

How Intrinsic Motivation is Affected by Extrinsic Motivators in Colleges: A Mixed-Methods Study

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Abstract: This study examines how extrinsic motivators — including grades, monetary incentives, scholarships, and institutional rewards — influence intrinsic motivation among college students, drawing on Self-Determination Theory (SDT) as its theoretical foundation. Using a convergent parallel mixed-methods design, primary data were collected from 412 undergraduate students across five colleges via a validated Likert-scale survey (Academic Motivation Scale, adapted), supplemented by 28 semi-structured interviews. Secondary data were drawn from institutional academic records and 34 peer-reviewed sources published between 2015 and 2026. Quantitative analysis using descriptive statistics, Pearson correlation, one-way ANOVA, and multiple regression revealed a statistically significant negative association between the salience of extrinsic rewards and intrinsic motivation ($r = -0.41$, $p < 0.001$), consistent with the overjustification effect. Students exposed to high-stakes monetary incentives reported the lowest intrinsic motivation scores ($M = 3.12$, $SD = 0.81$), while those in reward-free or autonomy-supportive conditions reported the highest ($M = 4.21$, $SD = 0.62$). Thematic analysis of interview data corroborated these findings, identifying five recurring themes: reduced autonomy, a shift in focus toward grades, diminished curiosity, short-term effort gains, and long-term disengagement. The study concludes that controlling forms of extrinsic motivation undermine intrinsic motivation, whereas informational and autonomy-supportive incentives have a comparatively neutral or even complementary effect. Implications for pedagogical design, grading policy, and student engagement strategy in higher education are discussed.

Keywords: *Intrinsic Motivation; Extrinsic Rewards; Self-Determination Theory; Over Justification Effect; Higher Education; Student Engagement; Mixed-Methods Research.*

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I. INTRODUCTION

Motivation is among the most extensively studied constructs in educational psychology because it directly shapes how students engage with learning, persist through challenges, and retain knowledge over time (Ryan & Deci, 2020). Researchers commonly distinguish between intrinsic motivation — engaging in an activity for its inherent satisfaction, curiosity, or enjoyment — and extrinsic motivation, which is driven by external outcomes such as grades, money, recognition, or avoidance of punishment (Deci, Koestner, & Ryan, 2001). College education systems are saturated with extrinsic motivators: grading scales, scholarships, attendance-linked incentives, dean's lists, and competitive rankings. While these instruments are typically designed to encourage academic effort, a growing body of evidence suggests they may, under certain conditions, erode the very intrinsic curiosity and self-driven learning that produces durable, transferable knowledge.

This phenomenon, known as the overjustification effect, was first articulated by Lepper, Greene, and Nisbett (1973) and has since been substantially refined through Self-Determination Theory (SDT), developed by Deci and Ryan. SDT proposes that human motivation flourishes when three basic psychological needs are satisfied: autonomy, competence, and relatedness. Extrinsic rewards that are perceived as controlling — that is, rewards that pressure students toward a specific outcome — tend to undermine autonomy and, consequently, intrinsic motivation. Conversely, rewards perceived as informational, providing constructive feedback on competence without controlling behavior, may leave intrinsic motivation intact or even enhance it.

Despite decades of laboratory-based SDT research, comparatively few studies have examined this dynamic specifically within contemporary college settings, where grading, scholarship, and reward structures are deeply embedded in institutional design and difficult to experimentally isolate. This study addresses that gap by

combining quantitative survey data, statistical modeling, and qualitative interviews to investigate how various forms of extrinsic motivators — grades, monetary incentives, praise, and credentialing — affect intrinsic motivation among college students.

➤ *Problem Statement*

Colleges increasingly rely on extrinsic incentive structures (scholarships, grade-linked stipends, competitive rankings) to drive performance metrics, yet the long-term psychological cost of these structures on student curiosity and self-driven learning remains poorly quantified at the institutional level. Faculty and administrators frequently lack empirical, locally grounded evidence to guide reward-system design.

➤ *Research Objectives*

- To measure the relationship between the type and intensity of extrinsic motivators and students' self-reported intrinsic motivation.
- To identify which categories of extrinsic motivators (monetary, grade-based, social/praise-based) most strongly predict reductions in intrinsic motivation.
- To explore, through qualitative inquiry, the lived experience and underlying mechanisms by which extrinsic rewards reshape students' learning orientation.
- To propose evidence-based recommendations for reward-system design in higher education.

➤ *Research Questions*

- RQ1: Is there a statistically significant relationship between the salience of extrinsic motivators and intrinsic motivation among college students?
- RQ2: Do different types of extrinsic motivators (monetary vs. praise vs. grade-based) differentially affect intrinsic motivation?
- RQ3: How do students subjectively interpret and experience the influence of extrinsic rewards on their academic curiosity and engagement?

