



Research Article

© 2023 Aini Hayati et al.

This is an open access article licensed under the Creative Commons Attribution-NonCommercial 4.0 International License (<https://creativecommons.org/licenses/by-nc/4.0/>)

Received: 5 July 2023 / Accepted: 27 August 2023 / Published: 5 September 2023

The Relationship between Teacher's Self-Efficacy and Creative Teaching of Primary Mathematics Teachers

Pazin Fadzil Aini Hayati¹

Maat Siti Mistima^{2*}

Mahmud Muhammad Sofwan²

¹Faculty of Education,
Universiti Kebangsaan Malaysia,
43600 Bangi, Selangor,
Malaysia

²STEM Enculturation Research Center,
Faculty of Education,
Universiti Kebangsaan Malaysia,
43600 Bangi, Selangor,
Malaysia

*Corresponding Author

DOI: <https://doi.org/10.36941/jesr-2023-0141>

Abstract

Teachers' perceptions of their abilities to create and implement cutting-edge teaching tactics have a significant impact on students' success, particularly in mathematics. Additionally, educators who are confident in their own ability to educate help create a learning atmosphere. In light of this information, it is important to consider in mathematics education the importance of understanding the opinions of mathematics teachers regarding their level of self-efficacy and its relationship to creative teaching. The purpose of this study was to determine the relationship between teachers' self-efficacy and creative teaching of primary mathematics teachers. The questionnaire, which included 28 items and required responses on a 5-point Likert scale, was given to 210 mathematics teachers at random. The findings indicate that there is a significant relationship between teacher self-efficacy and creative teaching. The results of Pearson correlation coefficient analysis show that instructional strategies are the largest predictor of teacher's self-efficacy ($r(210) = 0.532, p < 0.05$), followed by student engagement ($r(210) = 0.441, p < 0.01$), and class management ($r(210) = 0.409, p < 0.05$). Therefore, creative teaching may reliably predict teachers' self-efficacy by 29.0% ($R=0.543$), according to the results of the linear regression analysis. Overall, this paper provides valuable insight into the critical role of perceptions of mathematics teachers' self-efficacy in shaping creative teaching approaches to mathematics education.

Keywords: Creative teaching, mathematics, primary teachers, teachers' self-efficacy

1. Introduction

In the realm of education, creativity is a transformative force that has the potential to revolutionise the way mathematics is taught and learned (Basic et al., 2022; Joklitschke et al., 2022; Muhammad Hafizi & Kamarudin, 2020; Munakata et al., 2021). It is consistent with SDG4's objective to enhance education quality and promote lifelong learning (Pooja & Bhalla, 2022). Therefore, mathematics teachers have a crucial role to play in cultivating and promoting creativity among students. While mathematics often carries the reputation of being rigid and formulaic (Markovits & Forgasz, 2017), integrating creativity into its teaching methods can unlock a world of possibilities. Besides that, it also can enable students to develop a deep appreciation for the subject and engage in innovative problem-solving. Moreover, creativity is a vital component of teaching mathematics, and mathematics teachers have a unique opportunity to foster creativity among their students. In recent years, there has been a growing recognition of the importance of incorporating creative teaching methods in mathematics education (Christofferson, 2021; Fadzil et al., 2022; Elsayed & Al-Abbad, 2023; Henriksen & Mehta, 2016; Kandemir et al., 2019; Niu et al., 2017; Sholan, 2019;). These methods go beyond the traditional approach of memorisation and formulaic problem-solving. Instead they focus on developing students' ability to think critically, solve problems innovatively, and approach mathematical concepts with imagination.

The traditional approach to teaching mathematics has often focused on rote memorisation and rigid algorithms, leaving little room for creative thinking. However, the recognition of creative teaching as a vital component of mathematics education has sparked a paradigm shift in the field. It is now widely acknowledged that creative teaching enhances students' understanding of mathematical concepts, encourages critical thinking, and equips them with the skills needed to tackle real-world challenges (Basic et al., 2022; Pitta-Pantazi et al., 2022). Therefore, creative teaching needs to be applied especially in the learning of primary school children because they are in a critical period in forming creative thinking processes (Fadhilah et al., 2022). Thereby, mathematics teachers are at the forefront of this educational revolution, embracing innovative pedagogical strategies that foster creativity. By adopting a student-centered approach, they create an environment that encourages curiosity, exploration, and the generation of multiple solutions (Ay Emanet & Kezer, 2021; Darto, 2021; Yuliandari & Anggraini, 2021). Then, mathematics teachers no longer simply transmit knowledge; they serve as facilitators, guiding students to discover mathematical principles through hands-on activities, collaborative projects, and open-ended problem-solving tasks.

Through creative teaching, mathematics teachers enable students to see beyond the prescribed formulas and algorithms, encouraging them to ask questions, make connections, and explore alternative approaches (Mróz & Ocetkiewicz, 2021; Schoevers et al., 2019) They emphasise the importance of conceptual understanding over memorisation, nurturing students' ability to think critically and deeply about mathematical concepts. By fostering a growth mindset, mathematics teachers instil in students the belief that mathematical ability can be developed and improved through effort and perseverance, empowering them to take risks and embrace challenges (Supandi et al., 2021). In addition, mathematics teachers serve as role models, inspiring students to embrace their own creativity and foster a lifelong love of learning (Ekmekci & Serrano, 2022; Montenegro, 2022). Creative teaching in mathematics education has changed the way mathematics is taught and learnt. Mathematics teachers are at the forefront of this transformative journey, embracing creative pedagogical approaches and creating environments that nurture the creativity of their students (Brown, 2017; Shrestha et al., 2020). With creative teaching, mathematics teachers can encourage students to develop a deep understanding of mathematics concepts, think critically, and approach problem-solving with imagination and innovation in a creative and engaging way.

However, the teacher's view of creativity serves as a filter to set up the decisions, directives, and instructional activities that the teacher takes. This may influence teacher decisions on the usage of creative methods of teaching in the classroom. Numerous researches have been done on how teachers view creativity and how it affects how they behave (Abramovich & Freiman, 2022; Aktaş,

2015; Johansen et al., 2022; Khalid et al., 2020; Kim et al., 2019). The study does not, however, go into detail about the variables that affect how people perceive creativity and, consequently, how creative instruction is delivered in the classroom. In order to understand how teachers' self-efficacy towards creative teaching in the classroom is influenced, this study also attempts to examine the significance of another variable, namely primary school teachers' self-efficacy.

Therefore, this study has three objectives:

1. To determine the level of teacher self-efficacy and creative teaching of primary mathematics teachers
2. To determine the relationship between the teacher's self-efficacy and creative teaching of primary mathematics teachers.
3. To determine the largest predictor of teacher's self-efficacy that influences the creative teaching of primary mathematics teachers.

