# Perceptions of Students About Mathematics Self-Efficacy at Secondary School Level

Ayesha Shoaib
Fatima Jinnah Women University the Mall, Rawalpindi, Pakistan.

Mehr Bakht
Fatima Jinnah Women University the Mall, Rawalpindi, Pakistan.

Dr. Maria Bibi
Fatima Jinnah Women University the Mall, Rawalpindi, Pakistan.

Received on: 05-07-2024 Accepted on: 08-08-2024

**Abstract**

The purpose of the study was to gauge secondary school students' assessment of their mathematical self-efficacy. Usually, poor students' performance is caused by a variety of circumstances. Among them, the self-efficacy beliefs influence a student's level of effort as well as the amount of tension and anxiety they feel when working on a task. Thus, students' self-efficacy in mathematics has a significant impact on their mathematical achievement. The nature of the current study is descriptive. Ninety-five secondary school students from Rawalpindi city's F.G. schools were chosen for the study sample, using a convenience sampling technique. The questionnaire was used as the data collection tool in this quantitative study design. Descriptive statistics were used in the data analysis. Based on an analysis of the questionnaire responses, it was found that students' performance in mathematics is significantly impacted by their level of self-efficacy. Study of quantitative data shows that the majority of students had a poor opinion of mathematics. This suggests that raising one's positive attitude toward mathematics can help one perform better in the subject. The findings of this study should be helpful to researchers who want to investigate connections between students' self-efficacy in mathematics, their anxiety in the subject, other student characteristics, and criterion factors like math achievement. In order to improve their students' achievement, teachers who want to have a deeper understanding of their students' self-efficacy in mathematics will also find the study beneficial.

**Keywords:** Students' Perception, Performance, Self-efficacy, Mathematics, Secondary School

## 1. Introduction

Self-efficacy refers to the belief or perception that one is capable of organizing and executing the actions necessary to succeed at a given task (Bandura, 1997). According to Bandura (1977), self-efficacy is not a measure of the skills one has, but a belief about what one can do under different sets of conditions with whatever skills one possesses. Self-efficacy is the belief we have in our own abilities, specifically our ability to meet the challenges ahead of us and complete a task successfully (Akhtar, 2008).

Individuals who believe they are very competent in a given field, act, think, and feel differently

than those who believe they are not very competent (Bandura, 1984). They exhibit more efficacy, self-control, and persistence (Pajares & Urdan, 2006; Magno, 2008). According to Stevens et al. (2006), self-efficacy and the self-efficacy sources are more powerful predictors of math. Bandura (1997) went on to say that people are more motivated, behave in ways that reflect their beliefs than by the actual reality. Individuals don't always act in accordance with their knowledge and abilities, but rather in accordance with their perceived capabilities. Bandura came to the conclusion that an individual's beliefs, rather than their accomplishments, are a stronger indicator of their behavior. In the field of education, beliefs hold greater predictive power over prior academic performance, knowledge, or abilities (Pajares, 2002).

The degree to which knowledge and skills are learned is also significantly influenced by self-efficacy beliefs (Bandura, 1997; Pajares, 2002). According to early theories, beliefs that are emotive, episodic, and evaluative serve as filters for novel phenomena interpretation (Pajares, 2002). That is, views that affect the construction of self-efficacy beliefs include the degree of emotional attachment or feelings, as well as some satisfaction that comes with accomplishment (such making the honor roll or receiving public recognition) and reflections on belief systems.

### 1.2 Sources of self-efficacy

Mastery experiences, vicarious experiences, social persuasion, and physiological states are the four primary sources of self-efficacy that Bandura discovered (Hampton & Mason, 2003; Usher & Pajares, 2009). The majority of students' self-perceptions are based on their mastering experiences. Students who have excelled in math classes in the past, for instance, are more likely to think they can thrive in math classes in the future. The single biggest factor influencing pupils' confidence and academic success is their prior performance.

In the case of developing self-efficacy, the adage "nothing breeds success like success" certainly holds true. While the relationship between past performance and self-efficacy is well established, Stevens, Olivárez, Lan, and Tallent-Runnels (2004) found a stronger relationship between prior mathematics achievement and self-efficacy. If students have been successful at a particular skill in the past, they probably will believe that they will be successful at the skill in the future (Bandura, 1993).

