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Research Article

STEM Strand Academic Performance and Undergraduate Program Readiness Among Rural High School Graduates

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Abstract
Rural students face unique educational challenges affecting their transition to tertiary education. This descriptive-correlational study examined whether Senior High School STEM academic performance correlates with college readiness among 80 rural graduates from Bato, Leyte who enrolled in STEM undergraduate programs in 2025. Using a validated 20-item assessment based on Conley's framework, the study measured readiness across content knowledge, cognitive strategies, academic behaviors, and contextual skills and awareness. Despite high academic achievement (M = 91.4%, SD = 2.78), graduates reported moderate readiness (M = 74.4/100), with notable gaps in content knowledge (M = 17.5/25) and cognitive strategies (M = 17.7/25). Pearson correlation revealed significant positive relationships between GWA and all readiness dimensions (r = .373 to .465, $p < .001$), though academic performance explained only 21.6% of readiness variance. These findings suggest that while STEM performance contributes meaningfully to undergraduate program readiness, substantial additional factors influence readiness outcomes. The study provides empirical evidence for policy refinement and targeted interventions to strengthen rural STEM education effectiveness in the Philippines.
Keywords: STEM Strand, College Readiness, Academic Performance, Senior High School, Rural Education, K-12 Curriculum.

Introduction

The K to 12 Basic Education Program represents the most significant educational reform in Philippine history, extending compulsory education from 10 to 12 years and introducing the Senior High School (SHS) program in 2016. This reform aimed to align Philippine education with international standards and better prepare graduates for higher education, employment, or entrepreneurship (DepEd, 2024). The Science, Technology, Engineering, and Mathematics (STEM) strand, one of four specialized tracks under the academic strand, was designed specifically to develop scientific literacy, mathematical proficiency, and analytical skills required for success in college-level STEM programs.

The strategic importance of STEM education extends beyond individual student outcomes. As the Philippines positions itself within an increasingly knowledge-driven global economy, the demand for skilled STEM professionals intensifies across sectors including healthcare, information technology, engineering, and applied sciences (Widya *et al.,* 2019). The STEM strand therefore serves as a critical pipeline for developing human capital essential to national competitiveness and economic development. Understanding whether this educational pathway effectively prepares students for higher education success has important implications for education policy, curriculum design, and resource allocation.

However, substantial questions remain about the STEM strand's actual effectiveness in preparing students for college-level coursework demands. International research presents mixed findings regarding STEM education outcomes. Wu *et al.,* (2024) documented considerable variation in program effectiveness, with some initiatives demonstrating significant improvements in student readiness while others revealed persistent challenges including inadequate resources, inconsistent implementation, and insufficient teacher preparation. These implementation gaps often translate into disparities in student outcomes, raising concerns about educational equity.

In the Philippine context, Ferma (2025) identified significant inequalities in STEM education access and quality, with rural and economically disadvantaged communities experiencing particularly acute challenges. These disparities manifest in limited laboratory facilities, insufficient instructional materials, teacher shortages in specialized subjects, and restricted access to technology-enhanced learning opportunities. Such contextual factors raise fundamental questions about whether the intended benefits of STEM education are being realized equitably across diverse educational settings (Lee and Shute, 2010).

The policy environment surrounding SHS adds urgency to this inquiry. In early 2025, Senate Bill No. 2876 proposed reverting to a 10-year basic education cycle, citing implementation difficulties and concerns about employment outcomes (Mangaluz, 2025). While this legislation remains under deliberation, such proposals reflect ongoing debates about program value and effectiveness. This contentious policy climate underscores the critical need for empirical evidence demonstrating whether specialized tracks like STEM successfully achieve their stated objectives.

Rural public schools represent a particularly important yet understudied context for examining STEM education effectiveness. A public secondary school in Bato, Leyte, which initiated STEM strand offerings in Academic Year 2020-2021, provides a relevant case study. As a recent program implementer in a resource-constrained rural setting, this school exemplifies both the opportunities and challenges facing similar institutions throughout the Philippines. Examining student outcomes from this context offers valuable insights into program effectiveness under real-world conditions typical of rural educational environments.

Current research literature exhibits a critical gap regarding the empirical relationship between SHS STEM academic performance and subsequent undergraduate program readiness. This deficit is particularly pronounced for rural public schools, where educational resources, infrastructure, and support systems may differ substantially from urban counterparts (Wood, 2023). Understanding this relationship is essential for evidence-based policy development, targeted program improvements, and equitable resource allocation.

This study addresses this knowledge gap by investigating the relationship between academic performance in the SHS STEM strand and college readiness among graduates pursuing STEM-related higher education. By focusing specifically on 2025 graduates from a rural public school in Bato, Leyte, this research generates empirical evidence to inform policy decisions, guide program enhancements, and provide actionable insights for improving STEM education effectiveness in similar rural contexts. The findings contribute to broader understanding of STEM education outcomes in the Philippine context while offering specific guidance for rural schools implementing similar programs.

Research Gap

Three critical gaps warrant investigation. First, while considerable research examines college readiness broadly, minimal empirical work investigates STEM strand effectiveness in preparing students for college-level programs, particularly in rural contexts where implementation challenges differ substantially from urban settings. Second, existing Philippine tracer studies predominantly focus on cohorts graduating between 2013 and 2022, with insufficient research examining students graduating from 2022 onward who experienced significant pandemic-related educational disruptions that may have affected learning outcomes. Third, limited research employs validated multidimensional frameworks beyond traditional achievement measures, neglecting cognitive, behavioral, and contextual readiness dimensions essential for college success. These gaps in existing literature provide the foundation and motivation for this study.