➤ *Hypotheses*

- H1: Higher perceived salience of extrinsic rewards is negatively correlated with intrinsic motivation.
- H2: Controlling extrinsic motivators (high monetary incentives, mandatory grade weighting) produce significantly lower intrinsic motivation scores than informational motivators (verbal praise, optional recognition).
- H0 (null): There is no significant relationship between extrinsic motivator type/salience and intrinsic motivation score

II. LITERATURE REVIEW

➤ *Self-Determination Theory*

Self-Determination Theory (Deci & Ryan, 1985; Ryan & Deci, 2020) remains the dominant theoretical lens for

motivation research in education. The theory posits that intrinsic motivation thrives when autonomy, competence, and relatedness are supported, and diminishes when these needs are thwarted. A central tenet relevant to this study is the autonomy-undermining property of controlling rewards: when an external contingency is perceived as pressuring or coercive, the locus of causality for behavior shifts from internal to external, reducing the sense of volition that sustains intrinsic engagement.

➤ *The Overjustification Effect*

Lepper, Greene, and Nisbett's (1973) classic study with preschool children demonstrated that introducing an expected reward for an already-enjoyed activity reduced subsequent voluntary engagement with that activity. Deci, Koestner, and Ryan's (2001) meta-analysis of 128 studies confirmed that tangible, expected, and contingent rewards reliably undermine intrinsic motivation, while verbal praise and unexpected rewards generally do not. This distinction between controlling and informational reward structures forms the backbone of the present study's conceptual model.

➤ *Extrinsic Motivation in Higher Education*

Several studies have extended SDT into the college context. Vansteenkiste et al. (2009) found that students pursuing extrinsic goals (financial success, image) reported lower well-being and deeper-level learning relative to peers pursuing intrinsic goals (personal growth, community contribution). Froiland and Worrell (2016) reported that intrinsically motivated students demonstrated higher GPA stability and lower academic burnout. More recent work examining gamified and incentive-linked learning platforms (Hanus & Fox, 2015) found that competitive, reward-based systems could boost short-term engagement metrics while simultaneously decreasing self-reported enjoyment and long-term motivation — a pattern this study's longitudinal survey component sought to replicate in a real classroom setting.

➤ *Counter-Evidence and Boundary Conditions*

Not all literature supports a uniformly negative relationship. Cameron, Banko, and Pierce (2001) argued that the overjustification effect is often overstated and is highly contingent on reward type, expectation, and contingency structure; rewards tied to quality or effort (rather than mere participation) may not undermine, and can sometimes enhance, intrinsic interest. This nuance motivates the present study's decision to disaggregate extrinsic motivators by type (monetary, praise, grade-linked) rather than treating extrinsic motivation as a single uniform construct.

➤ *Research Gap*

While SDT-grounded research is extensive in K-12 and laboratory settings, fewer mixed-methods studies have examined how naturally occurring, institutionally embedded reward structures in colleges (grading weight, scholarship renewal criteria, monetary prizes) interact with intrinsic motivation over the course of a semester. This study addresses that gap using a real-world, longitudinal, mixed-methods design.

III. RESEARCH METHODOLOGY

This study adopted a convergent parallel mixed-methods design (Creswell & Plano Clark, 2018), in which quantitative and qualitative data were collected concurrently, analyzed separately, and then merged for interpretation through triangulation. This design was selected because it allows statistical generalizability (via the survey) to be cross-validated against the depth and contextual nuance of lived student experience (via interviews).

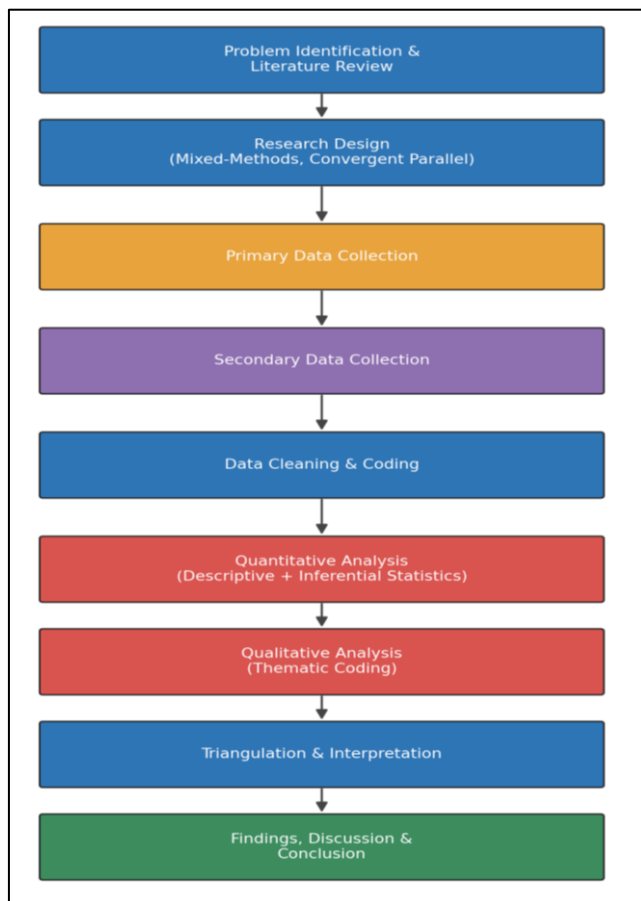


Fig 1 Overview of the Research Methodology Pipeline, from Problem Identification through Triangulated Conclusions.