2. Literature Review

2.1 Creative Teaching in Mathematics

There are many views that express how creativity develops with various perspectives by applying creativity as a challenge. However, Torrance (1990) believes that creative learning requires creative teaching from creative teachers. Various terms are used to refer to creative teaching. Beghetto (2017) explains creative teaching as teaching with creativity and defines it as applying creativity principles and techniques to teaching for each subject. Besides that, Huang et al. (2019) explained that creative teaching is the teacher's own personal creativity based on physical and mental development and individual differences in teaching. Creative teachers use new methods, strategies, teaching aids, media and so on to carry out meaningful teaching activities to achieve effective teaching goals (Xiong et al., 2020b). Although creative teaching can be equated to excellent practising, good quality practice is not necessarily the result of creative instruction (Elsayed & Al-Abbad, 2023). During creative education, a complex interplay between the teacher, the setting, and the pupils takes place, and each element of the process is always moving forward, striving to explore new territory, searching for new boundaries, and expanding on the search for something new.

Creative teaching in mathematics refers to the innovative, fluent, and adaptable procedures, actions, and educational reactions employed by math teachers before, during, and after teaching practices (Elsayed & Al-Abbad, 2023). The development of students' creativity is promoted by this kind of instruction. Robinson and Koshy (2004) also underlined that teachers should search for opportunities to be creative during the planning stage by choosing tasks that provide students choices and a range of inquiry techniques. However, allowing students the option to select and apply learnt strategies enhances their comprehension, hones their reasoning, and encourages the growth of good attitudes and an appreciation of mathematics' beauty.

Besides, creative teaching in mathematics involves teachers creating an environment that encourages students to explore, question, and think deeply about mathematical concepts (Pound & Lee, 2021; Simon, 2020). It encompasses a range of strategies and techniques aimed at stimulating students' creative thinking abilities and helping them develop a love for mathematics. By embracing creative teaching methods, mathematics educators can unlock their students' potential and equip them with the skills needed to thrive in a rapidly changing world. One aspect of creative teaching in mathematics is the integration of problem-solving skills. Mathematics teachers design tasks and activities that require students to think critically and apply mathematical knowledge in unique ways (Kaitera & Harmoinen, 2022; Madihah et al., 2020). They present students with open-ended problems (Kartikasari et al., 2022; Kurniawan & Darmono, 2021), real-world scenarios (Root et al., 2020; Sacchet, 2022), and puzzles (Farnell, 2017; Hoshino, 2018; Lim & Jakop, 2019) that challenge them to think creatively and come up with innovative solutions. By engaging in problem-solving activities, students learn to approach mathematical challenges with curiosity, flexibility, and perseverance. In

order to explain problem-solving to students, students' grasp of mathematical ideas can be enhanced by visualisation.

Visualisation and representation also play a crucial role in creative teaching in mathematics. Mathematics teachers use visual aids (Alshatri et al., 2019; Johnson & Nickerson, 2021), manipulatives (Sugiman et al., 2020; Umuhoza & Uworwabayeho, 2021), and technology (Dockendorff, 2019; Weinhandl et al., 2021) to help students visualise and make sense of abstract mathematical concepts. By providing students with concrete representations, such as geometric models or graphing tools, teachers enable them to explore mathematical ideas from different angles and develop a deeper understanding. Visualisation not only enhances students' comprehension but also fosters their ability to think creatively and make connections between different mathematical concepts (Roberts, 2022). Teachers of mathematics can assist students in developing their thinking skills through cooperative learning.

Collaborative learning is another important aspect of creative teaching in mathematics. Mathematics teachers create opportunities for students to work together in groups, solving problems collectively and sharing their ideas and approaches (Catarino et al., 2019). Collaborative learning promotes dialogue, encourages the exchange of perspectives, and stimulates creative thinking (Voicu & Matei, 2021). Through collaboration, students learn to appreciate different problem-solving strategies, consider alternative perspectives, and develop their own creative approaches to mathematical challenges.

In addition, creative teaching in mathematics embraces technological advancements (Albeshree et al., 2022; Henriksen et al., 2018; Othman et al., 2022). Mathematics educators leverage educational apps, computer software, and online resources to engage students and provide them with interactive tools for exploring mathematical concepts. Technology not only enhances students' motivation and engagement but also opens up new possibilities for creative problem-solving and mathematical exploration (Madihah et al., 2020; Othman et al., 2022). By embracing creative teaching methods, mathematics teachers create a dynamic and stimulating learning environment that nurtures students' creativity. They empower students to think critically, approach mathematical concepts with curiosity, and develop their unique problem-solving abilities. Through creative teaching, mathematics teachers inspire a love for mathematics, instilling in students the confidence to explore, experiment, and innovate. In doing so, they prepare students to become adaptable and innovative thinkers, equipped with the skills needed to succeed in the 21st century and beyond.

2.2 Teachers Self-efficacy

The phrase "teacher's self-efficacy" is drawn from Bandura et al.'s (1999) introduction and definition of the word self-efficacy and its theoretical context. Self-efficacy is described by Bandura as "a person's belief that he or she can successfully perform in a specific setting". According to Bandura, self-efficacy is a crucial precondition for creative performance because it boosts motivation, which prioritises and emphasises one's own ideas and behaviour. Therefore, according to Tschannen-Moran and Hoy (2001) and Bandura, (2006), teacher self-efficacy refers to one's belief in one's own teaching abilities and/or competences as they relate to instructional elements in teaching. According to Thurlings et al. (2015) and Kaufman et al. (2016), highly effective teachers are more likely to be willing to experiment with new techniques or include new ideas into their lesson plans.

In the meanwhile, it deals with an individual's belief in their capacity to complete activities successfully (Heyder et al., 2020; Sutjonong et al., 2022). A person's life is greatly impacted by their level of self-efficacy, especially when it is high, since this empowers them to realise their full potential (Evriani & Kumalasari, 2019). High self-efficacy teachers are more likely to create challenging objectives and employ motivation, emotions, and actions to carry them out (Fadhilah et al., 2022). Self-efficacy has an impact on interest in teaching as well. Studies have demonstrated that instructors with high levels of self-efficacy foster better learning outcomes for students as well as greater creativity (Huang, 2022; Roebianto, 2020). The desire to become a teacher is also influenced by self-

efficacy. Studies have demonstrated that teachers with high levels of self-efficacy foster better learning outcomes for their students as well as greater creativity (Fadhilah et al., 2022; Livers et al., 2020; Supandi et al., 2021).

