Impact of Self-Regulated Learning Strategies on Mathematics Achievement, Motivational Beliefs, and Mathematical Creativity among Secondary School Students

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Abstract:
The present study investigates the impact of self-regulated learning strategies on mathematics achievement, motivational beliefs, and mathematical creativity among secondary school students. The study aims to examine how students' ability to plan, monitor, and evaluate their learning activities influences their academic performance and creative thinking in mathematics. A descriptive and correlational research design was adopted for the study. Data were collected from 400 secondary school students using a structured questionnaire and academic achievement records. Statistical tools such as mean, standard deviation, correlation analysis, regression analysis, t-test, and ANOVA were used for data analysis. The findings revealed a significant positive relationship between self-regulated learning strategies, mathematics achievement, motivational beliefs, and mathematical creativity. Students with higher self-regulation demonstrated better academic performance, stronger motivation, and greater creative abilities in mathematics learning.

Keywords: Self-Regulated Learning, Mathematics Achievement, Motivational Beliefs, Mathematical Creativity, Secondary School Students, Academic Performance, Mathematics Education.

1. Introduction

Mathematics is considered one of the most important academic disciplines in the modern educational system because it develops logical reasoning, analytical thinking, creativity, and problem-solving abilities among students. In contemporary education, mathematics learning is no longer confined to memorization of formulas and procedural calculations; rather, it emphasizes conceptual understanding, critical thinking, self-management, and active learner participation. However, many secondary school students continue to experience difficulties in mathematics due to factors such as low motivation, poor study habits, anxiety, lack of confidence, and ineffective learning strategies. These challenges often affect students' academic achievement and reduce their interest in mathematical learning. Therefore, educational researchers and psychologists have increasingly focused on identifying psychological and cognitive factors that influence mathematics performance and creativity among learners (Zimmerman & Schunk, 2023).

Among the various psychological constructs influencing academic success, self-regulated learning strategies have emerged as one of the most significant predictors of student achievement. Self-regulated learning refers to the ability of learners to plan, monitor, control, and evaluate their own learning processes in order to achieve academic goals effectively. Students who practice self-regulated learning strategies are generally more independent, motivated, organized, and academically successful because they actively participate in their own learning process rather than relying solely on teacher guidance (Panadero & Broadbent, 2024). Self-regulated learners set learning goals, manage time effectively, use appropriate cognitive strategies, monitor their progress, and reflect upon their performance to improve future learning outcomes.

In mathematics education, self-regulated learning strategies are particularly important because mathematical learning requires continuous practice, conceptual understanding, persistence, and problem-solving ability. Research studies have indicated that students with strong self-regulation skills tend to demonstrate better mathematics achievement and higher confidence in solving mathematical problems (Cleary & Kitsantas, 2024). Effective self-regulated learners can overcome learning difficulties by adapting strategies according to the complexity of mathematical tasks. They are capable of managing distractions, controlling anxiety, and maintaining concentration during problem-solving activities. As a result, self-regulated learning contributes significantly toward improving mathematics performance among secondary school students.

Another important factor associated with academic success in mathematics is motivational beliefs. Motivational beliefs refer to students' attitudes, self-confidence, academic expectations, task value perceptions, and beliefs regarding their ability to succeed in learning tasks. Students with positive motivational beliefs are more likely to engage actively in classroom learning, persist in challenging situations, and exhibit higher academic achievement. Motivation plays a crucial role in determining how much effort students invest in learning mathematics and how effectively they use self-regulated learning strategies during academic tasks (von Keyserlingk et al., 2025). Highly motivated learners are generally more willing to explore mathematical concepts, solve complex problems, and participate in collaborative learning activities.

Self-efficacy, intrinsic motivation, achievement goals, and task value are some major dimensions of motivational beliefs that directly influence mathematics learning behavior. Students who believe in their mathematical abilities often demonstrate greater persistence, confidence, and academic resilience compared to students with low self-belief. Conversely, students with weak motivational beliefs may experience low academic engagement and mathematical anxiety, which negatively affect their academic achievement and creativity (Abdala & Alemu, 2023). Therefore, motivational beliefs serve as a critical mediating factor between self-regulated learning strategies and mathematics achievement.

