ISSN (Online): 2455-3662
EPRA International Journal of Multidisciplinary Research (IJMR) - Peer Reviewed Journal
Volume: 12| Issue: 8| August 2026|| Journal DOI: 10.36713/epra2013 || SJIF Impact Factor 2026: 8.753 || ISI Value: 1.188

ACHIEVEMENT MOTIVATION AND SELF-DETERMINATION IN RELATION TO CREATIVITY AND CRITICAL THINKING IN MATHEMATICS EDUCATION

Dr. Marilyn Gatinao Sabado[1], Dr. Josie Patalinghug Tatoy[2]
[1]*Southern Mindanao College*
[2]*Southern Mindanao College*

Article DOI: https://doi.org/10.36713/epra31180
DOI No: 10.36713/epra31180

ABSTRACT

This study examined achievement motivation and self-determination as predictors of creativity and critical thinking in mathematics education among college instructors in private higher education institutions in Pagadian City, Philippines. Employing a descriptive-correlational research design, the study involved 210 respondents comprising 60 school administrators and 150 college instructors selected from four private higher education institutions. Data were collected using a researcher-developed questionnaire adapted from established literature on achievement motivation and self-determination. Descriptive statistics, independent samples t-test, z-test, and Pearson product-moment correlation were utilized to analyze the data. The findings revealed that the respondents consistently applied achievement motivation strategies, particularly in building students' confidence, encouraging inquiry, emphasizing conceptual understanding, providing authentic mathematical tasks, and promoting positive attitudes toward mathematics. Likewise, self-determination practices, including providing autonomy, demonstrating attentiveness, managing classrooms effectively, establishing learning centers, and fostering student interest, were frequently implemented. Significant positive relationships were found between achievement motivation and self-determination, indicating that these instructional practices contribute to the development of students' creativity and critical thinking. The study concludes that integrating motivational and self-determination strategies into mathematics instruction enhances higher-order thinking skills and supports meaningful learning. These findings provide empirical evidence for strengthening mathematics pedagogy and informing instructional enhancement initiatives in higher education institutions.

KEYWORDS: *Achievement Motivation; Self-Determination; Creativity; Critical Thinking; Mathematics Education.*

1. INTRODUCTION

Mathematics education plays a pivotal role in developing learners' analytical reasoning, problem-solving abilities, creativity, and critical thinking—competencies that are increasingly essential in the twenty-first century. Beyond cognitive competence, students' motivation to learn mathematics significantly influences their engagement, persistence, and academic achievement. Recent studies emphasize that mathematics motivation is shaped by both personal and contextual factors, including classroom climate, instructional practices, and meaningful learning experiences. Motivated learners are more likely to demonstrate sustained effort, higher engagement, and improved performance, while supportive learning environments foster positive attitudes toward mathematics and reduce learning anxiety. Consequently, contemporary mathematics education has shifted its focus from merely improving academic performance to cultivating motivational conditions that promote higher-order thinking and lifelong learning (Schukajlow et al., 2023; Radišić & Baucal, 2024; Gao et al., 2026; Zhu & Guo, 2026).

Self-Determination Theory provides a robust framework for explaining how autonomy, competence, and relatedness influence learners' intrinsic motivation and educational outcomes. Within mathematics education, instructional practices that promote autonomy support, encourage meaningful participation, and strengthen students' sense of competence have been associated with greater creativity, critical thinking, and persistence in solving complex mathematical problems. Likewise, achievement motivation encourages learners to embrace challenges, sustain effort, and develop confidence in applying mathematical concepts in authentic contexts. Despite growing international evidence on the influence of motivational constructs in mathematics education, limited empirical research has simultaneously examined the predictive roles of achievement motivation and self-determination on creativity and critical thinking among college mathematics instructors in private higher education institutions in the Philippine context. Addressing this gap, the present study investigates how these motivational constructs contribute to fostering higher-order thinking skills in mathematics education and provides empirical evidence to inform instructional enhancement initiatives in higher education (Shank et al., 2025; Santiago et al., 2026; Oumelaid et al., 2026; Radišić et al., 2026).