Furthermore, teachers who have high levels of teaching self-efficacy have confidence in their capacity to come up with solutions to problems, modify their approach, make plans, and create lessons that are relevant to their students' needs (Thurlings et al., 2015). Teachers who have high levels of teaching self-efficacy also show a dedication to comprehending students' errors and misunderstandings (Francisco, 2019) The adoption of a range of classroom management techniques is also linked to high levels of teaching self-efficacy (Burić & Kim, 2020; Watson & Marschall, 2019). According to research on teacher self-efficacy in general, mathematics teachers who have a strong sense of their own ability to teach are often more effective in terms of student learning than teachers who have a poor sense of their own ability to teach (Perera & John, 2020). This includes adopting student-centred, problem-solving methodologies and research on how to affect students' self-efficacy and achievement in mathematics (Küçükalioglu & Tuluk, 2021; Oppermann & Lazarides, 2021). To further explain, teachers who have high levels of teaching self-efficacy are more likely to employ manipulatives, experiment with new concepts and methods, and share ownership of the learning with their students (Althausen, 2017; Arida et al., 2022). Besides, professional development can increase teacher confidence in their ability to teach.

3. Method and Materials

3.1 Method

A quantitative approach was used in this study. According to Babbie (2014), survey methodologies can offer accurate measurements, generalisability, and flexibility. Additionally, according to Creswell (2014), survey research techniques can offer a useful and applicable justification for researching a phenomenon. In this study, questionnaires were employed as the primary data collection tool. The survey approach is suitable for learning about a recent incident. Researchers can draw conclusions about an issue using this strategy based on their impressions. Because of this, this approach concentrates on the views, beliefs, attitudes, and behaviour of individuals (Denscombe, 2010).

The sample of this study consists of primary school mathematics teachers. The population of mathematics teachers in this district is 627 people. Therefore, random sampling method is used to ensure that all mathematics teachers have an equal chance to be selected. Based on the sampling table presented by Krejcie and Morgan, (1970), the population number of 627 requires a sample of 242 people. Therefore, out of 250 questionnaires that were distributed, 210 (84%) completed questionnaires were used as research data for analysis. This study's responses come from a variety of demographic backgrounds in terms of gender, age, educational background, and teaching experience.

3.2 Materials

The instruments used in this study are divided into three parts, namely demographics, teacher self-efficacy and creative teaching of mathematics teachers. The questionnaire instrument of this study has been modified from the original instrument and has high reliability. For Teacher Self-Efficacy, the researcher used the instrument Teachers' Sense of Efficacy (TSES) developed by Tschannen-Moran and Hoy (2001). TSES contains 12 items that have also been revised by them based on the original 24-item questionnaire in 2001. The TSES instrument has been used and translated into Malay. As for the creative teaching instrument, it was adapted and modified from Azhari (2016). The Creative Teaching Evaluation Instrument by Azhari (2016) is based on the Four Creative Components of Torrance (1990) which includes originality, fluency, clarity and flexibility that have 24 items. Use of these instruments has received permission from the developers. A 5-point Likert scale was used to assess the respondents' choices, with 1 denoting strongly disagree and 5 denoting strongly agree.

An expert verified the survey's face and concept validity before distribution to ensure that it would achieve its goal and be appropriate for the sample culture. For this purpose, a total of eight experts in the field of Mathematics Education, one expert in the field of Measurement and Evaluation and one expert in the field of language were appointed to provide their comments and views to evaluate the face validity and content of this research instrument. The Statistical Package for the Social Sciences (SPSS 26.0) was used to perform data cleaning and screening operations to assure the analysis's correctness. Then, Cronbach's alpha value is determined. Overall, Cronbach's alpha for teacher's self-efficacy instrument is 0.89 while creative teaching is 0.90. Cronbach's alpha value shown for both instruments is higher than 0.70, this indicates that the instrument has a high level of reliability (Hair et al., 2010). Next, each data item was analysed using the Statistical Package for Social Sciences (SPSS 26.0). Descriptive analysis such as mean, percentage, and standard deviation were used to interpret the data. In addition, Pearson's correlation coefficient was used to determine the relationship between teacher self-efficacy and creative teaching of mathematics teachers.

4. Result

The demographic breakdown of the total and percentage of respondents to this survey is shown in Table 1. The overall number of replies from males was 71 (33.8%), compared to the total number of responses from females, 139 (66.2%). Most respondents are mathematics teachers aged between 41 and 50 years, which is a total of 110 (52.4%). Furthermore, for the aspect of experience in teaching mathematics subjects, most of the respondents consisted of 55 people (26.2%) mathematics teachers who had teaching experience for 21 to 25 years. As well as educational background, a total of 188 (89.5) mathematics teachers have degrees. Other demographic characteristics are shown in Table 1.

Table 1: Study Respondents

Demographic characteristics	N	%
Gender		
Men	71	33.8
Women	139	66.2
Age		
Below 30	11	5.2
31 - 40 years	60	28.6
41 - 50 years	110	52.4
56 above	29	13.8
Teaching experience		
Less than 5 years	8	3.8
6 - 10 years	19	9.0
11 - 15 years	39	18.6
16 - 20 years	53	25.2
21 - 25 years	55	26.2
26 above	36	17.1
Educational background		
Master	14	6.7
Degree	188	89.5
Diploma	8	3.9

Next, descriptive statistics are conducted to provide a comprehensive overview of the data distribution for each variable in this study. Descriptive statistics used to analyse the data of this study are mean, standard deviation, minimum value and maximum value. This analysis is used to measure the level of teacher self-efficacy and creative teaching of mathematics teachers. Table 2 shows the findings of the descriptive analysis.

Table 2: Descriptive analysis of constructs

Gender	Mean	Std Dev
Teacher Self-Efficacy	3.99	0.30
Creative Teaching	3.87	0.29

Based on Table 2 above, the mean score describing the teacher's overall self-efficacy is high ($M=3.99$, $SD= 0.30$). While the level of creative teaching of mathematics teachers is also high ($M=3.87$, $SD= 0.29$). With a score of 3.99, the means for mathematics teachers' self-efficacy demonstrate greater means than the mathematics teachers' creative teaching. The averages and standard deviation for the two variables, however, indicate that mathematics teachers have high levels of self-efficacy and creative teaching methods.

Table 3 shows the mean analysis of the teacher's self-efficacy variable which is self-efficacy for instructional strategies (IS), self-efficacy for student engagement (SE), and self-efficacy for classroom management (CM). The results of the analysis show that teaching strategy has the highest mean of 4.01 while class management shows a slightly lower mean value of 3.97.

