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Relationship between Problem-Solving Ability and Mathematics Achievement among Higher Secondary School Students

Dr. Susanta Kumar Khan
Headmaster, Krishnapur Adarsha Vidyamandir

Abstract

Mathematics education aims not only to develop computational proficiency but also to foster students' ability to solve problems effectively in diverse contexts. Problem-solving ability is considered one of the most important cognitive skills influencing students' success in mathematics. The present study investigates the relationship between problem-solving ability and mathematics achievement among higher secondary school students. It examines how analytical thinking, logical reasoning, critical thinking, and decision-making skills contribute to students' understanding of mathematical concepts and their academic performance.

The study is based on the premise that students who possess strong problem-solving competencies are better able to interpret mathematical situations, formulate appropriate strategies, apply learned concepts, and evaluate solutions systematically. Such learners tend to demonstrate greater confidence, deeper conceptual understanding, and higher levels of achievement in mathematics. Conversely, students with weaker problem-solving skills often experience difficulties in comprehending complex mathematical tasks, leading to lower academic performance and reduced engagement with the subject.

The findings reveal a significant positive relationship between problem-solving ability and mathematics achievement. Students exhibiting higher levels of analytical and reasoning skills generally achieve better results in mathematics examinations and classroom assessments. The study further emphasizes the importance of incorporating problem-based learning, inquiry-oriented instruction, and higher-order thinking activities into mathematics classrooms to strengthen students' problem-solving competence. The paper concludes that enhancing problem-solving ability is essential for improving mathematics achievement and preparing learners to meet the intellectual demands of higher education and contemporary society.

Keywords: *Problem-Solving Ability, Mathematics Achievement, Analytical Thinking, Higher Secondary Students, Mathematics Education, Logical Reasoning, Critical Thinking, Academic Performance, Mathematical Understanding*.

Introduction

Mathematics is widely recognized as a fundamental discipline that develops logical reasoning, analytical thinking, and decision-making skills essential for academic success and everyday life. The ability to solve mathematical problems effectively is considered one of the most important educational outcomes of mathematics instruction. Problem-solving not only enables

students to apply mathematical concepts in diverse situations but also promotes critical thinking and intellectual growth (**Polya, 1957**).

Problem-solving ability refers to an individual's capacity to identify a problem, analyze relevant information, formulate appropriate strategies, implement solutions, and evaluate outcomes systematically (**Schoenfeld, 1985**). In mathematics education, problem-solving serves as a bridge between conceptual understanding and practical application. Students who possess strong problem-solving skills are generally more capable of interpreting mathematical situations, selecting suitable methods, and arriving at accurate solutions (**Kilpatrick, Swafford, & Findell, 2001**).

Academic achievement in mathematics is influenced by numerous cognitive and affective factors. Among these, problem-solving ability has emerged as a critical predictor of students' success in mathematics. Research indicates that learners with strong analytical and reasoning abilities tend to demonstrate better conceptual understanding, greater confidence, and higher levels of achievement in mathematics (**Lester, 2013**). Conversely, students with poor problem-solving skills often struggle to understand complex mathematical concepts and perform less effectively in academic assessments (**Mayer, 2002**).

At the higher secondary level, mathematics becomes increasingly abstract and requires students to engage in advanced reasoning, critical thinking, and independent problem-solving. Success in mathematics at this stage depends not only on memorization of formulas and procedures but also on the ability to analyze problems and apply knowledge creatively (**National Council of Teachers of Mathematics [NCTM], 2000**). Therefore, understanding the relationship between problem-solving ability and mathematics achievement is crucial for improving instructional practices and learning outcomes.

The Krishnapur area, like many semi-urban and rural regions, presents diverse educational experiences among higher secondary students. Differences in learning opportunities, instructional methods, and cognitive skill development may influence students' problem-solving abilities and academic performance. Investigating this relationship can provide valuable insights for teachers, school administrators, and policymakers seeking to enhance mathematics education.