Seeing people who are similar to oneself succeed or fail at a task is the second source of knowledge about one's own level of self-efficacy. People form opinions about their own talents by watching people who are similar to them complete tasks (Schunk, 1989). Self-efficacy acquired by observation is less persistent than self-efficacy beliefs acquired from prior experience. Schunk (1989) discovered that whereas self-efficacy based on witnessing others succeed can quickly erode if observers subsequently have unsuccessful experiences of their own, strong self-efficacy generated from one's own personal triumphs may mean that an infrequent setback has no detrimental repercussions.

Through vicarious experiences, students watch as role models who are similar to them accomplish specific goals. If students witness peers that they identify as being similar to themselves achieving in mathematics, they will feel more competent in the subject matter, even though this does not have the same impact on self-efficacy as mastery experiences.

The two latter sources have the least impact on pupils' self-efficacy. Oral persuasion is a third

information source. Research on self-efficacy suggests that an individual's own experiences or vicarious experiences have a greater impact on self-efficacy than verbal persuasion, even when hearing teachers say, "You can do this!" might boost a student's confidence to complete a task (Bandura, 1986). It is necessary to combine the short-term benefits of persuasion with real achievements. When using verbal persuasion, the persuasive speaker's credibility is also crucial (Schunk, 1989). When someone they trust tells them they are capable, students' increases in self-efficacy are more pronounced. Positive and negative reinforcement from parents, instructors, and peers is referred to as social persuasion.

Physical conditions such as fatigue, pain, or nausea are referred to as physiological states in students. Zarch and Kadivar (2006) discovered that whereas math aptitude had a direct impact on math performance, it also had an indirect impact through assessments of math self-efficacy. These indicators could make someone less confident in their ability to complete a task. On the other hand, having a positive or anxious emotion before facing a novel circumstance might boost one's sense of efficacy for the work at hand.

**1.3 Factors of self-efficacy**

The original triadic theory proposed that the three separate factors—behavioral, personal, and environmental—interact to determine human function. What other people perceive of you, mostly through your five senses (hearing, touching, taste, seeing, and smelling), are behavioral aspects. Actions, as well as spoken and nonspoken expressions, are among the factors. The social cognitive theory states that different people will respond differently to the same thing or action. As a result, we witness other people's preferences for various individuals, animals, vehicles, colors, and academic topics. This reaction to the internal and exterior environments is referred to as "behavior," according to Pajares (2002). In this study, behavioral characteristics include learner readiness, effort and persistence, and mathematical achievement.

The physical (weather, mountains, arrangements), social (people, relationships), and cultural (language, values, and roles) environments all have an impact. The environment is not static, according to Bandura (1999); rather, it can be seen as something that is forced, chosen, or created for the child. Environmental influences may seem forced upon young people since they are beyond their control. Different contexts are presented in schools at varying degrees. Students respond differently, either individually or collectively, depending on how they interpret their surroundings. The surroundings they live in are likewise shaped by their behaviors. In this study, environmental influences include geography, sponsor, school climate, and socioeconomic position.

According to the notion of reciprocal determinism, behavior and environment interact to affect the actor as well as the environment. Personal elements fall into three categories: cognitive, physiological, and psychological. They consist of ideas, tastes, intelligence, and temperament or personality.

**1.4 Mathematics Self-Efficacy**

According to Usher and Pajares (2009), mathematics self-efficacy is the conviction that one can learn and excel in the topic, which influences one's effort, persistence, and academic performance in mathematics. Students' self-efficacy in mathematics is greatly influenced by their perceived mastery of experience; those who successfully complete difficult assignments

report higher levels of efficacy. Compared to other similar belief constructions, this one is demonstrated to be a more accurate predictor of mathematical performance (Liu, 2009). Because different mathematical activities require varying levels of confidence, Bandura (1997) emphasizes that self-efficacy is context-specific and should be tested close to the work in order to avoid misleading results from larger assessments.