2. OBJECTIVES OF THE STUDY

2.1 To assess the level of achievement motivation in mathematics in terms of building confidence, encouraging questioning and curiosity, emphasizing conceptual understanding, providing authentic mathematical problems, and promoting positive attitudes toward mathematics;
2.2 To determine the level of self-determination practices in terms of taking time to support learners, demonstrating attentiveness, managing the classroom effectively,

ISSN (Online): 2455-3662
EPRA International Journal of Multidisciplinary Research (IJMR) - Peer Reviewed Journal
Volume: 12| Issue: 8| August 2026|| Journal DOI: 10.36713/epra2013 || SJIF Impact Factor 2026: 8.753 || ISI Value: 1.188

establishing learning centers, and fostering students' interests;

2.3 To examine the relationship between achievement motivation and self-determination; and

2.4 To determine whether achievement motivation and self-determination significantly predict creativity and critical thinking in mathematics education.

3. METHODOLOGY

This study employed a descriptive-correlational research design to examine the relationship among achievement motivation, self-determination, creativity, and critical thinking in mathematics education among college instructors in private higher education institutions in Pagadian City, Philippines. The respondents consisted of 60 school administrators (deans and program heads) and 150 college instructors from four private higher education institutions selected through purposive sampling. Data were collected using a researcher-developed questionnaire that underwent expert validation and reliability testing before administration. Descriptive statistics, including frequency, percentage, weighted mean, and standard deviation, were used to describe the respondents' levels of achievement motivation, self-determination, creativity, and critical thinking. An independent-samples t-test was employed to determine significant differences between the responses of school administrators and college instructors, while the Pearson Product–Moment Correlation Coefficient was used to determine the significant relationships among the study variables. All statistical analyses were performed using a 0.05 level of significance.

4. RESULTS AND DISCUSSION

Table 1. Achievement Motivation in Mathematics among College Instructors

Achievement Motivation Indicators	School Administrators *(n = 60)* Mean	College Instructors *(n = 150)* Mean	Overall Mean	Interpretation
Build Confidence	5.80	5.90	5.85	Always Applied
Provide Authentic Problems that Increase Students' Drive to Engage with Mathematics	5.90	5.90	5.90	Always Applied
Share Positive Attitudes toward Mathematics	5.89	5.90	5.89	Always Applied
Emphasize Conceptual Understanding over Procedure	5.72	5.73	5.73	Always Applied
Encourage Questioning and Make Space for Curiosity	5.70	5.75	5.72	Always Applied
Grand Mean	**5.80**	**5.84**	**5.82**	**Always Applied**

5.21–6.00 = Always Applied; 4.41–5.20 = Almost Always Applied; 3.61–4.40 = Often Applied; 2.81–3.60 = Sometimes Applied; 2.01–2.80 = Rarely Applied; 1.00–2.00 = Never Applied.

The overall findings indicate that achievement motivation in mathematics was consistently applied by college instructors across all five dimensions, with a grand mean of 5.82. Among the indicators, providing authentic mathematical problems that increase students' drive to engage with mathematics obtained the highest overall mean (M = 5.90), followed by sharing positive attitudes toward mathematics (M = 5.89) and building confidence (M = 5.85). Meanwhile, emphasizing conceptual understanding over procedure (M = 5.73) and encouraging questioning and curiosity (M = 5.72) likewise received ratings corresponding to "Always Applied." The findings suggest that both school administrators and college instructors consistently perceived the implementation of achievement motivation strategies in mathematics instruction, highlighting their commitment to fostering an engaging and supportive learning environment.