The present study, therefore, aims to examine the relationship between problem-solving ability and mathematics achievement among higher secondary school students of the Krishnapur area. The study seeks to identify the extent to which problem-solving competence contributes to academic success and to suggest educational strategies for strengthening students' mathematical thinking and achievement.

Background of the Study

Mathematics education has undergone significant transformation over the past several decades, shifting from a traditional emphasis on procedural knowledge toward the development of higher-order thinking skills and problem-solving competence (**Bransford, Brown, & Cocking, 2000**). Contemporary educational theories recognize that students learn mathematics more effectively when they are actively engaged in exploring, analyzing, and solving meaningful problems rather than merely memorizing rules and formulas (**Hiebert et al., 1997**).

The concept of problem-solving gained prominence through the pioneering work of **George Polya (1957)**, who emphasized systematic approaches to solving mathematical problems. Polya argued that successful problem-solving involves understanding the problem, devising a plan, carrying out the plan, and reviewing the solution. His framework continues to influence mathematics teaching and learning worldwide.

Educational researchers have consistently reported that problem-solving ability is closely associated with academic achievement in mathematics. Students who can analyze situations, identify patterns, and apply logical reasoning are generally more successful in mathematics learning (**Schoenfeld, 1985**). Such learners demonstrate greater flexibility in thinking and are better equipped to transfer knowledge to new situations (**Kilpatrick et al., 2001**).

In the Indian educational context, mathematics remains one of the most challenging subjects for many students. Higher secondary learners often encounter difficulties in solving non-routine problems that require analytical thinking and conceptual understanding. These challenges frequently result in lower achievement levels and reduced confidence in mathematics (**NCERT, 2023**).

Recent educational reforms, including the **National Education Policy (NEP) 2020**, emphasize competency-based learning, critical thinking, creativity, and problem-solving skills as essential components of quality education (**Government of India, 2020**). The policy advocates learner-centered approaches that encourage students to develop reasoning abilities and apply knowledge in real-life situations.

Against this backdrop, examining the relationship between problem-solving ability and mathematics achievement among higher secondary students becomes highly relevant. Such an investigation can help identify the role of cognitive skills in academic performance and contribute to the development of more effective teaching-learning strategies.

Rationale of the Study

The rationale for conducting the present study stems from the growing recognition that mathematics achievement depends not only on subject knowledge but also on students' ability to solve problems effectively (**Mayer, 2002**). In contemporary education, problem-solving ability is considered a fundamental competency that enables learners to apply knowledge, think critically, and make informed decisions.

Many higher secondary students experience difficulties in mathematics despite having adequate classroom instruction. One possible reason for this challenge is the lack of well-developed problem-solving skills, which are essential for understanding and applying mathematical concepts (**Schoenfeld, 1985**). Identifying the relationship between problem-solving ability and mathematics achievement can therefore help educators understand the factors contributing to students' success or failure in mathematics.

The study is particularly relevant in the context of Krishnapur, where students come from diverse socio-economic and educational backgrounds. Understanding how problem-solving ability influences mathematics achievement may assist teachers in designing instructional strategies that address learners' specific needs and promote academic excellence.

Furthermore, educational institutions increasingly emphasize competency-based education and higher-order thinking skills. The findings of this study can provide empirical evidence supporting the integration of problem-based learning, inquiry-oriented instruction, and critical thinking activities into mathematics classrooms (**NCTM, 2000**).

The study is also significant because it aligns with the objectives of **NEP 2020**, which advocates the development of analytical thinking, creativity, and problem-solving competencies among learners (**Government of India, 2020**). By exploring the relationship between problem-solving ability and mathematics achievement, the study contributes to the broader goal of enhancing educational quality and student performance.

Finally, the findings may serve as a valuable resource for teachers, parents, curriculum developers, and policymakers seeking to improve mathematics education. The study is expected to offer practical recommendations for fostering problem-solving skills and promoting higher levels of mathematics achievement among higher secondary school students of the Krishnapur area.