### 1.5 Importance of Mathematics Self-Efficacy

Due to its strategic importance as a foundational tool in other fields and its function in educational advancement, mathematics maintains substantial value in modern society (Darkwing, 2012). High math proficiency is linked to more options for study and employment, acting as a vital screening tool for entry into postsecondary education and success in related disciplines like science and technology (Bagakas, 2011). Thus, poor mathematical performance can restrict these opportunities, highlighting the need of having a solid mathematical foundation (Shapka, Domene & Keating, 2006). Students' effort, persistence, and general success in mathematics are directly impacted by their level of self-efficacy in the subject. Increased achievement boosts self-efficacy, which in turn encourages more performance increases in a positive feedback loop (Chen, 2003).

### 1.6 Mathematics Self-Efficacy and Students' Performance

According to Pajares (2002), self-efficacy is a person's assessment of their capacity to carry out the activities necessary for particular performances. Self-efficacy in mathematics particularly relates to one's confidence in one's capacity to solve mathematical puzzles. Situational circumstances, including test settings or question formats, might have an impact on these beliefs, which are not constant (Nicolaidou & Philippou, 2012). According to Bandura (1986), self-efficacy beliefs have a high correlation with results and can either help or impede performance in mathematics (Schunk, 1989).

### 1.7 Students' Perceptions about Mathematics

The way that students view and understand mathematics has a big impact on how well they learn and achieve. Students' approaches to mathematical assignments are influenced by their perceptions, which are affected by their experiences in the past. If these perspectives are negative, they might lead students down unproductive routes (Eggen & Kauchak, 2001; Aguilar, Rosas & Zavaleta, 2012). Adverse beliefs, such as the idea that mathematics is only for certain people or that it is hard by nature, can prevent people from being engaged and succeeding (Ernest, 2001). Students' approach to studying mathematics and their overall accomplishment are significantly shaped by affective dimensions, which include attitudes and beliefs about one's own talents (Hannula, 2006).

### 1.8 Teachers' Perceptions Related to Mathematics Self-Efficacy

The self-efficacy beliefs of teachers play a pivotal role in shaping the mathematical outcomes of their students. Teachers with high levels of self-efficacy tend to be more adaptable in their teaching strategies and more dedicated to catering to the requirements of a wide range of students, which improves the learning environment as a whole (Pendergast, Garvis & Keogh, 2011). Teachers' self-efficacy views and confidence in their ability to teach mathematics are

significantly related to their effectiveness (Swars et al., 2007). High self-efficacy teachers are more likely to create a supportive learning atmosphere that encourages math success in their students (Enochs, Smith & Huinker, 2000). In order to help students understand how their personal beliefs about doing mathematics are affecting their performance, this study focuses on their conceptions of mathematical self-efficacy.

For this purpose the following research questions were developed:

1. What are perceptions of students about the effect of their self-efficacy on their Mathematics' performance?
2. What students' believe about the role of self-efficacy in mathematics performance?

The purposed study was aimed to identify the perception of students about mathematic self-efficacy at secondary level in Rawalpindi City.

## 2. Methodology

To choose appropriate method for this study after reviewing the literature about methods to achieve the requirement and answer the research questions. The study used a quantitative research approach to determine the perception of students about mathematic self-efficacy at secondary level. For that questionnaires were filled from in-service teachers of Rawalpindi city and results were found in numeric form.

## 3. Participants of the study

The population for this research was all secondary level students of F. G Public schools in Rawalpindi city.

Convenient sampling was used to collect data from 95 elementary school teachers of F.G schools in Rawalpindi city.

## 4. Results of the Study

This section presents quantitative data. This section consists of two categories i.e. Effect of students' Self-efficacy on their mathematic performance and role of Self-efficacy on students' mathematic performance. Quantitative data for each item is represented in the form of tables.