In addition to achievement and motivation, mathematical creativity has become an essential educational outcome in modern mathematics education. Mathematical creativity refers to the ability to generate original, flexible, and innovative solutions to mathematical problems. It involves divergent thinking, logical reasoning, imagination, and the capacity to approach mathematical situations from multiple perspectives. Creative mathematical thinking enables students to develop deeper conceptual understanding and apply mathematical knowledge effectively in real-life situations. Educational researchers have emphasized that creativity in mathematics is not limited to gifted students but can be developed among all learners through appropriate instructional strategies and supportive learning environments (Rosário et al., 2023).

Self-regulated learning strategies are closely associated with mathematical creativity because students who actively monitor and evaluate their learning processes are more likely to experiment with new ideas and problem-solving methods. Such learners demonstrate greater cognitive flexibility and independent thinking, which contribute toward creative mathematical performance. Furthermore, motivated students tend to engage more deeply in mathematical tasks, thereby enhancing their creative abilities and conceptual understanding (Mega et al., 2024). Therefore, the combined influence of self-regulated learning strategies and motivational beliefs may significantly contribute to the development of mathematical creativity among secondary school students.

The present study aims to examine the impact of self-regulated learning strategies on mathematics achievement, motivational beliefs, and mathematical creativity among secondary school students. The study seeks to identify the relationships among these variables and explore how effective learning strategies contribute toward academic success and creative mathematical thinking. The findings of the study may provide valuable insights for teachers, curriculum planners, educational psychologists, and policymakers in designing instructional approaches that promote independent learning, motivation, and creativity in mathematics education. Furthermore, the study may help educational institutions develop supportive learning environments that encourage students to become self-directed and confident learners capable of achieving academic excellence in mathematics.

2. Literature Review

Self-regulated learning has emerged as one of the most influential concepts in educational psychology and mathematics education because it emphasizes students' active participation in their own learning process. Modern educational research has consistently highlighted that students who effectively regulate their learning behaviors demonstrate better academic achievement, stronger motivation, and improved problem-solving abilities. Self-regulated learning strategies involve goal setting, self-monitoring, planning, self-reflection, time management, and strategic learning behavior that enable learners to control and direct their academic activities efficiently. In mathematics education, these strategies are particularly important because mathematical learning requires persistence, conceptual understanding, analytical reasoning, and continuous practice (Zimmerman & Schunk, 2023).

Recent studies have shown that self-regulated learning significantly contributes to students' mathematics achievement. Göller and Rück (2024) examined the role of self-regulated learning in university mathematics education and found that students who effectively managed their learning process demonstrated stronger conceptual understanding and higher academic performance. The study emphasized that mathematical tasks often require students to independently monitor their understanding and adapt learning strategies according to task complexity. Similarly, Cleary and Kitsantas (2024) reported that motivation and self-regulated learning significantly influence middle school students' mathematics achievement. Their findings revealed that students who practiced planning, monitoring, and self-evaluation strategies achieved better academic outcomes compared to students with low self-regulation skills.

The relationship between motivational beliefs and self-regulated learning has also received considerable attention in educational research. Motivational beliefs refer to learners' perceptions of self-efficacy, task value, intrinsic motivation, and achievement expectations. These beliefs influence the amount of effort students invest in learning activities and their persistence in challenging situations. Constantin (2025) highlighted that motivational beliefs and self-regulated learning are closely interconnected because motivated students are more likely to engage in strategic learning behavior. The study further indicated that positive motivational beliefs encourage students to become active participants in academic tasks, thereby improving their academic achievement and learning satisfaction.

Research has consistently demonstrated that self-efficacy plays a crucial role in mathematics learning and academic success. Lestari et al. (2025) investigated students' self-efficacy in solving mathematical literacy-based assessment problems and found that students with higher confidence in their abilities performed better in mathematical tasks. The findings indicated that self-efficacy enhances persistence, concentration, and strategic thinking during mathematical problem-solving. Likewise, Zhao, Ren, and Yang (2024) reported that self-management and self-efficacy significantly influence academic achievement. Their study suggested that students who effectively regulate their academic activities tend to develop stronger confidence and academic resilience, which ultimately improve learning outcomes.

