The Normal Lights
2024, Volume 18, Issue No. 2

PHILIPPINE NORMAL UNIVERSITY
National Center for Teacher Education

Multivariate Analysis: Teachers' Attitudes, Students' Interests, Intrinsic Motivation on Students' Learning Outputs

Meg C. Enriquez, Melody R. Alvarado, Marivel A. Apit, Joden John V. Nituda

Davao de Oro State College, Compostela, Davao de Oro, Philippines 8803

ABSTRACT

This study examined how teachers' attitudes, students' interests, and intrinsic motivation influenced students' learning outputs in mathematics. It addressed the challenge of improving learning outputs amidst the Philippines' education crisis, shaped by traditional teaching methods and socioeconomic barriers. Using a descriptive-correlational design, 156 first-year mathematics students were selected through purposive random sampling. Data were collected via an adapted questionnaire and analyzed using multiple regression, Pearson correlation, standard deviation, and mean. Results revealed a significant positive relationship between supportive teacher attitudes, increased student interest, and intrinsic motivation in enhancing learning outputs. The findings highlighted the need to foster learner-centered, interest-driven, and intrinsically motivating environments. Education practitioners were encouraged to adopt strategies that promoted autonomous thinking and engagement. Future research could explore targeted interventions to strengthen motivation and interest across diverse educational contexts.

ARTICLE HISTORY

Lead Editor:
Marie Paz E. Morales, PhD

Received:
August 31, 2024
Revised:
December 26, 2024
Accepted:
December 27, 2024

KEYWORDS:

teachers' attitudes, interests, intrinsic motivation, learning outputs

Introduction

Teachers' positive attitudes significantly enhanced learning environments, fostering student engagement and boosting academic performance. Research showed that supportive teacher attitudes created a conducive and motivating learning atmosphere for improving student success (Fuad, 2021). Conversely, negative attitudes could diminish students' motivation and

Enriquez M.C., Alvarado, M.R, Apit, M.A., & Nituda, J.J. (2024). Multivariate analysis: Teachers' attitudes, students' interests, intrinsic motivation on students' learning outputs. *The Normal Lights, 18*(2). 19–38.

Corresponding Author: meg.enriquez@ddosc.edu.ph

academic performance, lowering learning outputs. These challenges resonated worldwide, as low student performance was often linked to insufficient motivation, interest, and preparation (Wu & Xin, 2019). Additionally, factors like unrealistic goals, cognitive misunderstandings, emotional instability, and personal challenges had been linked to poor academic performance.

The education system faced pressing challenges in the Philippines, as evidenced by the 2018 Programme for International Student Assessment (PISA) results, in which Filipino students ranked last in mathematics proficiency. Less than 20% achieved Level 2 proficiency, while over 50% scored at Level 1 or below, revealing substantial gaps in foundational mathematics skills. This highlighted the urgent need for innovative teaching strategies to foster interest and motivation among Filipino students (Bernardo et al., 2022).

Locally, Davao City reflected the national trend, with students exhibiting low performance in mathematics due to insufficient interest and motivation. According to Galabo et al. (2018), regional assessments indicated that a lack of intrinsic motivation and teacher support negatively impacted student engagement and learning outputs. Ladrero et al. (2020) noted that improving student interest and intrinsic motivation was crucial to addressing the persistent gaps in mathematical achievement in the region.

This research examined the relationship between teacher attitudes, student interest, and intrinsic motivation, as well as their combined influence on learning outputs. While existing studies had explored the individual effects of these factors, this study investigated how they interacted and collectively impacted student learning outputs in mathematics. By addressing these factors, the study sought to provide actionable insights into fostering supportive, motivating, and learner-centered educational environments, enhancing student engagement and academic outputs. The findings informed effective teaching strategies for improving student performance.

Theoretical Framework

This study was grounded in several theories that explained how teacher attitudes, student interest, and intrinsic motivation influenced learning outputs. These frameworks provided a basis for understanding the hypothesized relationships in this research.

Ajzen's (1991) *Theory of Planned Behavior (TPB)* posited that attitudes, subjective norms, and perceived behavioral control shaped intentions and behaviors. Applied here, TPB suggested that positive teacher attitudes created a supportive classroom environment, fostering student engagement and participation, which significantly impacted learning outputs. Chan et al.'s (2019) *Interest-Driven Creator (IDC) Theory* emphasized that student engagement and creativity were fueled by genuine interest. Students who were interested in the curriculum actively generated ideas and solutions, thereby boosting their academic performance. This theory framed student interest as a key driver of learning outputs. Deci and Ryan's (1985)

Self-Determination Theory (SDT) focused on intrinsic motivation, proposing that students achieved higher academic success when their psychological needs for autonomy, competence, and relatedness were met. Intrinsic motivation directly influenced student engagement and performance, thereby contributing to improved learning outputs. Ames' (1992) *Achievement Goal Theory (AGT)* explored how mastery-oriented academic goals enhanced performance by prioritizing learning over external validation. This theory underscored the role of internal objectives in shaping outputs. These theories provided an integrated framework for understanding the interplay between teacher attitudes, student interest, intrinsic motivation, and their combined impact on learning outputs. This study hypothesized that positive teacher attitudes, increased student interest, and intrinsic motivation collectively enhanced learning outputs.