Statement of the Problem

This study investigates the relationship between students' academic performance in the Senior High School STEM strand and their readiness in STEM-related higher education programs. Specifically, the study seeks to answer the following questions:

1) What is the academic performance of the STEM strand graduates based on their general weighted average?

2) What is the level of readiness of the SHS STEM graduates who pursued STEM-related undergraduate programs in terms of:

2.1. Content knowledge
2.2. Cognitive strategies
2.3. Academic behavior
2.4. Contextual skills and awareness
2.5. Total score based on Conley's four keys to college and career readiness

3) Is there a significant relationship between STEM strand academic performance and undergraduate program readiness among rural high school graduates?

Materials and Methods

Research Design

This study employed a quantitative correlational research design using a cross-sectional survey approach. According to Creswell (2014), correlational designs are appropriate for examining relationships between variables without manipulation. The research is non-experimental, involving no treatment interventions or control groups. Instead, data were gathered from existing academic records and student self-assessments, allowing for natural observation of variable relationships. The cross-sectional approach collected data at a single point in time from 2025 graduates enrolled in STEM college programs.

Research Locale

This study was conducted at a public secondary school located in the rural municipality of Bato, Leyte, Philippines. The school began offering the STEM strand during Academic Year 2020-2021. Situated in a rural area with limited educational resources compared to urban counterparts, the school provides a relevant setting for examining how students from geographically and economically marginalized contexts transition from SHS to higher education in STEM programs. This school was selected because it represents a growing number of rural public high schools implementing the STEM strand despite resource challenges, and no prior studies have examined SHS STEM program effectiveness in similar rural public-school settings.

Respondents

The participants were graduates of the STEM strand who completed their Senior High School education in Academic Year 2024-2025. School registrar records indicated that 163 students graduated from the STEM strand. This study employed census sampling, wherein all STEM strand graduates meeting inclusion criteria were invited to participate. Inclusion criteria required participants to have: (1) graduated from the STEM strand in Academic Year 2024-2025, (2) enrolled in a STEM-related undergraduate program (engineering, biology, nursing, computer science, mathematics, physics, chemistry, information technology, or related fields), (3) provided voluntary informed consent, and (4) accessibility via Facebook Messenger, SMS, or phone call for survey administration.

Of the 163 total graduates, 127 (77.9%) were successfully contacted. Among these, 81 (63.8%) were currently enrolled in STEM-related college programs and met all inclusion criteria. All 81 eligible participants were invited, and 80 agreed to complete the survey, resulting in a 98.8% response rate among eligible participants. This exceptionally high response rate was achieved through personalized recruitment, multiple follow-up reminders, flexible survey completion timelines, and clear communication about the study's potential to improve STEM education for future students.

Instrument

The study utilized a structured questionnaire comprising three main sections. Section A collected demographic information including sex, age, degree program, and type of higher education institution. Section B gathered academic performance data through self-reported overall general weighted average (GWA) in the STEM strand using percentage format. Section C employed a self-assessment checklist based on Conley's Four Keys to College and Career Readiness Framework (2007).

The College Readiness Assessment consisted of 20 items organized into four domains, each containing five items. Content Knowledge assessed perceived mastery in Mathematics, Statistics, Physics, Chemistry, and Biology. Cognitive Strategies evaluated confidence in critical thinking, problem-solving, data analysis, research skills, and drawing logical conclusions. Academic Behaviors measured perceived competence in time management, note-taking, independent study, exam preparation, and academic persistence. Contextual Skills and Awareness assessed written communication, oral presentation, teamwork, technology use, and understanding of college expectations. All items used a 5-point Likert scale ranging from 1 (Strongly Disagree) to 5 (Strongly Agree), with total readiness scores calculated as the sum of all items, ranging from 20 to 100.

The questionnaire underwent expert validation by three education specialists: two content experts in STEM education and research methodology, and one language expert. Following expert validation, a pilot test was conducted with 30 non-participant STEM graduates from a similar rural public high school. Reliability analysis demonstrated strong psychometric properties.

Cronbach's alpha for the total 20-item scale was α = 0.887 (95% CI [0.843, 0.922]), substantially exceeding the acceptable threshold of .70 (Nunnally and Bernstein, 1994). Reliability coefficients for individual subscales were also satisfactory: Content Knowledge (α = 0.823), Cognitive Strategies (α = 0.856), Academic Behaviors (α = 0.811), and Contextual Skills and Awareness (α = 0.798).

Data Collection

Data were collected through an online questionnaire administered via Google Forms. The data gathering procedure began by contacting all potential respondents and adding them to a Facebook Messenger group chat. Participants then attended a virtual orientation session conducted via Google Meet, where they received information about the study purpose, procedures, voluntary participation, confidentiality protections, and their rights as research participants. Following orientation, the communication letter, informed consent form, and survey questionnaire were administered electronically.

Survey access was restricted to invited respondents only, with data accessible exclusively to the researcher. Where participants provided consent and school policies permitted, selected data from school registrar records were reviewed to verify accuracy of self-reported SHS GWA. Once data collection was complete, the Google Form was closed and data were downloaded to a secure computer in Excel format for subsequent analysis.

