REVIJA ZA ELEMENTARNO IZOBRAŽEVANJE
JOURNAL OF ELEMENTARY EDUCATION
Vol. 16, No. 4, pp. 375–391, December 2023

INVESTIGATING THE SOURCE OF STUDENT SELF-EFFICACY AND ITS RELATIONS TO AFFECTIVE FACTORS IN MATHEMATICS LEARNING

SULTHON AMIEN, RATNO ABIDIN, ACHMAD HIDAYATULLAH & MUHAMMAD RIDLWAN

Universitas Muhammadiyah Surabaya, Faculty of teaching and education, Surabaya Jawa Timur, Indonesia

CORRESPONDING AUTHOR/KORESPONDENČNI AVTOR/
achmadhidayatullah@um-surabaya.ac.id

Potrjeno/Accepted
13. 4. 2023

Objavljeno/Published
11. 12. 2023

Abstract/Izvleček

The purpose of this study was to explore the source of students' self-efficacy and its relation to motivation, attitude, and students' perception of teacher support in mathematics learning. Three hundred and fifty participants were selected using a stratified random sampling method. The study was survey-based and quantitative; data were analysed through statistical tests. Findings showed that most students reported having good grades in math. The source of self-efficacy in mathematics significantly correlates with attitude, intrinsic motivation, and students' perception of teacher support.

Keywords:
self-efficacy, attitude, student motivation, teacher support

Raziskovanje izvora študentove samoučinkovitosti in njenega odnosa do afektivnih dejavnikov pri učenju matematike

Namen te študije je bil raziskati vir samoučinkovitosti učencev in njihov odnos do motivacije, njihova stališča ter njihovo dojemanja podpore učiteljev pri učenju matematike. Tristo petdeset udeležencev je bilo izbranih z metodo stratificiranega naključnega vzorčenja. Študija je temeljila na anketi in kvantitativni analizi; podatki so bili analizirani s statističnimi testi. Ugotovljeno je bilo, da ima večina učencev dobre ocene pri matematiki. Vir samoučinkovitosti pri matematiki je pomembno povezan z odnosom, notranjo motivacijo in učenčevim dojemanjem podpore učitelja.

Ključne besede:
samoučinkovitost, odnos, motivacija, podpora učitelja

UDK/UDC
[37.091.3:37.015.3-057.87]:51

DOI https://doi.org/10.18690/rei.2463

Introduction

Describing the factors behind student performance in mathematics learning is a challenging task for researchers. Some researchers have suggested that self-efficacy is a powerful factor in determining student achievement. Jiang et al. (2014) defined self-efficacy as the conviction that one can succeed in certain purposes. Self-efficacy also plays a critical role in shaping motivation, learning, engagement, and achievement (Chong et al., 2018).

In Indonesia, students have struggled with mathematics achievement, according to international surveys such as PISA (OECD, 2018) and TIMMS (Patahuddin et al., 2020). Although researchers such as Usher and Pajares (2009) suggested that student performance can be explained by measuring student self-efficacy, there is a scarcity of investigation about the extent of Indonesian students' self-efficacy in mathematics learning. Suryadi and Santoso (2017) reported that self-efficacy was associated with achievement, although the contribution of student self-efficacy was weak. Simamora et al. (2019) suggested that self-efficacy could be increased using a certain method, but the researchers did not explain how student self-efficacy could do so. However, both studies were conducted in secondary schools, and there was no explanation of whether beliefs were associated with other factors.