Objectives of the Study

1. To assess the level of problem-solving ability among higher secondary school students of Krishnapur area.
2. To examine the level of mathematics achievement among higher secondary school students of Krishnapur area.
3. To investigate the relationship between problem-solving ability and mathematics achievement among higher secondary school students of Krishnapur area.
4. To determine the extent to which problem-solving ability predicts mathematics achievement among higher secondary school students.
5. To compare the mathematics achievement of students with high, moderate, and low levels of problem-solving ability in the Krishnapur area.

Research Questions

1. What is the level of problem-solving ability among higher secondary school students of Krishnapur area?
2. What is the level of mathematics achievement among higher secondary school students of Krishnapur area?
3. Is there a significant relationship between problem-solving ability and mathematics achievement among higher secondary school students of Krishnapur area?
4. To what extent does problem-solving ability influence or predict mathematics achievement among higher secondary school students?
5. Is there a significant difference in mathematics achievement among students possessing different levels of problem-solving ability (high, moderate, and low)?

Quantitative Research Hypotheses

Null Hypotheses (H_0)

1. **H_{01}:** There is no significant difference in the level of problem-solving ability among higher secondary school students of Krishnapur area.

2. **H_{02}:** There is no significant difference in the mathematics achievement of higher secondary school students of Krishnapur area.
3. **H_{03}:** There is no significant relationship between problem-solving ability and mathematics achievement among higher secondary school students of Krishnapur area.
4. **H_{04}:** Problem-solving ability does not significantly predict mathematics achievement among higher secondary school students of Krishnapur area.
5. **H_{05}:** There is no significant difference in mathematics achievement among students with high, moderate, and low levels of problem-solving ability.

Alternative Hypotheses (H_1)

1. **H_{11}:** There is a significant variation in the level of problem-solving ability among higher secondary school students of Krishnapur area.
2. **H_{12}:** There is a significant variation in the mathematics achievement of higher secondary school students of Krishnapur area.
3. **H_{13}:** There is a significant positive relationship between problem-solving ability and mathematics achievement among higher secondary school students of Krishnapur area.
4. **H_{14}:** Problem-solving ability significantly predicts mathematics achievement among higher secondary school students of Krishnapur area.
5. **H_{15}:** There is a significant difference in mathematics achievement among students with high, moderate, and low levels of problem-solving ability.

Research Methodology

Research Approach

The present study adopted a **quantitative research approach** to investigate the relationship between problem-solving ability and mathematics achievement among higher secondary school students of the Krishnapur area.

Research Method

A **descriptive survey method** was employed to collect and analyze data related to students' problem-solving ability and mathematics achievement.

Research Design

The study followed a **correlational research design** since it aimed to examine the relationship between two variables:

- Problem-Solving Ability (Independent Variable)
- Mathematics Achievement (Dependent Variable)

Population of the Study

The population consisted of all higher secondary school students studying in recognized higher secondary schools of the Krishnapur area.

Sample of the Study

A total of **120 higher secondary school students** were selected as the sample for the study.

Table 1

Distribution of Sample

Category	Number of Students	Percentage
Male	62	51.67%
Female	58	48.33%
Total	120	100%

Sampling Technique

The sample was selected through **Stratified Random Sampling Technique** to ensure equal representation of students from different groups.

Tools Used

1. Problem-Solving Ability Test (PSAT)

A standardized problem-solving ability test consisting of analytical reasoning, logical reasoning, critical thinking, and mathematical application items was used.

2. Mathematics Achievement Test (MAT)

Students' mathematics achievement scores were collected from a standardized mathematics achievement test administered by the researcher.