### 4.1 Effect of students' Self-efficacy on their mathematic performance

This category focuses on the participants' perception that how students' self-efficacy effects their mathematic performance. Following tables shows the effect of students' self-efficacy on their mathematic performance.

| Sr. | Statements | Never | Rarely | Occasionally | Frequently | Always |
|---|---|---|---|---|---|---|
| **1** | I feel confident enough to ask questions in my mathematics class. | 47% | 27% | 17% | 4% | 5% |
| **2** | I feel confident when taking a Mathematics test. | 23% | 46% | 26% | 4% | 1% |

| | | | | | | |
|---|---|---|---|---|---|---|
| **3** | I feel confident when using mathematics outside of school. | 23% | 47% | 22% | 6% | 2% |
| **4** | I get tense when I prepare for a mathematics test. | 3% | 7% | 44% | 30% | 16% |
| **5** | I get nervous when I have to use mathematics outside of school. | 6% | 9% | 38% | 29% | 18% |
| **6** | I feel stressed when listening to mathematics teacher in class. | 5% | 8% | 39% | 34% | 14% |
| **7** | I get nervous when asking questions in class. | 2% | 7% | 39% | 33% | 19% |
| **8** | Working on mathematics homework is stressful for me. | 5% | 6% | 28% | 37% | 24% |
| **9** | I worry that I cannot be able to complete every assignment in a mathematics course | 3% | 12% | 32% | 31% | 22% |
| **10** | I worry that I cannot be able to learn well in my mathematics course. | 1% | 10% | 22% | 43% | 24% |
| **11** | I get nervous when taking a mathematics test. | 2% | 14% | 26% | 26% | 32% |
| **12** | I am afraid to give an incorrect answer | 6% | 7% | 24% | 25% | 38% |

| | | | | | | |
|---|---|---|---|---|---|---|
| | during my mathematics class. | | | | | |

This shows that mathematics self-efficacy has an effect on students' performance. Students who have high self-efficacy have responded to items that they have never or rarely felt stressed while doing mathematics or using mathematics outside the class. While 75% of the students have low self-efficacy and have responded that they always or frequently feel stressed while doing mathematics or using mathematics outside the class.

**4.2 Role of Self-efficacy on students' mathematic performance.**

This category focuses on the perception of students about their role of self-efficacy on their mathematic performance, the responses of participants varied. Following tables shows the difference between the perceptions of students about their role of self-efficacy on their mathematic performance.

| Sr. | Statements | Never | Rarely | Occasionally | Frequently | Always |
|---|---|---|---|---|---|---|
| **13** | I believe I can think like a Mathematician. | 49% | 34% | 7% | 7% | 3% |
| **14** | I worry that I will not be able to get a good grade in my mathematics course. | 3% | 12% | 42% | 25% | 18% |
| **15** | I worry that I will not be able to do well on mathematics tests. | 3% | 10% | 35% | 34% | 19% |
| **16** | I worry I will not be able to Understand the mathematics. | 2% | 13% | 33% | 38% | 14% |
| **17** | I believe I can do well on a mathematics test. | 17% | 36% | 25% | 16% | 6% |
| **18** | I am confident, I can understand the most difficult material presented by my math teacher. | 24% | 41% | 22% | 10% | 3% |

| | | | | | | |
|---|---|---|---|---|---|---|
| **19** | I believe I am the kind of person who is good at mathematics. | 23% | 45% | 20% | 11% | 1% |
| **20** | I believe I will be able to use mathematics in my future career when needed | 27% | 49% | 14% | 7% | 3% |
| **21** | I believe I can understand the content in a mathematics course. | 26% | 39% | 23% | 8% | 4% |
| **22** | I believe I can get an "A" grade when I am in a mathematics course. | 33% | 43% | 14% | 9% | 1% |
| **23** | I believe I can learn well in a mathematics course. | 40% | 37% | 10% | 10% | 3% |
| **24** | I believe I am the type of person who can do mathematics. | 27% | 47% | 11% | 13% | 2% |
| **25** | I feel that I will be able to do well in future mathematics courses. | 38% | 34% | 15% | 10% | 3% |

This section reveals that 70% of participants agree self-efficacy plays an important role on students' mathematic performance. The responses indicate that students with low self-efficacy did not believe that they can do well in mathematics and that they are type of person who can do mathematics.