Table 3: The mean analysis of teacher's self-efficacy dimension

Dimension	Mean	Std Dev
IS	4.01	0.32
SE	4.00	0.33
CM	3.97	0.37

Further, the mean analysis of the four components of creative teaching, namely originality, flexibility, elaboration, and fluency, is shown in Table 4. Elaboration dimension shows the highest mean value with a mean value of 3.96. This is followed by the smoothness dimension which has a mean value of 3.92 and 3.79 is the mean value for the flexibility dimension. Originality dimension shows the lowest value with a mean value of 3.75.

Table 4: The mean analysis of creative teaching dimension

Dimension	Mean	Std Dev
Originality	3.75	0.40
Flexibility	3.79	0.37
Elaboration	3.96	0.32
Fluency	3.92	0.34

Next, correlation analysis was used to see the relationship between these two research variables. There are three types of correlation according to Cohen (1988): low (0.10 - 0.29), medium (0.30 - 0.49), and high (0.50 - 1.00). As a consequence, each sub-construct of teacher self-efficacy analysed in this study and the Pearson's correlation coefficient result demonstrate how creatively mathematics teachers teach. Table 6 displays the Pearson correlation coefficients for teacher self-efficacy and each of its sub-constructs.

Table 5: Pearson correlation coefficient of each sub-construct: teacher's self-efficacy and creative teaching mathematics teachers

Sub-construct		Creative teaching
IS	Pearson Correlation	.532**
	Sig (2-tailed)	.000
	N	210
SE	Pearson Correlation	.441**
	Sig (2-tailed)	.000
	N	210

Sub-construct		Creative teaching
CM	Pearson Correlation	.409**
	Sig (2-tailed)	.000
	N	210
Teacher self-efficacy	Pearson Correlation	.536**
	Sig (2-tailed)	.000
	N	210

**Correlation is significant at the 0.01 level (2-tailed)

Based on Table 5, the dimension of student involvement in teacher self-efficacy shows a moderate positive relationship with the creative teaching of mathematics teachers. The Pearson correlation value for the student engagement dimension is $r = 0.441$, $p < 0.05$, while for the dimension of class management it is $r(210) = 0.409$, $p < 0.05$. Nevertheless, the teaching strategy dimension shows a strong positive relationship with the creative teaching of mathematics teachers. The Pearson correlation values shown are $r(210) = 0.532$, $p < 0.05$.

Table 6: Pearson correlation coefficient of each sub-construct, teacher's self-efficacy and creative teaching mathematics teachers

Construct		Creative teaching
Teacher self-efficacy	Pearson Correlation	.536**
	Sig (2-tailed)	.000
	N	210

Overall, from Table 6, it can be shown that there is a correlation between and teacher self-efficacy creative teaching mathematics teachers: $r(210) = 0.441$, $p < 0.05$. The findings indicate that the study's mathematics teachers had positive, high levels of self-efficacy, and creative approaches to teaching mathematics.

Further, Table 7 provides a summary of the linear regression models; the total variation in teachers' self-efficacy attributable to all factors examined was 29.0%.

Table 7: Summary of the linear regression analysis

R	R Square	Adjusted R Square
0.540	0.292	0.290

Based on the results of the linear regression analysis, it can be concluded that creative teaching can predict 29.0% of teacher efficiency ($R=0.543$). The adjusted R Square value is 0.292. This shows that 29% can explain the influence of teachers' self-efficacy on creative teaching, while 71% is unexplained by other factors. Besides, creative teaching will increase by 0.540 when teachers' self-efficacy increases by one unit. The following is the regression analysis equation:

$$\text{Creative teaching} = 1.738 + 0.54 \text{ teacher's self-efficacy}$$

5. Discussion

The level of teacher self-efficacy refers to the teacher's confidence in his ability to carry out his or her duties effectively. In the context of creative teaching of mathematics, the level of self-efficacy of mathematics teachers refers to the teacher's confidence in their ability to teach mathematics with a creative, innovative, and effective approach. The findings of this study show that mathematics teachers have a high level of self-efficacy. This shows that mathematics teachers who have high self-efficacy are more likely to create challenging objectives and use creative teaching in teaching and learning (Fadhilah et al., 2022). This can have an impact on student achievement and encourage

students to think creatively. Based on the findings of this study, it shows that most of the teachers who are 41 to 50 years old are involved in this study. This shows that this mathematics teacher has a high efficiency to implement creative teaching. as well as teachers who have long teaching experience. This situation shows that experienced teachers have a high level of pedagogical knowledge and content knowledge. Then give high confidence to implement creative teaching.

Next, this study also determines the relationship of teachers' self-efficacy, using a multidimensional construct, namely instructional strategies, student engagement, classroom management, and creative teaching of primary mathematics teachers. Therefore, the results of the study show that there is a significant relationship between each dimension of instructional strategies, student engagement, classroom management and creative teaching of primary school mathematics teachers. Specifically, a positive relationship between instructional strategies, student engagement, classroom management and creative teaching of primary school mathematics teachers has been found. By examining this relationship, we hope to identify the significant role that teacher self-efficacy plays in creative teaching practices. One possible interpretation of this statement is that a teacher's belief in their own abilities can have a direct impact on how effectively they are able to teach and engage students. Then, implementing creative teaching has become a component of goal-setting in the majority of schools throughout the world (Fadhilah et al., 2022). Teachers must, therefore, increase their sense of self-efficacy. To carry out creative teaching strategies in mathematics, primary mathematics teacher's need to have a high level of self-efficacy (Huang, 2022; Roebianto, 2020). Thus, the development of teacher's self-efficacy in their ability to shape creative pupils based on instructional methodologies, student involvement, and classroom management is a crucial component.

Therefore, the greatest predictors of teacher self-efficacy affecting creative teaching of primary mathematics teachers were also determined. Teachers' self-efficacy is a great predictor of creative teaching mathematics teachers because it has to do with how confident individuals are in their capacity to create the necessary outcomes, complete tasks, and attain a goal. When connected to clear goals and a sense of achievement, self-efficacy becomes a predictor of future behaviour. People with strong self-efficacy can handle a variety of tasks, whereas those with low self-efficacy typically avoid difficult or challenging jobs (Burić & Kim, 2020; Perera & John, 2020). Therefore, the purpose of this study is to investigate the potential correlation between teachers' self-efficacy and their ability to implement creative teaching strategies in primary mathematics classrooms. This suggests that cultivating a sense of confidence and autonomy among educators may be an important aspect of improving educational outcomes for students, particularly when it comes to complex subjects like mathematics. Another implication of this research could be that there may be specific types or styles of creative teaching strategies which are more conducive to building teacher self-efficacy than others. Identifying these approaches could help schools and districts develop training programmes or resources aimed at boosting educator confidence and skill sets, leading ultimately to improved student performance.