Data Analysis

The collected data were analyzed using JAMOVI, a free and open-source statistical software. Descriptive statistics including frequencies, percentages, means, standard deviations, and measures of distribution were used to describe demographic profiles, academic performance, and college readiness levels. Pearson correlation coefficient was computed to examine relationships between SHS GWA and college readiness dimensions. Statistical significance was set at α = .05. Effect sizes were interpreted using Cohen's (1988) guidelines: small (r = .10-.29), medium (r = .30-.49), large (r ≥ .50).

Results and Discussion

Demographic Profile of the STEM Strand Graduates AY: 2024-2025

Table 1. Frequency distribution of the respondents' demographic profile.

		Frequency	**Percentage**
Sex	Male	41	51.2%
	Female	39	48.8%
Age	18 years	67	83.8%
	19 years	11	13.8%
	20 years	2	2.5%
Degree program	BS Nursing (BSN)	13	16.3%
	BS Information Technology (BSIT)	12	15.0%
	BS Civil Engineering (BSCE)	11	13.8%
	BS Mechanical Engineering (BSME)	7	8.8%
	BS Marine Transportation (BSMT)	6	7.5%
	BS Information Systems (BSIS)	3	3.8%
	BS Food Technology (BSFT)	3	3.8%
	BS Biology (BS Bio)	3	3.8%
	Others	22	27.5%
Type of institution	State University/College (SUC)	45	56.3%
	Private University/College	35	43.8%

The demographic profile reveals a balanced gender distribution with males comprising 51.2% (n = 41) and females 48.8% (n = 39) of the sample. This near-equal representation differs markedly from typical patterns in education-related research where female participation often predominates (Schaeffer, 2024). The balanced gender composition is noteworthy and may reflect successful efforts to promote gender equity in STEM fields at the secondary level. Age distribution demonstrates that the vast majority of respondents were 18 years old (83.8%, n = 67), with smaller proportions aged 19 years (13.8%, n = 11) and 20 years (2.5%, n = 2). This clustering around age 18 indicates that most graduates completed their Senior High School education without significant delays, demonstrating successful on-time progression through the K-12 system.

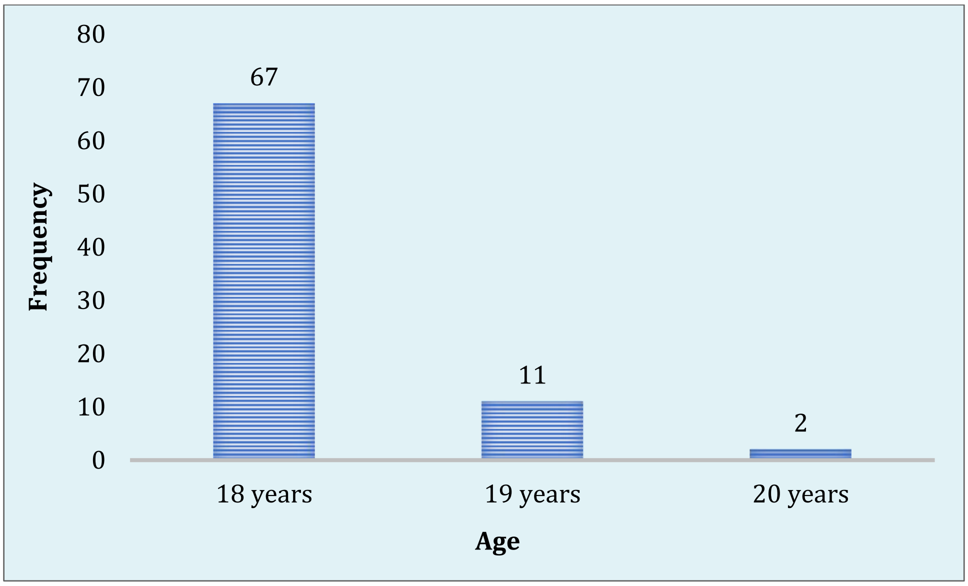

Figure 1. Age distribution of STEM strand graduates (N=80).

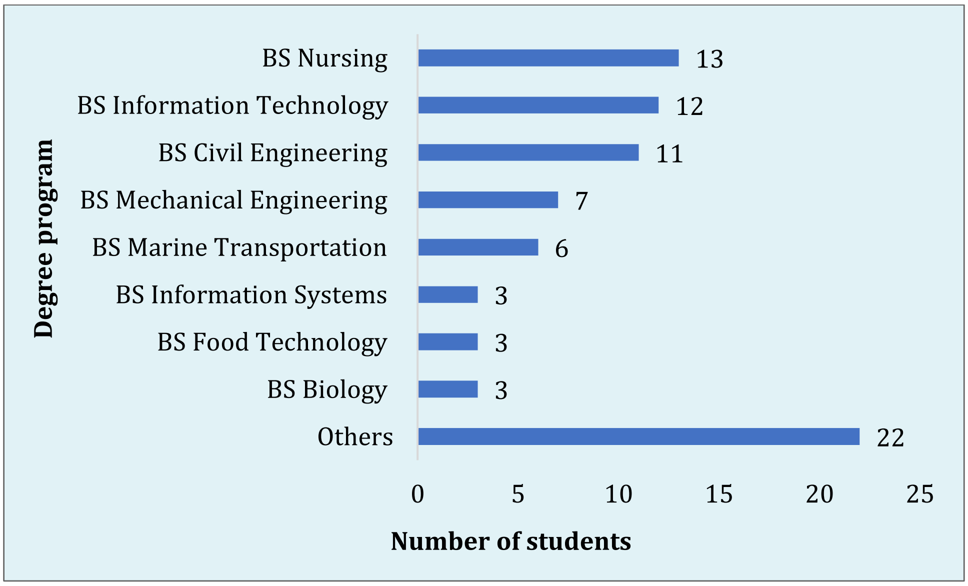

Figure 2. Distribution of STEM graduates by degree program (N=80).