Figure 1

Diagrammatic Framework of the Study

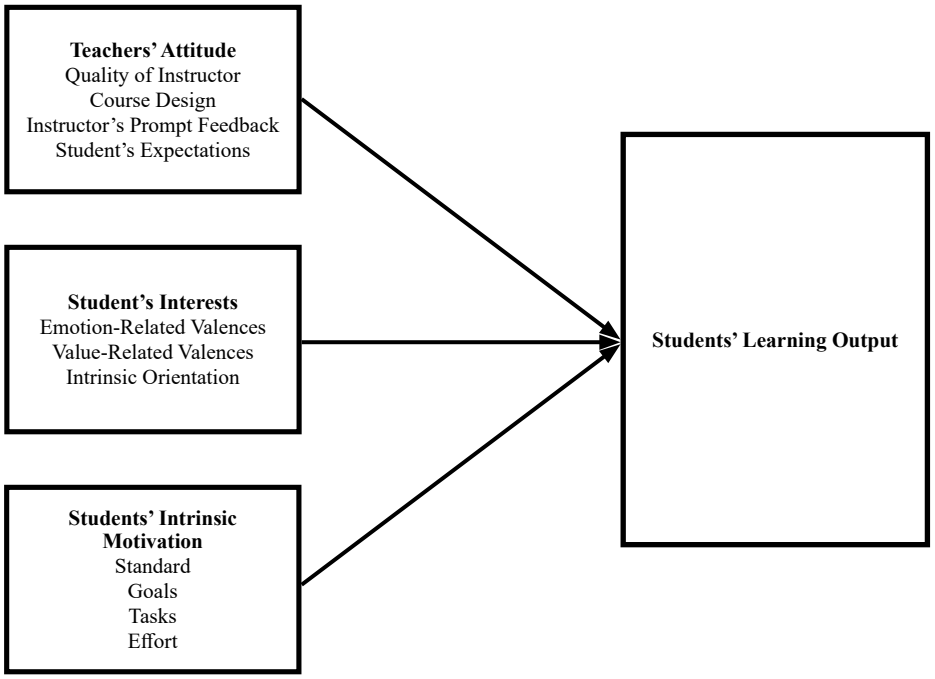

Figure 1 showed the relationships between teachers' attitudes, students' interests, intrinsic motivation, and learning outputs. The study suggested that teachers' attitudes — such as quality instruction, course design, feedback, and alignment with expectations — positively influenced student learning outputs. Students' interests, emotional connections, and intrinsic motivation drive active learning participation. Intrinsic motivation—shaped by standards, goals, task focus, and effort—enhances learning by fostering persistence. The framework hypothesized that these factors interacted dynamically, improving academic performance and highlighting the interconnected roles of both teacher-and student-related variables in learning success.

Review of Related Literature

The Influence of Teachers' Attitudes on Student Learning Outputs

Teachers' attitudes significantly influenced students' learning outputs by fostering a supportive environment that motivates active participation and enhanced academic achievement (Ekperi et al., 2019). A teacher's supportive and passionate demeanor has been shown to boost student motivation, a key factor in improved learning outputs (Goss, 2022). Furthermore, teacher efficacy—the belief in one's ability to positively impact students—is crucial in increasing student engagement and performance (Brandmiller et al., 2023). These align with Ajzen's (1991) Theory of Planned Behavior, which suggested that attitudes shaped behavior. Passionate and committed teachers nurture students' intrinsic motivation, leading to better academic results.

While research highlights the importance of teacher attitudes, there remains limited understanding of their specific impact on disciplines requiring critical thinking. Most studies focus on general education, overlooking challenging subjects. This study addressed this gap by examining how teacher attitudes influence learning outputs in complex subjects such as mathematics.

Student's Interests in Learning

Student interest played a vital role in fostering a productive learning environment. Harackiewicz et al. (2016) defined interest as focused attention, emotional engagement, and a lasting desire to explore a subject, which were key components of long-term academic success (Moneva & Gonzaga, 2020). Parental involvement, an important environmental factor, boosted intrinsic motivation and student interest in academic tasks (Essien et al., 2015). Aligning student interests with teaching methods, however, proved challenging. Rone et al. (2023) found that a mismatch between personal interests and the prescribed curriculum often led to disengagement. Nevertheless, active learning strategies increased motivation and academic understanding, particularly in younger students (Fadilah & Alwi, 2020).

There remained a research gap regarding how educators could effectively integrate students' interests with the curriculum to prevent disengagement, particularly in secondary education settings. The current study addressed this gap by exploring methods that could better align teaching practices with students' interests, fostering greater engagement in learning.

Students' Intrinsic Motivation

Intrinsic motivation, the internal drive to engage in tasks for personal satisfaction or enjoyment, was a key predictor of academic success (Affuso et al., 2022). Liu et al. (2020) suggested that intrinsic motivation fostered persistence, focus, and self-expression, all of which contributed to improved academic performance. According to Deci and Ryan's (2020) Self-Determination Theory, students were more likely to be intrinsically motivated when their

psychological needs for autonomy, competence, and relatedness were fulfilled, resulting in higher academic achievements. A supportive learning environment that nurtured these needs enhanced intrinsic motivation and student performance (Hafızoglu & Yerdelen, 2019).