In the literature review, the association of self-efficacy beliefs with non-cognitive factors (e.g., attitudes, motivation, and perception of teacher support) in mathematics learning has been extensively studied in research (Chong et al., 2018; Li, 2012; Skaalvik et al., 2015). Attitude is a personal tendency to respond to an object positively or negatively. Intrinsic motivation involves doing an activity for the inherent satisfaction of the activity itself (Schukajlow et al., 2017). Perceptions of teacher support are students' beliefs about their teacher in mathematics learning, for example, the perception of whether the mathematics teacher is friendly or not (Op't Eynde and De Corte, 2003). For example, Li (2012) reported on the association between self-efficacy and attitudes. The more positive student attitudes increase their self-efficacy in mathematics. Skaalvik et al.(2015) through their investigation in secondary schools, suggested that self-efficacy was strongly associated with intrinsic motivation in mathematics learning. Chong et al. (2018) stated that self-efficacy moderately correlated with students' perception of teacher support, where both self-efficacy and students' perception of teacher support also determined performance in grades 7-8.

Therefore, most of the previous research (Chong et al., 2018; Li, 2012; Skaalvik et al., 2015) was conducted in secondary schools and focused on a particular aspect of self-efficacy in mathematics. Little attention has been addressed to the extent to which students shaped their self-efficacy beliefs in mathematics. Also, little is known whether the source of self-efficacy beliefs is associated with attitudes, motivation, and student perception of teacher support, especially for primary education. Therefore, in the present study, we investigated the source of self-efficacy beliefs and their relation to attitudes, motivation, and perception of teacher support. Four research questions were formulated to answer the research purposes of the present study:

Research questions:

1. How do students express their source of self-efficacy in mathematics?
2. What kind of relationship can be described in the investigation of the correlation of the source of self-efficacy with attitude toward mathematics?
3. What insight can be gained through investigation into the source of self-efficacy and motivation toward mathematics?
4. What kind of correlation can be explained through investigation into the source of self-efficacy and students' perception of the teachers?

Theoretical framework

Self-efficacy and academic performance

Most definitions of self-efficacy in the literature review refer to Bandura's idea; self-efficacy is the judgment of confidence to perform tasks or succeed in activities (Ellez, 2020; Yıldırım and Güler, 2020; Usher and Pajares, 2009). Self-efficacy is also perceived as the concept built on the perception that students are individuals who actively influence the direction of their learning approach and achievement (Yıldırım and Güler, 2020; Rohatgi et al., 2016; Bandura, 1997). According to Hatlevik et al. (2018), self-efficacy beliefs are personal beliefs about what someone is capable of doing or learning and are not the same as knowing what to do.

The source of self-efficacy consists of four dimensions: mastery experience, vicarious experience, social persuasion, and physiological state (Usher and Pajares, 2009). Mastery experience is the degree to which a student has experienced academic success or failure (Gao, 2020). We would ask students about their experience in the past rather than their grade in academic achievement.

Vicarious experience deals with the degree to which students perceive the academic skills of career role models, parents, teachers, and older students. Social persuasion relates to external encouragement for students in their academic capabilities, such as support from their parents, teachers, and peers. Physiological states are physiological aspects such as feelings about the subject, how much students like or dislike the subject, feeling positive or negative about the subject, etc. (Gao, 2020; Klassen, 2004). In the present study using these constructs, researchers testify to the intercorrelation and the influence of this self-efficacy on other aspects such as motivation, attitude, and achievement.

Attitude towards mathematics

Attitude concerns students' positive or negative feelings about studies and whether these determine student success in all subjects. As mentioned by Aiken (1970), attitude is a tendency on the part of an individual to respond positively or negatively to some object, subject, situation, concept, or another person. According to Nja et al. (2022), attitude is an emotional and mental entity that propels students to take any strategy toward an object or subject. Di Martino and Zan (2011) state that there are two kinds of attitude definitions: simple and three-dimensional. The simple definition refers to the terms positive and negative as associated with the current subject, while the three-dimensional definition incorporates emotional dispositions, beliefs, and behaviour. In this study, however, researchers emphasize students' positive attitudes toward mathematics to represent the consistency and affirmation of mathematics learning.