Degree program selection reveals important patterns in students' educational trajectories. BS Nursing emerged as the most popular choice (16.3%, n = 13), followed by BS Information Technology (15.0%, n = 12) and BS Civil Engineering (13.8%, n = 11). Engineering programs collectively demonstrated substantial representation, with BS Mechanical Engineering attracting 8.8% (n = 7), BS Marine Transportation 7.5% (n = 6), and various other engineering specializations accounting for additional enrollments. Other programs including BS Information Systems, BS Food Technology, and BS Biology each attracted 3.8% (n = 3) of graduates, while 27.5% (n = 22) enrolled in various other STEM-related programs.

The strong preference for Nursing aligns with the Philippines' well-established healthcare education tradition and persistent demand for nursing professionals both domestically and internationally. The substantial enrollment in Information Technology programs reflects growing recognition of technology careers as viable pathways in an increasingly digital economy. Engineering programs' collective popularity demonstrates the STEM strand's effectiveness in directing students toward traditional STEM fields that drive infrastructure development.

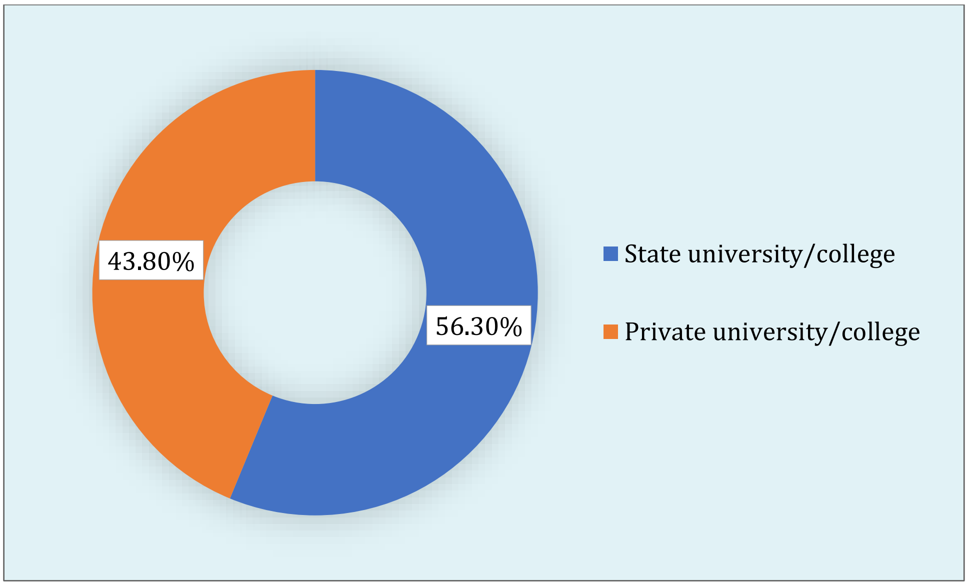

Figure 3. Distribution by type of higher education institution (N=80).

Institutional preference patterns reveal significant socioeconomic influences on educational choices. The majority of graduates (56.3%, n = 45) enrolled in State Universities and Colleges (SUCs), while 43.8% (n = 35) chose private institutions. This distribution suggests that graduates from rural public high schools prioritize accessible and affordable public higher education options, reflecting economic realities facing rural families. However, the substantial minority choosing private institutions demonstrates that when families perceive distinctive value such as specialized programs or institutional reputation, they are willing to invest in private education despite potentially higher costs.

Academic Performance of STEM Strand Graduates

Table 2. Descriptive statistics for SHS STEM strand academic performance (N=80).

Variable	N	Mean	Median	SD	Min	Max	Range	Skewness
SHS GWA (%)	80	91.4	92.0	2.78	81.0	95.7	14.7	-1.35

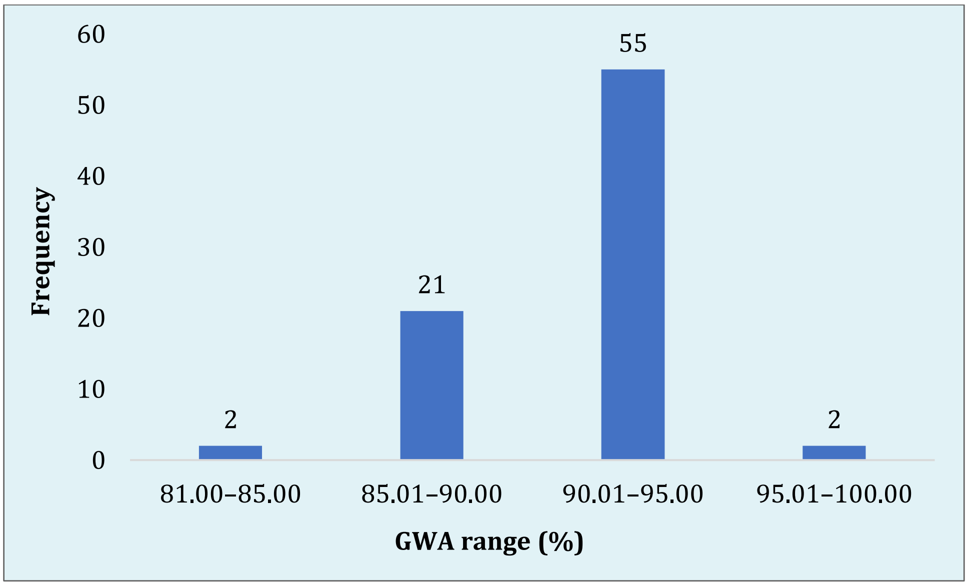

Figure 4. Distribution of SHS GWA among STEM graduates (N=80).

