



Intrinsic and Extrinsic Motivation as Predictors of Academic Performance in Mathematics among High School Students

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ABSTRACT :

Motivation is among the most studied non-cognitive factors in mathematics learning, yet evidence on whether intrinsic or extrinsic motivation better predicts achievement in Philippine junior high school remains limited and inconsistent. Guided by Self-Determination Theory, this study examined the levels of intrinsic motivation, extrinsic motivation, and amotivation of Grade 8 Science Section students at a private school in Nueva Vizcaya, Philippines, and tested whether intrinsic and extrinsic motivation predicted their mathematics performance. A correlational-predictive design was used with all 30 students of an intact Grade 8 Science Section class. Motivation was measured with a 28-item questionnaire adapted from the Academic Motivation Scale, and performance was taken from the students' Grade 7 final mathematics grade. Data were analyzed using means, standard deviations, Pearson and Spearman correlation, and multiple linear regression. Students reported high intrinsic motivation ($M = 2.95$, $SD = 0.76$), high extrinsic motivation ($M = 2.89$, $SD = 0.84$), and low amotivation ($M = 1.99$, $SD = 0.74$). Their mathematics grades were uniformly high ($M = 90.13$, $SD = 3.54$, range = 85 to 96). Intrinsic motivation was not related to mathematics grades ($r = .11$, $p = .559$). Extrinsic motivation showed a weak-to-moderate positive correlation ($r = .36$, $p = .048$), but this result was not confirmed by Spearman's correlation ($\rho = .34$, $p = .069$). The regression model with both predictors was not significant, $F(2, 27) = 2.34$, $p = .116$, $R^2 = .148$. Extrinsic motivation had the larger standardized coefficient ($\beta = .45$, $p = .048$) compared with intrinsic motivation ($\beta = -.15$, $p = .497$), but neither type of motivation can be considered a reliable predictor in this sample. The narrow spread of grades in a high-achieving class and the small sample likely limited the ability to detect associations, so the findings call for replication with larger and more varied groups.

***Keywords:** *academic motivation, intrinsic motivation, extrinsic motivation, amotivation, mathematics performance, Self-Determination Theory, junior high school*

Introduction

Mathematics performance remains a persistent concern in many educational settings, and the Philippines is no exception. In the Programme for International Student Assessment (PISA) 2022, Filipino 15-year-olds obtained a mean mathematics score of 355, among the lowest of the 81 participating countries and economies (OECD, 2023). Beyond cognitive factors such as prior knowledge and intelligence, non-cognitive factors such as motivation shape how persistently students engage with mathematical tasks, how they respond to difficulty, and ultimately how well they perform.

International research underscores the role of motivation in mathematics learning. Among Peruvian undergraduates, both intrinsic motivation (enjoyment, curiosity, and interest) and extrinsic motivation (grades and rewards) correlated positively with mathematics performance, with intrinsic motivation emerging as the stronger predictor (Yarin et al., 2022). Among high school students, those with strong profiles of intrinsic motivation, grit, and growth mindset performed better in mathematics and other subjects than peers with weaker motivational profiles (Wu et al., 2022). Longitudinal work with high school and college students found that intrinsic motivation was the motivation type most consistently and positively linked with school achievement over time (Taylor et al., 2014), and a meta-analysis of 344 samples showed that intrinsic and identified motivation related to student success, while external regulation showed no reliable association with performance (Howard et al., 2021). More recent work also links specific forms of intrinsic motivation to achievement through deep learning strategies (Kamberi, 2025).

The evidence is not uniform, however. Some studies report that extrinsic motivation relates more strongly to achievement than intrinsic motivation, particularly among younger learners (Adamma et al., 2018; Khaliq, 2023). Garon-Carrier et al. (2016) also found that, among elementary pupils, earlier mathematics achievement predicted later intrinsic motivation, while intrinsic motivation did not predict later achievement. This pattern suggests that the motivation-achievement link may depend on the age of learners, the type of achievement measure, and the direction of influence being examined.

In the Philippine context, Pastera et al. (2018) found that both intrinsic and extrinsic motivation significantly affected college students' performance in Plane Trigonometry. At the elementary level, Capuyan et al. (2024) reported that extrinsic motivation had a strong relationship with pupils' academic performance, while intrinsic motivation showed only a weak relationship. Philippine evidence therefore covers college and elementary learners but says little about junior high school, the stage where learners begin to exercise greater autonomy and form longer-term academic goals. The

difference in findings across levels also leaves open the question of which type of motivation better predicts mathematics performance in secondary education.

