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The Influence of Educational Environment and Self-Regulated Learning (SRL) On the Scientific Epistemic Beliefs of Senior High Students

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Abstract

This study examined the influence of educational environment and self-regulated learning on the scientific epistemic beliefs of senior high school students. Anchored on Bandura's social cognitive theory, Vygotsky's constructivist perspective, and Zimmerman's social cognitive model of self-regulated learning, the study investigated how supportive learning conditions and students' regulation of their own learning relate to their understanding of scientific knowledge and inquiry. A quantitative descriptive-correlational design was employed. The respondents were 306 Grade 12 students selected through stratified random sampling from Cateel Vocational High School and San Antonio National High School in Cateel, Davao Oriental, during the first semester of the 2025–2026 school year. Data were gathered using three adapted instruments: the Dundee Ready Education Environment Measure (DREEM), the Adaptive Self-Regulated Learning Questionnaire (ASRQ), and the Scientific Epistemic Belief (SEB) Survey. Mean, Pearson's r, and linear regression were used in data analysis. The findings showed that the educational environment, self-regulated learning, and scientific epistemic beliefs were all at high levels. Students' perception of learning obtained the highest mean under educational environment, self-evaluation and environmental structuring were strongest under self-regulated learning, and justification had the highest mean under scientific epistemic beliefs. The study also found significant positive relationships between educational environment and scientific epistemic beliefs, and between self-regulated learning and scientific epistemic beliefs. Regression analysis further showed that educational environment and self-regulated learning significantly influenced scientific epistemic beliefs, with perception of atmosphere and self-evaluation emerging as significant predictors. The study concluded that supportive educational settings and effective self-regulated learning behaviors contribute to stronger scientific epistemic beliefs among senior high school students. It recommended strengthening participatory learning activities, supportive classroom practices, self-regulated learning programs, and continuous evaluation of the school learning environment. The study aligns with SDG 4 by supporting quality education through improved science learning, critical thinking, and student engagement. It also relates to SDG 8 and SDG 9 through the development of scientific reasoning and skills relevant to future work and innovation. The study contributes to educational, institutional, and socio-economic sustainability by informing school practices that strengthen learner resilience, academic confidence, and meaningful participation in science education.

Keywords: Academic Self-Perception, Educational Environment, Scientific Epistemic Beliefs, Self-Regulated Learning, Senior High School Students, Social Cognitive Theory, Stratified Random Sampling

1. Introduction

Students' engagement in science learning is increasingly challenged by declining motivation, weak participation, and limited anticipation of classroom lessons. Epistemological beliefs play a critical role in shaping how learners perceive knowledge, engage with scientific content, and apply learning strategies. These beliefs influence students' academic performance, metacognition, motivation, persistence, and self-perception of competence. At the same time, the educational environment and students' ability to regulate their own learning significantly shape how they interpret and construct scientific knowledge. Understanding the interaction among the educational environment, self-regulated learning, and scientific epistemic beliefs is therefore essential for improving science education outcomes, particularly among senior high school students. This study examines how perceptions of the educational environment and self-regulated learning influence scientific epistemic beliefs, contributing insights for curriculum development and instructional improvement in science education.

1.1 Background of the Study

Many students struggle to anticipate classroom lessons and gradually become disengaged from learning activities. This disengagement often leads to declining motivation and reduced participation in academic tasks. One important factor influencing student engagement is epistemological beliefs, which shape how learners interpret knowledge and approach learning tasks. These beliefs affect students' cognitive processes, including performance, self-perception of competence, enjoyment of school, metacognitive practices, monitoring behavior, persistence, confidence, and academic success.