Academic performance data reveals uniformly high achievement levels among STEM strand graduates. The mean General Weighted Average was 91.4% (SD = 2.78, Mdn = 92.0%), indicating strong overall academic performance across the cohort. Performance ranged from a minimum of 81.0% to a maximum of 95.7%, yielding a range of 14.7 percentage points. The distribution exhibited moderate negative skewness (-1.35), indicating that most students clustered toward the upper end of the GWA distribution, with relatively fewer students in lower performance categories. The median GWA of 92.0% being slightly higher than the mean reflects this negative skewness and confirms that more than half of graduates achieved GPAs above 92%.

While these results initially appear to reflect highly successful STEM program implementation, this pattern of uniformly high grades and negative skewness warrants careful critical interpretation within the broader context of grade inflation concerns in Philippine education. Recent analyses by Dalisay (2023) documented substantial increases in the proportion of students receiving Latin honors at major Philippine universities, raising questions about whether grade increases reflect genuine improvements in learning outcomes or changes in assessment and grading practices. The concentration of STEM graduates in the 90-96% range raises legitimate questions about whether current assessment practices adequately differentiate among students with varying levels of content mastery and skill development.

The relatively narrow standard deviation (SD = 2.78) indicates limited variability in academic performance among STEM graduates. While this consistency could indicate that the STEM program effectively supported all students in reaching uniformly high achievement levels, it may alternatively suggest that assessment instruments and grading practices compressed the performance distribution, limiting the ability to distinguish among students with different levels of mastery.

Level of College Readiness Among STEM Graduates

Table 3. Descriptive statistics for college readiness assessment (N=80).

Dimension	N	Mean	SD	Range	Skewness
Content knowledge	80	17.5	3.66	20	-0.604
Cognitive strategies	80	17.7	3.79	20	-0.386
Academic behaviors	80	19.4	3.98	20	-0.830
Contextual skills and awareness	80	19.8	3.62	18	-1.292
Total readiness score	80	74.4	13.23	71	-0.798

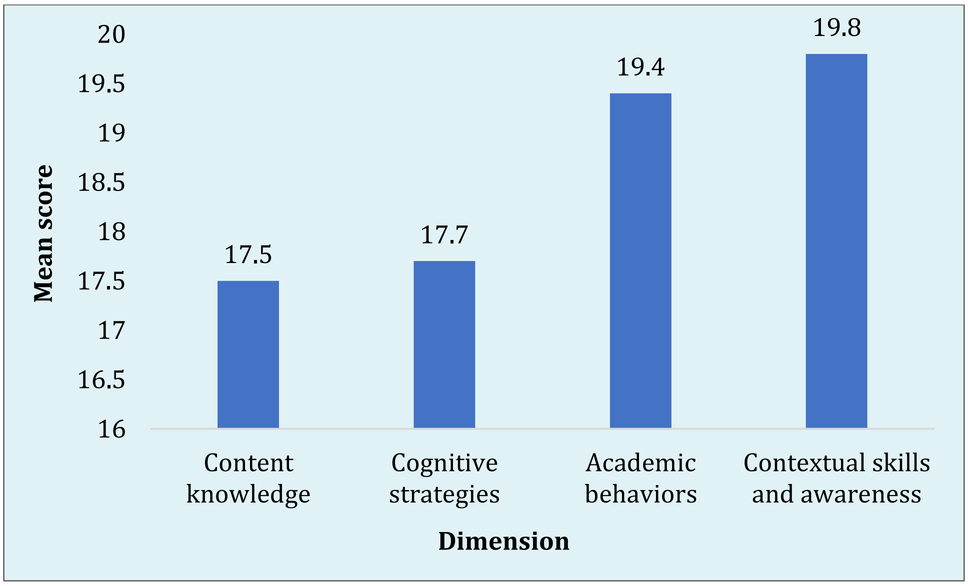

Figure 5. Mean scores by college readiness dimension (N=80).

College readiness assessment results reveal important patterns in how graduates perceive their readiness for undergraduate programs. Overall readiness averaged 74.4 out of 100 possible points (SD = 13.23), indicating that graduates generally felt moderately to highly prepared for college-level STEM coursework. This moderate readiness level aligns with research suggesting that the transition from high school to college represents a significant academic leap requiring substantial adjustments, even among high-performing students (Conley, 2007). The distribution showed moderate negative skewness (-0.798), suggesting a tendency toward higher readiness ratings, though the mean of 74.4% indicates considerable room for improvement.