The present study addresses this gap by examining intrinsic and extrinsic motivation as predictors of mathematics performance among Grade 8 students. By clarifying the predictive strength of these motivational factors, the study aims to provide evidence that can guide teachers, curriculum developers, and school leaders in designing strategies that support the forms of motivation most useful for success in mathematics.

Theoretical Framework

This study is anchored on Self-Determination Theory (SDT) developed by Deci and Ryan (1985) and elaborated by Ryan and Deci (2000, 2020). SDT distinguishes three broad forms of motivation. Intrinsic motivation involves engaging in an activity out of interest, curiosity, or enjoyment, such that students persist in mathematics because they find the subject meaningful and satisfying. Extrinsic motivation is driven by outcomes separable from the activity itself, such as grades, rewards, recognition, or future opportunities. Amotivation reflects a lack of intention to act, where learners see little value in a task or doubt their ability to succeed, often resulting in disengagement.

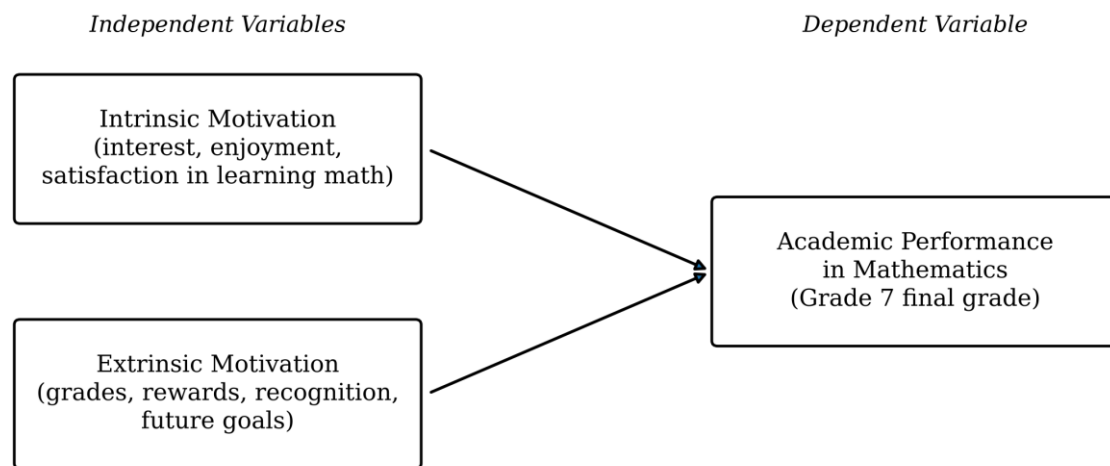
SDT proposes that both intrinsic and extrinsic motivation can direct learning behavior, although their effects on achievement may differ. Intrinsic motivation is expected to support deeper and more sustained engagement, while the effect of extrinsic motivation depends on how far students have internalized the value of the activity (Ryan & Deci, 2020). The Academic Motivation Scale (Vallerand et al., 1992), which operationalizes these SDT constructs for school settings, provides the measurement basis for this study.

Conceptual Framework

Figure 1 presents the conceptual model. Intrinsic and extrinsic motivation serve as the independent variables, and academic performance in mathematics, indicated by the students' final mathematics grade, serves as the dependent variable. Amotivation is assessed descriptively to complete the motivational profile of the respondents.

Figure 1

Conceptual Framework Showing Intrinsic and Extrinsic Motivation as Predictors of Mathematics Performance



Amotivation is measured as a descriptive variable (SOP 3).

Statement of the Problem

This study determined the predictive relationship between intrinsic and extrinsic motivation and the mathematics performance of Grade 8 students in School Year 2025–2026. Specifically, it sought to answer the following questions:

1. What is the level of intrinsic motivation of the respondents?
2. What is the level of extrinsic motivation of the respondents?
3. What is the level of amotivation of the respondents?
4. What is the academic performance in mathematics of the respondents as reflected in their final grade?
5. Is there a significant relationship between intrinsic motivation and mathematics performance?
6. Is there a significant relationship between extrinsic motivation and mathematics performance?
7. Which between intrinsic and extrinsic motivation is the stronger predictor of mathematics performance?