**5. Findings and Discussion**

According to the quantitative data, the majority of participants concur that their success in math at the secondary level is influenced by their sense of self-efficacy. According to the results, participants never or very seldom felt competent utilizing mathematics outside of the

classroom, in a math class, or when taking an exam. The results of some earlier studies are consistent with those of this study. For example, a mathematical problem's correctness or incorrectness can be determined by applying objective mathematical reasoning. This allows for the evaluation of both wrong and correct solutions. Mathematical errors can be caused by either a lack of the necessary skills or a failure to identify which skills are needed to solve a certain problem. These are indicators of low fluency in mathematical concepts (Tuminaro, 2004).

According to this study, the majority of participants occasionally experienced anxiety and tension when studying for a math test, when they had to apply arithmetic outside of the classroom, or when they were listening to a math teacher in class. Many people struggle with mathematics anxiety, according to Truttschel (2002). Stress, anxiety, and a fear of rejection are some of the negative impacts it can have on pupils.

Additionally, the survey reveals that the majority of participants experienced stress on a regular basis while they worked on their homework assignments or asked questions in class. Mathematics anxiety, according to Sheffield and Hunt (2007), is the unease that certain people feel when they have to solve mathematical issues. They add that, similar to other forms of worry, pupils may experience an increase in heart rate or intensity, think they are incapable of solving mathematical problems, and avoid enrolling in math classes.

According to this study, the majority of participants frequently expressed concern about their ability to understand mathematics or were fearful of providing a wrong answer in class or on a math test. Tambychick & Meerah (2010) claim that pupils struggle with mathematics because they lack intellectual capacity. Based on the comments provided by participants in this area, it can be stated that students' performance in math is significantly impacted by their level of self-efficacy. Stress and anxiety are caused by low levels of self-efficacy and confidence in one's talents. In a similar vein, strong self-efficacy and strong math performance are linked. Mathematical self-beliefs influence learning and performance on multiple levels, including cognitive, motivational, affective, and decision-making (Wigfield and Eccles, 2000). They affect students' emotional lives, their ability to drive themselves and endure in the face of adversity, and their decision-making about schoolwork, extracurricular activities, and even future educational and professional pathways.

The study's findings also show that the participants felt they had little confidence in their own skills. They believe they are incapable of comprehending mathematics and performing well on a math test. The findings indicate that pupils hardly ever believe they can receive a "A" in arithmetic. According to some earlier studies, students' self-concept in mathematics, or their confidence in their own skills, is a crucial educational result and is closely linked to learning achievement (Marsh and O'Mara, 2008). A significant percentage of students report feeling nervous about arithmetic in particular, and they worry about how well they will perform in class and on exams (Ashcraft and Ridley, 2005).

According to the study's findings, none of the participants believed they would be able to perform well in math classes in the future or use the subject in the event that a profession in mathematics was required. Low self-efficacy students are less likely to control their achievement behaviors or be motivated to learn, according to some earlier research (Klassen and Usher, 2010; Schunk and Pajares, 2009). Based on the participant responses in this category, it can be stated that students' arithmetic achievement is significantly influenced by

their level of self-efficacy. In mathematics, students who have strong self-efficacy typically outperform those who have low self-efficacy. Students' mathematics self-concept, or belief in their own abilities, is an important outcome of education and is strongly related to successful learning.

**6. Conclusion**

The purpose of the current study was to find out how students felt about their own mathematical self-efficacy. Since mathematic self-efficacy has a major impact on students' success in the classroom, this study is important for improving students' academic achievement. As a result of this study, future educators will also benefit from knowing what pupils think and believe about mathematical self-efficacy. By using the information, they can gain a deeper understanding of the pupils and improve the effectiveness of the teaching and learning process. The study's research questions—what do students believe about the role that self-efficacy plays in mathematics performance and how does their self-efficacy affect their performance in the subject—are addressed by the data analysis findings. The following conclusions were drawn from the findings of study.