Examination of the four readiness dimensions reveals a distinctive pattern with important implications. Contextual Skills and Awareness received the highest ratings (M = 19.8 out of 25, SD = 3.62), indicating strong confidence in written and oral communication abilities, teamwork skills, technology proficiency, and understanding of college expectations. This dimension exhibited the strongest negative skewness (-1.292), reflecting that most students rated themselves highly. Academic Behaviors received the second-highest ratings (M = 19.4 out of 25, SD = 3.98), reflecting strong perceived ability in time management, note-taking, independent study, examination preparation, and academic persistence. The robust ratings in this dimension suggest that the STEM strand successfully cultivated self-regulated learning habits and effective study strategies essential for college success.

In notable contrast, Cognitive Strategies and Content Knowledge received substantially lower though still positive ratings. Cognitive Strategies averaged 17.7 (SD = 3.79), while Content Knowledge averaged 17.5 (SD = 3.66), both out of 25 possible points. These dimensions received mean ratings approximately two points lower than the behavioral and contextual dimensions, a statistically and practically meaningful difference.

This pattern, where students rate themselves substantially higher in behavioral and contextual skills but lower in content knowledge and cognitive strategies, is particularly striking given that the same students achieved uniformly high academic performance (M = 91.4% GWA). This apparent disconnect warrants careful examination and suggests several plausible explanations. First, exposure to actual college-level syllabi and initial coursework may have provided students with new reference points for comparison, illuminating knowledge gaps that were not apparent during high school (Allensworth and Clark, 2020).

Second, the STEM curriculum's necessarily broad coverage of multiple subjects within the two-year SHS timeframe may have prioritized breadth of exposure over depth of mastery. Third, students from rural schools may have experienced resource constraints that affected their learning experiences. Limited laboratory facilities, restricted access to advanced learning materials, and potential teacher shortages in specialized subjects could all impact confidence in content mastery despite high grades that may have been based primarily on theoretical knowledge rather than deep conceptual understanding (Wood, 2023).

The moderate ratings for Cognitive Strategies suggest that while students developed critical thinking and problem-solving skills to some extent, they felt inadequately prepared for the analytical rigor characteristic of college-level STEM work. This finding aligns with research demonstrating that cognitive skill development requires extensive practice with complex, ill-structured problems and authentic disciplinary reasoning (Hill *et al.,* 2020), which may have been limited in resource-constrained rural school settings. Total readiness scores ranged from 29 to 100 points, demonstrating considerable variability in perceived readiness across the cohort. This 71-point range indicates that while some students felt highly confident in their readiness, others experienced significant uncertainty. This substantial variability underscores the critical need for differentiated support systems and targeted interventions to address individual readiness gaps, particularly for students at the lower end of the readiness spectrum who may be at elevated risk for academic difficulties during the college transition period.

Relationship Between STEM Performance and College Readiness

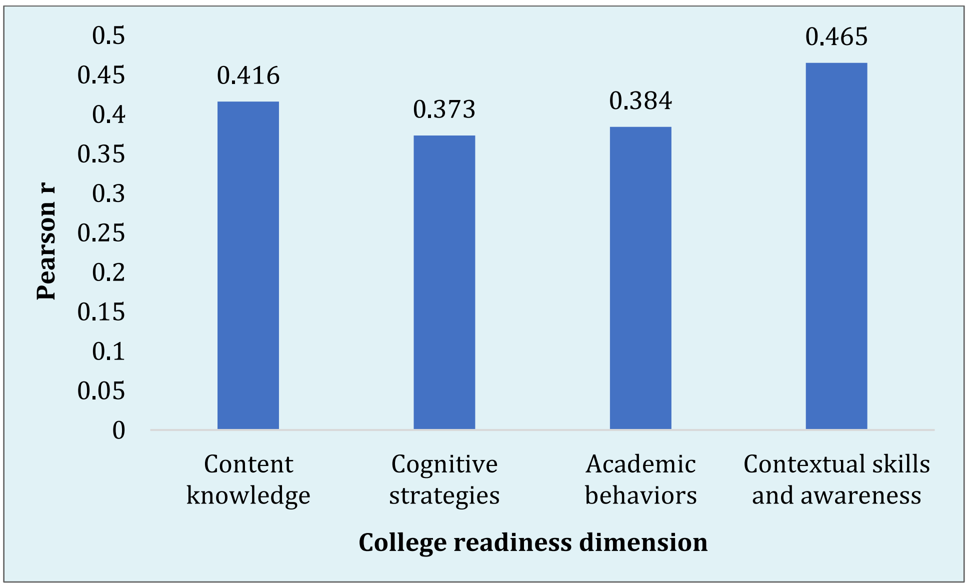

Figure 6. Correlation coefficients between SHS GWA and readiness dimensions (N=80).

Table 4. Pearson correlation between SHS GWA and college readiness dimensions (N=80).

College readiness dimension	Pearson r	95% CI	p-value	R^2	Effect size
Content knowledge	0.416	[0.216, 0.582]	<.001***	17.31%	Medium
Cognitive strategies	0.373	[0.167, 0.548]	<.001***	13.91%	Medium
Academic behaviors	0.384	[0.179, 0.557]	<.001***	14.75%	Medium
Contextual skills and awareness	0.465	[0.274, 0.622]	<.001***	21.62%	Medium
Total readiness score	0.465	[0.274, 0.622]	<.001***	21.62%	Medium
Note. ***p < .001. Effect sizes interpreted using Cohen's (1988) guidelines: small (r = .10-.29), medium (r = .30-.49), large (r ≥ .50). All correlations are statistically significant at p < .001.					