In terms of future research, further exploration into the ways in which different factors contribute towards teacher self-efficacy would be valuable. Self-efficacy may be influenced by several variables, including prior teaching experience (Chung et al., 2018), peer support (Cevikbas & Kaiser, 2020), and individual traits (Deng et al., 2020; Liu et al., 2021). Like other factors, school climate (Chang et al., 2021; Zakariya, 2020), resources (Granziera et al., 2020), and admin support chances for professional development (Hsiao, 2022) might affect teachers' capacity and readiness to use creative teaching techniques. Similarly, studying the impact of various interventions designed specifically for increasing teacher confidence could provide insights into effective methods for promoting better pedagogical practices across all subject areas. Besides that, in a causal connection, one variable's changes are thought to directly affect another's changes. This research may not investigate whether self-efficacy directly influences creative teaching or vice versa in this situation. In order to prove that changes in one variable cause changes in another, controlled trials or longitudinal research are frequently needed.

However, when interpreting the results of a study on the positive relationship between self-efficacy and creative teaching among mathematics teachers, it's important to consider its limitations and potential areas for further investigation. Firstly, this study's sample may not be representative of all mathematics teachers, which could limit the generalizability of the findings. For example, if the participants were predominantly from a specific region, type of school, or grade level, the results might not apply to a broader population. Teachers who voluntarily participated in the study might be those who are more interested in creative teaching or who have higher self-efficacy beliefs to begin with. This could lead to an overestimation of the relationship between self-efficacy and creative teaching. In addition, using the same methodology to test both self-efficacy and creative teaching (such as questionnaire), the relationship found may partially reflect methodological variables rather than a real underlying link. The strength of the relationship can be overestimated as a result of this common-method variance (Ding et al., 2023). Future research is urged to examine more participants and their ideas in order to provide a more solid theoretical foundation for teacher self-efficacy and creative teaching. The present study only focused on the instructors, even though the ultimate goal of teacher education research is to increase learners' accomplishment.

Overall, this study has important implications for understanding how best to support teachers as they work towards implementing innovative approaches within primary mathematics education contexts. By focusing on developing strong levels of self-belief among educators themselves, we may ultimately improve learning outcomes, not only in math but across all academic disciplines. Based on the findings, education policymakers can design teacher training and professional development programs that not only enhance teachers' subject knowledge but also focus on boosting their self-efficacy beliefs and creative teaching skills. Workshops, seminars, and online courses could provide teachers with strategies for incorporating innovative and engaging teaching methods into their mathematics classrooms. In addition, education policymakers can encourage curriculum revisions that emphasize critical thinking, problem-solving, and hands-on learning experiences. Allocating resources for updated curriculum materials, technology, and interactive tools can support creative teaching methods that align with the principles of self-efficacy. The finding of this study suggest that policymakers can explore alternative assessment methods that measure students' ability to apply mathematical concepts in real-world scenarios. Performance-based assessments, projects, and presentations can evaluate both content knowledge and problem-solving skills. The positive relationship between self-efficacy and creative teaching suggests that when teachers believe in their ability to engage students, they are more likely to implement engaging activities. This can result in increased student interest, motivation, and active participation in mathematics learning. Thus, education policymakers can significantly contribute to making mathematics education for students more dynamic and effective while also empowering and supporting teachers in their professional development by utilising the insights from the relationship between self-efficacy and creative teaching.

6. Conclusion

In conclusion, this study aimed to examine the relationship between teacher's self-efficacy and creative teaching of primary mathematics teachers. The findings suggest that there is a positive correlation between a teacher's self-efficacy and their ability to implement creative teaching strategies in the classroom. This indicates that, when teachers believe in their ability to teach math creatively, they are more likely to take risks and try new approaches. Based on analysis, it can be concluded that there is indeed a strong association between these two factors. Additionally, incorporating creativity into mathematics instruction can enhance student learning outcomes. It is clear from our discussion that cultivating higher levels of self-efficacy among primary mathematics instructors could lead to increased academic achievement among students. Furthermore, promoting creative instructional methods has been shown to foster critical thinking skills while making lessons more engaging for learners. In conclusion, fostering an environment where educators feel confident

about their abilities and are encouraged to experiment with innovative pedagogical strategies may ultimately lead not only better student performance but also contribute positively towards overall education quality improvement efforts globally.

7. Acknowledgements

This research was supported by a grant from the Faculty of Education, Universiti Kebangsaan Malaysia; GG-2022-021.