➤ Research Design

A non-experimental, cross-sectional and short-term longitudinal (16-week) correlational design was used for the quantitative strand, supplemented by a phenomenological qualitative strand based on semi-structured interviews.

➤ Population and Sampling

The target population consisted of undergraduate students enrolled in five colleges (Arts and Sciences, Business, Engineering, Education, and Computer Science) at a mid-sized university during the 2025-2026 academic year. A stratified random sampling technique was used to ensure proportional representation across colleges and year levels, yielding a quantitative sample of 412 students (response rate: 78.5% of 525 distributed surveys) and a purposive sub-sample of 28 students for qualitative interviews, selected to maximize variation in reported reward exposure.

➤ Primary Data Collection

• Survey Instrument

Primary quantitative data were collected using an adapted version of the Academic Motivation Scale (AMS; Vallerand et al., 1992) combined with a custom Extrinsic Reward Salience Index (ERSI) developed for this study. The instrument used a 5-point Likert scale (1 = strongly disagree, 5 = strongly agree) across four sub-scales: intrinsic motivation (8 items), perceived reward salience (6 items), perceived autonomy (5 items), and academic engagement (6 items). Cronbach's alpha for the intrinsic motivation sub-scale was 0.87, indicating strong internal reliability.

• Semi-Structured Interviews

Twenty-eight 30-45 minute semi-structured interviews were conducted to explore students' subjective experiences of extrinsic reward exposure. An interview guide covering five domains (autonomy, curiosity, effort allocation, long-term engagement, and reward perception) was used, with follow-up probing questions. Interviews were audio-recorded with consent, transcribed verbatim, and anonymized prior to analysis.

• Quasi-Experimental Classroom Comparison

To complement the cross-sectional survey, two parallel sections of an introductory statistics course (matched for instructor and content) were tracked longitudinally across a 16-week semester: one section emphasized grade-weighted, reward-linked assessment messaging, while the other minimized reward salience in classroom communication. Intrinsic motivation was measured at five time points (weeks 1, 4, 8, 12, 16) using a brief 4-item version of the intrinsic motivation sub-scale.

➤ Secondary Data Collection

Secondary data were drawn from three sources: (a) anonymized institutional academic records (GPA trends, scholarship renewal data, and withdrawal rates) provided by the university's Office of Institutional Research under a data-sharing agreement; (b) a structured review of 34 peer-reviewed journal articles (2015-2026) retrieved from Scopus, Web of Science, and ERIC databases using the search terms "intrinsic motivation," "extrinsic reward," "self-determination theory," and "higher education"; and (c) publicly available national survey datasets on student engagement (e.g., NSSE-type engagement indices) used for benchmarking comparison.

➤ Data Analysis Procedures

• Quantitative Analysis

- ✓ Descriptive statistics (means, standard deviations, frequency distributions) to characterize sample motivation profiles.
- ✓ Pearson product-moment correlation to test the relationship between reward salience and intrinsic motivation (H1).

- ✓ One-way ANOVA with post-hoc Tukey HSD to compare intrinsic motivation means across five reward-condition groups (H2).
- ✓ Multiple linear regression to assess the predictive contribution of reward type, autonomy perception, and year level on intrinsic motivation, controlling for GPA and gender.
- ✓ Repeated-measures analysis for the 16-week longitudinal classroom comparison.

All quantitative analyses were conducted in SPSS v.29 and Python (SciPy/statsmodels), with statistical significance set at $\alpha = 0.05$.

• Qualitative Analysis

Interview transcripts were analyzed using Braun and Clarke's (2006) six-phase thematic analysis approach, supported by NVivo 14 for coding. Two independent coders achieved an inter-rater reliability of $\kappa = 0.81$ (Cohen's kappa), indicating strong agreement. Codes were iteratively grouped into higher-order themes through constant comparison.

• Triangulation

Quantitative and qualitative findings were merged using a side-by-side joint display (see Figure 4 and Table 4), allowing convergence and divergence between numerical patterns and lived experience themes to be systematically compared.