Intrinsic motivation

Concerning the construct of motivation, there is a variety of conceptions among researchers. Commonly, researchers differentiate motivation into two categories: intrinsic motivation and extrinsic motivation. Intrinsic motivation refers to doing an activity for the inherent satisfaction of the activity itself (Ryan and Deci, 2020; Schukajlow et al., 2017). Intrinsic motivation refers to the student's tendency to enjoy an activity with no need for an external reward because he/she is driven by inherent value (Karimi et al., 2022).

For instance, students enjoy mathematics learning because of their inherent interest, or they experience satisfaction from mastering mathematical knowledge. In contrast, extrinsic motivation refers to the commitment to achieve something because of external factors (Yarin et al., 2022).
For instance, students commit to reaching a high score in mathematics because they want to get rewards from their teachers and parents. In the present study, we are interested the value of inherent personal value. Therefore, researchers investigate the intrinsic motivation of students in mathematics learning.

Students' perception of teacher support
In mathematics learning, the teacher also plays a key role in determining students' learning and development. The ways teachers transform and set the class are important to cultivate students' beliefs, motivation, and achievements (Raufelder et al., 2016). The habits of teachers in teaching and solving problems in mathematics also encourage students to solve mathematical tasks using the same techniques (Garofalo, 1989). De Corte (2015) deals with students' perception of mathematics teachers in mathematics learning as part of their beliefs about the mathematics class context. These perceptions involve student perceptions of their teacher in mathematics learning. For instance, our teacher is friendly to us, or our teacher really wants us to understand mathematics concepts, not only memorize them (Op't Eynde and De Corte, 2003). In the present study, the researcher seeks to measure whether students' perception of their teacher is associated with their self-efficacy in mathematics learning.

Methods

Participants
Twelve classes were selected randomly from five schools in Surabaya, Indonesia. Participants in this study were 350 students from fifth and sixth grade (total students grade fifth-sixth = $\pm$ 1,250 from 5 schools). The participants in the present study were 9-12 years old. All the schools were in urban areas, and the school system uses zoning. The location between school and home was close, meaning that there were students in every school from various economic backgrounds. Table 1 shows the demographics of the study sample.

Table 1. Demographics of participants

Category	N	Percentages
Fifth grade	169	48%
Sixth grade	181	52%
Boys	166	47%
Girls	184	53%
Age 9	7	2%
Age 10	114	33%
Age 11	175	50%
Age 12	54	15%

Instruments

Source of self-efficacy. Sixteen items were selected from the source mathematics self-efficacy questionnaire developed by (Usher and Pajares, 2009). This instrument consisted of four dimensions; we selected four items to measure students' *mastery experience*, five items for *vicarious experience*, four items for *social persuasion*, and three items for the *physiological state*. For instance: "I do well on my examination," "Seeing kids do better than me in the class pushes me to do better," "My mind goes blank, and I am unable to think clearly during examination," and "My whole body becomes tense during my learning in class." This questionnaire uses a Likert scale (1= Strongly disagree to 5 = Strongly agree).

Attitude towards mathematics. Attitude is students' evaluation of and feelings about the learning process, whether positively or negatively. These attitudes were measured by four items adapted from Grootenboer and Marshman (2016). Examples of these items were "Mathematics learning is very cool," "I like learning mathematics," and "I am happy working on mathematics." This questionnaire uses a Likert scale (1= Strongly disagree to 5 = Strongly agree).

Intrinsic motivation. Students' intrinsic motivation in the present study was measured by a five-item set adapted from PISA. These are some sample items: "I enjoy reading about mathematics," and "I do mathematics because I enjoy it." This questionnaire uses a Likert scale (1= Strongly disagree to 5 = Strongly agree).

Perception of teacher support. Students' perception of teacher support is the students' perception of the role and functioning of their mathematics teachers. This perception was measured using three items. These items were adapted from a mathematics-related beliefs system questionnaire (MRBQ) developed by Op't Eynde and De Corte (2003).