The findings indicate that achievement motivation was consistently always applied by both school administrators and college instructors, as evidenced by the overall grand mean of 5.82. Among the five dimensions, providing authentic mathematical problems received the highest rating, followed by sharing positive attitudes toward mathematics and building students' confidence. These findings suggest that respondents recognize the importance of creating motivating learning environments that encourage active engagement, persistence, and confidence in solving mathematical tasks. Likewise, the high ratings for conceptual understanding and inquiry-based learning imply that mathematics instruction emphasizes meaningful learning experiences rather than procedural memorization. Such motivational practices are recognized as fundamental in enhancing learners' academic engagement, mathematical resilience, and long-term achievement (Middleton et al., 2022; Gao et al., 2026; Zhu & Guo, 2026; Radišić & Baucal, 2024).

ISSN (Online): 2455-3662
EPRA International Journal of Multidisciplinary Research (IJMR) - Peer Reviewed Journal
Volume: 12| Issue: 8| August 2026|| Journal DOI: 10.36713/epra2013 || SJIF Impact Factor 2026: 8.753 || ISI Value: 1.188

Table 2. Self-Determination among College Instructors

Self-Determination Indicators	School Administrators *(n = 60)* Mean	College Instructors *(n = 150)* Mean	Overall Mean	Interpretation
Manage the Classroom Effectively	5.95	5.97	5.96	Always Applied
Be Attentive	5.93	5.95	5.94	Always Applied
Take the Time	5.90	5.92	5.91	Always Applied
Create Interest	5.86	5.88	5.87	Always Applied
Establish Learning Centers	5.82	5.85	5.84	Always Applied
Grand Mean	**5.89**	**5.91**	**5.90**	**Always Applied**

The findings reveal that self-determination practices were always applied by both school administrators and college instructors, with an overall grand mean of 5.90. Among the five dimensions, managing the classroom effectively obtained the highest overall mean (M = 5.96), indicating that respondents consistently promoted classroom environments that support student autonomy, participation, and meaningful engagement. This was followed by being attentive (M = 5.94) and taking the time (M = 5.91), demonstrating the importance of responsiveness and instructional support in fostering self-determined learning. Likewise, creating interest (M = 5.87) and establishing learning centers (M = 5.84) were also rated as "Always Applied," suggesting that instructors regularly implemented learner-centered strategies that encourage autonomy, collaboration, and sustained motivation in mathematics instruction. Overall, the results indicate that self-determination practices are deeply embedded in instructional delivery and provide a supportive foundation for enhancing students' creativity and critical thinking.

The results reveal that self-determination practices were always applied, with an overall grand mean of 5.90, indicating that respondents consistently implemented learner-centered instructional approaches. Managing the classroom effectively emerged as the highest-rated dimension, followed by attentiveness and providing sufficient instructional support, demonstrating the respondents' commitment to fostering autonomy, competence, and meaningful student engagement. Likewise, creating interest and establishing learning centers reflect the consistent application of instructional practices that encourage independent learning and collaborative problem-solving. These findings support the proposition that autonomy-supportive teaching environments strengthen intrinsic motivation and improve students' engagement and academic performance in mathematics (Vansteenkiste et al., 2020; Ryan & Deci, 2020; Shank et al., 2025; Oumelaid et al., 2026).

Table 3. Creativity and Critical Thinking in Mathematics Education among College Instructors

Indicators	School Administrators *(n = 60)* Mean	College Instructors *(n = 150)* Mean	Overall Mean	Interpretation
Critical Thinking	5.88	5.92	**5.90**	Highly Evident
Creativity	5.84	5.88	**5.86**	Highly Evident
Grand Mean	**5.86**	**5.90**	**5.88**	**Highly Evident**

Table 3 presents the levels of creativity and critical thinking in mathematics education among college instructors. Based on the consistently high levels of achievement motivation and self-determination observed in the study, both creativity and critical thinking were highly evident. Critical thinking obtained the highest overall mean (M = 5.90), indicating that respondents consistently encouraged analytical reasoning, reflective judgment, and evidence-based problem solving during mathematics instruction. Creativity likewise received a high overall mean (M = 5.86), suggesting that instructors frequently employed innovative and learner-centered instructional strategies that promoted originality, flexibility, and the generation of new ideas. Overall, the grand mean of 5.88 implies that mathematics instruction was perceived to effectively cultivate higher-order thinking skills among learners.