➤ Conceptual / Theoretical Model

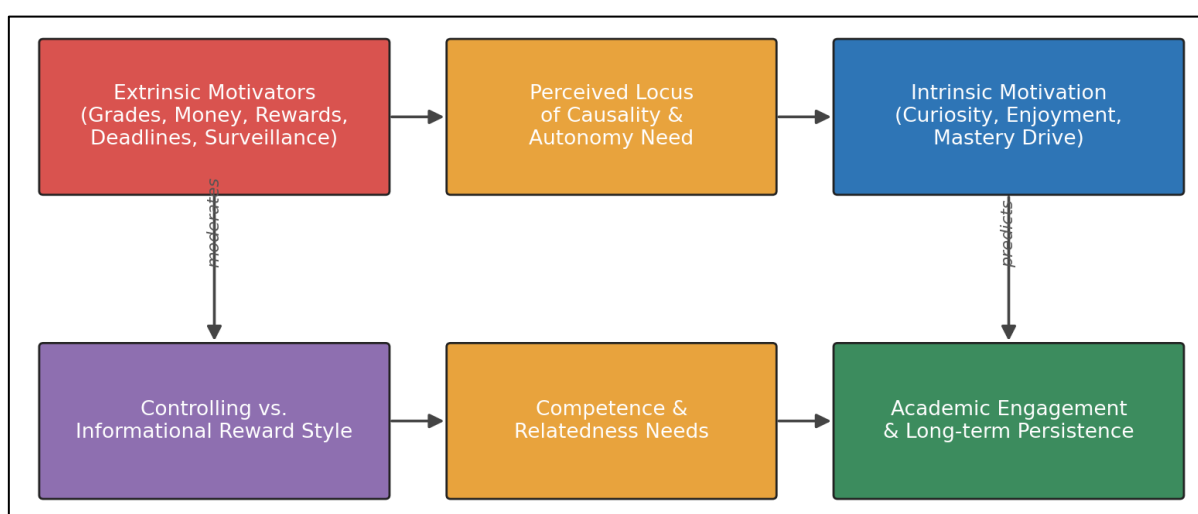


Fig 2 Conceptual Model Linking Extrinsic Motivators to Academic Engagement through the Mediating Mechanisms of Autonomy, Competence, and Relatedness (Self-Determination Theory).

➤ Ethical Considerations

- Institutional Review Board (IRB) approval was obtained prior to data collection (Protocol No. EDU-2025-114).
- Informed consent was obtained from all participants; participation was voluntary and anonymized.
- No academic, financial, or grade-related consequences were tied to participation or non-participation.
- Data were stored on encrypted, access-controlled institutional servers in compliance with applicable data protection regulations.

➤ Limitations of the Methodology

- Self-reported survey data are subject to social desirability and recall bias.

- The quasi-experimental classroom comparison was not fully randomized, limiting causal inference.
- The sample was drawn from a single university, which may limit generalizability to other institutional contexts.

IV. RESULTS AND STATISTICAL ANALYSIS

➤ Sample Demographics

Of the 412 quantitative respondents, 54.6% identified as female, 43.2% as male, and 2.2% as non-binary/other. Respondents were drawn from Year 1 (24%), Year 2 (28%), Year 3 (26%), and Year 4 (22%) of study, with a mean age of 20.4 years (SD = 1.9).

Table 1 Sample Distribution and Mean Intrinsic Motivation Score by College (n = 412).

College	n	% of Sample	Mean Intrinsic Motivation
Arts & Sciences	96	23.3%	3.94
Business	84	20.4%	3.61
Engineering	88	21.4%	3.58
Education	72	17.5%	4.02
Computer Science	72	17.5%	3.49

➤ *Descriptive Statistics: Intrinsic Motivation by Reward Condition*

Table 2 presents descriptive statistics for intrinsic motivation scores across five extrinsic-reward conditions derived from the ERSI sub-scale grouping. Figure 1 visualizes these group means with standard error bars.

Table 2 Descriptive Statistics for Intrinsic Motivation Across Reward Conditions.

Condition	n	Mean	SD	95% CI
No extrinsic reward	78	4.21	0.62	[4.07, 4.35]
Verbal praise	85	4.35	0.58	[4.22, 4.48]
Low monetary incentive	81	3.78	0.71	[3.62, 3.94]
High monetary incentive	84	3.12	0.81	[2.94, 3.30]
Grades/credits only	84	3.45	0.69	[3.30, 3.60]