According to Su et al. (2022), students develop responsibility in learning when they actively participate in scientific inquiry and hands-on experiences. Various external factors also influence student engagement and learning behavior. Mughal A. W. (2020) identified that conditions such as large family size and financial difficulties can place pressure on students and affect their academic commitment. Similarly, ineffective time management may reduce motivation and academic performance (Heibutzki, 2019). Teachers also play a crucial role in shaping students' motivation, as effective classroom management and instructional planning enhance engagement, while poor time management during instruction may reduce learner motivation (Carnegie Mellon University, 2019). Scientific epistemic beliefs provide a framework for how students approach learning and respond to challenges in science education. These beliefs guide students' understanding of knowledge construction and influence how they process scientific information. Panergayo et al. (2023) emphasized that epistemic beliefs contribute to the development of educational resources and interventions that enhance students' understanding of science as a form of knowledge. Consequently, understanding students' epistemic beliefs is essential for designing effective instructional strategies and improving science education outcomes.

1.2 Themes and Insights from Related Literature on Educational Environment, Self-Regulated Learning, and Scientific Epistemic Beliefs

The educational environment significantly influences students' learning experiences and academic outcomes. Roff and McAleer (2019) observed that stressful or competitive classroom settings can demotivate students and reduce their engagement in learning. Conversely, Maya et al. (2019) noted that students perform better in controlled and supportive learning environments that address both academic and social needs. Classroom environments that are relaxed, non-threatening, and intellectually stimulating encourage students to participate actively and develop positive attitudes toward learning. Research also highlights the importance of teacher behavior in shaping students' learning experiences. Teaching behavior supports student achievement and engagement by facilitating meaningful learning experiences (Andre et al., 2020; Fernandez-Garcia et al., 2019). Teachers' experience and instructional practices can significantly influence students' academic achievement (Havik & Westergard, 2019). Students benefit from guidance and scaffolding provided by teachers and more experienced peers when solving complex problems (Jong, 2019). Student feedback also plays an important role in improving teaching effectiveness and instructional practices (Chen, Y. L. et al., 2021; Göbel et al., 2021), while the inclusion of student voices in educational processes supports participatory learning environments (Finefter-Rosenbluh, 2022). Students' academic self-perceptions and motivation further contribute to their engagement in learning. Flook et al. (2020) emphasized that positive academic self-perceptions strengthen intrinsic motivation, confidence, and focus in academic contexts. Students' self-esteem and confidence influence their effort, aspirations, and academic success, and these perceptions often evolve through repeated experiences of success and failure. Evaluations from teachers and parents also shape students' academic self-perceptions and learning behaviors (Flook et al., 2020). Another significant factor in student learning is self-regulated learning. Self-regulated learners actively manage their cognitive, motivational, and behavioral processes during learning. According to El-AdI & Alkharusi (2020), self-regulated learning enables students to plan and evaluate learning tasks effectively. Similarly, McMillan & Moore (2020) described self-regulated learning as the process through which learners set goals, monitor progress, select strategies, and regulate their learning environments. Zimmerman (2019) emphasized that students who set specific goals and develop strategies to achieve them are more likely to maintain motivation and focus throughout the learning process. Metacognitive monitoring is another essential component of self-regulated learning. Students who regularly evaluate their understanding can identify weaknesses and modify their learning strategies accordingly (Pintrich & De Groot, 2019). These practices also encourage students to seek additional information and develop deeper conceptual understanding (Brown & Lee, 2019). Environmental structuring further supports self-regulated learning by minimizing distractions and promoting focused engagement with learning tasks (Schraw & Olafson, 2019). A well-organized learning environment encourages systematic inquiry and scientific reasoning (Tsai & Chou, 2020). Research also shows that self-regulated learning practices support students' understanding of scientific inquiry. Students who engage in rehearsal, reflection, and monitoring of learning strategies develop stronger scientific reasoning skills (Chen & Klahr, 2020). Johnson and Johnson (2019) found that active engagement with learning materials allows students to connect scientific concepts and develop deeper understanding. Similarly, reviewing learning records enhances metacognitive awareness and improves learning strategies (Chen & Klahr, 2020). Students' epistemic beliefs about science significantly influence their engagement in scientific inquiry. Scientific epistemic beliefs refer to individuals' understanding of the nature of scientific knowledge and how such knowledge is developed. Smith and Scharmann (2020) noted that many senior high school students hold naïve epistemic beliefs, viewing scientific knowledge as fixed and certain. Such beliefs may hinder critical thinking and scientific reasoning. In contrast, students with more advanced epistemic beliefs recognize the evolving nature of scientific knowledge and are more capable of engaging in complex scientific discussions and inquiry processes.

