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Scientific Literacy Skills and Attitudinal Profile of Freshmen SAM Students in Universidad de Zamboanga

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Abstract

This study assessed the scientific literacy skills and attitudes toward science of freshmen students in the School of Allied Medicine at Universidad de Zamboanga. It focused on three core dimensions of scientific literacy: explaining scientific phenomena, interpreting data and evidence, and evaluating scientific inquiry. The study also examined the relationship between scientific literacy and attitude toward science, as well as differences across sex and academic program. A quantitative descriptive-correlational design was employed, with data collected from 263 purposively selected students and analyzed using descriptive and inferential statistics. The findings indicated that the respondents possessed generally high levels of scientific literacy and favorable attitudes toward science. A significant positive relationship was found between scientific literacy and attitude toward science, suggesting that students with stronger scientific literacy also tend to hold more positive views toward science. In contrast, no significant differences were observed in scientific literacy and attitudes toward science when grouped according to sex and academic program. The study provides empirical evidence that may inform curriculum development, instructional improvement, and intervention planning aimed at strengthening scientific literacy and sustaining positive engagement with science among allied medicine students.

Keywords: Scientific Literacy Skills, Explaining Scientific Phenomena, Interpret Data and Evidences, Evaluate Scientific Inquiry, Attitude towards Science, SAM students

1. Introduction

1.1 Institutional Context and Study Background

Universidad de Zamboanga (UZ) is a private, non-profit university in Zamboanga City, Philippines, established in 1948 as Zamboanga A.E. Colleges and later granted university status as Universidad de Zamboanga. Over the decades, UZ has grown into one of the leading private educational institutions in Western Mindanao, offering diverse programs across secondary, tertiary, technical-vocational, and graduate levels (Universidad de Zamboanga). In an era where science and technology shape many aspects of health, society, and professional practice, scientific literacy has become a critical competence for students preparing for careers in allied medicine. This study, *Scientific Literacy Skills and Attitudinal Profile of Freshmen SAM Students in UZ*, aims to assess how well freshmen in the School of Allied Medicine (SAM) demonstrate scientific literacy skills and their attitudes toward science. The results are expected to inform educators, curriculum planners, and institutional stakeholders in designing interventions to strengthen critical thinking, inquiry, and evidence-based decision-making (Zhang & colleagues, 2023).

1.2 Scientific Literacy as a Multidimensional Construct

Scientific literacy is a multidimensional construct encompassing knowledge, competencies, and attitudes necessary for individuals to engage effectively with scientific issues (Organization for Economic Cooperation and Development [OECD], 2019). A scientifically literate student should be able to explain phenomena scientifically, interpret data and evidence scientifically, and evaluate or design scientific inquiry (OECD, 2019; Peng, Chang and Li, 2017). These competencies are grounded in three major types of knowledge: content knowledge, which refers to facts, concepts, and theories; procedural knowledge, which includes the methods and practices of science; and epistemic understanding, which concerns how scientific knowledge is validated and what its limitations are (Zhang & colleagues, 2023). Together, these dimensions enable students not only to acquire scientific information but also to apply, analyze, and critically assess such knowledge in relevant contexts.

1.3 Importance of Explaining Scientific Phenomena

The ability to explain scientific phenomena enables students to understand natural or technological events, formulate hypotheses, and make justifiable predictions (OECD, 2019). For allied-medicine students, this skill is especially important because it supports understanding of biological, physiological, and health-related processes, including disease progression, treatment mechanisms, and diagnostic procedures (Aquino, Caingcoy, & Zamora, 2025). As future health professionals, SAM students must be able to connect scientific concepts to real-life medical and clinical situations. This competency strengthens their ability to interpret scientific principles in ways that are relevant to patient care, health education, and professional decision-making.