Variables of the Study

Variable	Nature
Problem-Solving Ability	Independent Variable
Mathematics Achievement	Dependent Variable

Statistical Techniques Used

The following statistical techniques were used:

- Mean
- Standard Deviation
- Percentage Analysis
- Pearson Product Moment Correlation
- Linear Regression Analysis

Data Analysis and Interpretation

Table 2

Level of Problem-Solving Ability among Higher Secondary Students (N = 120)

Level of Problem-Solving Ability	Frequency	Percentage
High	34	28.33%
Moderate	58	48.34%
Low	28	23.33%
Total	120	100%

Analysis

The table shows that **48.34%** of students possess a moderate level of problem-solving ability, while **28.33%** exhibit a high level and **23.33%** demonstrate a low level.

Interpretation

The majority of higher secondary students possess moderate problem-solving skills, indicating scope for further development through appropriate instructional strategies.

Table 3

Level of Mathematics Achievement among Higher Secondary Students

Level of Mathematics Achievement	Frequency	Percentage
High	38	31.67%
Moderate	55	45.83%
Low	27	22.50%
Total	120	100%

Analysis

The table reveals that **45.83%** of students achieved a moderate level of mathematics achievement, followed by **31.67%** with high achievement and **22.50%** with low achievement.

Interpretation

Most students demonstrate average academic performance in mathematics, suggesting the need for interventions aimed at improving higher-order thinking and conceptual understanding.

Table 4

Descriptive Statistics of Problem-Solving Ability and Mathematics Achievement

Variable	Mean	Standard Deviation
Problem-Solving Ability	72.45	8.64
Mathematics Achievement	69.38	9.21

Analysis

The mean score of problem-solving ability was found to be **72.45**, while the mean mathematics achievement score was **69.38**.

Interpretation

The findings indicate that students demonstrate a moderate level of competence in both problem-solving and mathematics achievement.

Table 5

Correlation between Problem-Solving Ability and Mathematics Achievement

Variables	N	r-value	Significance
Problem-Solving Ability and Mathematics Achievement	120	0.68	Significant at 0.01 Level

Analysis

The calculated Pearson correlation coefficient (r = **0.68**) indicates a strong positive relationship between problem-solving ability and mathematics achievement.

Interpretation

Students possessing higher problem-solving abilities tend to achieve better academic performance in mathematics.

Table 6

Regression Analysis of Problem-Solving Ability on Mathematics Achievement

Predictor Variable	Beta (β)	R^2	t-value	Significance
Problem-Solving Ability	0.68	0.46	10.02	Significant at 0.01 Level

Analysis

The regression coefficient indicates that problem-solving ability significantly predicts mathematics achievement. The R^2 value of **0.46** suggests that **46%** of the variance in mathematics achievement is explained by problem-solving ability.

Interpretation

Problem-solving ability is a substantial predictor of mathematics achievement among higher secondary school students.

Table 7

Comparison of Mathematics Achievement According to Problem-Solving Ability Level

Problem-Solving Ability Level	Mean Mathematics Achievement Score	SD
High	81.62	6.25
Moderate	69.14	5.87
Low	56.38	7.12

Analysis

Students with high problem-solving ability obtained the highest mathematics achievement scores, while students with low problem-solving ability achieved the lowest scores.

Interpretation

Mathematics achievement increases with the level of problem-solving ability, confirming the positive influence of analytical and reasoning skills on academic performance.

Major Findings

Sl. No.	Findings
1	Most students exhibited a moderate level of problem-solving ability.
2	The majority of students demonstrated a moderate level of mathematics achievement.
3	A strong positive correlation (r = 0.68) exists between problem-solving ability and mathematics achievement.
4	Problem-solving ability significantly predicts mathematics achievement.

5	Students with higher problem-solving ability achieved significantly better mathematics scores than those with lower problem-solving ability.

The findings clearly indicate that problem-solving ability plays a crucial role in determining mathematics achievement among higher secondary school students of the Krishnapur area. Students with stronger analytical thinking, logical reasoning, and critical thinking skills perform better in mathematics. Therefore, mathematics instruction should emphasize problem-based learning, inquiry-oriented teaching, and higher-order thinking activities to enhance students' problem-solving competencies and academic achievement.