For instance, "My teacher tries to make the lessons interesting," and "My teacher gives me time to really explore new problems and to try out possible strategies." This questionnaire uses a Likert scale (1= Strongly disagree to 5 = Strongly agree).

Procedure

Researchers administered the questionnaire to students in the fifth and sixth grades. The class was selected randomly in every school. The teacher participated in the present study to help with the data collection. This study uses the paper-pencil test technique. Students completed the profile and the questions about personal background, such as gender. Students were allowed to complete the questionnaire at home. This technique was chosen to avoid student fatigue. We allowed two weeks for students to complete this questionnaire.

Data analysis

Confirmatory factor analysis (CFA) was performed to confirm the validity of the construct of the questionnaire, using the principal component method, TLI, CFI, > 0.9, and RMSEA < .005 to indicate the model fit (Hu and Bentler, 1999). Cronbach alpha was used to examine the reliability of the questionnaire, with an alpha coefficient above 0.7 indicating the instrument's reliability (Hair et al., 2009). In the second step, descriptive statistics were performed to answer the first question. In the third step, Pearson correlation was performed to answer the second to fourth questions.

Results

Confirming the validity and reliability of the instruments

CFA confirmed the validity of this questionnaire by confirmatory factor analysis (CFA). We found the fit model, CFI = 0.93, TLI = 0.91, RMSEA = .06, Chi-Square = 281.74, df = 125, p < .001, The loading factors range from 0.44 – 0.81. We reexamined the reliability of each factor. The result showed that all the factors from this questionnaire were reliable. Mastery experience (α =.77), vicarious experience (α =.78), social persuasion (α =.71), and physiological state (α =.79). This questionnaire used a Likert scale (1= strongly disagree to 5 = Strongly agree). We also confirmed the reliability of the attitude, motivation toward mathematics, and students' perception of teacher support.

The Cronbach alpha coefficient showed that attitude (α =.88), motivation, and students' perceptions of teacher support (α =.82) were reliable.

Descriptive statistics and the correlation of each source of self-efficacy factor

Table 2 describes the descriptive statistical analysis of the source of student self-efficacy beliefs in mathematics. Generally, all the sources of self-efficacy dimensions were mutually correlated.

Table 2. Descriptive statistics on student self-efficacy in mathematics

Variables		Mean	SD	1	2	3
1.	Mastery experience	3.84	0.72	1		
2.	Vicarious experience	3.56	0.68	.60		
3.	Social persuasion	3.71	0.71	.50	.57	
4.	Physiological state	2.75	0.82	-.14	-.24	-.03

All variables show correlation except the correlation between physiological state and social persuasion (r = .03). The highest correlation occurs for the pair vicarious experience and mastery experience (r = .60). Social persuasion also correlates with physiological mastery experience (r = .50) and vicarious experience (r = .57). Physiological state correlates with mastery experience (r = -.14) and vicarious experience (r = -.24).

RQ1; How do students express their source of self-efficacy in mathematics?

Table 3 describes statistics for the items dealing with student source of self-efficacy in mathematics. *Mastery experience* shows students' perception of their experience in mathematics learning. Generally, students reported positive experiences with mathematics learning, as indicated by the high mean results concerning the corresponding items (3.64 - 3.94, on a 5-point Likert scale, 5 = strongly agree). Students expressed strong self-efficacy in their report of doing well concerning mathematics learning, as indicated by the mean result for the item "I do well on mathematics assignments" (M = 3.88, SD = 0.97). Students also reported receiving strong scores in mathematics class, as indicated by the high mean results of the item "I got good grades in math" (M = 3.88, SD = 0.97).