1.4 Importance of Interpreting Data and Evidence

Interpreting data and evidence is central to evidence-based practice in the health sciences. This competency requires students to analyze datasets, interpret graphs and tables, and draw conclusions grounded in evidence (Peng, Chang and Li, 2017). In allied medicine, where professional decisions are expected to be evidence-based, students must develop the capacity to evaluate findings accurately and use scientific evidence responsibly. This skill does not only improve academic performance but also prepares students to engage in clinical reasoning and informed professional judgment. The ability to interpret evidence critically is therefore essential in ensuring that future practitioners can respond effectively to complex health-related issues.

1.5 Evaluating and Designing Scientific Inquiry

Evaluating and designing scientific inquiry equips students with the ability to assess research validity, critique methodology, and understand the strengths and limitations of investigations (Zhang & colleagues, 2023). For School of Allied Medicine (SAM) students, this competency ensures responsible engagement with scientific literature, assessment of emerging evidence, and appropriate application of research outcomes in professional practice (Peng, Chang and Li, 2017). Since allied-medicine students are expected to work in fields where scientific developments continuously influence practice, the ability to understand how knowledge is produced and validated is crucial. This competency also strengthens students' research orientation, allowing them to appreciate the value of systematic investigation in solving health and medical concerns.

1.6 Attitudes Toward Science and Student Engagement

Attitudes toward science, including curiosity, openness to evidence, and critical thinking, strongly influence motivation, engagement, and persistence in learning (Zhang & colleagues, 2023). A positive attitude is especially important for allied-medicine students because it promotes lifelong learning and professional responsibility, ensuring their readiness to adapt to evolving scientific knowledge (Aquino, Caingcoy, & Zamora, 2025). Students who develop favorable attitudes toward science are more likely to appreciate its relevance, participate actively in scientific learning, and apply scientific ways of thinking in both academic and professional settings. Thus, attitudes toward science are not merely affective outcomes but are essential components of scientific literacy itself.

1.7 Demographic Factors and Variations in Scientific Literacy

Demographic factors such as sex and specific allied-medicine programs may influence scientific literacy and attitudes toward science (Follette et al., 2015). Understanding these variations can guide the development of pedagogical strategies and interventions tailored to diverse student needs (Zhang & colleagues, 2023). Differences in background, academic preparation, and learning experiences may affect how students develop scientific competencies and how they perceive science as a discipline. Examining these differences is important because it enables educators and administrators to identify which groups may need stronger support, targeted instruction, or specialized interventions to improve scientific literacy outcomes.

1.8 Research Gap and Need for the Study

Despite the recognized importance of scientific literacy, studies indicate that many college freshmen demonstrate insufficient competence in interpreting data and designing inquiry (Aquino et al., 2024; Zhang & colleagues, 2023). In the context of UZ, there is a lack of baseline data regarding the scientific literacy skills and attitudes of SAM freshmen, limiting the university's ability to design targeted curricular or instructional interventions (Universidad de Zamboanga). Without such baseline information, it becomes difficult to determine the extent of students' strengths and weaknesses or to identify the specific areas that require improvement. This gap highlights the need for an institutional study that will provide evidence on the current state of scientific literacy and attitudes toward science among freshmen SAM students.

1.9 Purpose and Contribution of the Study

This study will generate a profile of scientific literacy competencies and attitudes among SAM freshmen, as well as demographic trends, offering evidence-based insights for curriculum development, instructional planning, and student support initiatives (OECD, 2019; Peng, Chang and Li, 2017). Establishing a baseline of scientific literacy skills and attitudes toward science will enable UZ to prepare future allied-medicine professionals who are scientifically competent, evidence-oriented, and positively disposed toward science, thereby contributing to the overall quality of science education and professional readiness (Zhang & colleagues, 2023; Aquino et al., 2025). Through these contributions, the study seeks to support the university in strengthening science instruction, enhancing student preparedness, and promoting a culture of evidence-based learning and practice within the School of Allied Medicine.

2. Material and methods

2.1 Research Design

The research employed a quantitative descriptive design to determine the scientific literacy skills and attitudinal profile of freshmen students in the School of Allied Medicine at Universidad de Zamboanga. This design was appropriate because it enabled the researcher to gather measurable data, describe the characteristics of the respondents, and examine differences and relationships among the variables included in the study.