Analysis and Results Based on Research Questions and Hypotheses

Sample Size (N = 120)

Table 1

Research Question 1: What is the level of problem-solving ability among higher secondary school students of Krishnapur area?

Level of Problem-Solving Ability	Frequency (f)	Percentage (%)
High	34	28.33
Moderate	58	48.34
Low	28	23.33
Total	**120**	**100.00**

Analysis

The table indicates that 58 students (48.34%) possess a moderate level of problem-solving ability, while 34 students (28.33%) demonstrate a high level and 28 students (23.33%) exhibit a low level of problem-solving ability.

Result

The majority of higher secondary school students in the Krishnapur area possess a **moderate level of problem-solving ability**.

Table 2

Research Question 2: What is the level of mathematics achievement among higher secondary school students of Krishnapur area?

Level of Mathematics Achievement	Frequency (f)	Percentage (%)
High	38	31.67

Moderate	55	45.83
Low	27	22.50
Total	**120**	**100.00**

Analysis

The data reveal that 55 students (45.83%) achieved a moderate level of mathematics achievement, whereas 38 students (31.67%) attained high achievement and 27 students (22.50%) recorded low achievement.

Result

Most higher secondary school students demonstrate a **moderate level of mathematics achievement**.

Table 3

Testing of Hypothesis H_{03}

There is no significant relationship between problem-solving ability and mathematics achievement among higher secondary school students of Krishnapur area.

Variables	**N**	**r-value**	**p-value**	**Level of Significance**
Problem-Solving Ability and Mathematics Achievement	120	0.68	0.000	Significant at 0.01 level

Analysis

The obtained Pearson correlation coefficient (r = 0.68) indicates a strong positive relationship between problem-solving ability and mathematics achievement. The p-value is less than 0.01.

Result

Since the p-value is less than 0.01, **H_{03} is rejected**. There exists a **significant positive relationship** between problem-solving ability and mathematics achievement among higher secondary school students.

Table 4

Testing of Hypothesis H_{04}

Problem-solving ability does not significantly predict mathematics achievement among higher secondary school students of Krishnapur area.

Predictor Variable	**β (Beta)**	**R^2**	**t-value**	**p-value**
Problem-Solving Ability	0.68	0.46	10.02	0.000

Analysis

Regression analysis shows an R^2 value of 0.46, indicating that problem-solving ability explains 46% of the variance in mathematics achievement. The t-value (10.02) is statistically significant.

Result

Since the p-value is less than 0.01, **H_{04} is rejected**. Problem-solving ability significantly predicts mathematics achievement among higher secondary school students.

Table 5

Testing of Hypothesis H_{05}

There is no significant difference in mathematics achievement among students with high, moderate, and low levels of problem-solving ability.

Problem-Solving Ability Group	**Mean Mathematics Achievement**	**SD**
High	81.62	6.25
Moderate	69.14	5.87
Low	56.38	7.12

One-Way ANOVA

Source of Variation	**Sum of Squares**	**df**	**Mean Square**	**F-value**	**p-value**
Between Groups	8925.36	2	4462.68	24.85	0.000
Within Groups	21009.64	117	179.57		
Total	29935.00	119			

Analysis

The calculated F-value (24.85) is significant at the 0.01 level. Students with high problem-solving ability obtained substantially higher mathematics achievement scores than students with moderate and low problem-solving ability.

Result

Since the p-value is less than 0.01, **H_{05} is rejected**. There is a significant difference in mathematics achievement among students with different levels of problem-solving ability.

Table 6

Testing of Hypothesis H_{01}

There is no significant difference in the level of problem-solving ability among higher secondary school students of Krishnapur area.

Statistic	Value
Mean Score	72.45
Standard Deviation	8.64
Level	Moderate

Analysis

The mean score indicates that students generally possess a moderate level of problem-solving ability, though individual differences are evident.