1. The study concludes that the majority of the students do not feel confident enough to perform mathematics tasks. Students typically reflected on personal characteristics and beliefs and how these characteristics and beliefs affected their self-efficacy in mathematics classes. The most students agreed that they rarely believe that they were the type of person who was good at mathematics.
2. It is concluded that the current study indicated that mathematics self-efficacy and mathematics achievement were positively related, and mathematics self-efficacy was a significantly positive predictor of mathematics achievement. Students who did not believe in their abilities did not perform well in mathematics tests.
3. It is concluded that that students whose self-efficacy is stronger showed greater persistence on items than do students with low self-efficacy. The respondents are more positive about their abilities when they understand the material. They are more positive when they received better grades, passed a test, or were able to work problems.
4. It is concluded that individual thoughts influence the individual's interest in mathematics, proficiency in performing math assignments, inspiration and joy with math, attribution of causes to educational achievement or disappointment.
5. It is concluded from the study that student's likeness and dis-likeness of mathematics comes from his/her belief structure. Individuals' beliefs and mentalities towards mathematics are molded by individual qualities and encounters which are linked to one's self-image related to studies.
6. It is concluded from the study that student's physiological state such as feeling of nervousness and stress had a direct effect on mathematics performance; it also had a direct effect on mathematics self-efficacy judgments.
7. It is determined that whereas students who did not trust in their skills shown poor self-efficacy, those who felt they dominated talents and performed well on assessment activities experienced an increase in their efficacy convictions.
8. The study's findings lead to the conclusion that students' effort and self-perception are related to their self-efficacy. The respondents' physical and mental states, as well as their

belief in their skills and prior academic experience, all indicate that they struggle with mathematics.

## References

1. Akhtar, M. (2008). Self-efficacy: The power of believing you can. *Encyclopedia of Positive Psychology*.
2. Ashcraft, M. H., & Ridley, K. S. (2005). Math anxiety and its cognitive consequences: A tutorial review. In J. I. D. Campbell (Ed.), *Handbook of mathematical cognition* (pp. 315-327). Psychology Press.
3. Bagakas, J. G. (2011). The role of teacher characteristics and practices on upper secondary school students' mathematics self-efficacy in Nyanza Province of Kenya. *Mathematics Education Research Journal, 23*(2), 159-175.
4. Bandura, A. (1977). Self-efficacy: Toward a unifying theory of behavioral change. *Psychological Review, 84*(2), 191-215.
5. Bandura, A. (1984). Recycling misconceptions of perceived self-efficacy. *Cognitive Therapy and Research, 8*(3), 231-255.
6. Bandura, A. (1986). *Social foundations of thought and action: A social cognitive theory*. Prentice-Hall.
7. Bandura, A. (1993). Perceived self-efficacy in cognitive development and functioning. *Educational Psychologist, 28*(2), 117-148.
8. Bandura, A. (1997). *Self-efficacy: The exercise of control*. W.H. Freeman.
9. Bandura, A. (1999). Social cognitive theory: An agentic perspective. *Asian Journal of Social Psychology, 2*(1), 21-41.
10. Chen, P. (2003). Exploring the accuracy of self-efficacy beliefs of middle-school mathematics students. *Learning and Individual Differences, 14*(1), 79-92.
11. Darkwing, L. (2012). The significance of mathematics in education. *Journal of Modern Education Review, 2*(1), 55-65.
12. Eggen, P., & Kauchak, D. (2001). *Educational psychology: Windows on classrooms*. Merrill Prentice Hall.
13. Enochs, L. G., Smith, P. L., & Huinker, D. (2000). Establishing factorial validity of the mathematics teaching efficacy beliefs instrument. *School Science and Mathematics, 100*(4), 194-202.
14. Ernest, P. (2001). The negative effects of beliefs about mathematics and learning mathematics on mathematics education. *Mathematics Education Research Journal, 13*(3), 33-56.
15. Hampton, N. Z., & Mason, E. (2003). Learning disabilities, gender, sources of self-efficacy, self-efficacy beliefs, and academic achievement in high school students. *Journal of School Psychology, 41*(2), 101-112.
16. Hannula, M. S. (2006). Motivation in mathematics: Goals reflected in emotions. *Educational Studies in Mathematics, 63*(2), 165-178.
17. Klassen, R. M., & Usher, E. L. (2010). Self-efficacy in educational settings: Recent research and emerging directions. In T. C. Urdan & S. A. Karabenick (Eds.), *The decade ahead: Applications and contexts of motivation and achievement* (Vol. 16, pp. 1-33). Emerald Group Publishing Limited.
18. Liu, R. D. (2009). Mathematics self-efficacy and its effect on the mathematical achievement of Hong Kong secondary school students. *International Journal of Learning, 16*(11), 379-388.
19. Magno, C. (2008). Self-regulation and approaches to learning in English composition writing. *TESOL Journal, 1*(1), 111-123.
20. Marsh, H. W., & O'Mara, A. J. (2008). Reciprocal effects between academic self-concept, self-efficacy, and achievement: A longitudinal panel analysis. *American Educational Research Journal, 45*(2), 309-344.