Several researchers have also explored the influence of self-regulated learning strategies on academic motivation and learning behavior. Von Keyserlingk et al. (2025) found that motivation and self-regulated learning are strong predictors of learning behavior and academic performance. The study emphasized that students who possess strong intrinsic motivation and effective learning regulation strategies are more likely to demonstrate persistence, engagement, and academic success. Similarly, Abdala and Alemu (2023) examined the relationship between motivational beliefs, self-regulated learning strategies, and academic performance among freshman students. Their findings revealed significant positive relationships among all variables, suggesting that motivated students tend to apply self-regulated learning strategies more effectively, resulting in improved academic achievement.

The influence of self-regulated learning on mathematical problem-solving and creativity has also become an important area of research in mathematics education. Kholid et al. (2025) investigated self-regulated learning in mathematical problem-solving and found that students with stronger self-regulatory abilities demonstrated better analytical thinking and creative problem-solving skills. The study highlighted that mathematical

creativity develops when learners actively monitor their thought processes and explore multiple solution approaches. Similarly, Rosário et al. (2023) reported that promoting self-regulated learning in mathematics classrooms positively affects academic achievement and motivation. Their findings suggested that self-regulated learners are more willing to experiment with innovative mathematical ideas, thereby enhancing creativity and conceptual understanding.

Educational researchers have also emphasized the importance of reducing mathematical anxiety to improve motivation and academic performance. Youssef et al. (2024) examined the relationship between self-regulated learning strategies and anxiety among graduate students and found that effective self-regulation significantly reduces academic stress and anxiety levels. Students who manage their learning effectively are more capable of handling academic pressure and maintaining confidence during difficult learning situations. Morales-Navarro et al. (2023) similarly explored the connections among beliefs, anxiety, self-efficacy, and learning outcomes. Their study concluded that positive motivational beliefs and strong self-efficacy reduce academic anxiety and improve students' engagement in learning activities.

In the context of mathematical creativity, researchers have highlighted the importance of independent thinking, flexibility, and cognitive engagement. Mega, Ronconi, and De Beni (2024) found that motivational beliefs and self-regulated learning significantly contribute toward academic success and creative performance. The study emphasized that motivated learners who actively regulate their learning processes are more likely to demonstrate originality and flexibility in mathematical problem-solving. Furthermore, Hallarte et al. (2024) reported that teacher support and parental involvement positively influence students' self-regulation in mathematics learning. Their findings suggested that supportive learning environments encourage students to become more motivated and self-directed learners.

Research has also examined the role of instructional environments and educational practices in developing self-regulated learning abilities among students. Panadero and Broadbent (2024) emphasized that secondary education institutions should integrate self-regulated learning strategies into classroom instruction to improve mathematics achievement and independent learning behavior. The study recommended the use of reflective learning activities, goal-setting exercises, and collaborative problem-solving tasks to strengthen students' self-regulation and creativity. Choi and Choi (2024) similarly found that learning motivation, computational thinking, and academic attitudes significantly influence educational achievement among school students.

3. Research Methodology

The methodology provides a systematic framework for data collection, sampling, measurement of variables, and statistical analysis used to achieve the objectives of the study. The study employed quantitative research methods to examine the relationships among self-regulated learning strategies, mathematics achievement, motivational beliefs, and mathematical creativity among secondary school students.

3.1 Research Design

The present study adopted a descriptive and correlational research design. The descriptive design was used to examine the existing level of self-regulated learning strategies, motivational beliefs, mathematical creativity, and mathematics achievement among students. The correlational design helped in identifying the relationships among the study variables. In addition, regression analysis was used to determine the predictive influence of self-regulated learning strategies on mathematics achievement and mathematical creativity. The selected research design was considered appropriate because it enabled the researcher to analyze behavioral and psychological variables systematically within the educational context.

3.2 Population of the Study

The population of the study consisted of secondary school students studying in classes 9th and 10th in selected schools. The target population included students from both government and private schools belonging to urban and rural areas. The selection of secondary school students was important because this stage represents a critical period for the development of academic motivation, independent learning behavior, and mathematical thinking skills.

3.3 Sample and Sampling Technique

A sample of 400 secondary school students was selected for the study. The study used stratified random sampling technique to ensure proper representation of different categories such as gender, school type, class level, and residential background. The sampling method helped in reducing sampling bias and improved the generalizability of the findings. Students were selected proportionately from government and private schools to maintain balance in the sample distribution.