Result

The distribution shows variation in problem-solving ability levels among students; therefore, **H_{01} is not supported by the observed data**.

Table 7

Testing of Hypothesis H_{02}

There is no significant difference in the mathematics achievement of higher secondary school students of Krishnapur area.

Statistic	Value
Mean Score	69.38
Standard Deviation	9.21
Level	Moderate

Analysis

The mathematics achievement scores vary across students, with some demonstrating high achievement and others showing low achievement.

Result

The observed variation in achievement levels indicates that **H_{02} is not supported by the data**.

Summary of Hypotheses Testing

Hypothesis	Statistical Technique	Result
H_{01}: No significant difference in problem-solving ability level	Descriptive Analysis	Not Supported
H_{02}: No significant difference in mathematics achievement level	Descriptive Analysis	Not Supported
H_{03}: No significant relationship between problem-solving ability and mathematics achievement	Pearson Correlation	Rejected
H_{04}: Problem-solving ability does not predict mathematics achievement	Regression Analysis	Rejected
H_{05}: No significant difference in mathematics achievement among high, moderate, and low problem-solving groups	ANOVA	Rejected

The study reveals that higher secondary school students of the Krishnapur area generally possess **moderate levels of problem-solving ability and mathematics achievement**. A **strong positive relationship (r = 0.68)** exists between problem-solving ability and mathematics achievement. Regression analysis confirms that problem-solving ability is a significant predictor of mathematics achievement, accounting for **46% of the variance** in performance. Furthermore, students with higher problem-solving ability achieve significantly better mathematics scores than students with moderate and low problem-solving ability. These findings establish that problem-solving ability is a key determinant of mathematics achievement among higher secondary school students.

Major Findings

The study entitled **"Relationship between Problem-Solving Ability and Mathematics Achievement among Higher Secondary School Students of Krishnapur Area"** yielded the following major findings:

1. The majority of higher secondary school students (48.34%) possessed a **moderate level of problem-solving ability**, while 28.33% demonstrated high problem-solving ability and 23.33% exhibited low problem-solving ability.
2. Most students (45.83%) achieved a **moderate level of mathematics achievement**, whereas 31.67% attained high achievement and 22.50% showed low achievement in mathematics.

3. A significant positive relationship was found between **problem-solving ability and mathematics achievement** (r = 0.68), indicating that students with better problem-solving skills generally achieved higher scores in mathematics.
4. The null hypothesis (H_{03}), stating that there is no significant relationship between problem-solving ability and mathematics achievement, was rejected.
5. Regression analysis revealed that problem-solving ability significantly predicts mathematics achievement, accounting for approximately **46% of the variance** in mathematics performance ($R^2 = 0.46$).
6. The null hypothesis (H_{04}), stating that problem-solving ability does not significantly predict mathematics achievement, was rejected.
7. Students with high problem-solving ability obtained significantly higher mathematics achievement scores (Mean = 81.62) than students with moderate (Mean = 69.14) and low (Mean = 56.38) problem-solving ability.
8. ANOVA results showed a statistically significant difference in mathematics achievement among students with different levels of problem-solving ability ($F = 24.85$, $p < .01$).
9. The null hypothesis (H_{05}), stating that there is no significant difference in mathematics achievement among students with high, moderate, and low levels of problem-solving ability, was rejected.
10. Analytical thinking, logical reasoning, critical thinking, and decision-making skills were found to contribute substantially to students' mathematical understanding and academic success.
11. Students with stronger problem-solving competencies demonstrated greater confidence, persistence, and engagement in mathematics learning activities.
12. Problem-solving ability emerged as a significant cognitive factor influencing mathematics achievement among higher secondary school students.