2.2 Population and Sampling Design

The study involved 263 freshmen students from the School of Allied Medicine at Universidad de Zamboanga during the first semester of Academic Year 2025–2026. The respondents were selected using purposive sampling, wherein participants were chosen based on predetermined criteria aligned with the objectives of the research. Among the total respondents, the majority were female, comprising 188 students or 71.5% of the sample, while male respondents accounted for 75 students or 28.5%. This distribution indicates a notable gender imbalance, with female students forming the larger proportion of the participants. In terms of academic program, most respondents were enrolled in the BS Nursing program, with 143 students or 54.4% of the total sample. This was followed by BS Pharmacy with 62 respondents or 23.6%, BS Radiologic Technology with 50 respondents or 19.0%, BS Medical Technology with 5 respondents or 1.9%, and BS Respiratory Therapy with 3 respondents or 1.1%. This distribution reflects the concentration of respondents across the various programs under the School of Allied Medicine.

2.3 Research Locale

The study was conducted at Universidad de Zamboanga, where the researcher serves as a faculty member of the School of Liberal Arts and Sciences. This position provided the researcher with convenient access to relevant data while maintaining strict compliance with applicable data privacy laws and institutional regulations. All first-year students under the School of Allied Medicine are housed at the UZ-Tetuan Main Campus, which served as the primary setting of the study. The selection of this locale was appropriate because it allowed the researcher to directly access the target respondents within the academic environment where the study was most relevant.

2.4 Data Gathering Tool

The study utilized a self-made survey questionnaire to gather the necessary data. The instrument consisted of two parts. Part I focused on the demographic profile of the participants, specifically their sex and academic program. Part II measured scientific literacy skills and attitudes toward science using a Likert scale ranging from 1 (Strongly Disagree) to 5 (Strongly Agree). The questionnaire was organized into two main sections designed to gather insights into the four components of scientific literacy: explaining scientific phenomena, interpreting data and evidence, evaluating scientific inquiry, and attitudes toward science. Each of these four components was assessed using ten distinct statements, resulting in a total of forty statements in the entire questionnaire. The data gathered through this instrument were used to determine the profile of the students' scientific literacy skills and to examine their relationship with the demographic variables included in the study.

2.5 Reliability and Validity

To ensure the quality of the research instrument, the questionnaire was subjected to validation by two experts before its actual administration. Their review helped establish the content validity of the instrument and ensured that the items were aligned with the objectives of the study. The validation process also helped improve the clarity, relevance, and appropriateness of the statements included in the questionnaire.

2.6 Ethical Considerations

Ethical principles were observed throughout the conduct of the study. Participation of the respondents was entirely voluntary, and their confidentiality and anonymity were protected at all times. Respondents were informed of their right to withdraw their participation and data from the study if they chose to do so. All collected data were coded and stored securely in a protected folder within Microsoft Excel, with Stata 9 used for coding and saving the data. In addition, all information gathered from the participants will be retained for a period of up to three years and will thereafter be securely destroyed in accordance with data protection regulations.

2.7 Data Gathering Procedure

Before the conduct of the study, the research panel reviewed and approved the research. Afterward, the questionnaire was validated by two experts. The researcher then sought permission from the Dean of the College to identify and access the target respondents. Once approval was granted, the survey was disseminated both online through Google Classroom and offline during class sessions in order to reach a wider range of participants. Throughout the data gathering process, the researcher ensured that ethical standards were strictly followed, particularly with regard to voluntary participation, confidentiality, and anonymity.

2.8 Statistical Tools

The researcher employed various statistical treatments to analyze and interpret the raw data collected in the study. Data analysis was conducted using Jamovi software. Descriptive statistics, including frequency, percentage, and mean, were used to summarize the responses of the participants. To determine differences in scientific literacy skills, attitude, and sex, the t-test was applied. Meanwhile, analysis of variance (ANOVA) was used to examine differences across the various academic programs. These statistical tools enabled the researcher to present the findings in a meaningful and systematic manner.