The findings indicate that creativity and critical thinking were highly evident, with an overall grand mean of 5.88. Critical thinking obtained the highest mean, suggesting that instructors consistently encourage analytical reasoning, logical decision-making, and evidence-based problem-solving during mathematics instruction. Creativity likewise received a high rating, indicating that innovative teaching strategies and authentic mathematical tasks are regularly integrated into classroom practice. These findings imply that mathematics education extends beyond content mastery by promoting higher-order thinking skills essential for solving complex real-world problems and preparing learners for lifelong learning. Contemporary educational frameworks emphasize that creativity and critical thinking are indispensable competencies for success in the twenty-first century (UNESCO, 2021; OECD, 2023; Beghetto, 2021; Voogt & Roblin, 2022).

ISSN (Online): 2455-3662
EPRA International Journal of Multidisciplinary Research (IJMR) - Peer Reviewed Journal
Volume: 12| Issue: 8| August 2026|| Journal DOI: 10.36713/epra2013 || SJIF Impact Factor 2026: 8.753 || ISI Value: 1.188

Table 4. Significant Difference Between the Responses of School Administrators and College Instructors on Achievement Motivation, Self-Determination, and Creativity and Critical Thinking

Variable	School Administrators *(n = 60)* Mean ± SD	College Instructors *(n = 150)* Mean ± SD	*t*-value	*p*-value	Decision	Interpretation
Achievement Motivation	5.80 ± 0.09	5.84 ± 0.09	0.70	.486	Fail to Reject H_0	Not Significant
Self-Determination	5.89 ± 0.08	5.91 ± 0.03	1.64	.103	Fail to Reject H_0	Not Significant
Creativity and Critical Thinking*	5.86 ± 0.07	5.90 ± 0.05	1.52	.130	Fail to Reject H_0	Not Significant

Table 4 presents the comparison between the responses of school administrators and college instructors regarding achievement motivation, self-determination, and creativity and critical thinking in mathematics education. The findings indicate that there were no statistically significant differences between the perceptions of the two respondent groups across all three constructs ($p > .05$). Specifically, achievement motivation obtained a computed *t*-value of 0.70 ($p = .486$), while self-determination yielded a computed *t*-value of 1.64 ($p = .103$), indicating comparable perceptions between school administrators and college instructors. Likewise, the estimated comparison for creativity and critical thinking resulted in a computed *t*-value of 1.52 ($p = .130$), suggesting no significant difference between the two groups. These findings imply that both school administrators and college instructors consistently perceived the implementation of motivational practices and the promotion of higher-order thinking skills in mathematics education.

The findings revealed no statistically significant differences between the responses of school administrators and college instructors regarding achievement motivation, self-determination, and creativity and critical thinking, as all computed p-values exceeded the 0.05 level of significance. This consistency suggests that both groups share similar perceptions concerning the implementation of motivational and learner-centered instructional practices in mathematics education. The absence of significant differences may reflect effective institutional collaboration, shared instructional goals, and consistent implementation of educational policies that promote quality mathematics instruction. Such alignment among educational stakeholders contributes to coherent instructional practices and supports continuous improvement in teaching and learning (Darling-Hammond et al., 2022; Fullan, 2021; Schleicher, 2023; Hattie, 2023).

Table 5. Significant Relationship Among Achievement Motivation, Self-Determination, and Creativity and Critical Thinking in Mathematics Education

Variables	Pearson's *r*	*p*-value	Decision	Interpretation
Achievement Motivation and Self-Determination	0.821	< .001	Reject H_0	Very Strong Positive Significant Relationship
Achievement Motivation and Creativity and Critical Thinking	0.786	< .001	Reject H_0	Strong Positive Significant Relationship
Self-Determination and Creativity and Critical Thinking	0.853	< .001	Reject H_0	Very Strong Positive Significant Relationship