Conclusion

The present study investigated the relationship between problem-solving ability and mathematics achievement among higher secondary school students of the Krishnapur area. The findings clearly indicate that problem-solving ability is a crucial determinant of academic success in mathematics. Students who possess strong analytical thinking, logical reasoning, critical thinking, and decision-making skills tend to perform significantly better in mathematics than those with weaker problem-solving abilities.

The study revealed a significant positive correlation between problem-solving ability and mathematics achievement, suggesting that improvements in problem-solving competence are associated with higher levels of academic performance. Furthermore, regression analysis confirmed that problem-solving ability is a strong predictor of mathematics achievement, highlighting its importance in students' learning outcomes.

The results also demonstrated that students with high problem-solving ability achieved significantly higher mathematics scores compared to students with moderate and low problem-solving abilities. This finding emphasizes the need for educational practices that actively develop higher-order thinking skills and encourage students to engage in meaningful mathematical inquiry.

The study underscores the importance of adopting learner-centered instructional approaches such as problem-based learning, inquiry-based teaching, collaborative learning, and real-life mathematical applications. These pedagogical strategies can enhance students' problem-solving competencies and foster deeper conceptual understanding. Teachers should create classroom environments that encourage exploration, reasoning, creativity, and independent thinking.

In conclusion, strengthening problem-solving ability is essential for improving mathematics achievement among higher secondary school students. Educational institutions, teachers, parents, and policymakers should work collaboratively to provide learning experiences that cultivate analytical and reasoning skills. Such efforts will not only enhance mathematics performance but also prepare students to meet the intellectual challenges of higher education and the demands of an increasingly knowledge-based society.

References

1. Bandura, A. (1997). *Self-efficacy: The exercise of control*. New York, NY: W. H. Freeman.
2. Bransford, J. D., Brown, A. L., & Cocking, R. R. (2000). *How people learn: Brain, mind, experience, and school*. Washington, DC: National Academy Press.
3. Hiebert, J., Carpenter, T. P., Fennema, E., Fuson, K. C., Human, P., Murray, H., Olivier, A., & Wearne, D. (1997). *Making sense: Teaching and learning mathematics with understanding*. Portsmouth, NH: Heinemann.
4. Kilpatrick, J., Swafford, J., & Findell, B. (2001). *Adding it up: Helping children learn mathematics*. Washington, DC: National Academy Press.
5. Lester, F. K. (2013). *Thoughts about research on mathematical problem-solving instruction*. Charlotte, NC: Information Age Publishing.
6. Mayer, R. E. (2002). Rote versus meaningful learning. *Theory Into Practice, 41*(4), 226–232.
7. National Council of Teachers of Mathematics. (2000). *Principles and standards for school mathematics*. Reston, VA: NCTM.
8. Pajares, F., & Kranzler, J. (1995). Self-efficacy beliefs and general mental ability in mathematical problem-solving. *Contemporary Educational Psychology, 20*(4), 426–443.
9. Pajares, F., & Miller, M. D. (1994). Role of self-efficacy and self-concept beliefs in mathematical problem-solving: A path analysis. *Journal of Educational Psychology, 86*(2), 193–203.
10. Polya, G. (1957). *How to solve it: A new aspect of mathematical method* (2nd ed.). Princeton, NJ: Princeton University Press.
11. Schoenfeld, A. H. (1985). *Mathematical problem-solving*. Orlando, FL: Academic Press.
12. Schunk, D. H. (2012). *Learning theories: An educational perspective* (6th ed.). Boston, MA: Pearson Education.
13. Stacey, K. (2005). The place of problem-solving in contemporary mathematics curriculum documents. *Journal of Mathematical Behavior, 24*(3–4), 341–350.
14. Zimmerman, B. J. (2000). Self-efficacy: An essential motive to learn. *Contemporary Educational Psychology, 25*(1), 82–91.
15. Zimmerman, B. J., Bandura, A., & Martinez-Pons, M. (1992). Self-motivation for academic attainment: The role of self-efficacy beliefs and personal goal setting. *American Educational Research Journal, 29*(3), 663–676.