However, research by Meng and Hu (2023) highlighted intrinsic motivation's benefits and potential drawbacks, such as excessive engagement or burnout in high-stakes academic tasks. While intrinsic motivation positively impacted academic performance, limited studies addressed its long-term effects in secondary education. There was a pressing need to explore strategies for sustaining students' motivation during prolonged demanding coursework without triggering burnout.

While existing literature provided substantial insights into the role of teacher attitudes, student interest, and intrinsic motivation in shaping learning outputs, significant gaps remained. Specifically, further research was needed on the impact of teacher attitudes in critical thinking disciplines, effective strategies for aligning student interests with the curriculum, and maintaining intrinsic motivation in challenging subjects over time. This study sought to contribute to these areas, focusing on improving academic performance in secondary education.

Purposes of the Research

This study examined the relationship between teachers' attitudes, students' interests, and intrinsic motivation, and their collective impact on the learning outputs of first-year mathematics students for the academic year 2023-2024. Specifically, the study aims to:

1. What is the level of the teachers in terms of:

    1.1. Quality Instruction;
    1.2. Course Design;
    1.3. Instructor's Prompt Feedback;
    1.4. Student's Expectation?

2. What is the level of students' Interests in terms of:

    2.1. Emotion-Related Valences;
    2.2. Value-Related Valances;
    2.3. Intrinsic Orientation?

3. What is the level of students' Intrinsic Motivation in terms of:

    3.1. Standard;
    3.2. Goals;
    3.3. Tasks;

3.4. Efforts?

4. What is the level of students learning outputs of the first-year BSED Mathematics students?

5. Is there a significant relationship of the students' learning outputs between;

   5.1. Teachers' Attitudes;
   5.2. Students' Interest;
   5.3. Students' Intrinsic motivation?

6. Which domains of teacher's attitudes, students' interest and students' intrinsic motivation significantly predict the students learning outputs?

Methodology

Research Design

This study used a quantitative research design with a descriptive correlational method to systematically and objectively examine relationships among variables. The descriptive correlational method explored relationships between variables without manipulation or inferring causation, clearly depicting observed associations (Seeram, 2019). This method identified patterns, trends, and differences by employing various research tools to examine how variables naturally relate within real-world contexts (Thomas et al., 2023).

Participants

The study involved 156 first-year mathematics students from Davao de Oro State College, Philippines for the 2023–2024 school year, who were selected through purposive sampling. Inclusion criteria required participants to be officially enrolled as first-year mathematics students, taking at least one mathematics course, actively attending classes, and providing informed consent. This criteria ensured the sample was representative and aligned with the study's objectives. A minimum sample size of 100 was deemed sufficient for meaningful analysis, as recommended by Bullen & Bullen (2022), making the chosen sample size appropriate for reliable data collection.

Instruments

This study employed an adapted survey questionnaire administered to 156 respondents. To assess teachers' attitudes, the researchers used Gopal et al.'s (2021) 20-item questionnaire, categorized into quality instruction (7 items), course design (5 items items), prompt

feedback (3 items), and student expectations (5). For interest, Neurohret et al.'s (2023) 18-item questionnaire included feeling-related valences (7 items), value-related valences (7 items), and intrinsic orientation (4). For intrinsic motivation, Njiru's (2003) 19-item questionnaire focused on standards (3 items), goals (5 items), tasks (6 items), and effort (5 items). For learning outputs, Lichtenstein's (2011) RBOQ comprised 19 items. Experts in mathematics and English education evaluated the questionnaires for content and validity. The questionnaires also underwent pilot testing to refine the items and confirm reliability and consistency, as detailed in Table 1.

Table 1

Reliability Test Results

Variable	Cronbach's Alpha	Internal Validity	Number of Items
Teacher Attitude	.940	Excellent	20
Student Interest	.888	Good	18
Intrinsic Motivation	.971	Excellent	19
Learning Outputs	.932	Excellent	19

Data Gathering and Analysis

Phase 1: Pre-survey

Before conducting the survey, the researchers obtained approval from the Research Ethics Committee (REC) of Davao de Oro State College to ensure ethical compliance with ethical standards. The researchers then received formal authorization from the campus directors to proceed with the study. Three experts validated the survey instruments, and necessary revisions were made based on their feedback. Informed consent was obtained from participants. This ensured that their participation was voluntary and their responses confidential.

Phase 2: Survey Proper

The survey was administered to 156 first-year mathematics students at Davao de Oro State College during the 2023-2024 academic year. Data collection took place from March 23, 2024, to April 11, 2024. During this phase, the researchers conducted face-to-face surveys, adhering to established safety protocols. Students were given one hour to complete the questionnaire, which focused on teacher attitudes, student interests, and intrinsic motivation. To ensure accurate and comprehensive responses, the researchers gave clear instructions. The survey instruments were distributed to the participants and collected afterward, ensuring proper retrieval of all completed questionnaires.

Phase 3: Post-survey (Data Collection, Retrieval, and Cleaning)

After collecting the completed questionnaires, the data were organized and cleaned. The researchers ensured that all responses were valid, removing incomplete or inconsistent data. The final dataset was then prepared for analysis. Once this was completed, the cleaned data were forwarded to the statistician for further processing. Necessary statistical analyses were conducted to ensure accurate interpretation of the results before proceeding to the final phase of the study.