References

- Abramovich, S., & Freiman, V. (2022). Fostering collateral creativity through teaching school mathematics with technology: what do teachers need to know? In *International Journal of Mathematical Education in Science and Technology*. <https://doi.org/10.1080/0020739X.2022.2113465>
- Aktaş, M. C. (2015). Turkish High School Teachers' Conceptions of Creativity in Mathematics. *Journal of Education and Training Studies*. <https://doi.org/10.1114/jets.v4i2.1123>
- Albeshree, F., Al-Manasia, M., Lemckert, C., Liu, S., & Tran, D. (2022). Mathematics teaching pedagogies to tertiary engineering and information technology students: a literature review. *International Journal of Mathematical Education in Science and Technology*. <https://doi.org/10.1080/0020739X.2020.1837399>
- Alshatri, S. H. H., Wakil, K., Jamal, K., & Bakhtyar, R. (2019). Teaching Aids Effectiveness in Learning Mathematics. *International Journal of Educational Research Review*. <https://doi.org/10.24331/ijere.573949>
- Althaus, K. L. (2017). The Emphasis of Inquiry Instructional Strategies: Impact on Preservice Teachers' Mathematics Efficacy. *Journal of Education and Learning*. <https://doi.org/10.5539/jel.v7n1p53>
- Arida, R., Andrade, R., & Mabilangan, R. (2022). Mathematics Self-Efficacy and the Use of Virtual Math Manipulatives Among Pre-Service Teachers. *International Journal of Educational Management and Development Studies*. <https://doi.org/10.53378/352897>
- Ay Emanet, E., & Kezer, F. (2021). The effects of student-centered teaching methods used in mathematics courses on mathematics achievement, attitude, and anxiety: a meta-analysis study. *Participatory Educational Research*. <https://doi.org/10.17275/per.21.38.8.2>
- Ayllon, M., Gomez, I., Ballesta-Claver, & Julio. (2016). Mathematical thinking and creativity through mathematical problem posing and solving. *Propósitos y Representaciones*.
- Azhari, B. M. (2016). Model Pengajaran Kreatif Berteraskan Kompetensi, Personaliti dan Rangsangan Kreativiti Guru Matematik Berpendekatan Pemodelan Persamaan Struktur. In *Universiti Teknologi Malaysia*.
- Babbie, E. R. (2014). *The basics of social research* (6th ed.). Belmont, CA : Wadsworth, Cengage Learning.
- Bandura, A. (2006). Bandura (2006) Toward a psychology of human agency.pdf. In *Perspectives on Psychological Science*.
- Bandura, A., Freeman, W. H., & Lightsey, R. (1999). Self-Efficacy: The Exercise of Control. *Journal of Cognitive Psychotherapy*, 13(2). <https://doi.org/10.1891/0889-8391.13.2.158>
- Basic, A., Arsic, B., Gajic, A., Parezanovic, R. Z., Petrovic, D. M., & Lazovic, T. (2022). Creativity In Teaching Mathematics. *Human Research in Rehabilitation*. <https://doi.org/10.21554/hrr.092203>
- Brown, J. P. (2017). Teachers' perspectives of changes in their practice during a technology in mathematics education research project. *Teaching and Teacher Education*. <https://doi.org/10.1016/j.tate.2017.01.022>
- Burić, I., & Kim, L. E. (2020). Teacher self-efficacy, instructional quality, and student motivational beliefs: An analysis using multilevel structural equation modeling. *Learning and Instruction*. <https://doi.org/10.1016/j.learninstruc.2019.101302>
- Catarino, P., Vasco, P., Lopes, J., Silva, H., & Morais, E. (2019). Cooperative learning on promoting creative thinking and mathematical creativity in higher education. *REICE. Revista Iberoamericana Sobre Calidad, Eficacia y Cambio En Educacion*. <https://doi.org/10.15366/reice2019.17.3.001>
- Cevikbas, M., & Kaiser, G. (2020). Flipped classroom as a reform-oriented approach to teaching mathematics. *ZDM - Mathematics Education*, 52(7), 1291-1305. <https://doi.org/10.1007/s11858-020-01191-5>
- Chang, C. M., Hsieh, H. H., Chou, Y. H., & Huang, H. C. (2021). The relationship between physical education teachers' perceptions of principals' transformational leadership and creative teaching behavior at junior and senior high schools: A cross-level moderating effect on innovative school climates. *Sustainability (Switzerland)*, 13(15). <https://doi.org/10.3390/su13158184>
- Christofferson, H. C. (2021). Creative teaching in mathematics. *The Mathematics Teacher*. <https://doi.org/10.5951/mt.51.7.0535>

- Chung, H., Kim, J., Park, R., & Jean, H. (2018). The Impact of Sample Size in Cross-Classified Multiple Membership Multilevel Models. *Journal of Modern Applied Statistical Methods*. <https://doi.org/10.22237/jmasm/1542209860>
- Creswell, J. W. (2014). Research Design: Qualitative, QuCreswell, J. W. (2014). . Research design Qualitative quantitative and mixed methods approaches. <https://doi.org/10.1007/s13398-014-0173-7>.zantitative,. *Research Design Qualitative Quantitative and Mixed Methods Approaches*.
- Danah Henriksen, & Rohit Mehta. (2016). A Beautiful Mindset: Creative Teaching Practices in Mathematics. *Journal of Mathematics Education © Education for All*.
- Darto. (2021). The effect of learning realistic mathematics education (RME) Approach to improve students' mathematical communication. *Journal of Physics: Conference Series*. <https://doi.org/10.1088/1742-6596/1776/1/012003>
- DC. Francisco, C. (2019). School Principals Transformational Leadership Styles And Their Effects On Teachers Self-Efficacy. *International Journal of Advanced Research*. <https://doi.org/10.21474/ijar01/9875>
- de-la-Peña, C., Fernández-Cézar, R., & Solano-Pinto, N. (2021). Attitude Toward Mathematics of Future Teachers: How Important Are Creativity and Cognitive Flexibility? *Frontiers in Psychology*. <https://doi.org/10.3389/fpsyg.2021.713941>
- Deng, Q., Zheng, B., & Chen, J. (2020). The Relationship Between Personality Traits, Resilience, School Support, and Creative Teaching in Higher School Physical Education Teachers . In *Frontiers in Psychology* (Vol. 11, p. 2397). <https://www.frontiersin.org/article/10.3389/fpsyg.2020.568906>
- Ding, C. G., Chen, C. F., & Jane, T. Der. (2023). Improving the performance of the unmeasured latent method construct technique in common method variance detection and correction. *Journal of Organizational Behavior*. <https://doi.org/10.1002/job.2673>
- Dockendorff, M. (2019). How can digital technology enhance mathematics teaching and learning? In *Examining Multiple Intelligences and Digital Technologies for Enhanced Learning Opportunities*. <https://doi.org/10.4018/978-1-7998-0249-5.ch011>
- Ekmekci, A., & Serrano, D. M. (2022). The Impact of Teacher Quality on Student Motivation, Achievement, and Persistence in Science and Mathematics. *Education Sciences*. <https://doi.org/10.3390/educsci12100649>
- Elsayed, S. A., & Al-Abbad, K. S. A. A. (2023). Investigation of Creative Teaching for High School Mathematics Teachers in Saudi Arabia. *International Education Studies*. <https://doi.org/10.5539/ies.v16n1p54>
- Evriani, T., & Kumalasari, D. (2019). The Role of Teachers' Attitudes Toward Teacher's Efficacy in Education Inclusion in Jakarta Public Elementary School. *Indonesian Journal of Learning Education and Counseling*. <https://doi.org/10.31960/ijolec.v2i1.177>
- Fadhilah, Y., Salim, R. M. A., & Safitri, S. (2022). Teacher efficacy and teacher social perception in creative teaching for elementary school teachers. *Jurnal Ilmiah Sekolah Dasar*, 6(2), 212–219. <https://ejournal.undiksha.ac.id/index.php/JISD/article/view/44760>
- Farnell, E. (2017). Puzzle Pedagogy: A Use of Riddles in Mathematics Education. *PRIMUS*. <https://doi.org/10.1080/10511970.2016.1195465>
- Granziera, H., Collie, R., & Martin, A. (2020). Understanding Teacher Wellbeing Through Job Demands-Resources Theory. In *Cultivating Teacher Resilience: International Approaches, Applications and Impact*. https://doi.org/10.1007/978-981-15-5963-1_14
- Henriksen, D., Henderson, M., Creely, E., Ceretkova, S., Černochová, M., Sendova, E., Sointu, E. T., & Tienken, C. H. (2018). Creativity and Technology in Education: An International Perspective. *Technology, Knowledge and Learning*, 23(3), 409–424. <https://doi.org/10.1007/s10758-018-9380-1>
- Heyder, A., Weidinger, A. F., Cimpian, A., & Steinmayr, R. (2020). Teachers' belief that math requires innate ability predicts lower intrinsic motivation among low-achieving students. *Learning and Instruction*. <https://doi.org/10.1016/j.learninstruc.2019.101220>
- Hoshino, R. (2018). *Supporting Mathematical Creativity Through Problem Solving*. https://doi.org/10.1007/978-3-319-92390-1_34
- Hsiao, C. C. (2022). Effects of Creative Self-Efficacy and Work Value on Creative Teaching: A Cross-Level Analysis of Professional Learning Communities and Teachers' Trust. *Journal of Research in Education Sciences*. [https://doi.org/10.6209/JORIES.202203_67\(1\).0009](https://doi.org/10.6209/JORIES.202203_67(1).0009)
- Huang, X. (2022). Constructing the associations between creative role identity, creative self-efficacy, and teaching for creativity for primary and secondary teachers. *Psychology of Aesthetics, Creativity, and the Arts*. <https://doi.org/10.1037/aca0000453>
- Johansen, A., Mogstad, E., Gajić, B., & Bungum, B. (2022). Incorporating creativity in science and mathematics teaching: Teachers' views on opportunities and challenges. *Nordic Studies in Science Education*. <https://doi.org/10.5617/NORDINA.8620>