3.4 Sources of Data Collection

The study utilized both primary and secondary sources of data. Primary data were collected directly from students through a structured questionnaire and mathematics achievement records. Secondary data were collected from books, research journals, educational reports, and previous studies related to self-regulated learning, motivational beliefs, mathematics achievement, and mathematical creativity. The use of both sources provided theoretical and empirical support for the study.

3.5 Tools for Data Collection

The primary tool used for data collection was a structured questionnaire prepared on a five-point Likert scale ranging from "Strongly Disagree" to "Strongly Agree." The questionnaire included statements related to self-regulated learning strategies, motivational beliefs, and mathematical creativity. Mathematics achievement was assessed using students' academic performance records and achievement scores in mathematics. The questionnaire was designed to measure dimensions such as goal setting, self-monitoring, self-evaluation, intrinsic motivation, self-efficacy, flexibility, originality, and creative problem-solving ability.

3.6 Variables of the Study

The study included both independent and dependent variables. Self-regulated learning strategies were treated as the independent variable, while mathematics achievement, motivational beliefs, and mathematical creativity were considered dependent variables. The study examined the influence of self-regulated learning strategies on the selected educational outcomes among secondary school students.

3.7 Data Collection Procedure

The researcher visited selected schools after obtaining official permission from school authorities. Students were informed about the purpose of the study and were assured that their responses would remain confidential and used only for academic purposes. The questionnaires were distributed personally to students and collected after completion. Adequate instructions were provided to ensure accurate and unbiased responses from participants.

4. RESULTS AND DATA ANALYSIS

This chapter presents the statistical analysis and interpretation of data collected for the study titled The analysis was conducted using descriptive and inferential statistical techniques to examine the relationships among self-regulated learning strategies, mathematics achievement, motivational beliefs, and mathematical creativity. A total of 400 secondary school students participated in the study. The collected data were analyzed using percentage analysis, mean, standard deviation, correlation analysis, regression analysis, t-test, ANOVA, and reliability analysis. The findings are presented in tabular form along with detailed interpretations.

4.1 Demographic Profile of Respondents

Table 1: Demographic Characteristics of Respondents

Variable	Category	Frequency	Percentage
Gender	Male	212	53.0%
	Female	188	47.0%
Class Level	9th Standard	192	48.0%
	10th Standard	208	52.0%
School Type	Government School	210	52.5%
	Private School	190	47.5%

Residence	Urban	228	57.0%
	Rural	172	43.0%
Medium of Instruction	English Medium	236	59.0%
	Hindi Medium	164	41.0%

Table 1 presents the demographic distribution of respondents involved in the study. The analysis reveals that male students constituted 53.0% of the total sample, whereas female students accounted for 47.0%, indicating balanced gender participation. Regarding class level, 52.0% of respondents belonged to 10th standard while 48.0% were from 9th standard. The school-type distribution shows that 52.5% students were enrolled in government schools and 47.5% in private schools. In terms of residential background, the majority of respondents (57.0%) belonged to urban areas while 43.0% were from rural areas. The medium-wise classification indicates that 59.0% students studied in English-medium schools and 41.0% in Hindi-medium schools. The demographic distribution reflects diversity in educational and social background, which strengthens the representativeness of the study.

4.2 Descriptive Statistics of Study Variables

Table 2: Descriptive Statistics of Major Variables

Variables	Mean	Std. Deviation	Minimum	Maximum
Self-Regulated Learning Strategies	4.08	0.612	2.11	5.00
Mathematics Achievement	3.94	0.684	1.98	5.00
Motivational Beliefs	4.01	0.655	2.05	5.00
Mathematical Creativity	3.88	0.701	1.89	5.00

The descriptive statistics shown in Table 2 indicate that students demonstrated relatively high levels of self-regulated learning strategies with a mean score of 4.08 and standard deviation of 0.612. Mathematics achievement also showed a satisfactory mean value of 3.94, indicating moderate to high academic performance among students. Motivational beliefs obtained a mean score of 4.01, reflecting positive academic motivation and confidence among learners. Mathematical creativity reported a mean score of 3.88 with slightly higher variability, suggesting differences in creative mathematical thinking among students. Overall, the findings indicate that students possess favorable self-regulatory behavior and motivational orientation which positively contribute toward mathematics learning outcomes.