Data Analysis

The collected data were analyzed using descriptive and inferential statistical techniques. The analysis began with calculation the mean and standard deviation to understand the central tendency and variability of the responses. Pearson correlation was conducted to assess the strength and direction of relationships between teachers' attitudes, students' interests, intrinsic motivation, and students' learning outputs. Multiple regression analysis was employed to determine whether the domains of teachers' attitudes, student interests, and intrinsic motivation significantly predicted learning outputs. The statistical significance level was set at .05. These methods were utilized to rigorously evaluate the relationships among the variables and draw conclusions about their influence on student learning outputs.

Results and Discussion

This presented and analyzed the data gathered from the study respondents, examining the relationships between teachers' attitudes, student interests, intrinsic motivation, and their influence on students' learning outputs.

Teachers' Level of Attitudes in Terms of Quality Instruction, Course Design, Prompt Feedback for Students

Table 2 showed teachers' attitudes across four indicators: *quality instruction, course design, prompt feedback, and student expectations.* The course design had the highest weighted mean, rated as very high, along with the other indicators.

Table 2

Level of Teachers' Attitudes

Indicator	Mean	SD	Verbal Interpretation
Quality Instruction	4.26	.587	Very High
Course Design	4.29	.571	Very High
Prompt Feedback for Students	4.21	.675	Very High

Student Expectation	4.22	.652	Very High
Overall Teacher Attitude	4.24	.559	Very High

**4.20 and 5.00 - Strongly Agree (very high), 3.40 to 4.19 - Agree (high), 2.60 to 3.39 - Neutral (moderate), 1.80 to 2.59 - Disagree (low), and 1.00 to 1.79 - Strongly Disagree (very low)*

Table 2 revealed that teachers' attitudes were highly rated, with *course design* scoring the highest at 4.29, followed by *quality instruction* (4.26), s*tudent expectations* (4.22), and *prompt feedback* (4.21). The overall *teacher attitude* score was 4.24, reflected strong performance in these areas. The data trend suggested that teachers focused on structured, student-centered lessons, with room for improvement in providing consistent feedback. These results reflected teachers' commitment to delivering organized lessons and clear expectations. However, the slightly lower feedback score indicates a need for more consistent and timely feedback to enhance student engagement. Research by Saavedra and Del Toro Mijares (2024) supported the idea that structured lessons and clear goals were essential for student success.

Students' Level of Interest in Terms of Feeling-Related Valences, Value-Related Valences, and Intrinsic Orientation

Table 3 showed students' interest levels across three indicators: *Feeling-related valence, value-related valence, and intrinsic orientation.* The value-related valence and the other indicators had the highest weighted mean and were rated as high.

Table 3

Level of Students' Interest

Indicator	Mean	SD	Verbal Interpretation
Feeling-Related Valences	3.84	.650	High
Value-Related Valences	3.92	.640	High
Intrinsic Orientation	3.74	.727	High
Overall Students' Interest	3.83	.606	High

**4.20 and 5.00 - Strongly Agree (very high), 3.40 to 4.19 - Agree (high), 2.60 to 3.39 - Neutral (moderate), 1.80 to 2.59 - Disagree (low), and 1.00 to 1.79 - Strongly Disagree (very low)*

Table 3 showed high levels of student interest in three key areas: *feeling-related valences, value-related valences, and intrinsic orientation*, with mean scores ranging from 3.74 to 3.92. This trend suggested that students were emotionally engaged with the material, recognized its value, and were intrinsically motivated. The slightly lower score in intrinsic orientation indicated an opportunity to further enhance self-driven engagement. Students demonstrated strong emotional involvement and perceived the relevance of their studies for personal growth and future goals, reflecting both emotional and moral motivation. These

findings aligned with research that emphasized the role of emotional engagement and personal relevance in promoting deeper learning and sustained motivation (Liu et al., 2024). Educators should have link academic content to students' values and aspirations to sustain motivation, fostering greater self-driven engagement and long-term academic commitment.

Students Level of Intrinsic Motivation in Terms of Standard, Goals, Tasks, and Effort

Table 4 presented students' intrinsic motivation levels across *standards, goals, tasks, and effort.* Results showed that the standard had the highest weighted mean, which was verbally interpreted as high, along with the other indicators.

Table 4

Level of Intrinsic Motivation

Indicator	Mean	SD	Verbal Interpretation
Standard	4.01	.710	High
Goals	4.00	.685	High
Tasks	3.96	.667	High
Effort	4.08	.753	High
Overall Intrinsic Motivation	4.01	.636	High

**4.20 and 5.00 - Strongly Agree (very high), 3.40 to 4.19 - Agree (high), 2.60 to 3.39 - Neutral (moderate), 1.80 to 2.59 - Disagree (low), and 1.00 to 1.79 - Strongly Disagree (very low)*

Table 4 showed strong intrinsic motivation among students, with mean scores ranging from 3.96 to 4.08 across four indicators. Hence, students set high personal standards, aligned with academic goals, and invested significant effort. However, variability in sustained engagement suggested a need for strategies to maintain motivation. The lower score for task motivation pointed to an area for improvement in fostering interest in specific activities. These findings emphasized the need for tailored support to enhance and sustain student motivation.