Table 3. Student source of self-efficacy in mathematics learning

Self-efficacy in mathematics	Mean	SE mean	Median	SD
Mastery Experience				
I do well on math assignments	3.64	.05	4.00	1.00
I do well on even the most difficult math assignments, even though math is difficult	3.94	.04	4.00	0.89
I make excellent grades on math tests	3.93	.04	4.00	0.86
I got a good grade in math	3.88	.05	4.00	0.97
Vicarious Experience				
I have good ability in math	3.23	.05	3.00	1.02
I think I can overcome any challenge in math	3.38	.05	3.00	0.94
Seeing my friends doing math assignments encourages me to finish mine too	3.69	.05	4.00	0.96
Seeing friends who are better at math encourages me to study better	3.69	.05	4.00	1.05
The way the teacher does math encourages me to do it too	3.74	.05	4.00	0.96
Seeing other people who are good at math encourages me to study well	3.76	.05	4.00	0.97
Social Persuasion				
My friends like to work with me in math because they think I am good at math	3.39	.04	3.00	0.89
My parents have told me that I am good at mathematics	3.94	.05	4.00	0.94
My teachers have told me that I am good at mathematics	3.81	.04	4.00	0.85
Physiological state				
Only in math class do I get lazy	2.28	.06	2.00	1.14
Learning math makes me tired	2.78	.06	3.00	1.17
My mind goes blank, and I am unable to think clearly when doing math problems	2.79	.06	3.00	1.12
I often get depressed when studying math	2.87	.05	3.00	1.11
I'm often confused and don't understand math	3.02	.05	3.00	1.05

In the *Vicarious experience* factors, the data on the six items of this factor indicate that strong self-efficacy is also formed by other people, as indicated by the high mean results for the items (3.69 – 3.76, on a 5-point Likert scale, where 5 = strongly agree). Students expressed strong self-efficacy in studying math after seeing other students who were good at mathematics, as indicated by the high mean result for the item "Seeing friends who are better at math, encourages me to study better" (M = 3.69, SD = 0.96).

According to the mean result, students also had strong self-efficacy because of seeing the way their teacher solved mathematics problems (M =3.74, SD = 0.96). For instance, the mean result for the item "The way the teacher does math encourages me to do it too" was high (M= 3.74, SD = 0.96). However, we also found that students did not strongly believe in their math capability (M = 3.23, SD = 1.02).

Regarding *Social persuasion*, there were three items of self-efficacy in mathematics. Students' self-efficacy about their capability in math related to group work is moderate, as indicated by the mean result of the item "My friends like to work with me in math because they think I am good at math" (M = 3.39, SD = 0.89). Students strongly believed that they were good at mathematics, according to their parents' points of view, as indicated by the mean result for the item "My parents have told me that I am good at mathematics" (M = 3.81, SD = 0.85).

Concerning *the physiological state*, the data showed that students' response to the five items in this factor was low, as indicated by the mean result (2.28 -3.02, on a 5-point Likert scale), and many students did not decide to agree or disagree. For the first item, "Only in math class do I get lazy," we found that many students disagreed with this item, as indicated by the low mean results (M = 2.78, SD = 1.17). The mean result for the item "I often get depressed when studying math" was 2.87 (M = 2.87, SD = 1.11), indicating that there some students experienced depression during mathematics lessons, even if the number was not high. We found the mean result, "My mind goes blank, and I am unable to think clearly when doing math work", was low (M = 2.79, SD = 1.12).

RQ2; What kind of correlation can be described in the investigation of source of self-efficacy and attitude towards mathematics?

There is a scarcity of investigation about the relationship between self-efficacy and attitude toward mathematics, particularly in mathematics learning. A Pearson correlation was performed to examine the relationship between student self-efficacy in mathematics and their attitudes toward mathematics (See Table 4). All the factors of self-efficacy in mathematics correlate with attitudes towards mathematics. Mastery experience has a positive correlation with attitudes towards mathematics ($r = .39$, $p < .001$).