Hypotheses

The following null hypotheses were tested at the .05 level of significance:

1. H₀₁: There is no significant relationship between intrinsic motivation and the mathematics performance of the respondents.
2. H₀₂: There is no significant relationship between extrinsic motivation and the mathematics performance of the respondents.
3. H₀₃: Intrinsic and extrinsic motivation do not significantly predict the mathematics performance of the respondents.

Methodology

Research Design

The study used a quantitative correlational-predictive design. This design was appropriate because the study sought to measure the relationship between naturally occurring variables (intrinsic and extrinsic motivation) and an outcome (mathematics performance) without manipulation, and to estimate the relative predictive weight of each motivation type.

Participants

The respondents were the Grade 8 Science Section students of Aldersgate College, Inc., Solano, Nueva Vizcaya, Philippines, during School Year 2025–2026. Total enumeration was used, so all 30 students in the section took part: 17 male (56.7%) and 13 female (43.3%). Because the Science Section was taken as an intact class, the findings describe this group and do not represent a probability sample of all Grade 8 students.

Research Instrument

Motivation was measured with a 28-item questionnaire adapted to the mathematics context from the Academic Motivation Scale (AMS; Vallerand et al., 1992) and its high school adaptation (Stover et al., 2012). The items follow the seven-subscale structure of the AMS, with four items per subscale, and were written specifically for mathematics learning. Intrinsic motivation (12 items) covered intrinsic motivation to know, to accomplish, and to experience stimulation. Extrinsic motivation (12 items) covered identified, introjected, and external regulation. Amotivation had four items. Every item answered the stem “Why do you study mathematics?” Students rated each item on a four-point scale (1 = Totally Disagree, 2 = Somewhat Agree, 3 = Quite Agree, 4 = Totally Agree). The full questionnaire appears in

The instrument was content-validated by three experts in psychology, mathematics education, and educational research. Internal consistency was estimated with Cronbach’s alpha on the study data. Reliability was excellent for intrinsic motivation ($\alpha = .95$) and extrinsic motivation ($\alpha = .96$), and good for amotivation ($\alpha = .86$). Corrected item-total correlations ranged from .63 to .86 for intrinsic motivation, .71 to .88 for extrinsic motivation, and .66 to .76 for amotivation, and all six AMS subscales of intrinsic and extrinsic motivation had alphas between .85 and .93.

Subscale means were interpreted using the following scale: 3.26–4.00 (Very High), 2.51–3.25 (High), 1.76–2.50 (Low), and 1.00–1.75 (Very Low). Mathematics performance was described using the Department of Education grading descriptors: 90–100 (Outstanding), 85–89 (Very Satisfactory), 80–84 (Satisfactory), 75–79 (Fairly Satisfactory), and below 75 (Did Not Meet Expectations) (DepEd, 2015).

Data Gathering Procedure

The researcher obtained approval from the school principal and the research adviser prior to data collection. Parental consent and student assent were obtained from all participants. The questionnaires were administered during class hours in August 2025, and students were informed that participation was voluntary and would not affect their grades. With permission from the registrar, each respondent’s final grade in Grade 7 Mathematics (School Year 2024–2025) was retrieved and matched to the questionnaire using a coded student number.

Data Analysis

Means and standard deviations described the levels of each motivation type, and frequencies and percentages described the distribution of mathematics grades. Normality was checked with the Shapiro–Wilk test. Pearson product-moment correlation tested the relationship of each motivation type with mathematics performance, and Spearman’s rank correlation was run as a robustness check because intrinsic motivation, amotivation, and mathematics grades departed from normality. Multiple linear regression, with intrinsic and extrinsic motivation entered simultaneously, identified the stronger predictor through the standardized coefficients (β) and the squared semipartial correlations (sr^2), which show the variance each predictor explains on its own. Regression assumptions were checked through variance inflation factors (VIF), the Durbin–Watson statistic, the Breusch–Pagan test, the Shapiro–Wilk test of residuals, and Cook’s distance. Significance was set at $\alpha = .05$. Analyses were run in jamovi 2.7.