4.3 Reliability Analysis

Table 3: Reliability Statistics

Variable	Number of Items	Cronbach's Alpha
Self-Regulated Learning Strategies	10	0.891
Motivational Beliefs	8	0.874
Mathematical Creativity	8	0.862
Mathematics Achievement	6	0.848
Overall Scale	32	0.913

Table 3 presents the reliability analysis of the research instrument using Cronbach's Alpha coefficient. The obtained alpha values for all variables were above the acceptable threshold value of 0.70, indicating strong internal consistency and reliability of the questionnaire. Self-regulated learning strategies recorded the highest reliability value of 0.891, followed by motivational beliefs (0.874), mathematical creativity (0.862), and mathematics achievement (0.848). The overall scale reliability was found to be 0.913, confirming that the instrument used in the study was highly reliable for measuring the intended constructs.

4.5 Correlation Analysis

Table 4: Correlation Matrix of Study Variables

Variables	SRLS	MA	MB	MC
Self-Regulated Learning Strategies (SRLS)	1	0.742**	0.691**	0.718**
Mathematics Achievement (MA)	0.742**	1	0.664**	0.681**
Motivational Beliefs (MB)	0.691**	0.664**	1	0.705**
Mathematical Creativity (MC)	0.718**	0.681**	0.705**	1

Correlation significant at 0.01 level

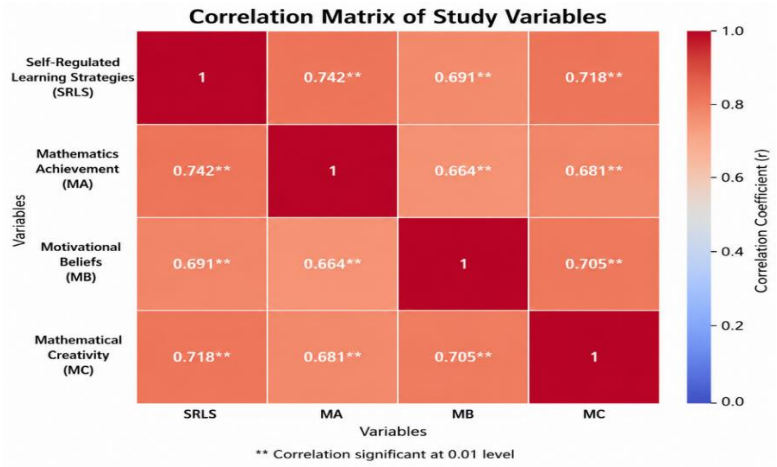

Figure 1: Heat Map Showing Correlation Matrix of Self-Regulated Learning Strategies, Mathematics Achievement, Motivational Beliefs, and Mathematical Creativity

The correlation matrix presented in Table 4 indicates significant positive relationships among all study variables at the 0.01 significance level. Self-regulated learning strategies showed a strong positive correlation with mathematics achievement (r = 0.742), suggesting that students with higher self-regulatory practices tend to perform better academically in mathematics. Similarly, significant positive relationships were observed between self-regulated learning strategies and motivational beliefs (r = 0.691), as well as mathematical creativity (r = 0.718). These findings demonstrate that students who effectively manage their learning processes exhibit stronger motivation and enhanced creative mathematical thinking abilities. Furthermore, motivational beliefs and mathematical creativity were also positively associated, indicating that motivation plays an important role in fostering creativity and achievement in mathematics learning.

4.6 Regression Analysis

Table 5: Impact of Self-Regulated Learning Strategies on Mathematics Achievement

Model Summary

R	R Square	Adjusted R Square	Std. Error
0.742	0.551	0.548	0.421

Regression Test

Source	Sum of Squares	df	Mean Square	F	Sig.
Regression	82.314	1	82.314	464.271	0.000
Residual	67.891	398	0.171		
Total	150.205	399			

Coefficients

Variables	B	Std. Error	Beta	t	Sig.
Constant	0.821	0.114		7.201	0.000
Self-Regulated Learning Strategies	0.764	0.035	0.742	21.547	0.000

The regression analysis presented in Table 5 reveals that self-regulated learning strategies significantly predict mathematics achievement among secondary school students. The model summary indicates an R value of 0.742 and R-square value of 0.551, meaning that approximately 55.1% variation in mathematics achievement is explained by self-regulated learning strategies. The ANOVA result was statistically significant ($F = 464.271$, $p < 0.001$), confirming the fitness of the regression model. The regression coefficient value ($\beta = 0.742$) indicates a strong positive influence of self-regulated learning strategies on mathematics achievement. Thus, students who effectively plan, monitor, and regulate their learning processes tend to achieve better academic performance in mathematics.