The results showed that students were self-motivated and driven by their standards and goals, which inspired them to work hard and enjoy academic challenges. Their commitment to success came from a desire for personal growth and academic autonomy, not external rewards. This suggested that student's motivation to learn was rooted in their internal drive, leading them to engage with their studies for personal fulfilment. Students with strong self-belief, high task value, and clear learning goals tended to perform better academically. These factors were stronger predictors of success than IQ or previous academic achievements. Intrinsically motivated students who sought personal growth and autonomy work harder and enjoyed learning more, improving their academic performance and engagement (Steinmayr et al., 2019).

Level of Students' Learning Output

Table 5 presented students' learning output levels following the Research-Based Outcomes Questionnaire (RBOQ). The following items measured the personal qualities and acquired learning.

Table 5

Level of Students' Learning Outputs

Learning Output	Mean	SD	Verbal Interpretation
Overall	4.02	.611	High

The students' learning outputs indicated a high level of academic performance, with an overall mean score of 4.02 and a standard deviation of .611. This suggested that students were highly engaged in their learning, excelling in critical thinking, writing, research, teamwork, and leadership. The relatively low standard deviation signified that most students had similar experiences, indicating strong consistency in their academic achievements. For example, students demonstrated substantial improvements in analytical thinking (M=4.08, SD=.857) and teamwork (M=4.26, SD=.784), reflecting a solid grasp of these essential skills. However, there was slightly more variation in the responses for leadership skills, with "Improved my ability to run meetings" (M=3.77, SD=.777) showing lower mean scores and a wider spread in experiences.

The data revealed that students' academic success was not only due to the knowledge acquired but also to their intrinsic motivation, as they focused on mastery goals, seeking to improve and develop skills rather than simply aiming to outperform others. This aligned with the Achievement Goal Theory (Ames et al., 1970), where mastery goals led to greater intrinsic motivation and higher academic achievement. Furthermore, the findings were supported by research such as Han et al. (2021), who emphasized the importance of self-efficacy and career awareness in student success. These results highlighted the value of fostering intrinsic motivation and engagement to enhance students' learning outputs.

Significant Relationship between Teachers' Attitude, Students' Interests, and Intrinsic Motivation on Students' Learning Outputs

The study revealed strong connections between teachers' attitudes, students' interests, intrinsic motivation, and learning outputs. Teachers' attitudes positively correlated with student learning outputs ($M = 4.24$, $SD = .559$, $r = .626$, $p < .001$), indicating that positive teacher attitudes significantly influenced student performance. Students' interest showed a strong relationship with effective learning outputs ($M = 3.83$, $SD = .606$, $r = .762$, $p < .001$), emphasizing the importance of engaging students to enhance learning. Intrinsic motivation strongly correlated with learning outputs ($M = 4.01$, $SD = .636$, $r = .806$, $p < .001$), highlighting

its pivotal role in student achievement. These factors worked synergistically to foster positive learning environments and improve essential skills such as problem-solving and retention (Wu et al., 2024).

Table 6

Relationship between the Study Variables and Learning Outputs

Variable	Mean	SD	r	p
Teachers' Attitude	4.24	.559	.626	<.001
Students' Interest	3.83	.606	.762	<.001
Intrinsic Motivation	4.01	.636	.806	<.001

The results were context-specific, limiting their applicability, as socio-economic, cultural, and academic factors influenced these relationships. Howard et al. (2021) suggested that motivation's effect on learning outputs varied with internal and external factors. High teacher expectations could boost motivation but might negatively affect low achievers due to the effect of self-fulfilling prophecy (SFP) (Nel, 2016). Additionally, motivational strategies' effectiveness depended on emotional responses and content relevance, often outweighing teacher expectations alone (Hornstra et al., 2018). Thus, these factors' impact varied based on context and individual differences.

Key Domains of Teacher's Attitudes, Students' Interests, Intrinsic Motivation Predicting Students' Learning Outputs

The regression analysis revealed key predictors of students' learning outputs, emphasizing academic and emotional factors. Teachers' attitudes, particularly p*rompt feedback* (B = .199, p = .037) and s*tudent expectations* (B = .236, p = .025), significantly influenced learning outputs, highlighting the importance of timely feedback and aligning student expectations with the learning environment. In contrast, *quality instruction* (p = .631) and *course design* (p = .168) were not significant predictors, suggesting that feedback and expectation alignment had a more immediate impact on student learning. These findings stressed the importance of consistent feedback and clear expectations in fostering motivation and engagement.

Further analysis revealed that v*alue-related valences* significantly influenced learning outputs (B = .520, p < .001), suggesting that students who found their education meaningful and relevant were more committed and likely to achieve better academic results. Feeling-related valences also positively impacted learning outputs (B = .220, p = .002), highlighting the importance of emotional connections to learning. *Intrinsic motivation* was not a significant predictor (B = .056, p = .411), implying that emotional and value-related factors strongly influenced performance rather than intrinsic motivation alone. Teachers should focused on creating emotional connections and emphasizing the value of education to improve student engagement and achievement (Garcia, 2020; Tan et al., 2021).