3. Results and Discussion

3.1 Level of Scientific Literacy in Terms of Explaining Scientific Phenomena

The results show that SAM students demonstrate a generally high level of scientific literacy in terms of explaining scientific phenomena, as reflected by a grand mean of 3.77, interpreted as Agree. Among the ten indicators, the highest mean rating was 4.02 for the statement, *"I change my explanation's level of detail and complexity based on who I am talking to,"* indicating that students are most confident in adjusting their explanations according to the needs of their audience. This suggests strong adaptability in communicating scientific concepts. The second highest ratings were 3.94 for using analogies or metaphors to help others visualize and understand abstract scientific ideas, 3.91 for prioritizing clear, non-technical language over precise scientific terminology, and 3.89 for quickly rephrasing or trying a different approach when someone expresses confusion. Other items also received favorable mean scores, including 3.78 for using diagrams, sketches, or physical models to support verbal explanations, 3.75 for distinguishing data or observations from scientific interpretation or conclusion, 3.72 for finding it challenging to simplify a scientific explanation without losing accuracy, and 3.62 each for being able to explain the underlying mechanism or cause of a scientific "why" question and for being comfortable answering follow-up questions even without immediately knowing the full answer. The lowest mean score was 3.58 for confidence in explaining complex scientific concepts to someone with little or no background in the subject, suggesting that although students generally possess explanatory skills, they may still experience some difficulty in simplifying challenging scientific concepts for non-experts. Overall, these findings indicate that while SAM students are good at explaining scientific ideas, there remains a need to further strengthen their confidence in communicating complex concepts more simply and effectively. These findings align with the PISA framework, which emphasizes explaining scientific phenomena as a key aspect of scientific literacy (OECD, 2023). Students' ability to adjust explanations based on their audience reflects Roberts' everyday-focused vision and sociocultural theory, highlighting the role of context and social interaction in understanding science. Their adaptability also supports constructivist principles, showing active construction of knowledge through experience. However, lower confidence in simplifying complex concepts for non-experts aligns with Bybee's Levels of Scientific Literacy and Ajzen's Theory of Planned Behavior, indicating that attitudes such as self-confidence influence performance. The results further suggest that teachers can support students by encouraging practice, interactive activities, and audience-focused communication so they can apply their scientific knowledge more effectively in both academic and everyday settings.

3.2 Level of Scientific Literacy in Terms of Interpreting Data and Evidences

In terms of interpreting data and evidences, SAM students also exhibited a generally high level of scientific literacy, with a grand mean of 3.72, interpreted as Agree. The highest mean score, 4.02, was obtained for the statement, *"I check the source and methodology of evidence before accepting it as credible or reliable,"* indicating that students are most confident in assessing the credibility and reliability of information. This was followed by mean scores of 3.74 for articulating conclusions directly supported by evidence while avoiding overgeneralization, 3.72 for identifying the main trend or pattern in a graph and for logically weighing contradictory pieces of evidence to form a conclusion, 3.71 for identifying potential biases or limitations in a research study or data collection method and for using statistical measures such as averages, percentages, and error bars to support interpretation, 3.68 for summarizing key findings from a complex data table using simple and clear language, 3.66 for evaluating whether someone else's interpretation of data is warranted or misinterpreted, and 3.65 for distinguishing between correlation and causation. The lowest mean score was 3.62 for finding it easy to extrapolate or make predictions based on a given data trend, suggesting that students are comparatively less confident in making predictions or extending conclusions from data patterns. These findings imply that SAM students can critically analyze and evaluate evidence effectively, but their predictive and inferential skills still require further enhancement. The findings align with the PISA framework, which identifies interpreting data and evidence as a core component of scientific literacy (OECD, 2023). SAM students' strength in evaluating the credibility and reliability of evidence reflects Roberts' everyday-focused vision and constructivist principles, emphasizing critical analysis and practical application of scientific knowledge. Their lower confidence in making predictions from data trends corresponds with Bybee's Levels of Scientific Literacy, suggesting the need to further develop higher-order reasoning skills. Sociocultural theory and Ajzen's Theory of Planned Behavior further underscore that context, collaboration, and confidence influence students' ability to interpret and apply evidence effectively. These findings suggest that educators can improve students' predictive and inferential skills by providing activities that emphasize real-world applications, collaborative analysis, and guided practice in interpreting complex data.