1.3 Local, National, and Global Context of Science Education and Student Epistemic Beliefs

Improving science education remains a significant challenge in the Philippines. Results from the Program for International Student Assessment show that Filipino students perform comparatively poorly in key academic subjects, particularly science (Organization for Economic Co-operation and Development, 2023; OECD, 2023). These results

highlight the need for curriculum improvement and educational reforms to strengthen students' scientific understanding and learning outcomes. The disparity in international assessments such as PISA 2022 raises critical questions about the effectiveness of current curricular practices and educational strategies. Addressing these challenges requires examining factors that influence students' learning processes, including the educational environment and self-regulated learning. Enhancing students' epistemic beliefs and engagement in science education can contribute to improved academic outcomes and the development of critical thinking skills needed for addressing complex societal challenges. Globally, educational research emphasizes the importance of supportive learning environments in promoting academic achievement and student satisfaction. Roff et al. (2020) identified the educational environment as a crucial factor influencing students' performance and achievement. Educational environments consist of physical, intellectual, and emotional components that shape students' experiences in learning institutions. Palmgren further described the educational environment as an institution's overall climate, atmosphere, and culture, which collectively influence students' learning outcomes and satisfaction.

1.4 Theoretical or Conceptual Basis

This study is grounded in several theoretical perspectives that explain how learning environments and self-regulated learning influence students' epistemic beliefs. Bandura's social cognitive theory (1986) emphasizes that individuals learn through observation and modeling. In educational settings, students' observations of teachers' and peers' attitudes toward scientific knowledge influence their epistemic beliefs and learning behaviors. The constructivist perspective proposed by Vygotsky (1978) highlights the importance of active engagement and collaborative learning in knowledge construction. According to this perspective, students develop understanding through social interaction and shared inquiry, which supports the development of more sophisticated epistemic beliefs. Zimmerman's social cognitive model of self-regulated learning (2000) further explains how students' beliefs about their abilities and control over their learning environment influence their engagement in learning activities. Students who possess strong self-efficacy beliefs and perceive their learning environment as supportive are more likely to set goals, monitor their progress, and reflect on their learning experiences. The conceptual framework of the study illustrates the relationship among three major variables: educational environment, self-regulated learning, and scientific epistemic beliefs. The educational environment is measured through indicators such as students' perceptions of learning, teachers, academic self-perception, classroom atmosphere, and social relationships using the Dundee Ready Environment Measure (DREEM) developed by Roff et al. (2020). Self-regulated learning is assessed using the Adaptive Self-Regulated Learning Questionnaire (ASRQ) developed by Magno (2010), which includes goal setting, environmental structuring, task strategies, time management, help-seeking, persistence, self-evaluation, and emotions and experience. Scientific epistemic beliefs are measured using the Scientific Epistemic Belief Survey developed by Conley et al. (2004), which examines students' views regarding the source, certainty, development, and justification of scientific knowledge.

1.5 Research Gaps and Rationale

Previous studies have explored factors influencing students' epistemic beliefs, including learning environments and self-regulated learning strategies. However, much of the existing research has examined these factors separately. Limited studies have investigated the combined influence of educational environment and self-regulated learning on scientific epistemic beliefs among senior high school students. This study addresses this gap by examining how perceptions of the educational environment and self-regulated learning collectively influence students' scientific epistemic beliefs. Understanding these relationships is essential because students with stronger epistemic beliefs are more likely to engage in deep learning, critical thinking, and scientific inquiry. These competencies are crucial for success in modern academic and professional contexts. By investigating these relationships, the study provides a more comprehensive understanding of how educational factors interact to shape students' scientific epistemic beliefs. The findings may inform curriculum development, instructional strategies, and educational interventions aimed at improving science education outcomes.