Table 7

Influence of Teacher's Attitudes, Students' Interests, Intrinsic Motivation on Students' Learning Outputs

Variable	Unstandardized Coefficients		Standardized Coefficients	t	p
	B	SE	Beta (β		
(Intercept)	1.168	.304		3.845	.000***
Quality Instruction	.059	.122	.056	.482	.631
Course Design	.179	.129	.167	1.384	.168
Prompt Feedback	.199	.094	.220	2.109	.037***
Student Expectation	.236	.104	.252	2.272	.025***
(Intercept)	.929	.202		4.590	.000***
Feeling-Related Valences	.220	.072	.234	3.078	.002
Value-Related Valences	.520	.080	.545	6.501	<.001
Intrinsic Orientation	.056	.067	.066	.824	.411
(Intercept)	.923	.187		4.944	.000***
Standard	.044	.067	.051	.658	.512
Goals	.339	.081	.380	4.174	<.001
Tasks	.190	.078	.207	2.424	.017
Effort	.200	.072	.246	2.755	.007

Constant=1.168, F (4,151) =24.831*, p<.001, R2=.397*

Constant=.929, F (3,152) =80.789*, p<.001, R2=.615*

Constant=.923, F (4,151) =74.505*, p<.001, R2=.664*

The analysis showed that *goals, tasks, and effort* significantly influenced learning outputs, with *goals* being the strongest predictor (B = .339, p < .001), followed by *tasks* (B = .190, p = .017), and *effort* (B = .200, p = .007) which also positively impacted academic success, emphasizing the role of personal motivation. Conversely, *standards* were not a significant predictor (B = .044, p = .512), suggesting that self-driven goals and effort were more influential than external standards. These findings highlighted the importance of goal-setting, task engagement, and effort for academic success, supporting self-regulated learning (Dunlosky et al., 2020; Malmberg et al., 2022;). Teachers should have encourage students to set goals and stay engaged to enhance learning outputs.

The regression analysis emphasized that feedback, student expectations, emotional connections, value-related perceptions, goal-setting, and effort significantly influenced learning outputs. These findings suggested that educators should have prioritized a supportive learning environment that addressed academic and emotional needs to improve student performance.

Conclusion and Recommendations

This study examined the relationship between teachers' attitudes, students' interests, and intrinsic motivation in first-year mathematics students to understand their influence on learning outputs. By exploring these factors, the research aimed to enhance teacher-student interactions and align lessons with students' interests, fostering improved academic success.

The results showed that teachers' attitudes and students' interests positively impacted learning outputs, but intrinsic motivation had an even stronger effect. This suggested that while creating an engaging classroom and sparking interest were important, helping students stay self-motivated was key. Giving them choices, encouraging decision-making, and showing how lessons connected to their goals could make a significant difference. However, this study only focused on teacher attitudes, student interest, and motivation but did not consider factors like socioeconomic status or school resources, which future research could explore.

In addition, the results showed that domains such as instructor prompt feedback, students' expectations, emotions, value-related valences, goals, tasks, and efforts were predictors of students' learning outputs. These factors should have been addressed in educational settings. The data supported that a holistic approach targeting these characteristics could substantially enhance student engagement and achievement.

This study's findings emphasized the importance of creating positive classroom environments and offering personalized learning experiences that aligned with students' interests and intrinsic motivation in the Philippines and ASEAN. Educational policies should have prioritized teacher professional development to foster engaging, supportive learning environments. Curricula should have promoted autonomy, self-regulation, and emotional connections to learning. Globally, these findings aligned with ASEAN's focus on motivation and emotional engagement as key drivers of success. Teacher training should have been revised to include strategies for fostering intrinsic motivation, aligning lessons with students' goals, and promoting emotional and value-related connections to enhance performance.

The study concluded that teachers' positive attitudes, supportive classroom environments, and prompt feedback significantly impacted student learning outputs. Students' interests, particularly those linked to emotional and value-driven connections, enhanced their commitment and academic success. Intrinsic motivation, the strongest predictor of success, was crucial in fostering autonomy and self-regulation, directly influencing learning outputs.

However, the study's focus on first-year mathematics students limited broader applicability. Future research should have included diverse student groups, directly measured learning outputs, and explored strategies like collaborative projects, student-led discussions, and real-world applications to enhance motivation. Curricula should have prioritized student autonomy and active participation, while institutions could have design teacher training and

inclusive programs. Policies should have invested in tools to track intrinsic motivation and support interventions, complemented by mentorship and extracurricular activities addressing emotional and value-driven learning.

■ ■ ■

Statements and Declarations

1. **Funding details.**

   This work received financial support from the researchers' personal finances.

2. **Disclosure statement.**

   The authors contend that there are no conflicting interests to disclose.

3. **Acknowledgement:**

   The researchers are grateful to the people and institutions whose unwavering support and efforts made this work possible.

4. **Ethical Approval:**

   This is to certify that the study entitled "A MULTIVARIATE ANALYSIS OF TEACHERS ATTITUDES, STUDENTS INTERESTS, INTRINSIC MOTIVATION ON STUDENTS LEARNING OUTPUTS" with REC Protocol Code: 116-02-2024 by MEG C. ENRIQUEZ, MELODY R. ALVARADO, and MARIVEL A. APIT, students of the Teacher Education Department of Davao de Oro State College – Main Campus, has been examined by the Davao de Oro State College – Research Ethics Committee (DdOSC-REC) as EXPEDITED REVIEW with Protocol Version no. 01 and ICF Version no. 01 and has been evaluated to have adequately complied the requirements for the study ethics protocol and is, therefore, cleared for implementation using universally scientific procedures and internationally accepted ethical guidelines effective February 26, 2024, until July 25, 2024.