Correlation analysis revealed statistically significant positive relationships between SHS STEM strand GWA and all dimensions of college readiness, providing strong evidence to reject the null hypothesis of no relationship. The overall relationship between SHS GWA and total college readiness was moderate and positive (r = .465, 95% CI [0.274, 0.622], p < .001), with SHS academic performance explaining 21.62% of the variance in total readiness scores. This finding confirms that academic performance in the STEM strand serves has a meaningful and statistically significant relationship with perceived college readiness (Duckworth *et al.,* 2019).

All four readiness dimensions showed significant positive correlations with SHS GWA, with correlation coefficients ranging from r = .373 to r = .465, all achieving statistical significance at p < .001. The strongest relationships were found between GWA and Contextual Skills and Awareness (r = .465, 95% CI [0.274, 0.622], p < .001, R^2 = 21.62%) and Content Knowledge (r = .416, 95% CI [0.216, 0.582], p < .001, R^2 = 17.31%). Academic Behaviors (r = .384, 95% CI [0.179, 0.557], p < .001, R^2 = 14.75%) and Cognitive Strategies (r = .373, 95% CI [0.167, 0.548], p < .001, R^2 = 13.91%) showed moderate positive correlations, though slightly lower in magnitude. According to Cohen's (1988) guidelines, all four correlations fall within the medium effect size range (r = .30 to .49), indicating practically meaningful relationships.

The strength and consistency of significant correlations across all four domains of Conley's (2007) framework provide important validation that effective STEM programs cultivate a comprehensive constellation of competencies essential for higher education success. The particularly strong relationship between GWA and Contextual Skills and Awareness (r = .465) suggests that students who perform well academically also develop stronger communication abilities, college awareness, and capacity to navigate academic contexts effectively. This finding provides strong support for Bandura's (1997) self-efficacy theory, which posits that mastery experiences in challenging academic contexts build both domain-specific competence and broader academic confidence.

The robust correlation between GWA and Content Knowledge (r = .416) validates that academic grades in the STEM strand reflect genuine foundational learning in core STEM subjects, despite students' moderate self-ratings in this dimension. From a Human Capital Theory perspective (Becker, 1964), this finding suggests that investment in STEM education yields measurable returns in the form of developed knowledge capital that students themselves recognize as valuable preparation for college success.

Despite the statistical significance and practical meaningfulness of these relationships, the finding that SHS GWA explained only 21.6% of variance in college readiness perceptions provides critically important evidence about both the value and the limitations of high school academic performance as a predictor of college readiness. The substantial unexplained variance (approximately 78.4%) indicates considerable contributions from factors not captured by academic performance metrics.

This moderate predictive power is notably lower than relationships documented in some previous studies conducted in different contexts. For example, Allensworth and Clark (2020) found that high school GPA was the single strongest predictor of college readiness and success in urban U.S. school districts, explaining substantially larger proportions of variance than observed in this study. Several contextual factors may explain the relatively lower predictive power observed here.

First, rural school contexts may present unique challenges that attenuate the relationship between high school performance and college readiness. Rural students often face resource constraints, limited exposure to college-preparatory experiences, fewer opportunities for enrichment activities, less access to college counseling, and limited contact with college-educated role models (Saw and Agger, 2021). Second, self-efficacy and expectancy factors may play particularly influential roles among rural students. Students from rural backgrounds, despite strong academic performance, may experience lower academic self-efficacy influenced by limited exposure to college environments, awareness of resource disparities, concerns about financial constraints, and uncertainty about their ability to succeed in competitive college environments (Wood, 2023). Third, measurement approach differences must be considered. This study measured perceived readiness through self-assessment at college entry rather than actual college performance outcomes such as first-year GPA or persistence rates. Finally, sample selection effects warrant consideration, as this study examined only graduates who successfully enrolled in STEM college programs, which may represent a more motivated or academically capable subset.

The moderate correlations observed suggest that college readiness development is a complex process influenced by academic preparation, personal characteristics, family and community contexts, institutional factors, and socioeconomic resources. This finding has important implications for educational policy and practice. While maintaining rigorous academic standards and supporting high achievement remain essential, these efforts alone are insufficient to ensure college readiness. Comprehensive approaches that address motivation, self-efficacy, study skills, college knowledge, financial preparation, and family engagement are equally critical components of effective college preparation programs.

Conclusion

This study examined the relationship between Senior High School STEM strand academic performance and perceived college readiness among 80 graduates from a rural public school in Bato, Leyte who enrolled in STEM-related undergraduate programs in 2025. The findings provide important empirical evidence addressing critical gaps in understanding STEM education effectiveness in rural Philippine contexts. The demographic profile reveals balanced gender participation with males (51.2%) and females (48.8%) nearly equally represented, differing from historical trends showing female underrepresentation in STEM fields. This suggests that efforts to promote gender equity in STEM education may be achieving success at the secondary level. The predominance of 18-year-old graduates (83.8%) demonstrates timely degree completion without significant delays. Degree program preferences favoring Nursing (16.3%), Information Technology (15.0%), and Civil Engineering (13.8%) reflect labor market demands and career opportunities available to Filipino graduates. The preference for State Universities and Colleges (56.3%) over private institutions underscores how financial constraints shape educational decision-making among rural students, even those with strong academic credentials.