3.3 Level of Scientific Literacy in Terms of Evaluating Scientific Inquiry

The results further reveal that SAM students demonstrate a generally high level of scientific literacy in evaluating scientific inquiry, with a grand mean of 3.66, interpreted as Agree. Among the ten indicators, the highest mean scores of 3.75 were recorded for the statements, *"I am able to identify the independent, dependent, and control variables in a typical experimental design"* and *"I am comfortable suggesting ways to improve or modify a given scientific procedure to increase the validity or reliability of the results."* These results indicate that students are most confident in identifying experimental variables and proposing improvements to scientific procedures. Other items also yielded positive mean scores, including 3.74 for evaluating whether instruments and procedures are appropriate for accurately measuring the intended outcome, 3.69 for judging whether the sample size used in a study is large enough to support the reliability of conclusions, 3.68 for understanding and explaining why a single study's findings are generally insufficient to establish a new scientific theory, 3.66 for critiquing whether ethical guidelines for human or animal subjects were properly considered and followed in a research proposal, 3.62 for determining whether a research question is testable using current scientific methods, 3.61 for identifying a study's null hypothesis and assessing whether the reported results support rejecting or failing to reject it, and 3.58 for determining if experimental controls were adequate to isolate the effect of the independent variable. The lowest mean score was 3.52 for differentiating between blind and double-blind protocols and evaluating the importance of this distinction, indicating that students are comparatively less confident in understanding more nuanced aspects of experimental design. Overall, these findings show that students possess strong analytical and problem-solving skills in evaluating scientific investigations, though they may benefit from further support in understanding complex methodological concepts. These findings are consistent with the PISA framework, which highlights evaluating scientific inquiry as a key aspect of scientific literacy (OECD, 2023). SAM students' confidence in identifying variables and suggesting procedural improvements reflects Roberts' everyday-focused vision and constructivist principles. Their lower confidence in blind and double-blind experiments indicates the need to develop higher-order reasoning, as noted in Bybee's Levels of Scientific Literacy. Sociocultural and attitudinal theories further emphasize the role of context, interaction, and self-confidence in evaluating scientific procedures. The findings suggest that educators can provide guided practice, collaborative activities, and real-world applications to strengthen students' methodological understanding and deepen their scientific literacy.

3.4 Summary of the Level of Scientific Literacy of SAM Students

When the three domains of scientific literacy were viewed together, the overall results show that SAM students demonstrate a generally high level of scientific literacy, with a grand mean of 3.72, interpreted as Agree. Among the three components, the highest mean was recorded in Explaining Scientific Phenomena at 3.77, indicating students' stronger confidence in communicating and clarifying scientific concepts. This was followed by Interpreting Data and Evidences with a mean of 3.72, reflecting competence in analyzing and evaluating information. The lowest, though still favorable, mean was observed in Evaluating Scientific Inquiry at 3.66, suggesting that students are capable of assessing experiments and procedures but may need additional development in understanding more complex methodological aspects. Overall, the results indicate that students have a solid foundation in scientific literacy, with particular strengths in explanation and data interpretation and with opportunities to strengthen inquiry evaluation skills. These findings are consistent with the PISA framework, which identifies explaining phenomena, interpreting data, and evaluating inquiry as central dimensions of scientific literacy (OECD, 2023). SAM students' strengths in explanation and data interpretation reflect Roberts' everyday-focused vision and constructivist principles, while lower confidence in evaluating inquiry corresponds with Bybee's Levels of Scientific Literacy. Sociocultural and attitudinal theories also suggest that interaction, context, and confidence influence how students engage with science. These findings imply that while SAM students already possess a sound scientific foundation, targeted strategies are still necessary to strengthen their skills in evaluating scientific inquiries through guided practice, collaborative learning, and real-world scientific problem-solving tasks.