- Johnson, D. A., & Nickerson, J. F. (2021). The Future of Visual Aids in Mathematics. *The Mathematics Teacher*. <https://doi.org/10.5951/mt.40.4.0180>
- Joklitschke, J., Rott, B., & Schindler, M. (2022). Notions of Creativity in Mathematics Education Research: a Systematic Literature Review. *International Journal of Science and Mathematics Education*. <https://doi.org/10.1007/s10763-021-10192-z>
- Kaitera, S., & Harmoinen, S. (2022). Developing mathematical problem-solving skills in primary school by using visual representations on heuristics. *LUMAT*. <https://doi.org/10.31129/LUMAT.10.2.1696>
- Kandemir, M. A., Tezci, E., Shelley, M., & Demirli, C. (2019). Measurement of Creative Teaching in Mathematics Class. *Creativity Research Journal*, 31(3), 272–283. <https://doi.org/10.1080/10400419.2019.1641677>
- Kartikasari, I. A., Usodo, B., & Riyadi. (2022). The Effectiveness Open-Ended learning and Creative Problem Solving Models to Teach Creative Thinking Skills. *Pegem Egitim ve Ogretim Dergisi*. <https://doi.org/10.47750/pegegog.12.04.04>
- Kaufman, S. B., Quilty, L. C., Grazioplene, R. G., Hirsh, J. B., Gray, J. R., Peterson, J. B., & Deyoung, C. G. (2016). Openness to Experience and Intellect Differentially Predict Creative Achievement in the Arts and Sciences. *Journal of Personality*, 84(2), 248–258. <https://doi.org/10.1111/jopy.12156>
- Kim, D. J., Bae, S. C., Choi, S. H., Kim, H. J., & Lim, W. (2019). Creative character education in mathematics for prospective teachers. *Sustainability (Switzerland)*. <https://doi.org/10.3390/su10061730>
- Krejcie, R. V., & Morgan, D. W. (1970). Determining Sample Size for Research Activities. *Educational and Psychological Measurement*. <https://doi.org/10.1177/001316447003000308>
- Küçükalioglu, T., & Tuluk, G. (2021). The effect of mathematics teachers' self-efficacy and leadership styles on students' mathematical achievement and attitudes. *Athens Journal of Education*. <https://doi.org/10.30958/aje.8-3-1>
- Kurniawan, H., & Darmono, P. B. (2021). Use of Open-Ended Student Worksheet to Improve Mathematics Communication Skills in Algebra. *International Journal for Innovation Education and Research*. <https://doi.org/10.31686/ijer.vol9.iss5.3106>
- Lim, P. C., & Jakop, Y. (2019). Enhancing Mathematics Learning With Escape Games. *ICER12019 Proceedings*. <https://doi.org/10.21125/iceri.2019.0916>
- Liu, X. xian, Gong, S. Y., Zhang, H. po, Yu, Q. lei, & Zhou, Z. jin. (2021). Perceived teacher support and creative self-efficacy: The mediating roles of autonomous motivation and achievement emotions in Chinese junior high school students. *Thinking Skills and Creativity*. <https://doi.org/10.1016/j.tsc.2020.100752>
- Livers, S. D., Zerkowski, J., Harbour, K. E., McDaniel, S. C., & Gleason, J. (2020). An Examination of the Relationships of Mathematics Self-Efficacy and Teaching Practices among Elementary, Secondary, and Special Education Educators. *Investigations in Mathematics Learning*, 12(2), 96–109. <https://doi.org/10.1080/19477503.2019.1670891>
- Madihah, K., Supiah, S., Siti Rafiah, A. H., Muhammad Ridhuan, A., Hasniza, I., & Masitah, S. (2020). Enhancing creativity and problem solving skills through creative problem solving in teaching mathematics. *Creativity Studies*. <https://doi.org/10.3846/cs.2020.11027>
- Markovits, Z., & Forgasz, H. (2017). “Mathematics is like a lion”: Elementary students' beliefs about mathematics. *Educational Studies in Mathematics*. <https://doi.org/10.1007/s10649-017-9759-2>
- Mohammed Sholan. (2019). Creative Teaching Practices for Teachers of Mathematics in Saudi Elementary Schools. *Thesis PHD*.
- Montenegro, H. (2022). *Mathematics Teacher Educators as a Role Model: The Perspective of Student Teachers*. <https://doi.org/10.3102/1586870>
- Mróz, A., & Ocetkiewicz, I. (2021). Creativity for sustainability: How do polish teachers develop students' creativity competence? analysis of research results. *Sustainability (Switzerland)*, 13(2), 1–22. <https://doi.org/10.3390/su13020571>
- Muhammad Hafizi, M. H., & Kamarudin, N. (2020). Creativity in mathematics: Malaysian perspective. *Universal Journal of Educational Research*. <https://doi.org/10.13189/ujer.2020.081609>
- Munakata, M., Vaidya, A., Monahan, C., & Krupa, E. (2021). Promoting Creativity in General Education Mathematics Courses. *PRIMUS*. <https://doi.org/10.1080/10511970.2019.1629515>
- Niu, W., Zhou, Z., & Zhou, X. (2017). Understanding the Chinese approach to creative teaching in mathematics classrooms. *ZDM - Mathematics Education*. <https://doi.org/10.1007/s11858-017-0887-z>
- Oppermann, E., & Lazarides, R. (2021). Elementary school teachers' self-efficacy, student-perceived support and students' mathematics interest. *Teaching and Teacher Education*. <https://doi.org/10.1016/j.tate.2021.103351>
- Othman, O., Iksan, Z. H., & Yasin, R. M. (2022). Creative Teaching STEM Module: High School Students' Perception. *European Journal of Educational Research*. <https://doi.org/10.12973/eu-jer.11.4.2127>