Ethical Considerations

The study observed voluntary participation, informed consent and assent, and confidentiality. Questionnaires and grade records were linked only through codes, and no names were recorded in the analysis file. Data was used solely for research purposes, and no respondent is identifiable in this report.

Results and Discussion

Level of Intrinsic Motivation

Table 1

Level of Intrinsic Motivation of the Respondents (n = 30)

Indicator	M	SD	Interpretation
<i>To know</i>	2.96	0.87	High
1. I enjoy learning new things in mathematics.	3.03	0.96	High

8. I find it satisfying to understand how a math concept works.	2.97	1.16	High
15. I like discovering different ways to solve a math problem.	2.93	0.94	High
22. I am curious to learn more math topics than those required in class.	2.90	1.03	High
<i>To accomplish</i>	2.89	0.76	High
4. I feel proud when I solve a difficult math problem on my own.	2.90	0.84	High
11. I enjoy challenging myself with harder math problems.	2.83	0.95	High
18. I feel a sense of achievement when I master a new math skill.	2.97	0.93	High
25. I like improving my math skills little by little.	2.87	0.90	High
<i>To experience stimulation</i>	2.99	0.78	High
6. I feel excited when I work on interesting math problems.	3.10	0.99	High
13. Math class activities hold my attention and make time pass quickly.	3.13	0.90	High
20. I enjoy math puzzles and games.	2.83	0.87	High
27. I find real pleasure in thinking through math problems.	2.90	0.99	High
Overall intrinsic motivation	2.95	0.76	High

Note. Item numbers refer to the questionnaire. Italic rows are subscale means. 3.26–4.00 = Very High, 2.51–3.25 = High, 1.76–2.50 = Low, 1.00–1.75 = Very Low.

Students reported a high level of intrinsic motivation toward mathematics ($M = 2.95$, $SD = 0.76$). All 12 items and all three subscales fell in the High range. Intrinsic motivation to experience stimulation was rated highest ($M = 2.99$), led by the item on math class activities holding students' attention ($M = 3.13$), while intrinsic motivation to accomplish was rated lowest ($M = 2.89$), with the item on enjoying harder problems among the lowest ($M = 2.83$). Students therefore seemed more drawn to the engaging side of mathematics than to the challenge of difficult tasks. The overall mean, however, hides a wide spread. Twenty-one students (70.0%) scored High or Very High, while nine (30.0%) scored Low or Very Low, so close to a third of the class reported limited personal interest in the subject. The overall high level agrees with the intrinsic motivation reported by Yarin et al. (2022) and differs from the weak intrinsic motivation found among Filipino elementary pupils by Capuyan et al. (2024).

Level of Extrinsic Motivation

Table 2

Level of Extrinsic Motivation of the Respondents (n = 30)

Indicator	M	SD	Interpretation
<i>Identified regulation</i>	2.89	0.89	High
2. I study math because it will help me in the course I want to take in college.	3.00	1.02	High
9. I believe that learning math is important for my future career.	2.87	0.97	High
16. I study math because it helps me think logically and solve everyday problems.	2.87	0.94	High
23. I study math because I know it is needed in other subjects, like science.	2.83	0.99	High
<i>Introjected regulation</i>	2.84	0.88	High
7. I study math because I would feel guilty if I did not do well.	3.03	0.89	High
14. I study math to prove to myself that I am capable.	2.83	0.91	High
21. I feel ashamed when I get low grades in math, so I try hard.	2.80	1.13	High
28. I study math because I want to be seen as a smart student.	2.70	1.12	High
<i>External regulation</i>	2.93	0.87	High
3. I study math to get high grades.	2.97	0.96	High
10. I study math so I can receive awards, honors, or rewards from my parents or school.	3.07	0.98	High
17. I study math because my parents or teachers expect me to.	2.77	1.07	High
24. I study math to avoid being scolded or punished for poor performance.	2.93	0.94	High
Overall extrinsic motivation	2.89	0.84	High

Note. Same notes and interpretation scale as Table 1.