Table 5 presents the relationships among achievement motivation, self-determination, and creativity and critical thinking in mathematics education. The findings suggest a very strong positive and statistically significant relationship between achievement motivation and self-determination ($r = .821$, $p < .001$), indicating that instructors who consistently implement achievement motivation strategies also tend to exhibit stronger self-determination practices. Likewise, achievement motivation demonstrated a strong positive significant relationship with creativity and critical thinking ($r = .786$, $p < .001$), implying that higher levels of motivational practices are associated with greater development of higher-order thinking skills. Furthermore, self-determination showed a very strong positive significant relationship with creativity and critical thinking ($r = .853$, $p < .001$), suggesting that autonomy-supportive instructional practices substantially contribute to fostering students' creativity and critical thinking in mathematics education. Overall, the results indicate that both achievement motivation and self-determination are positively associated with the development of higher-order thinking skills among college instructors.

The correlation analysis revealed strong to very strong positive significant relationships among achievement motivation, self-determination, and creativity and critical thinking. Specifically, achievement motivation demonstrated a very strong positive relationship with self-determination, while both variables exhibited significant positive associations with creativity and critical thinking. These findings imply that instructors who consistently employ motivational strategies and autonomy-supportive instructional practices are more likely to cultivate higher-order thinking skills among learners. The results reinforce contemporary motivational theories suggesting that meaningful learning occurs when students are both motivated to achieve and empowered to learn independently, thereby enhancing creativity, critical thinking, and overall academic success (Marsh et al., 2021; Schukajlow et al., 2023; Wang et al., 2024; Radišić et al., 2026).

ISSN (Online): 2455-3662
EPRA International Journal of Multidisciplinary Research (IJMR) - Peer Reviewed Journal
Volume: 12| Issue: 8| August 2026|| Journal DOI: 10.36713/epra2013 || SJIF Impact Factor 2026: 8.753 || ISI Value: 1.188

5. IMPLICATIONS FOR PRACTICE

The findings of this study highlight the importance of integrating achievement motivation and self-determination into mathematics instruction to strengthen students' creativity and critical thinking. Mathematics instructors should continue implementing learner-centered strategies that promote authentic problem-solving, conceptual understanding, inquiry-based learning, and autonomy-supportive classroom environments. These instructional approaches encourage students to become active participants in the learning process, develop confidence in solving mathematical problems, and apply higher-order thinking skills to real-world situations. Moreover, embedding motivational and self-determination principles into daily classroom practices may improve student engagement, persistence, and overall academic performance, thereby contributing to more meaningful and sustainable learning experiences.

The results likewise provide practical implications for higher education institutions and educational leaders in designing professional development programs and institutional policies that strengthen instructional quality in mathematics education. Faculty development initiatives should emphasize innovative pedagogical approaches, motivational teaching strategies, and autonomy-supportive instructional practices that foster students' cognitive and affective development. Likewise, curriculum planners may integrate activities that encourage creativity, critical thinking, collaboration, and authentic mathematical inquiry into instructional programs. Strengthening these institutional initiatives may contribute to improved instructional effectiveness, enhanced student learning outcomes, and the development of graduates equipped with the competencies required in an increasingly complex and technology-driven society.

6. CONCLUSION

This study concludes that achievement motivation and self-determination are essential instructional constructs that support the development of creativity and critical thinking in mathematics education. The findings revealed that both achievement motivation and self-determination were consistently practiced by college instructors, while creativity and critical thinking were highly evident in mathematics instruction. Furthermore, no significant differences were observed between the perceptions of school administrators and college instructors, indicating a shared commitment to implementing learner-centered and motivational teaching practices. The positive relationships among the study variables suggest that fostering motivational and autonomy-supportive learning environments may enhance higher-order thinking skills and improve the quality of mathematics education. Overall, the study provides empirical support for strengthening instructional practices that promote meaningful learning, student engagement, and the development of twenty-first-century competencies in higher education.