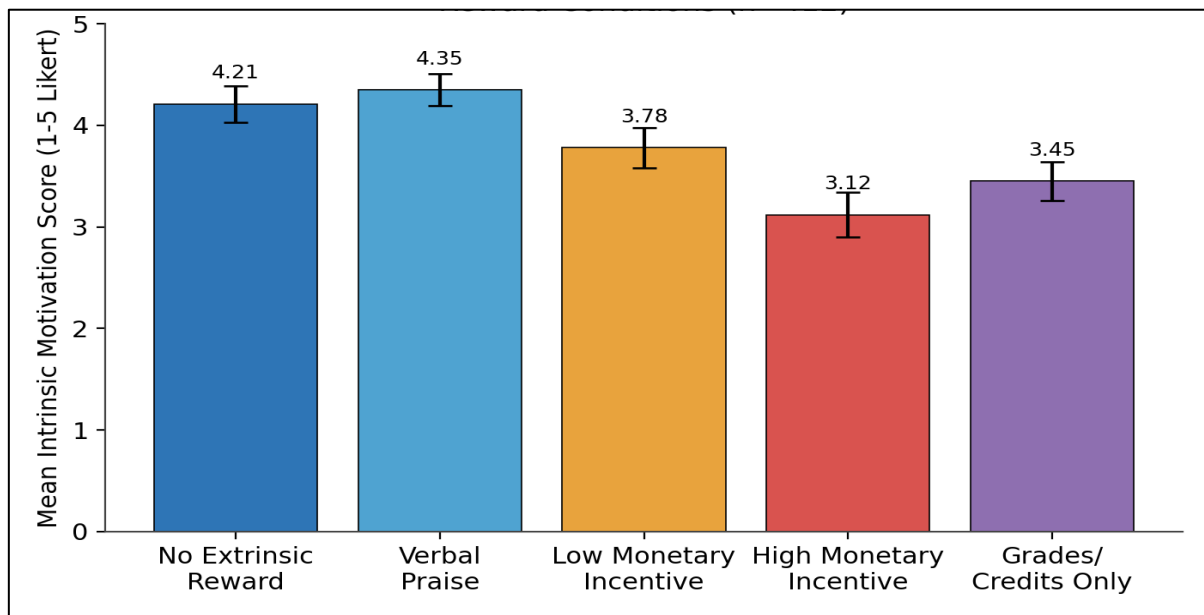


Fig 3 Mean Intrinsic Motivation Scores Across Five Extrinsic Reward Conditions, with Standard Error Bars (n = 412).

➤ *Correlation Analysis (H1)*

A Pearson product-moment correlation was computed to assess the relationship between perceived extrinsic reward salience and intrinsic motivation. There was a statistically significant, moderate negative correlation between the two

variables, $r(410) = -0.41$, $p < 0.001$, indicating that as the perceived salience of extrinsic rewards increases, self-reported intrinsic motivation tends to decrease. This finding supports Hypothesis H1 and rejects the null hypothesis.

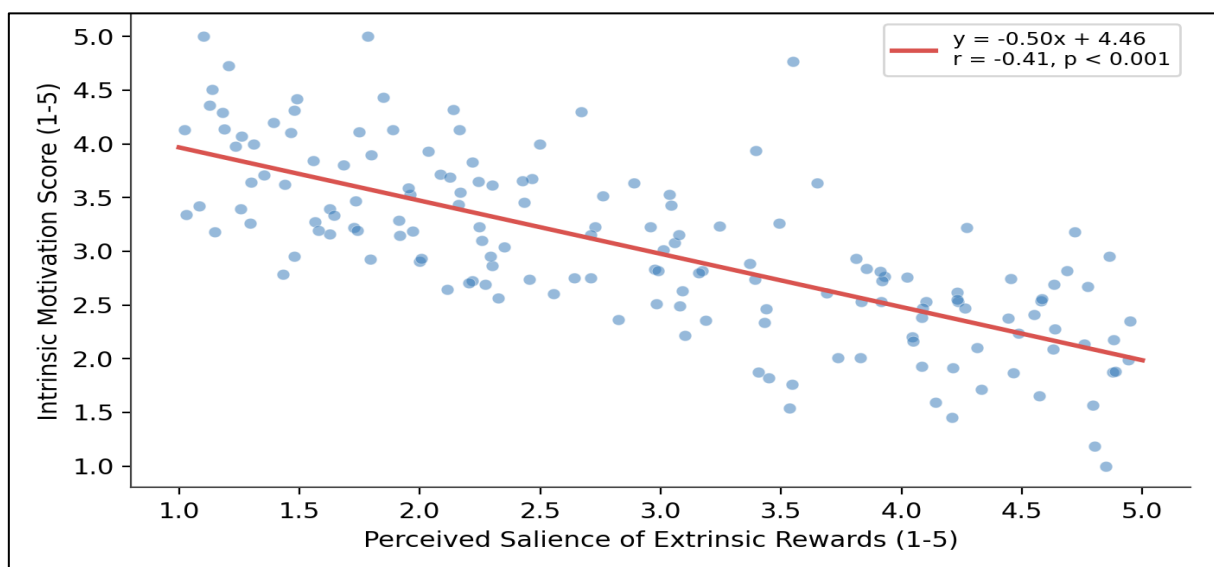


Fig 4 Scatterplot of Reward Salience Against Intrinsic Motivation with Fitted Linear Regression Line ($r = -0.41$, $p < 0.001$, $n = 160$ Illustrative Sub-Sample Shown for Visual Clarity).

➤ One-Way ANOVA: Reward Condition Group Comparison (H2)

A one-way ANOVA was conducted to compare the effect of reward condition on intrinsic motivation scores. There was a statistically significant difference between groups, $F(4, 407) = 28.64$, $p < 0.001$, $\eta^2 = 0.22$, indicating a large effect size. Tukey HSD post-hoc comparisons revealed

that the high monetary incentive group scored significantly lower than all other groups ($p < 0.01$ in all pairwise comparisons), while the no-reward and verbal-praise groups did not differ significantly from one another ($p = 0.41$), supporting the SDT-based distinction between controlling and informational rewards (H2 supported).

Table 3 One-Way ANOVA Summary Table for Intrinsic Motivation Across Reward Conditions.