1.6 Alignment with Relevant Sustainable Development Goals (SDGs)

This study aligns with SDG 4 – Quality Education, which aims to ensure inclusive and equitable quality education and promote lifelong learning opportunities for all. By examining factors that influence students' epistemic beliefs and learning processes, the research contributes to improving science education and strengthening critical thinking skills among learners. The study also supports SDG 8 – Decent Work and Economic Growth, as education that fosters scientific reasoning and problem-solving skills prepares students for future employment and innovation in knowledge-based economies. Furthermore, the research relates to SDG 9 – Industry, Innovation and Infrastructure, as developing students' scientific epistemic beliefs encourages innovation, research literacy, and technological advancement. Strengthening students' understanding of scientific inquiry supports the development of future scientists, engineers, and innovators who can contribute to sustainable societal development.

1.7 Importance of the Study to Multidisciplinary Sustainability

The study contributes to educational sustainability by identifying educational practices that enhance students' engagement, critical thinking, and lifelong learning skills. Understanding how educational environments and self-

regulated learning influence epistemic beliefs helps educators design more effective instructional strategies and supportive learning environments. The findings also contribute to socio-economic sustainability, as improved science education strengthens students' problem-solving abilities and prepares them to address complex societal challenges. Students who develop sophisticated epistemic beliefs are more capable of evaluating scientific evidence, making informed decisions, and participating actively in knowledge-based societies. Additionally, the study supports community and institutional sustainability by providing insights that can guide school administrators, teachers, parents, and policymakers in improving educational practices. Creating supportive learning environments and promoting self-regulated learning helps students develop academic resilience, confidence, and motivation, which are essential for sustainable educational development and long-term societal progress.

2. Material and methods

2.1 Research Design

This study employed a quantitative descriptive–correlational research design to examine the relationship between the educational environment, self-regulated learning, and scientific epistemic beliefs among senior high school students. Descriptive research aims to systematically describe a population, situation, or phenomenon by addressing questions related to what, where, when, and how rather than explaining causal relationships (McCombes, 2019). In this approach, variables are directly observed and measured without manipulation by the researcher. Descriptive research focuses on identifying characteristics of a population or phenomenon, emphasizing the description of the research topic rather than causal explanations (Baht, 2020). Correlational analysis was applied to determine the relationship among the study variables. While correlational studies cannot establish cause-and-effect relationships, carefully collected and analyzed data may provide evidence supporting possible relationships between variables. In this study, the design allowed the researchers to determine the influence of the educational environment and self-regulated learning on the scientific epistemic beliefs of senior high school students.

2.2 Locale of the Study

The study was conducted in two public secondary schools located in the Municipality of Cateel, Province of Davao Oriental, Philippines. The first research site was Cateel Vocational High School, situated along Castro Avenue in Barangay Poblacion. This institution is a public technical-vocational school with an area of approximately 74,389 square meters. The second research site was San Antonio National High School, located in Barangay San Antonio in the same municipality. This school operates as a public agricultural high school with an area of approximately 14 square meters. These institutions were selected because they accommodate senior high school students who served as respondents in the study. The research was conducted during the first semester of the 2025–2026 school year, providing an appropriate context for examining the educational environment and learning practices among Grade 12 students.

2.3 Respondents of the Study

The respondents of the study consisted of Grade 12 senior high school students enrolled at Cateel Vocational High School and San Antonio National High School during the first semester of the 2025–2026 academic year. These students were selected because they had sufficient exposure to the educational environment and academic experiences necessary for evaluating the variables investigated in the study. The total population consisted of approximately 1,500 senior high school students, from which the respondents were drawn. The study focused exclusively on Grade 12 students to ensure that the participants had developed adequate academic experiences relevant to the investigation of educational environment, self-regulated learning, and scientific epistemic beliefs.