Extrinsic motivation was also high ($M = 2.89$, $SD = 0.84$). External regulation had the highest subscale mean ($M = 2.93$), with receiving awards, honors, or rewards as the top-rated item ($M = 3.07$), while introjected regulation had the lowest ($M = 2.84$), with wanting to be seen as a smart student rated lowest of all 24 intrinsic and extrinsic items ($M = 2.70$). Students thus responded more to concrete rewards than to pressures tied to self-image. As with intrinsic motivation, the class split widely: 19 students (63.3%) scored High or Very High and 11 (36.7%) scored Low or Very Low. Intrinsic and extrinsic motivation were moderately and positively correlated ($r = .58$, $p = .001$), which supports the SDT view that the two forms can coexist in the same learner rather than replace one another (Ryan & Deci, 2020).

Level of Amotivation

Table 3

Level of Amotivation of the Respondents (n = 30)

Indicator	M	SD	Interpretation
5. I do not see why I should study math.	1.83	0.83	Low
12. I often feel that studying math is a waste of time.	1.90	0.80	Low
19. I cannot see how learning math is useful to me.	2.03	0.93	Low
26. I go through the motions in math class, but I am not sure why I am doing it.	2.20	0.96	Low
Overall amotivation	1.99	0.74	Low

Note. Same interpretation scale as Table 1. For amotivation, a lower mean is the favorable result.

Amotivation was low ($M = 1.99$, $SD = 0.74$). All four items fell in the Low range. The highest-rated item described going through the motions in math class without knowing why ($M = 2.20$), and the lowest described not seeing why one should study math ($M = 1.83$). Fifteen students (50.0%) were in the Very Low range and eight (26.7%) in the Low range, but seven (23.3%) reported High or Very High amotivation. This group matters because amotivation is the motivational state most consistently tied to poor school outcomes (Howard et al., 2021). Amotivation was also negatively correlated with intrinsic motivation ($r = -.47$, $p = .009$) but not with extrinsic motivation ($r = -.21$, $p = .278$), suggesting that students who lacked interest in mathematics were the ones most likely to feel aimless in it.

Academic Performance in Mathematics

Table 4

Academic Performance in Mathematics of the Respondents (n = 30)

Grade range	Descriptor	f	%
90–100	Outstanding	15	50.0
85–89	Very Satisfactory	15	50.0
80–84	Satisfactory	0	0.0
75–79	Fairly Satisfactory	0	0.0
Below 75	Did Not Meet Expectations	0	0.0
Total		30	100.0

Note. $M = 90.13$, $SD = 3.54$, $Mdn = 89.5$, range = 85–96. Descriptors follow DepEd Order No. 8, s. 2015.

The respondents' Grade 7 mathematics grades were uniformly high ($M = 90.13$, $SD = 3.54$), with a mean in the Outstanding band. The class split evenly, with 15 students (50.0%) earning Outstanding grades and 15 (50.0%) earning Very Satisfactory grades. No student scored below 85, and the full range spanned only 11 points (85 to 96). This pattern fits a Science Section, which is commonly formed from students with strong prior grades. The narrow, upper-end distribution matters for the analyses that follow, because a restricted range of scores on one variable reduces the size of any correlation that can be observed (Cohen, 1992).

Relationship Between Motivation and Mathematics Performance

The Shapiro–Wilk test showed that extrinsic motivation did not depart significantly from normality ($W = .938$, $p = .078$), while intrinsic motivation ($W = .896$, $p = .007$), amotivation ($W = .918$, $p = .024$), and mathematics grades ($W = .930$, $p = .048$) did. Spearman's correlation was therefore computed alongside Pearson's r for all pairs.

Table 5

Correlation Between Motivation Types and Mathematics Performance (n = 30)

Variable	r	95% CI	p	p (Spearman)	p (p)	Decision
Intrinsic motivation	.11	[-.26, .45]	.559	.05	.781	Fail to reject H_{01}
Extrinsic motivation	.36	[.00, .64]	.048	.34	.069	Reject H_{02} (Pearson only)
Amotivation	.22	[-.15, .54]	.233	.16	.403	Not significant