3.5 Level of Attitude Toward Science

The results indicate that SAM students generally demonstrate a positive attitude toward science, as reflected by a grand mean of 3.99, interpreted as Agree. The highest mean score was 4.26 for the statement, *"I believe that science and research are essential for solving the world's major problems,"* showing that students strongly recognize the importance of science in addressing global concerns. This was followed by a mean of 4.20 for *"Learning about science and technology makes me feel more capable and informed about the future,"* 4.18 for *"I feel a sense of excitement or wonder when learning about how the natural world works,"* 4.10 for trust in the findings and conclusions of qualified scientists and research institutions, 4.04 for believing that all students should be required to take science courses throughout their education, and 4.03 for enjoying reading or watching content about new scientific discoveries and technological advancements. Other favorable responses included 3.99 for believing that scientific understanding is highly relevant to everyday life and decision-making, 3.96 for actively seeking out scientific explanations for common phenomena, and 3.65 for finding scientific concepts too difficult or complicated to understand in depth. The lowest mean score was 3.48 for the statement, *"I believe that scientific theories are no more valid than other forms of knowledge or belief,"* interpreted as Somewhat Agree, suggesting a slight uncertainty among students regarding the authority of scientific knowledge relative to other ways of knowing. Overall, the findings indicate that students exhibit a favorable disposition toward science, with some minor areas for strengthening confidence in the legitimacy of scientific understanding. These results align with the PISA framework, which highlights attitudes as a key component of scientific literacy (OECD, 2023). SAM students' positive attitudes, such as valuing science,

feeling informed, and experiencing excitement in learning, reflect Roberts' everyday-focused vision and constructivist principles. Their slight uncertainty about the validity of scientific theories suggests the need to strengthen trust in scientific knowledge, consistent with Bybee's Levels of Scientific Literacy. Sociocultural and attitudinal theories also emphasize that motivation, confidence, and social interaction influence engagement. These findings suggest that educators can leverage students' already positive attitudes by using inquiry-based activities, real-world applications, and collaborative learning strategies to further deepen engagement and appreciation for science.

3.6 Relationship Between Scientific Literacy and Attitude Toward Science

The analysis of the relationship between scientific literacy and attitude toward science reveals a statistically significant and high positive correlation. The computed r-value of 0.662 indicates a high correlation between the Level of Scientific Literacy and the Level of Attitude Toward Science among the respondents. Moreover, the p-value of 0.000 is lower than the 0.05 level of significance, indicating that the relationship is statistically significant. As a result, the null hypothesis stating that there is no significant relationship between the variables is rejected. This finding means that students with higher levels of scientific literacy also tend to demonstrate more positive attitudes toward science. The result emphasizes the importance of enhancing scientific literacy as a means of promoting stronger interest, more positive attitudes, and deeper engagement in science. The rejection of the null hypothesis is strongly supported by the Theory of Planned Behavior (Ajzen, 1985), which posits that positive attitudes influence intentions and behaviors. Within this sample, students with higher scientific literacy demonstrate more favorable attitudes, greater curiosity, and increased engagement in the cognitive, emotional, and behavioral dimensions of learning science. Similarly, Wigfield and Eccles' (2000) Expectancy-Value Theory explains that when learners perceive success as attainable and recognize the value of the subject, they become more motivated and actively engaged. Together, these theories suggest that strengthening students' scientific literacy can substantially foster positive attitudes and encourage active participation in scientific learning. These findings also have important implications for curriculum design, teaching strategies, and student support systems, as promoting scientific literacy alongside positive attitudes may help address students' disengagement and limited interest in science through relevance, real-world applications, and meaningful personal connections to scientific concepts.