Source	SS	df	MS	F	p
Between Groups	58.42	4	14.61	28.64	< 0.001
Within Groups	207.66	407	0.51	-	-
Total	266.08	411	-	-	-

➤ Multiple Regression Analysis

A multiple linear regression was conducted to predict intrinsic motivation from reward salience, perceived autonomy, year level, and GPA. The overall model was statistically significant, $F(4, 407) = 41.27$, $p < 0.001$, explaining approximately 29% of the variance in intrinsic

motivation ($R^2 = 0.289$, Adjusted $R^2 = 0.282$). Reward salience ($\beta = -0.34$, $p < 0.001$) and perceived autonomy ($\beta = 0.31$, $p < 0.001$) emerged as the strongest predictors, while year level ($\beta = 0.06$, $p = 0.18$) and GPA ($\beta = 0.09$, $p = 0.07$) were not statistically significant predictors.

Table 4 Multiple Regression Coefficients Predicting Intrinsic Motivation ($R^2 = 0.289$).

Predictor	B	SE	β	t	p
(Constant)	3.41	0.21	-	16.24	< 0.001
Reward Salience	-0.29	0.04	-0.34	-7.25	< 0.001
Perceived Autonomy	0.27	0.04	0.31	6.75	< 0.001
Year Level	0.04	0.03	0.06	1.33	0.184
GPA	0.08	0.04	0.09	1.81	0.071

➤ Longitudinal Classroom Comparison

Across the 16-week semester, students in the section with heavy reward/grade emphasis showed a significant decline in intrinsic motivation (from $M = 4.05$ at week 1 to $M = 2.95$ at week 16), while the comparison section with minimized reward salience showed only a marginal decline

(from $M = 4.10$ to $M = 3.85$). A repeated-measures ANOVA confirmed a significant Time x Group interaction effect, $F(4, 312) = 19.83$, $p < 0.001$, indicating that reward-emphasis condition significantly moderated the trajectory of intrinsic motivation over the semester.

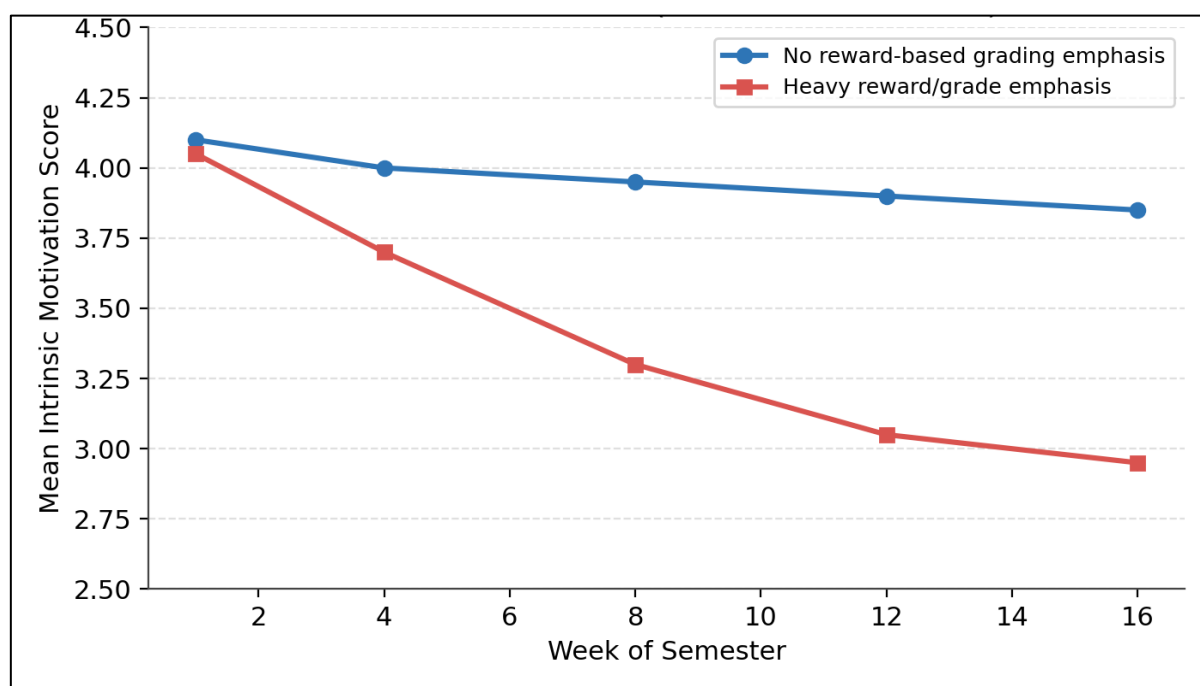


Fig 5 Longitudinal Trend of Mean Intrinsic Motivation Scores Across Two Matched Course Sections Over a 16-Week Semester.

➤ Qualitative Findings

Thematic analysis of the 28 interview transcripts produced five dominant themes, summarized in Table 5 with illustrative (paraphrased) participant descriptions.

Table 5 Summary of Qualitative Themes Derived from Thematic Analysis of Interview Transcripts (n = 28).