5. **Declaration of Generative AI in Scientific Writing**

   During the preparation of this work, the author(s) used AI website and quillbot to enhance text clarity and originality. After using this tool/service, the author(s) reviewed and edited the content as needed and take(s) full responsibility for the publication's content.

References

Affuso, G., Zannone, A., Esposito, C., Pannone, M., Miranda, M.C., D., Angelis, G., Aquilar, S., Dragone, M., & Bacchini, D. (2022). "The effects of teacher support, parental monitoring, motivation and self-efficacy on academic performance over time", *European Journal of Psychology of Education*, *38*(1), 1-23. doi: 10.1007/s10212-021-00594-6.

Alasqah, S. S. (2022). Goal orientation and its impact on university students' academic achievement during the COVID-19 pandemic. *SAGE Open*, *12*(2), 215824402210936. https://doi.org/10.1177/21582440221093617

Bernardo, A. B. I., Cordel, M. O., II, Lapinid, M. R. C., Teves, J. M. M., Yap, S. A., & Chua, U. C. (2022). Contrasting profiles of low-performing mathematics students in public and private schools in the Philippines: Insights from machine learning. *Journal of Intelligence, 10*(3), 61. https://doi.org/10.3390/jintelligence10030061

Brandmiller, C., Schnitzler, K., & Dumont, H. (2023). Teacher perceptions of student motivation and engagement: longitudinal associations with student outcomes. *European Journal of Psychology of Education*, *39*(2), 1397–1420. https://doi.org/10.1007/s10212-023-00741-1

Bullen, P. B., & Bullen, P. B. (2022). *How to choose a sample size (for the statistically challenged).* Tools4dev. https://tools4dev.org/resources/how-to-choose-a-sample-size/

Chan, T. W., Looi, C. K., Chang, B., Chen, W., Wong, L. H., Wong, S. L., … & Chou, C. Y. (2019). IDC theory: creation and the creation loop. *Research and Practice in Technology Enhanced Learning*, *14*, 1-29. https://10.1186/s41039-019-0120-5

Cordero, J. M., & Gil-Izquierdo, M. (2018). The effect of teaching strategies on student achievement: An analysis using TALIS-PISA-link. *Journal of Policy Modeling*, *40*(6), 1313–1331. https://doi.org/10.1016/j.jpolmod.2018.04.003

Crossman, A. (2020, March 19). *Understanding purposive sampling.* ThoughtCo. https://www.thoughtco.com/purposive-sampling-3026727

Dunlosky, J., Badali, S., Rivers, M. L., & Rawson, K. A. (2020). The role of effort in understanding educational achievement: objective effort as an explanatory construct versus effort as a student perception. *Educational Psychology Review*, *32*(4), 1163–1175. https://doi.org/10.1007/s10648-020-09577-3

Essien, Essien & Akpan, Okon & Obot, Imo. (2015). Students' interest in social studies and academic achievement in tertiary institutions in Cross River State, Nigeria. 2. 35-40. Retrieved from https://www.researchgate.net/publication/320333289_Students'_Interest_in_Social_Studies_And_Academic_Achievement_in_Tertiary_Institutions_In_Cross_River_State_Nigeria.

Fadilah, D., & Alwi, M. (2020). Increased student interest in learning through the application of active learning methods in the thematic learning. *Journal of Physics Conference Series*, *1539*(1), 012050. https://doi.org/10.1088/1742-6596/1539/1/012050

Fuad, M., Suyanto, E., & Muhammad, U. (2021). Can 'Reward and Punishment' improve student motivation? *European Online Journal of Natural and Social Sciences,* 10 (1) https://european-science.com/eojnss/article/view/6144

Galabo, N. R., Abellanosa, G. G., & Gempes, G. P. (2018). The level of readiness in mathematics of first year high school students of cluster 6 tugbok secondary schools: basis for intervention program. *International Journal of Humanities, Arts & Social Sciences*, 4(1). https://dx.doi.org/10.20469/ijhss.4.10005-1

Gan, Z., An, Z., & Liu, F. (2021). Teacher feedback practices, student feedback motivation, and feedback behavior: how are they associated with learning outcomes? *Frontiers in Psychology, 12*. https://doi.org/10.3389/fpsyg.2021.697045

Garcia, R. C. (2020). The relevance of values, skills, and learning outcomes indicators for the employment of business administration graduates: a case study of an international higher education institution. *International Journal of Learning and Intellectual Capital*, *17*(2), 165. https://doi.org/10.1504/ijlic.2020.108882

Hafızoglu, A., & Yerdelen, S. (2019). The role of students' motivation in the relationship between perceived learning environment and achievement in science: A mediation analysis. *Science Education International*, *30*(4), 51–260. https://doi.org/10.33828/sei.v30.i4.2

Han, J., Kelley, T., & Knowles, J. G. (2021). Factors influencing student STEM learning: Self-efficacy and outcome expectancy, 21st-century skills, and career awareness. *Journal for STEM Education Research*, 4(2), 117–137. https://doi.org/10.1007/s41979-021-00053-3

Howard, J. L., Bureau, J. S., Guay, F., Chong, J. X. Y., & Ryan, R. M. (2021). Student motivation and associated outcomes: a meta-analysis from self-determination theory. *Perspectives on Psychological Science, 16*(6), 1300–1323. https://doi.org/10.1177/1745691620966789