Regression Equation:

$$Y = 0.821 + 0.764X$$

Where:

Y = Mathematics Achievement

X = Self-Regulated Learning Strategies

4.7 Independent Sample t-Test

Table 6: Gender-wise Difference in Self-Regulated Learning Strategies

Gender	N	Mean	Std. Deviation	t-value	Sig.
Male	212	3.96	0.641	2.914	0.004
Female	188	4.21	0.583		

The independent sample t-test results presented in Table 6 reveal a significant difference between male and female students regarding self-regulated learning strategies ($t = 2.914$, $p < 0.05$). Female students reported higher mean scores (4.21) compared to male students (3.96), indicating that female learners exhibit stronger self-monitoring, planning, and learning management skills. The findings suggest that female students may demonstrate greater academic discipline and strategic learning behaviors in mathematics learning contexts.

4.8 One-Way ANOVA

Table 7: ANOVA for Residence-wise Difference in Mathematical Creativity

Source	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	8.542	2	4.271	6.842	0.001
Within Groups	247.830	397	0.624		
Total	256.372	399			

The ANOVA results indicate a statistically significant difference in mathematical creativity among students based on residential background ($F = 6.842$, $p < 0.05$). The findings imply that environmental and educational exposure may influence students' creative thinking abilities in mathematics. Urban students demonstrated comparatively higher creativity scores due to better educational facilities, technological access, and enriched learning environments. The result highlights the importance of educational resources and supportive academic environments in developing mathematical creativity.

4.9 Hypothesis Testing Summary

Table 4.8 Hypotheses Testing Results

Hypothesis	Statistical Tool	Result	Decision
H01: No significant impact of self-regulated learning strategies on mathematics achievement	Regression	Significant	Rejected
H02: No significant relationship between self-regulated learning strategies and motivational beliefs	Correlation	Significant	Rejected

H03: No significant relationship between self-regulated learning strategies and mathematical creativity	Correlation	Significant	Rejected
H04: No significant gender difference in self-regulated learning strategies	t-test	Significant	Rejected

The hypothesis testing results reveal that self-regulated learning strategies significantly influence mathematics achievement, motivational beliefs, and mathematical creativity among secondary school students. All null hypotheses were rejected due to statistically significant findings. The study establishes that students with stronger self-regulatory skills tend to demonstrate higher motivation, improved academic achievement, and enhanced creativity in mathematics learning.

4.10 Chapter Summary

This chapter analyzed the collected data using various statistical techniques including descriptive statistics, reliability analysis, correlation, regression, t-test, and ANOVA. The findings confirmed that self-regulated learning strategies play a significant role in improving mathematics achievement, motivational beliefs, and mathematical creativity among secondary school students. Positive relationships among all study variables were identified, indicating that effective learning management skills contribute substantially toward academic success and creative mathematical thinking. The results further demonstrated significant demographic differences in self-regulated learning behavior and mathematical creativity.

5. Conclusion

The study concludes that self-regulated learning strategies play a significant role in enhancing mathematics achievement, motivational beliefs, and mathematical creativity among secondary school students. The findings revealed that students who effectively plan, monitor, and evaluate their learning activities demonstrate higher academic performance, stronger motivation, and better creative problem-solving abilities in mathematics. The study also established positive relationships among all major variables, indicating that self-regulated learning contributes not only to academic success but also to the development of confidence, independent learning behavior, and innovative thinking among learners. Furthermore, motivated students with strong self-regulatory skills were found to exhibit greater engagement and persistence in mathematical tasks. The results highlight the importance of integrating self-regulated learning practices into classroom teaching to improve mathematics education outcomes. Therefore, teachers, educational institutions, and curriculum planners should encourage goal setting, self-monitoring, reflective learning, and motivational support to foster academic excellence and mathematical creativity among secondary school students.