2.4 Sample and Sampling Procedure

The study employed stratified random sampling to select the respondents. Stratified random sampling involves dividing a population into smaller subgroups or strata based on shared characteristics, ensuring that different groups within the population are represented in the sample (Hayes et al., 2023). This sampling method was used to highlight differences between groups and ensure balanced representation of respondents from both participating schools. Based on the Raosoft sample size calculator, a population of 1,500 students required a sample size of 306 respondents with a margin of error of 0.05. The respondents were grouped according to their respective schools to ensure proportional representation. The final sample therefore consisted of 306 Grade 12 students from Cateel Vocational High School and San Antonio National High School.

2.5 Research Instrument

The study utilized three adapted survey questionnaires as the primary research instruments. These instruments measured the independent variables educational environment and self-regulated learning and the dependent variable, scientific epistemic beliefs. The first questionnaire measured the educational environment using the Dundee Ready Education Environment Measure (DREEM) developed by Roff et al. (2020). This instrument assessed students' perceptions of the educational environment through indicators including students' perception of learning, students' perception of teachers,

students' academic self-perception, students' perception of the atmosphere, and social self-perception. The second questionnaire measured self-regulated learning using the Adaptive Self-Regulated Learning Questionnaire (ASRQ) developed by Magno (2010). This instrument assessed several indicators of self-regulated learning, including goal setting, environmental structuring, task strategies, time management, help-seeking, persistence, self-evaluation, and emotions and experience. The third questionnaire measured scientific epistemic beliefs using the Scientific Epistemic Belief (SEB) Survey developed by Conley et al. (2004). This instrument evaluated students' beliefs about scientific knowledge through indicators such as source, certainty, development, and justification. Responses were interpreted using a Likert scale to determine the level of scientific epistemic beliefs among the respondents. To ensure validity, the survey instruments were reviewed and modified to suit the context of the study before being submitted to a panel of experts for content validation. After incorporating the experts' comments and suggestions, the questionnaires underwent pilot testing involving 30 non-respondents of the study. The collected pilot data were analyzed by a statistician to determine the reliability of the instruments. Reliability was assessed using Cronbach's alpha, with a value of at least 0.90 considered acceptable, indicating high internal consistency of the instruments.

2.6 Data Gathering Procedure

Prior to data collection, the researcher obtained formal approval from the Schools Division Superintendent of the Division of Davao Oriental. An endorsement letter was subsequently forwarded to the principals of Cateel Vocational High School and San Antonio National High School to secure institutional permission to conduct the study. After receiving approval from the school administrators, the researcher identified and recruited the respondents. The researcher personally administered the survey questionnaires to the selected participants and provided clear instructions on how to complete the instruments accurately. Each item was explained to ensure that the respondents clearly understood the questions, thereby improving the validity and reliability of the responses. Parental consent was obtained for respondents who were minors before participation in the study. The questionnaires were administered through face-to-face data collection, and the researcher personally retrieved the completed instruments after the respondents had finished answering them. The data collection process lasted six months, from February to July, during which the researcher gathered, organized, analyzed, and interpreted the data. Throughout the process, the researcher ensured that all collected information remained confidential and complied with the provisions of the Data Privacy Act of 2012 of the Philippines (Republic Act No. 10173).

2.7 Data Analysis Techniques

Several statistical tools were employed to analyze the data and address the objectives of the study. The mean was used to determine the level of the educational environment, self-regulated learning, and scientific epistemic beliefs among the senior high school students. To determine the relationship between variables, Pearson's r correlation analysis was applied to examine the association between self-regulated learning and students' scientific epistemic beliefs. Additionally, linear regression analysis was used to determine whether the educational environment and self-regulated learning significantly influenced the scientific epistemic beliefs of senior high school students. These statistical techniques allowed the researchers to evaluate the level of each variable, determine the relationships among them, and identify whether significant influences existed between the independent variables and the dependent variable.