3.7 Differences in Scientific Literacy and Attitude Toward Science According to Academic Program

The results show that the scientific literacy and attitudes toward science of SAM students do not significantly differ when grouped according to academic program. In terms of scientific literacy, the mean scores were 3.95 for BS Medical Technology, 3.74 for BS Nursing, 3.78 for BS Pharmacy, 3.53 for BS Radiologic Technology, and 4.47 for BS Respiratory Therapy. Despite these differences in mean values, the computed F-value of 2.31 and p-value of 0.124 indicate that the variation is not significant, leading to the decision to not reject the null hypothesis. Similarly, in terms of attitude toward science, the mean scores were 4.12 for BS Medical Technology, 4.00 for BS Nursing, 4.05 for BS Pharmacy, 3.82 for BS Radiologic Technology, and 4.57 for BS Respiratory Therapy. The obtained F-value of 1.64 and p-value of 0.236 likewise show that the differences are not significant, and the null hypothesis is again not rejected. These findings indicate that, despite minor differences in mean responses, students across all academic programs demonstrate comparable levels of scientific literacy and similar attitudes toward science. Several studies support this finding. OECD (2023) notes that scientific literacy is shaped more by shared learning environments than by specific course tracks, which explains why SAM students show comparable levels across programs. Liu and Lederman (2024) similarly found that when students experience similar inquiry-based and laboratory-centered instruction, their scientific literacy develops at parallel levels, consistent with Roberts' framework and constructivist theory. From a sociocultural perspective, Bórquez-Sánchez et al. (2025) also reported that collaborative and institutional learning contexts minimize differences among disciplines. In terms of attitudes, studies aligned with Ajzen's Theory of Planned Behavior, such as Velasquez and Dela Cruz (2023), show that motivation and interest in science are shaped more by institutional climate and teaching practices than by program specialization. Park and Kim (2024) further found that when students share similar instructional exposures, they tend to develop comparable affective responses toward science. These findings imply that the school's curriculum and teaching approaches are consistently implemented across programs, and that any efforts to improve scientific literacy, teaching strategies, or student engagement should be designed at the institutional level rather than as program-specific interventions.

3.8 Differences in Scientific Literacy and Attitude Toward Science According to Sex

The comparison of scientific literacy skills and attitudes toward science according to sex also revealed no statistically significant differences. For scientific literacy, male students obtained a mean score of 3.81, while female students obtained a mean score of 3.69. Although males scored slightly higher, the computed t-value of -1.52 and p-value of 0.13 indicate that the difference is not significant, leading to the decision to not reject the null hypothesis. In terms of attitude toward science, male students had a mean score of 4.11, compared with 3.94 for female students. Again, while the male mean was slightly higher, the computed t-value of -1.95 and p-value of 0.053 indicate that the difference is also not significant, and the null hypothesis is likewise not rejected. These findings show that sex does not substantially influence students' scientific literacy or their attitudes toward science, suggesting that both male and female SAM students demonstrate comparable levels of scientific understanding and similar dispositions toward science. Several studies support this result. OECD (2023), using the PISA framework, emphasizes that scientific literacy is largely shaped by learning experiences and school environments rather than biological sex, which explains why male and female SAM students show comparable skills. Consistent with Roberts' visions of scientific literacy and constructivist learning theory, Liu and Lederman (2024) found

that when both sexes engage in similar inquiry-based and hands-on learning activities, their levels of scientific understanding develop similarly regardless of gender. Sociocultural perspectives further support this pattern, with Bórquez-Sánchez et al. (2025) reporting that shared classroom interactions and collaborative scientific tasks reduce gender-based differences in performance. In terms of attitudes toward science, studies grounded in Ajzen's Theory of Planned Behavior, such as Velasquez and Dela Cruz (2023), show that motivation and interest in science are influenced more by instructional support and learning climate than by sex. Likewise, Park and Kim (2024), drawing on Krathwohl's affective taxonomy, found that male and female students exposed to similar teaching practices develop comparable affective engagement in science. These findings imply that sex does not play a determining role in the development of scientific skills or affective engagement, and that improvements in scientific literacy and attitudes toward science should focus on school-wide teaching practices, curriculum design, and active learning opportunities rather than on gender-specific interventions.