Kahveci, H. (2023). The positive and negative effects of teacher attitudes and behaviors on student progress. *Journal of Pedagogical Research,* 7(1), 290-306. https://doi.org/10.33902/JPR.202319128

Ladrero, H., Villanueva, A. V., & Mirasol, M. (2020). Factors that cause low academic performances among Grade 12 HUMSS s trand s tudents in Bestlink College of the Philippines. *Ascendens Asia Singapore–Bestlink College of the Philippines Journal of Multidisciplinary Research*, *2*(1). https://ojs.aaresearchindex.com/index.php/aasgbcpjmra/article/view/2645

Liu, Y., Hau, K.-T., Liu, H., Wu, J., Wang, X., & Zheng, X. (2020). Multiplicative effect of intrinsic and extrinsic motivation on academic performance: A longitudinal study of Chinese students. *Journal of Personality, 88*(3), 584–595. https://doi.org/10.1111/jopy.12512

Liu, Y., Ma, S., & Chen, Y. (2024). The impacts of learning motivation, emotional engagement and psychological capital on academic performance in a blended learning university course. *Frontiers in Psychology*, 15. https://doi.org/10.3389/fpsyg.2024.1357936

Malmberg, J., Haataja, E., & Järvelä, S. (2022). Exploring the connection between task difficulty, task perceptions, physiological arousal and learning outcomes in collaborative learning situations. *Metacognition and Learning*, *17*(3), 793–811. https://doi.org/10.1007/s11409-022-09320-z

Meng, X., & Hu, Z. (2022). The relationship between student motivation and academic performance: the mediating role of online learning behavior. *Quality Assurance in Education*, *31*(1), 167–180. https://doi.org/10.1108/qae-02-2022-0046

Mohamoud, A. M. (2024). The impact of growth mindset interventions on students' motivation, resilience, and academic achievement. *Multidisciplinary Journal of Horseed International University (MJHIU)*, *2*(1), 102–125. https://doi.org/10.59336/7adj0850

Moneva, J., & Gonzaga, J. (2020). Parental motivation and students' interest in their studies. *Asia Pacific Journal of Academic Research in Social Sciences*, *5*(1), 71–76. https://research.lpubatangas.edu.ph/wp-content/uploads/2021/01/APJARSS-2020.010.pdf

Pinquart, M., & Ebeling, M. (2020). Students expected and actual academic achievement – A meta-analysis. *International Journal of Educational Research*, *100,* 101524. https://doi.org/10.1016/j.ijer.2019.101524

Rone, N. A., Guao, N. a. A., Jariol, M. S., Jr, Acedillo, N. B., Balinton, K. R., & Francisco, J. O. (2023b). Students' lack of interest, motivation in learning, and classroom participation: how to motivate them? *Zenodo (CERN European Organization for Nuclear Research)*. https://doi.org/10.5281/zenodo.7749977

Ryan, R. M., & Deci, E. L. (2020). Intrinsic and extrinsic motivation from a self-determination theory perspective: Definitions, theory, practices, and future directions. *Contemporary Educational Psychology*, *61*, 101860. https://doi.org/10.1016/j.cedpsych.2020.101860

Saavedra, J., & Del Toro Mijares, A. T. (2024, March 16). A focus on improving the learning experience in the classroom. *World Bank Blogs*. https://blogs.worldbank.org/en/education/focus-improving-learning-experience-classroom

Steinmayr, R., Weidinger, A. F., Schwinger, M., & Spinath, B. (2019). The importance of students' motivation for their academic achievement – replicating and extending previous findings. *Frontiers in Psychology*, 10. https://doi.org/10.3389/fpsyg.2019.01730

Tan, J., Mao, J., Jiang, Y., & Gao, M. (2021). The influence of academic emotions on learning effects: A systematic review. *International Journal of Environmental Research and Public Health*, *18*(18), 9678. https://doi.org/10.3390/ijerph18189678

Thomas, D., & Zubkov, P. (2023). *Quantitative research designs*. Andrews University https://www.researchgate.net/publication/370630979_Quantitative_Research_Designs

Wu, B., & Xin, Y. (2019, April). Investigation and study on the causes of college students' poor academic performances and intervention mechanism taking college students in Xi'an as an example. In *3rd International Conference on Culture, Education and Economic Development of Modern Society (ICCESE 2019)* (pp. 1649-1658). Atlantis Press. https://doi.org/10.2991/iccese-19.2019.364

Wu, X., Liu, H., Xiao, L., & Yao, M. (2024). Reciprocal relationship between learning interest and learning persistence: Roles of strategies for self-regulated learning behaviors and academic performance. *Journal of Youth and Adolescence.* https://doi.org/10.1007/s10964-024-01994-9

Authors' Bionote

Meg C. Enriquez is a fourth-year college student at Davao de Oro State College. Pursuing BSED major in Mathematics, expected to graduate in 2025. Her research interests include mathematics education.

Melody R. Alvarado is a fourth-year college student at Davao de Oro State College. Pursuing BSED major in Mathematics, expected to graduate in 2025. Her research interests include mathematics education and teaching.

Marivel A. Apit is a fourth-year college student at Davao de Oro State College. Pursuing BSED major in Mathematics, expected to graduate in 2026. Her research interests include mathematics education.

Joden John V. Nituda is a mathematics teacher at Davao de Oro State College. Graduated from Nigrad College in 2011. His research interest includes mathematics pedagogy.