2.8 Ethical Considerations

The study followed the ethical guidelines of the University of Mindanao Ethics Review Committee (UMERC). The research underwent an ethics review and was approved under protocol number 2025-284 with contact number (082) 297-6115. Permissions were obtained from relevant public-school officials before the study was conducted. Participation in the study was voluntary, and respondents were informed of the purpose and significance of the research. For participants under 18 years of age, parental consent was obtained prior to their participation. Respondents were assured that their information would remain confidential and used only for research purposes. Participants were also informed that they could withdraw from the study at any time without penalty and were allowed to skip any questions they were uncomfortable answering. The researcher ensured that no physical, psychological, or economic risks were involved in the study. Participants were informed about their rights and the importance of the research before participating. The researcher also declared that there were no conflicts of interest (COI) and maintained objectivity throughout the research process. To maintain academic integrity, plagiarism detection tools such as Grammarly and Turnitin were used to ensure that the study did not involve plagiarism, falsification, or fabrication of data. The research was conducted as a requirement for the Master's Degree in Education at the University of Mindanao Professional School, and publication of the study would involve the adviser as a co-author.

3. Results and Discussion

3.1 Levels of Educational Environment, Self-Regulated Learning, and Scientific Epistemic Beliefs

3.1.1 Educational Environment of Senior High School Students

The findings indicate that the overall level of the educational environment among senior high school students was high, with a mean score of 3.99 and a standard deviation of 0.38. This suggests that students generally shared similar positive perceptions regarding their learning environment. Among the indicators, students' perception of learning obtained the highest mean score of 4.19, indicating that students believed their teachers were competent and effective in delivering instruction and helping them develop competence and confidence. Students' academic self-perception, perception of teachers, and perception of atmosphere also showed high mean scores, while social self-perception obtained the lowest mean score of 3.77 but remained within the high descriptive level. Overall, these results suggest that the educational environment experienced by the respondents was consistently positive and supportive. This finding supports the assertion of Slee (2019), who emphasized that students feel more engaged and valued when teachers and peers demonstrate respect and care within the classroom environment. A supportive and respectful classroom climate promotes positive learning experiences and encourages students to participate actively in academic activities. However, the results differ from the findings of Mayya et al. (2019), who emphasized that students perform best in highly regulated environments that simultaneously address both academic and social needs. These perspectives highlight the importance of creating learning environments that are supportive, relaxed, and free from threats or excessive competition so that students can participate effectively and enjoy classroom learning.

3.1.2 Self-Regulated Learning of Senior High School Students

The results revealed that the level of self-regulated learning among senior high school students was also high, with an overall mean score of 4.10. This indicates that students were generally capable of managing their own learning processes effectively. Among the indicators, self-evaluation obtained the highest mean score of 4.23, suggesting that students frequently evaluated their understanding and identified their strengths and weaknesses in learning. Environmental structuring also showed a very high mean score, indicating that students were able to organize their learning environments effectively. In contrast, help-seeking recorded the lowest mean score of 3.78, although it still fell within the high descriptive level, suggesting that students were willing to seek assistance from teachers or knowledgeable peers when encountering learning difficulties. These findings align with the work of Zimmerman (2019), which explains that students who establish clear learning goals and develop strategies to achieve them are more likely to maintain motivation and focus throughout the learning process. Self-regulated learning encourages students to take responsibility for their own learning through goal setting, monitoring, and reflection. The results are also consistent with the findings of Brown and Lee (2019), who reported that students with higher levels of self-regulated learning are more likely to seek additional information, close knowledge gaps, and develop deeper understanding of scientific concepts. Such behaviors contribute to improved academic engagement and learning outcomes.