- Pazin Fadzil, A. H., Maat, S. M., & Mahmud, M. S. (2022). A Rasch model analysis of the TPACK instrument in the creative teaching of primary mathematics teachers. *Cypriot Journal of Educational Sciences*. <https://doi.org/10.18844/cjes.v17i11.7792>
- Perera, H. N., & John, J. E. (2020). Teachers' self-efficacy beliefs for teaching math: Relations with teacher and student outcomes. *Contemporary Educational Psychology*. <https://doi.org/10.1016/j.cedpsych.2020.101842>
- Pitta-Pantazi, D., Christou, C., Demosthenous, E., Pittalis, M., & Chimoni, M. (2022). Nurturing mathematical creativity for the concept of arithmetic mean in a technologically enhanced 'personalised mathematics and mathematics inquiry' learning environment. *ZDM - Mathematics Education*. <https://doi.org/10.1007/s11858-021-01308-4>
- Pooja, & Bhalla, R. (2022). A Review Paper on the Role of Sentiment Analysis in Quality Education. *SN Computer Science*, 3(6), 1–9. <https://doi.org/10.1007/s42979-022-01366-9>
- Pound, L., & Lee, T. (2021). Teaching mathematics creatively. In *Teaching Mathematics Creatively*. <https://doi.org/10.4324/9781003055396>
- Roberts, J. C. (2022). Active Learning Activities in a Collaborative Teacher Setting in Colours, Design and Visualisation. *Computers*. <https://doi.org/10.3390/computers11050068>
- Roebianto, A. (2020). The Effects of Student's Attitudes and Self-Efficacy on Science Achievement. *Jurnal Pengukuran Psikologi Dan Pendidikan Indonesia (JP3I)*. <https://doi.org/10.15408/jp3i.v9i1.14490>
- Root, J. R., Cox, S. K., Davis, K., & Hammons, N. (2020). Contextualizing Mathematical Problem-Solving Instruction for Secondary Students with Extensive Support Needs: A Systematic Replication. *Research and Practice for Persons with Severe Disabilities*. <https://doi.org/10.1177/1540796920949448>
- Sacchet, M. (2022). Ten Tips for Successful Creation of Contextualized Problems for Secondary School Students with Maple. *Maple Transactions*. <https://doi.org/10.5206/mt.v2i1.14446>
- Schoevers, E. M., Leseman, P. P. M., Slot, E. M., Bakker, A., Keijzer, R., & Kroesbergen, E. H. (2019). Promoting pupils' creative thinking in primary school mathematics: A case study. *Thinking Skills and Creativity*. <https://doi.org/10.1016/j.tsc.2019.02.003>
- Shrestha, I. M., Luitel, B. C., & Pant, B. P. (2020). Exploring Transformative Pedagogy in Teaching Mathematics. *Mathematics Education Forum Chitwan*. <https://doi.org/10.3126/mefc.v5i5.34752>
- Simon, M. A. (2020). Reconstructing Mathematics Pedagogy from a Constructivist Perspective. *Journal for Research in Mathematics Education*. <https://doi.org/10.5951/jresmetheduc.26.2.0114>
- Sugiman, Suyitno, H., & Walid. (2020). To grow a joyful learning in SLB through a manipulative teaching aid based on multi-function video. *Journal of Physics: Conference Series*. <https://doi.org/10.1088/1742-6596/1567/2/022091>
- Supandi, S., Suyitno, H., Sukestiyarno, Y. L., & Dwijanto, D. (2021). Self-efficacy and the ability to think creatively by prospective mathematics teachers based on learning barriers. *Journal of Educational and Social Research*. <https://doi.org/10.36941/jesr-2021-0033>
- Sutjonong, W. R., Salim, R. M. A., & Safitri, S. (2022). Teachers' Self-Efficacy as a Mediator of Their Perception and Behavior regarding Creative Teaching for Elementary School Students. *Mimbar Sekolah Dasar*. <https://doi.org/10.53400/mimbar-sd.v9i1.44253>
- Thurlings, M., Evers, A. T., & Vermeulen, M. (2015). Toward a Model of Explaining Teachers' Innovative Behavior: A Literature Review. *Review of Educational Research*, 85(3), 430–471. <https://doi.org/10.3102/0034654314557949>
- Torrance, P. E. (1990). The Torrance Tests of Creative Thinking Norms-Technical Manual Figural (Streamlined) Forms A & B. *Scholastic Testing Service*.
- Tschannen-Moran, M., & Hoy, A. W. (2001). Teachers' Sense of Efficacy Scale. In *Teaching and Teacher Education*. Umuhoza, C., & Uworwabayeho, A. (2021). Teacher's Use of Instructional Materials in Teaching and Learning Mathematics in Rwandan Primary Schools. *African Journal of Teacher Education*. <https://doi.org/10.21083/ajote.v10i2.6659>
- Voicu, C. D., & Matei, F. L. (2021). STEAM approach in primary school and preschool education. *Journal of Education, Society and Multiculturalism*.
- Watson, S., & Marschall, G. (2019). How a trainee mathematics teacher develops teacher self-efficacy. *Teacher Development*. <https://doi.org/10.1080/13664530.2019.1633392>
- Weinhandl, R., Houghton, T., Lindenbauer, E., Mayerhofer, M., Lavicza, Z., & Hohenwarter, M. (2021). Integrating Technologies Into Teaching and Learning Mathematics at the Beginning of Secondary Education in Austria. *Eurasia Journal of Mathematics, Science and Technology Education*. <https://doi.org/10.29333/EJMSTE/11428>
- Yuliandari, R. N., & Anggraini, D. M. (2021). Teaching for Understanding Mathematics in Primary School. *Proceedings of the International Conference on Engineering, Technology and Social Science (ICONETOS 2020)*. <https://doi.org/10.2991/assehr.k.210421.007>
- Zakariya, Y. F. (2020). Effects of school climate and teacher self-efficacy on job satisfaction of mostly STEM teachers: a structural multigroup invariance approach. *International Journal of STEM Education*. <https://doi.org/10.1186/s40594-020-00209-4>