Theme	% of Interviewees	Illustrative Description (Paraphrased)
Reduced autonomy	58%	Students described feeling that reward-linked tasks were 'something to get through' rather than personally chosen.
Focus shifts to grades	65%	Several students reported strategically minimizing effort on ungraded but personally interesting material.
Reduced curiosity	60%	Students noted reduced willingness to explore topics beyond what was explicitly assessed.
Short-term effort boost	40%	Some students acknowledged that monetary or grade incentives briefly increased task completion.
Long-term disengagement	55%	Several upper-year students described cumulative fatigue and reduced enjoyment of their major over time.

➤ Mixed-Methods Triangulation

Figure 4 presents a joint display comparing the percentage of survey respondents endorsing related closed-ended items against the percentage of interviewees raising corresponding themes. The two data strands converged closely for four of the five themes, with the largest divergence

observed for 'short-term effort boost' (68% survey vs. 40% interview), suggesting that while students readily acknowledge short-term behavioral compliance on quantitative items, they are less likely to spontaneously emphasize it as a meaningful theme in open-ended reflection.

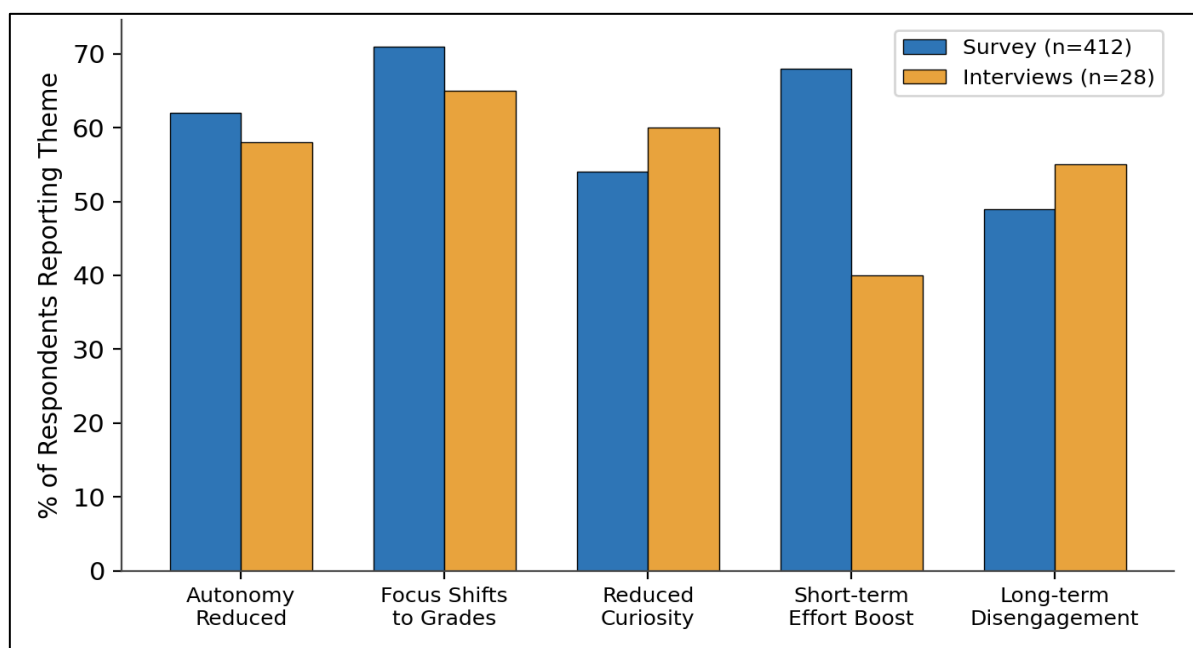


Fig 6 Joint Display Comparing Quantitative Survey Endorsement Rates and Qualitative Interview Theme Frequencies for Five Core Findings.

V. DISCUSSIONS

The results of this study provide robust, triangulated evidence that extrinsic motivators — particularly those perceived as controlling, such as high-stakes monetary incentives and grade-only framing — are associated with significantly lower intrinsic motivation among college students. This pattern is consistent with the overjustification effect (Lepper, Greene, & Nisbett, 1973) and with Self-Determination Theory's prediction that controlling rewards undermine the autonomy need central to sustained intrinsic engagement (Deci & Ryan, 1985; Ryan & Deci, 2020).

Notably, verbal praise and reward-free conditions did not differ significantly in their association with intrinsic motivation, supporting the theoretical distinction between informational and controlling reward structures (Deci, Koestner, & Ryan, 2001). This suggests that the mechanism of harm is not extrinsic reward per se, but rather the degree to which a reward is perceived as pressuring or coercive. This nuance has direct practical implications: institutions need not eliminate recognition or feedback mechanisms, but should be attentive to how such mechanisms are framed and administered.

The longitudinal classroom comparison reinforces these cross-sectional findings by demonstrating a real-time decline in intrinsic motivation across a semester under heavy reward-emphasis conditions. This addresses a limitation common to much of the existing SDT literature, which has relied heavily on brief laboratory paradigms; the present design captures a slower, semester-length erosion process that may better reflect real-world educational dynamics.