3.1.3 Scientific Epistemic Beliefs of Senior High School Students

The results showed that the overall level of scientific epistemic belief among senior high school students was high, with a mean score of 3.99. This indicates that students generally possessed positive attitudes toward science and scientific inquiry. Among the indicators, justification obtained the highest mean score of 4.32, suggesting that students strongly believed that scientific knowledge should be supported by evidence from multiple experiments. The development indicator also obtained a high mean score, indicating that students recognized that scientific knowledge evolves over time. In contrast, the source indicator recorded the lowest mean score of 3.77, suggesting that some students still tended to rely on authoritative sources such as scientists when evaluating scientific information. These findings support the study of Mönch & Markic (2022), which highlighted the importance of presenting scientific concepts using clear and understandable language to enhance students' comprehension of complex scientific ideas. When scientific concepts are communicated effectively, students are more capable of understanding and applying scientific reasoning. As a result, clear instructional communication and accessible learning materials contribute to improved epistemic beliefs and stronger engagement in scientific learning.

3.2 Relationship Between Educational Environment and Scientific Epistemic Beliefs

The results revealed a statistically significant relationship between the educational environment and scientific epistemic beliefs among senior high school students. The overall correlation coefficient was 0.622 with a p-value of 0.000, indicating a strong and significant positive relationship. This means that improvements in the educational environment were associated with higher levels of scientific epistemic beliefs. Several components of the educational environment, including students' perception of learning, perception of teachers, academic self-perception, perception of atmosphere, and social self-perception, all showed significant correlations with the indicators of scientific epistemic belief, including source, certainty, development, and justification. These findings support the work of Roff et al. (2020), who emphasized that effective teaching environments are not determined solely by teachers' communication skills and knowledge but also by the overall quality of the educational climate experienced by students. A supportive learning environment fosters students' intellectual, social, and personal development while preparing them for future academic and professional responsibilities. Consequently, creating positive classroom environments benefits both teachers and students by promoting meaningful learning experiences and encouraging deeper engagement with scientific knowledge.

3.3 Relationship Between Self-Regulated Learning and Scientific Epistemic Beliefs

The analysis also revealed a significant relationship between self-regulated learning and scientific epistemic beliefs among senior high school students. The overall correlation coefficient was 0.610 with a p-value of 0.000, indicating a strong and statistically significant positive relationship. This result suggests that students who demonstrated higher levels of self-regulated learning were more likely to exhibit stronger scientific epistemic beliefs. All indicators of self-regulated learning, including goal setting, environmental structuring, task strategies, time management, help-seeking, persistence, self-evaluation, and emotion and experience, showed significant relationships with the dimensions of scientific epistemic belief. This finding is consistent with the study of Alharbi, M., & Alrabai, F. (2021), which reported a positive relationship between self-regulated learning and epistemic beliefs. Their research demonstrated that students who actively regulate their learning processes tend to develop more sophisticated understandings of knowledge and scientific inquiry. By engaging in strategies such as planning, monitoring, and evaluating their learning activities, students enhance their ability to interpret and apply scientific information effectively.

3.4 Influence of Educational Environment and Self-Regulated Learning on Scientific Epistemic Beliefs

The regression analysis revealed that educational environment and self-regulated learning significantly influenced scientific epistemic beliefs among senior high school students. The model produced an adjusted R value indicating that approximately 44.0 percent of the variability in scientific epistemic beliefs could be explained by the combined influence of the educational environment and self-regulated learning. The analysis also showed a statistically significant p-value of 0.001, confirming that the independent variables significantly predicted the level of scientific epistemic beliefs. Among the indicators examined, perception of atmosphere and self-evaluation emerged as the most significant predictors of students' epistemic beliefs. These findings support the study of Wang and Liu (2020), which found that students who use metacognitive strategies such as self-monitoring and self-evaluation demonstrate more advanced epistemic beliefs in science and higher levels of self-regulated learning. Similarly, Roff et al. (2020) emphasized that students' perceptions of the educational environment are among the most important factors affecting successful curriculum outcomes. Positive classroom climates and effective learning strategies encourage students to engage more actively in academic activities and develop stronger understanding of scientific knowledge. In addition, Flook et al. (2020) highlighted that positive academic perceptions significantly influence students' academic progress and motivation. Overall, the findings of the study support theoretical perspectives that emphasize the interaction between learning environments and self-regulated learning in shaping students' epistemic beliefs. When students experience supportive educational environments and actively regulate their learning processes through goal setting, planning, monitoring, and reflection, they are more likely to develop stronger scientific epistemic beliefs. These results are consistent with Bandura's social cognitive theory, which emphasizes that learning occurs through observation, interaction, and active engagement with one's learning environment.