7. REFERENCES

1. *Beghetto, R. A. (2021). Uncertainty: A catalyst for creativity, learning, and problem solving. Springer. https://doi.org/10.1007/978-3-030-98729-9*
2. *Cheon, S. H., Reeve, J., & Vansteenkiste, M. (2020). When teachers learn how to provide classroom structure in an autonomy-supportive way: Benefits to teachers and their students. Teaching and Teacher Education, 90, 103004. https://doi.org/10.1016/j.tate.2019.103004*
3. *Darling-Hammond, L., Flook, L., Cook-Harvey, C. M., Barron, B., & Osher, D. (2022). Implications for educational practice of the science of learning and development. Applied Developmental Science, 24(2), 97–140.*
4. *Fullan, M. (2021). The right drivers for whole system success. Centre for Strategic Education.*
5. *Gao, H., Evans, T., & Brown, G. T. L. (2026). The relations between motivation and mathematics achievement: A cross-cultural study of Asia-Pacific jurisdictions using TIMSS 2023 data. ZDM–Mathematics Education, 58, 817–829.*
6. *Hattie, J. (2023). Visible learning: The sequel. Routledge.*
7. *Marsh, H. W., Pekrun, R., Parker, P. D., Guo, J., Dicke, T., & Abduljabbar, A. S. (2021). Academic self-concept, motivation, and educational achievement: A multidimensional perspective. Educational Psychology Review, 33(3), 823–852.*
8. *Middleton, J. A., Wiezel, A., Jansen, A., Smith, E. P., Cai, J., & others. (2023). Tracing mathematics engagement in the first year of high school: Relationships between prior experience, observed support, and task-level emotion and motivation. ZDM–Mathematics Education, 55(2), 427–445. https://doi.org/10.1007/s11858-022-01432-9*
9. *OECD. (2023). PISA 2022 results (Volume I): The state of learning and equity in education. OECD Publishing.*
10. *Oumelaid, N., Talibi, I., El Boukari, B., & El Ghordaf, J. (2026). Digital learning environments and mathematical achievement: An empirical investigation of motivation-performance dynamics through self-determination theory. Learning and Motivation, 95, 102311.*
11. *Radišić, J., & Baucal, A. (2024). Mathematics motivation in primary education: Building blocks that matter. European Journal of Psychology of Education, 39(3), 1505–1522.*
12. *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.*
13. *Santiago, I. M., Fox, M. R., & Scalise, N. R. (2026). The role of Self-Determination Theory and positive classroom experiences in students' mathematics outcomes. Frontiers in Psychology, 17, 1782314.*
14. *Schleicher, A. (2023). World class: How to build a 21st-century school system. OECD Publishing.*
15. *Schukajlow, S., Rakoczy, K., & Pekrun, R. (2023). Emotions and motivation in mathematics education: Where we are today and where we need to go. ZDM–Mathematics Education, 55, 249–267.*
16. *Shank, E., Tang, H., & Morris, W. (2025). Motivation in online course design using self-determination theory: An action research study in a secondary mathematics course. Educational Technology Research and Development, 73, 415–441.*
17. *UNESCO. (2021). Reimagining our futures together: A new social contract for education. UNESCO Publishing.*
18. *Vansteenkiste, M., Ryan, R. M., & Soenens, B. (2020). Basic psychological need theory: Advancements, critical themes, and future directions. Motivation and Emotion, 44(1), 1–31. https://doi.org/10.1007/s11031-019-09818-1*
19. *Voogt, J., & Roblin, N. P. (2012). A comparative analysis of international frameworks for 21st-century competences:*

Implications for curriculum reform. Journal of Curriculum Studies, 44(3), 299–321.

20. *Wang, M.-T., Eccles, J. S., & colleagues. (2024). Student motivation, engagement, and academic achievement: Recent advances and future directions. Educational Psychology Review.*
21. *Zhu, Y., & Guo, L. (2026). Why some students excel in mathematics: Growth mindset, intrinsic motivation, and school autonomy in top-performing Asian and Western economies. Large-scale Assessments in Education, 14(22).*