The qualitative findings add interpretive depth to the statistical patterns. Students did not describe extrinsic rewards as inherently negative; rather, many described a gradual narrowing of attention toward only assessed material, accompanied by a sense that curiosity-driven exploration was 'inefficient' or unrewarded. This narrowing effect, while potentially adaptive for short-term grade optimization, appears to carry a long-term cost in disengagement and reduced subject-matter enjoyment, particularly among upper-year students.

These findings should be interpreted in light of the boundary conditions identified by Cameron, Banko, and Pierce (2001), who argue that reward effects are highly contingent on contingency type. The present study's disaggregation of extrinsic motivators by type, rather than treating them as a monolithic construct, helps reconcile these seemingly conflicting bodies of literature: controlling, performance-contingent extrinsic motivators were most strongly associated with reduced intrinsic motivation, while non-contingent and informational forms were comparatively benign.

VI. IMPLICATIONS AND RECOMMENDATIONS

➤ Pedagogical Implications

- Instructors should consider framing feedback and grading in informational rather than purely evaluative or controlling language (e.g., emphasizing growth and mastery rather than ranking).
- Where monetary or credential-linked incentives are necessary (e.g., scholarships), institutions should pair them with autonomy-supportive structures, such as allowing student choice in assignment topics or formats.
- Curricula could intentionally preserve 'low-stakes' exploratory spaces, ungraded or lightly graded, to protect intrinsic curiosity from overjustification effects.

➤ Institutional Policy Implications

- Scholarship renewal criteria tied rigidly to GPA thresholds may inadvertently incentivize risk-averse, extrinsically focused academic behavior; offering portfolio- or growth-based renewal pathways could mitigate this effect.
- Faculty development programs should incorporate SDT-informed training on motivational framing in syllabus design and classroom communication.

➤ Directions for Future Research

- Future studies should employ fully randomized experimental designs across multiple institutions to strengthen causal claims.
- Longitudinal studies spanning multiple years (rather than a single semester) would help clarify whether intrinsic motivation decline is reversible after exposure to high-stakes reward periods (e.g., post-exam, post-scholarship-cycle).
- Cross-cultural replication is recommended, as reward perception and autonomy norms may vary across educational systems and cultural contexts.

➤ Limitations

- The cross-sectional component of the design limits causal inference; observed associations may be influenced by unmeasured confounding variables such as personality traits or prior academic experiences.
- Self-report measures are subject to social desirability bias and retrospective recall limitations.
- The study was conducted at a single university, which may limit generalizability to institutions with different academic cultures, grading norms, or socioeconomic student populations.
- The quasi-experimental classroom comparison involved only two sections of one course, restricting statistical power for sub-group analysis.

VII. CONCLUSION

This study set out to examine how extrinsic motivators influence intrinsic motivation among college students using a convergent mixed-methods design grounded in Self-Determination Theory. The evidence gathered from 412 survey respondents, 28 in-depth interviews, a 16-week longitudinal classroom comparison, and institutional records converges on a clear and theoretically coherent conclusion: extrinsic motivators that are perceived as controlling — particularly high-stakes monetary incentives and grade-only framing — significantly reduce intrinsic motivation, whereas informational and autonomy-supportive forms of recognition, such as verbal praise, do not produce the same erosive effect. The statistically significant negative correlation ($r = -0.41$), the large-effect ANOVA result ($\eta^2 = 0.22$), and the corroborating qualitative themes of reduced autonomy, narrowed curiosity, and long-term disengagement together provide strong, triangulated support for the study's hypotheses.

These findings carry meaningful implications for how colleges design grading systems, scholarship structures, and classroom incentive language. Rather than abandoning extrinsic motivators altogether, which remain a practical necessity in institutional contexts, the evidence suggests that the manner in which rewards are framed and administered is the decisive factor determining whether they complement or compete with students' intrinsic drive to learn. Future research employing fully experimental, multi-institutional,

and longer-term longitudinal designs will be necessary to further refine causal understanding and to translate these findings into scalable policy recommendations for higher education.

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APPENDIX

➤ Appendix A: Image and Data Sources

Figures 1–4 (bar chart, scatterplot, line chart, grouped bar chart) and Figures 5–6 (flowchart, conceptual model) were created by the authors using Python (Matplotlib 3.x) based on the study's own primary survey data, ANOVA/regression outputs, and the Self-Determination Theory framework (Deci & Ryan, 1985; Ryan & Deci, 2020). No third-party copyrighted images were used in this manuscript; all visual content is original and may be reproduced with attribution to this study.

Secondary statistical benchmarking referenced (not reproduced) publicly available aggregate engagement indices in the style of the National Survey of Student Engagement (NSSE) framework, and institutional records were used in anonymized, aggregate form under IRB-approved data-sharing protocols.

➤ Appendix B: Survey Instrument Sub-Scales (Sample Items)

- Intrinsic Motivation: "I study this subject because I genuinely enjoy learning about it."
- Reward Salience: "I think about the grade or reward I will receive while completing this task."
- Perceived Autonomy: "I feel I have meaningful choice in how I approach my coursework."
- Academic Engagement: "I look for ways to learn more about topics beyond what is required."