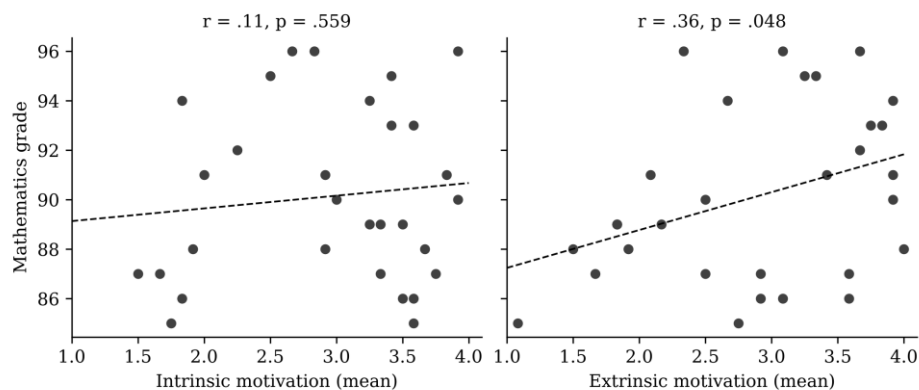
Note. Two-tailed tests at $\alpha = .05$. CI = confidence interval for Pearson r .

Intrinsic motivation was not significantly related to mathematics grades, $r(28) = .11$, $p = .559$, 95% CI [-.26, .45], and H_{01} was not rejected. Extrinsic motivation showed a weak-to-moderate positive correlation that reached significance by Pearson's test, $r(28) = .36$, $p = .048$, so H_{02} was rejected. This result, however, sits at the edge of significance. The lower bound of its confidence interval is .00, and Spearman's correlation, which is more appropriate given the non-normal grades, did not reach significance ($p = .34$, $p = .069$). Amotivation was not related to grades ($r = .22$, $p = .233$). Figure 2 shows that students with very different intrinsic motivation scores earned similar grades across the 85–96 band, while students with higher extrinsic motivation tended to earn somewhat higher grades.

Figure 2

Scatterplots of Intrinsic and Extrinsic Motivation Against Mathematics Grade

Note. Dashed lines show ordinary least squares fit lines.



At the subscale level, only introjected regulation correlated significantly with grades ($r = .40, p = .028$). Identified regulation ($r = .32, p = .082$) and external regulation ($r = .32, p = .087$) showed weak, non-significant positive correlations, and the three intrinsic subscales were essentially unrelated to grades ($r = .06$ to $.17$, all $p > .36$). Introjected regulation reflects studying to avoid guilt or shame and to protect self-esteem. Howard et al. (2021) found that this form of motivation is tied to performance-oriented goals, which may explain why it was the subscale most closely linked to grades in a class of high achievers.

These results differ from studies reporting intrinsic motivation as the stronger correlate of mathematics performance (Taylor et al., 2014; Yarin et al., 2022) and from Pastera et al. (2018), who found both forms significant among college students. The direction of the findings is closer to Capuyan et al. (2024), who reported a stronger link for extrinsic than for intrinsic motivation among Filipino pupils, and to Adamma et al. (2018) and Khaliq (2023), who emphasized the role of extrinsic motivation. Because the extrinsic correlation was marginal and not robust to the rank-based test, this agreement should be read cautiously.

Several features of the design help explain why the associations were weak. First, the sample was small. With 30 respondents, the study had 80% power to detect only correlations of about $|r| \geq .49$, while a moderate correlation of $.30$ would have required about 85 respondents (Cohen, 1992). Second, all grades fell within the Very Satisfactory and Outstanding bands, which leaves little variance for motivation to explain. Third, the grades came from Grade 7, while motivation was measured in Grade 8. The analysis therefore tests whether current motivation corresponds with past performance. Garon-Carrier et al. (2016) showed that the direction of influence between mathematics achievement and intrinsic motivation is not straightforward, which makes the timing of measurement a substantive issue.

Intrinsic and Extrinsic Motivation as Predictors of Mathematics Performance

Multiple regression assumptions were met. Multicollinearity was not a concern ($VIF = 1.50$ for both predictors), the residuals were independent (Durbin-Watson = 2.32), homoscedastic (Breusch-Pagan $\chi^2(2) = 0.98, p = .613$), and normally distributed (Shapiro-Wilk $W = .969, p = .510$). No case was overly influential (maximum Cook's $D = 0.19$).