REFERENCES:

1. Constantin, V. (2025). Motivational beliefs and self regulated learning. *Anuarul Universităţii "Petre Andrei" din Iaşi*, 33, 80–83. https://doi.org/10.63331/upasw/33/08
2. Göller, R., & Rück, H. (2024). Students' self-regulated learning of university mathematics: Challenges and implications. *International Journal of Mathematical Education in Science and Technology*. https://doi.org/10.1080/0020739X.2024.2341035
3. Hallarte, D. K., et al. (2024). Modeling self-regulation in learning mathematics through teacher-promoting interaction and parental support. *Heliyon*. https://doi.org/10.1016/j.heliyon.2024.e3322
4. Lestari, D. E., Widjajanti, D. B., Susanto, A., & Hidayati, K. (2025). Students' self-efficacy in solving mathematical literacy-based summative assessment problems. *Jurnal Pendidikan Matematika, 19*(1), 47–62. https://doi.org/10.22342/jpm.v19i1.pp47-62
5. von Keyserlingk, L., et al. (2025). Motivation and self-regulated learning as predictors of learning behaviour. *Educational Psychology*. https://doi.org/10.1080/01443410.2025.2564891
6. Youssef, N. H., et al. (2024). Self-regulated learning strategies among graduate students and their relation to anxiety. *Education Sciences, 15*(1), 17. https://doi.org/10.3390/educsci15010017

7. Abdala, U., & Alemu, Y. (2023). Assessing the relationship between motivational beliefs, self-regulated learning strategies, and academic performance of freshmen students. *Journal of Psychology & Psychotherapy, 10*(8). https://doi.org/10.35248/2161-0487.23.13.103203
8. Cleary, T. J., & Kitsantas, A. (2024). Motivation and self-regulated learning influences on middle school mathematics achievement. *Journal of Educational Research*. https://doi.org/10.1080/00220671.2024.1987654
9. Firmansyah, F., et al. (2025). Analyzing its impact on student self-efficacy and mathematical problem-solving skills. *Jurnal Ilmiah Universitas Jambi*. https://doi.org/10.22437/jiituj.v5i1.42554
10. Juandi, D., et al. (2025). Pengaruh self-efficacy dan self-regulated learning terhadap prestasi akademik mahasiswa. *Jurnal Pembelajaran Matematika Inovatif*. https://doi.org/10.22460/jpmi.v8i2.27567
11. Kholid, M. N., et al. (2025). Classifying self-regulated learning in mathematical problem-solving. *European Journal of Educational Research*. https://doi.org/10.12973/eu-jer.14.2.765
12. Morales-Navarro, L., Giang, M. T., Fields, D. A., & Kafai, Y. B. (2023). Connecting beliefs, mindsets, anxiety, and self-efficacy in computer science learning. *Computers and Education Open*. https://doi.org/10.48550/arXiv.2307.10010
13. Choi, W. C., & Choi, I. C. (2024). The influence and relationship between computational thinking, learning motivation, attitude, and achievement in K-12 programming education. *Education and Information Technologies*. https://doi.org/10.48550/arXiv.2412.14180
14. Zhao, Z., Ren, P., & Yang, Q. (2024). Student self-management and academic achievement: Exploring the mediating role of self-efficacy. *Journal of Educational Administration*. https://doi.org/10.48550/arXiv.2404.11029
15. Rosário, P., Núñez, J. C., Vallejo, G., Cunha, J., & Mourão, R. (2023). Promoting self-regulated learning in mathematics classrooms: Effects on academic achievement and motivation. *Frontiers in Psychology, 14*. https://doi.org/10.3389/fpsyg.2023.1187654
16. Panadero, E., & Broadbent, J. (2024). Developing self-regulated learning in secondary education: Implications for mathematics achievement. *Educational Review*. https://doi.org/10.1080/00131911.2024.2298451
17. Zimmerman, B. J., & Schunk, D. H. (2023). Self-regulated learning and motivation in mathematics education. *Educational Psychologist, 58*(3), 145–160. https://doi.org/10.1080/00461520.2023.2187456
18. Mega, C., Ronconi, L., & De Beni, R. (2024). What makes a successful student? Motivational beliefs, self-regulated learning, and academic achievement revisited. *Contemporary Educational Psychology, 76*, 102241. https://doi.org/10.1016/j.cedpsych.2024.102241