Academic performance data reveals uniformly high achievement, with graduates attaining a mean GWA of 91.4% (SD = 2.78). However, this pattern of compressed high grades with limited variability and negative skewness (-1.35) raises important questions about assessment practices and grade inflation that must be addressed in future program evaluations. The narrow standard deviation suggests that current grading practices may not adequately differentiate among students with varying levels of content mastery, potentially limiting the information value of grades for college admissions and placement decisions. College readiness assessment reveals a noteworthy pattern where graduates reported strong confidence in Contextual Skills and Awareness (M = 19.8/25, 79% of maximum) and Academic Behaviors (M = 19.4/25, 78% of maximum), but substantially lower confidence in Content Knowledge (M = 17.5/25, 70% of maximum) and Cognitive Strategies (M = 17.7/25, 71% of maximum). This disconnect between high academic grades and moderate perceived content mastery represents a critical finding with important implications for curriculum development and instructional improvement. The pattern suggests that while the STEM strand effectively develops communication skills, study habits, and awareness of college expectations, it may provide less adequate preparation in deep content understanding and higher-order cognitive skills essential for success in rigorous college STEM programs.

Correlation analysis confirmed significant positive relationships between SHS GWA and all dimensions of college readiness, with coefficients ranging from $r = .373$ to $r = .465$ (all $p < .001$). These medium-strength correlations validate that academic performance contributes meaningfully to perceived college readiness. However, the finding that SHS GWA explained only 21.6% of variance in total readiness perceptions is equally significant, demonstrating that college readiness is fundamentally multifaceted and influenced by numerous factors beyond academic achievement alone. The substantial unexplained variance (78.4%) indicates that non-academic factors including motivation, self-efficacy, family support, socioeconomic resources, and institutional characteristics play major roles in shaping college readiness that are not captured by traditional achievement measures. These findings provide empirical support for continued STEM strand implementation in rural areas while simultaneously highlighting specific areas requiring programmatic attention and improvement. The results validate Conley's (2007) four keys to college and career readiness framework in a Philippine rural context, demonstrating that all four dimensions are positively associated with academic performance and contribute to overall perceived preparation. The findings also support Bandura's (1986) social cognitive theory, as mastery experiences in STEM coursework were associated with stronger self-efficacy beliefs and perceived readiness across multiple dimensions. From a human capital theory perspective (Becker, 1964), the results suggest that investment in STEM education yields returns in developed competencies that students recognize as valuable for college success, though the moderate effect sizes indicate that comprehensive rather than purely academic investments are necessary to optimize outcomes.

The study's findings must be interpreted within the context of several important limitations. The cross-sectional design precludes causal inferences about whether STEM performance causes improved readiness or whether both are influenced by common underlying factors. The single-school sample limits generalizability to other contexts, particularly urban schools or institutions with different resource levels. Reliance on self-reported readiness perceptions rather than objective performance measures may introduce measurement bias. The examination of only students who successfully enrolled in STEM programs creates potential selection effects. These limitations suggest that findings are most directly applicable to understanding perceived readiness among STEM graduates from rural public schools who successfully transition to college, rather than to all STEM students or actual college performance outcomes.

Despite these limitations, the study makes several important contributions to understanding STEM education effectiveness in the Philippines. It provides empirical evidence that STEM strand implementation in resource-constrained rural settings can contribute to college readiness development, supporting policy decisions to maintain and strengthen the program. It identifies specific readiness dimensions requiring targeted attention, particularly content knowledge and cognitive strategies. It demonstrates that college readiness assessment must extend beyond traditional achievement measures to capture the full range of competencies required for success. It provides baseline data for longitudinal follow-up studies that can track actual college performance outcomes.

Recommendations

The following are recommended from the findings of this study:

- ✓ Since academic performance explains only 21.6% of college readiness variance, policymakers should support comprehensive college preparation initiatives that address non-academic factors including guidance counseling, college awareness programs, financial aid support, and family engagement activities. Additionally, establish monitoring systems to assess STEM strand quality across schools and support longitudinal research tracking graduates through college to measure actual performance outcomes.
- ✓ Administrators should prioritize qualified teachers with strong STEM content knowledge and pedagogical skills in inquiry-based learning. Adequate laboratory facilities, technology resources, and instructional materials are essential. Establish partnerships with higher education institutions for campus visits, mentorship programs, and dual enrollment opportunities to enhance student readiness.
- ✓ Teachers should address the identified gaps in Content Knowledge and Cognitive Strategies by prioritizing deep conceptual understanding over content coverage. Employ inquiry-based and project-based learning approaches that develop critical thinking and problem-solving skills. Explicitly teach academic behaviors including time management, note-taking, and study strategies. Create authentic assessments that mirror college-level expectations and require higher-order thinking.
- ✓ Higher education institutions should develop bridge and orientation programs for STEM strand graduates from rural schools that address readiness gaps, particularly in content knowledge. Implement early alert systems during the first year and provide accessible academic support services including tutoring and peer mentorship programs.
- ✓ Future researchers should conduct longitudinal studies tracking STEM graduates through college, measuring first-year GPA, retention rates, and degree completion rather than relying solely on perceived readiness at entry. Replicate this study across multiple schools with diverse contexts to test generalizability. Employ mixed-methods approaches and examine factors beyond grades, including self-efficacy, family support, and teacher quality, to explain the substantial unexplained variance. Investigate the disconnect between high grades and moderate content confidence through studies that include objective assessments and analysis of grading practices.

Declarations

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