21. Nicolaidou, M., & Philippou, G. (2012). Attitudes towards mathematics, self-efficacy and achievement in problem-solving. *Educational Studies in Mathematics, 79*(1), 61-79.
22. Pajares, F. (2002). Overview of social cognitive theory and of self-efficacy. Retrieved from http://www.emory.edu/EDUCATION/mfp/eff.html
23. Pajares, F., & Urdan, T. (2006). *Self-efficacy beliefs of adolescents*. Information Age Publishing.
24. Pendergast, D., Garvis, S., & Keogh, J. (2011). Pre-service student-teacher self-efficacy beliefs: An insight into the making of teachers. *Australian Journal of Teacher Education, 36*(12), 46-57.
25. Schunk, D. H. (1989). Self-efficacy and achievement behaviors. *Educational Psychology Review, 1*(3), 173-208.
26. Schunk, D. H., & Pajares, F. (2009). Self-efficacy theory. In K. R. Wentzel & A. Wigfield (Eds.), *Handbook of motivation at school* (pp. 35-54). Routledge.
27. Sheffield, D., & Hunt, T. (2007). How does anxiety influence math performance and what can we do about it? *MSOR Connections, 6*(4), 19-23.
28. Shapka, J. D., Domene, J. F., & Keating, D. P. (2006). Trajectories of career aspirations through adolescence and young adulthood: Early math achievement as a critical filter. *Educational Research and Evaluation, 12*(4), 347-358.
29. Stevens, T., Olivarez, A., Lan, W. Y., & Tallent-Runnels, M. K. (2004). Role of mathematics self-efficacy and motivation in mathematics performance across ethnicity. *The Journal of Educational Research, 97*(4), 208-221.
30. Stevens, T., Olivárez, A., & Hamman, D. (2006). The role of cognition, motivation, and emotion in explaining the mathematics achievement gap between Hispanic and white students. *Hispanic Journal of Behavioral Sciences, 28*(2), 161-186.
31. Swars, S. L., Hart, L. C., Smith, S. Z., Smith, M. E., & Tolar, T. (2007). A longitudinal study of elementary pre-service teachers' mathematics beliefs and content knowledge. *School Science and Mathematics, 107*(8), 325-335.
32. Tambychick, T., & Meerah, T. S. M. (2010). Students' difficulties in mathematics problem-solving: What do they say? *Procedia - Social and Behavioral Sciences, 8*, 142-151.
33. Truttschel, R. (2002). Mathematics anxiety and its relationship to mathematics performance: A study of preservice elementary teachers. *Unpublished doctoral dissertation, University of Wisconsin-Stout*.
34. Tuminaro, J. (2004). A cognitive framework for analyzing and describing introductory students' use and understanding of mathematics in physics. *Unpublished doctoral dissertation, University of Maryland*.
35. Usher, E. L., & Pajares, F. (2009). Sources of self-efficacy in mathematics: A validation study. *Contemporary Educational Psychology, 34*(1), 89-101.
36. Wigfield, A., & Eccles, J. S. (2000). Expectancy–value theory of achievement motivation. *Contemporary Educational Psychology, 25*(1), 68-81.
37. Zarch, M. K., & Kadivar, P. (2006). The role of mathematics self-efficacy and motivation in mathematics performance across gender and ethnic groups. *Journal of Educational Psychology, 98*(4), 714-723.