4. Conclusion & Recommendations

The study revealed that the educational environment of senior high school students was at a high level, as reflected in students' perceptions of learning, teachers, academic self-perception, atmosphere, and social self-perception. Similarly, the level of self-regulated learning was high, with goal setting, task strategies, time management, help-seeking, persistence, and emotion and experience rated high, while environmental structuring and self-evaluation reached very high levels. The level of scientific epistemic belief among students was also high, with source, certainty, and development rated high and justification rated very high. The results further showed that there were significant relationships between the educational environment and scientific epistemic beliefs, as well as between self-regulated learning and scientific epistemic beliefs. Moreover, both the educational environment and self-regulated learning significantly influenced the scientific epistemic beliefs of senior high school students, indicating that supportive learning environments and effective self-regulated learning behaviors contribute to the development of students' understanding of scientific knowledge and inquiry.

Based on the findings of the study, it is recommended that schools strengthen participatory and experiential learning activities that encourage active engagement, collaboration, and real-world application of knowledge. Teachers should continue enhancing their instructional practices by fostering supportive classroom environments, maintaining effective communication with students, and providing regular feedback to support learning needs and preferences. Programs that develop students' self-regulated learning skills, such as goal setting, planning, monitoring progress, and self-reflection, should be promoted to strengthen students' academic confidence and engagement. Schools may also encourage mentorship programs, peer support systems, and activities that build students' social interaction and sense of belonging. Administrators and educational institutions should continuously evaluate the learning environment and improve school facilities and instructional resources to enhance students' learning experiences. Parents may also play a role by assessing the suitability of educational environments that support their children's academic growth, while students are encouraged to actively adapt to their learning environments and develop effective learning strategies. Future researchers are also encouraged to conduct further studies exploring other variables related to educational environment, self-regulated

learning, and scientific epistemic beliefs.

This study was limited to examining the relationship and influence of the educational environment and self-regulated learning on the scientific epistemic beliefs of senior high school students from selected schools. The respondents were restricted to Grade 12 students from two public high schools in the Municipality of Cateel, Davao Oriental, during the specified academic period. The findings were based on self-reported survey responses, which may reflect the students' perceptions and experiences within their educational context. Furthermore, the study focused only on the selected variables and indicators used in the research instruments, which means that other possible factors influencing scientific epistemic beliefs were not included in the analysis. These limitations suggest that the results may be interpreted within the context of the selected participants and variables considered in the study.

Compliance with ethical standards

The study followed institutional ethical guidelines during the conduct of the research. Participation was voluntary, and respondents were informed about the purpose of the study prior to participation. The researchers ensured that all collected information remained confidential and handled responsibly throughout the research process.

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Conflict of interest statement
The authors declare that there are no financial, personal, or professional conflicts of interest related to this study.

Statement of ethical approval
The study involved non-invasive, survey-based data collection and followed institutional research procedures. An ethics review was conducted and the study was approved under protocol number 2025-284.

Statement of informed consent
Informed consent was obtained from all participants prior to their involvement in the study, including parental consent for respondents under 18 years old. Participation was voluntary, and respondents were assured that their responses would remain confidential and that no personal identifiers would be disclosed.

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