3.9 Proposed Intervention Program

Based on the findings of the study, an intervention program is proposed to enhance students' scientific literacy skills and attitudes toward science. The proposed program focuses on academic support and review strategies, including active learning, guided practice, and faculty-led workshops, while also strengthening institutional support through resources and training for educators. The intervention aims to create a more engaging and supportive learning environment for students and serves as the basis of Chapter VI of the study. These recommendations are grounded in the overall findings that students already possess a solid foundation in scientific literacy and favorable attitudes toward science, but still require support in areas such as evaluating scientific inquiry, predictive reasoning, and confidence in the authority of scientific knowledge.

4. Conclusion & Recommendations

The study concludes that freshmen students of the School of Allied Medicine at Universidad de Zamboanga generally demonstrate a high level of scientific literacy across the three measured dimensions: explaining scientific phenomena, interpreting data and evidences, and evaluating scientific inquiry. The findings further reveal that the respondents possess a generally positive attitude toward science, indicating that they value the role of science in understanding the world and addressing real-life concerns. Moreover, the results establish a positive and statistically significant relationship between students' scientific literacy skills and their attitudes toward science, suggesting that stronger scientific literacy is associated with more favorable dispositions toward scientific learning. The study also shows that there are no significant differences in students' scientific literacy skills and attitudes toward science when they are grouped according to academic program and sex, which implies that these competencies and dispositions are shared relatively equally across the respondents. Overall, the findings affirm the importance of sustaining and strengthening science-related learning experiences that foster both cognitive competence and positive attitudes among allied medicine students.

Based on the findings and conclusions of the study, several recommendations are forwarded for consideration. The Universidad de Zamboanga Academic Council is encouraged to continue supporting science-oriented programs through sustained investments in laboratory facilities, instructional technologies, and faculty development, while also institutionalizing scientific literacy standards and promoting interdisciplinary initiatives that allow students to apply scientific knowledge in real-world contexts. The School of Allied Medicine faculty members are encouraged to maintain and further strengthen inquiry-based learning, critical thinking, and evidence-based reasoning through hands-on, community-based, and collaborative scientific activities, supported by regular formative assessment and inclusive teaching practices. SAM students are likewise encouraged to actively participate in research, laboratory work, seminars, organizations, and scientific discussions in order to further enhance their analytical, problem-solving, and reasoning skills, while cultivating lifelong learning habits through reading, digital platforms, and continuous engagement with current scientific developments. Curriculum developers are advised to integrate higher-order thinking tasks such as research projects, data analysis, and evidence-based decision-making into the curriculum, while ensuring a uniform and equitable science program that incorporates interdisciplinary, real-world, and community-relevant learning experiences. Future researchers are encouraged to examine other variables that may influence scientific literacy and attitudes toward science, such as learning environment, instructional practices, and socio-demographic factors, and to consider mixed-method or longitudinal approaches, as well as intervention-based studies, to generate deeper and more comprehensive

This study is limited by several factors that should be considered when interpreting the findings. First, the study focused only on freshmen students from the School of Allied Medicine at Universidad de Zamboanga during the first semester of Academic Year 2025–2026, which limits the generalizability of the results to students from other year levels, colleges, or institutions. Second, the study employed a quantitative descriptive design using a self-made survey questionnaire, which means that the findings rely primarily on self-reported responses and may not fully capture the depth of students' actual scientific literacy practices and attitudes in authentic settings. Third, the use of purposive sampling limits the extent to which the findings may be generalized beyond the selected respondents. Finally, although the study examined scientific literacy and attitudes toward science in relation to sex and academic program, there may be other relevant variables, such as prior academic preparation, socioeconomic background, learning experiences, and instructional exposure, that were not

included in the analysis but may also influence the results. Despite these limitations, the study provides useful baseline data that may guide future research, curricular improvement, and intervention development.

Compliance with ethical standards

The researchers adhered to appropriate ethical standards in the conduct of this study. Participation was voluntary, informed consent was obtained, and the confidentiality and anonymity of the respondents were protected. All data were handled securely and used solely for research purposes in accordance with institutional and data privacy guidelines.

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