Table 6

Multiple Regression of Mathematics Performance on Intrinsic and Extrinsic Motivation (n = 30)

Predictor	B	SE	β	t	p	sr ²	95% CI for B
(Constant)	86.71	2.67		32.52	< .001		[81.24, 92.18]
Intrinsic motivation	-0.69	1.01	-.15	-0.69	.497	.02	[-2.76, 1.37]
Extrinsic motivation	1.90	0.91	.45	2.07	.048	.14	[0.02, 3.77]

Note. $R = .38$, $R^2 = .148$, adjusted $R^2 = .085$, $F(2, 27) = 2.34, p = .116$. sr^2 = squared semipartial correlation (unique variance explained). Adding amotivation as a third predictor did not produce a significant model ($R^2 = .226$, $F(3, 26) = 2.54, p = .079$; amotivation $\beta = .32, p = .116$).

Intrinsic and extrinsic motivation together explained 14.8% of the variance in mathematics grades, but the model was not statistically significant, $F(2, 27) = 2.34, p = .116$, and H_{03} was not rejected. The adjusted R^2 of .085 indicates that little of this variance would be expected to generalize beyond the sample. Within the model, extrinsic motivation had the larger standardized coefficient ($\beta = .45, p = .048$) and uniquely accounted for about 14% of the variance, while intrinsic motivation had a small negative and non-significant coefficient ($\beta = -.15, p = .497$) and uniquely accounted for about 2%.

The answer to the question of which motivation type is the stronger predictor is therefore qualified. Extrinsic motivation carried more weight than intrinsic motivation in this sample, but because the overall model was not significant, the individual coefficient should not be interpreted as a reliable effect. The negative intrinsic coefficient also reflects the overlap between the two predictors ($r = .58$). Once extrinsic motivation was held constant, the remaining part of intrinsic motivation carried no positive information about grades. This is a statistical adjustment and not evidence that interest in mathematics lowers performance.

Taken together, the results suggest that among students who already perform at Very Satisfactory to Outstanding levels, differences in self-reported motivation translate into only small and uncertain differences in classroom grades, with extrinsic and particularly introjected forms showing the clearest links. This conclusion is narrower than a claim that motivation does not matter. SDT and meta-analytic evidence consistently link intrinsic motivation with better school outcomes across larger and more varied populations (Howard et al., 2021; Ryan & Deci, 2020), and the present data are too limited to contradict that body of work.

Conclusions

Grade 8 Science Section students reported high intrinsic and extrinsic motivation and low amotivation toward mathematics, although about a third of the class scored low on each motivation type. Their Grade 7 mathematics grades were uniformly high. Intrinsic motivation was not related to mathematics performance. Extrinsic motivation showed a weak positive relationship that was significant by Pearson's test but not by the rank-based test, and the regression model with both predictors was not significant. In this sample, extrinsic motivation carried more predictive weight than intrinsic motivation, but neither emerged as a reliable predictor. Within the limits of a small, high-achieving, single-class sample and a grade measured the year before the survey, self-reported motivation did not clearly distinguish students' mathematics performance.

Recommendations

Based on the findings, the following are recommended:

1. Mathematics teachers may continue to use clear goals, feedback, grades, and recognition, since extrinsic motivation, especially introjected regulation, showed the clearest link with performance in this class, while watching that pressure tied to guilt or shame does not undermine students' well-being.
2. Teachers may still build intrinsic motivation through problem-solving tasks, puzzles, and activities that give students a sense of mastery. About a third of the class reported low intrinsic motivation, and SDT research links interest-based motivation with long-term engagement even where short-term grades do not show it.
3. The school may identify students who reported high amotivation and offer early support, such as mentoring or peer tutoring, before disengagement affects their grades.
4. Future researchers may use a larger sample (at least 85 respondents for a moderate effect) that includes regular as well as Science Sections, or several schools, so that both motivation and performance vary more widely.
5. Future studies may measure motivation first and then use mathematics grades or standardized test scores from the same or following term, or follow students across several terms, to clarify the direction of the relationship.

Limitations of the Study

The findings should be read considering several limitations. The sample was a single Science Section of 30 students from one private school, taken as an intact class, so the results cannot be generalized to regular sections or to Grade 8 students in general, and the small sample limited statistical power. All grades fell between 85 and 96, which restricted the variance available for analysis. Mathematics performance was measured through teacher-assigned grades from the previous school year, obtained before the motivation survey. Motivation was self-reported and may reflect socially desirable responding. Finally, the questionnaire used a four-point scale with labels that are not evenly spaced ("Totally Disagree" followed by "Somewhat Agree"), which may have affected how students used the lower end of the scale.

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