Table 4. Correlation between source of self-efficacy mathematics and attitude, students' perception and motivation

Self-efficacy mathematics	Attitude towards mathematics	Motivation towards mathematics	Students' perception of math teacher
1. Mastery experience	.39**	.33**	.41**
2. Vicarious experience	.46**	.36**	.53**
3. Social persuasion	.36**	.33**	.49**
4. Physiological state	-.14**	.09	-.07*
Mean (SD)	15.59 (3.10)	14.81 (2.99)	15.50 (2.79)

*Note: *significant at a level of 0.05 (p <.05), ** significant at a level of 0.001 (p < .001)*

Vicarious experience gained the highest correlation with attitude towards mathematics, among other factors (r = .46, p <.001). Social persuasion is associated with attitudes towards mathematics (r = .36, p < .001), while physiological states are negatively correlated with students' attitudes toward mathematics (r = -.14, p <. 001). It means that when students perceive that mathematics is difficult for them, they are more likely to have negative attitudes towards learning mathematics.

RQ3: What insight can be gained through investigation into the source between self-efficacy and motivation toward mathematics?

In the previous study, there was a dearth of empirical studies about the relationship between self-efficacy and motivation toward mathematics. We also identified this relationship by performing Pearson correlations (see Table 4). We found that mastery experience was positively correlated with students' intrinsic motivation towards mathematics (r = .33, p < .001). Vicarious experience was also positively correlated with their intrinsic motivation for mathematics (r = .36, p < .001). In other words, students' beliefs about their parent's perception of their capabilities in their math assignments correlate positively with intrinsic motivation, such as their desire for mathematics (r = .33, p < .001). We also found an insignificant correlation between the physiological state and intrinsic motivation (r = .09, p = .16).

RQ4: what kind of correlation can be explained through the investigation of source of self-efficacy and students' perception of the teachers?

We performed a Pearson correlation between students' perception of their teacher in mathematics and their self-efficacy (See Table 4).

We found that mastery experience positively correlated with their perception of their teacher (r = .41, p < .001). For instance, students' perceptions that their teacher tried to make mathematics class interesting in the past may also be associated with their

beliefs about themselves, such as believing they could get the highest math score. Vicarious experience correlated positively with their perception of the role of their teacher ($r = .53$, $p < .001$). Social persuasion was positively correlated with their perception of the role of their mathematics teacher in the class ($r = .49$, $p < .001$). Physiological state's correlation with students' perception of the role of their teacher was not significant ($r = -.07$, $p < .005$).

Discussion

The present study has examined student source of self-efficacy in towards mathematics in the Indonesian context by applying the theoretical framework proposed by Usher and Pajares (2009). This theoretical framework consists of four dimensions: mastery experience, vicarious experience, social persuasion, and physiological state. We also examined whether these dimensions correlated with attitude, motivation, and student's perception of the role of their mathematics teacher.

For the mastery experience dimensions, researchers found students reporting a positive experience with mathematics learning. Most students also reported that they got good scores in mathematics. This finding indicates that students have no problem with their scores in mathematics based on their experience. In this stage, we assume that student response on the items about the mathematics grade refers to their achievements in the past, for example, their mathematics score in annual book reports. In the Indonesian system, the minimum grade for all subjects is 75 (range 1-100). In the second dimension, vicarious experience, researchers found students expressing a strong belief that they could be motivated to solve their mathematical tasks by observing the time in which their friends could finish the tasks. Possibly, students who are good at mathematics also inspire their peers in the class. They also become more interested in solving mathematics tasks after watching their teacher solving mathematical problems. According to social cognitive theory, students' beliefs are determined by social stimuli (Bandura, 2001; Usher and Pajares, 2009). Therefore, it is important for mathematics educators to involve students in the working group because this would improve students' beliefs about their own relation to mathematics.

Concerning social persuasion, researchers found that students expressed a strong belief that they were good at math according to their parents, teachers, and friends.

In the primary education context, we assume that parents' and teachers' appreciation of students would shape student self-efficacy in math. The involvement of parents and greater effort by mathematics educators to care about student learning would increase students' beliefs in their own relation to mathematics.

The physiological state dimension deals with students' mood and anxiety during mathematics learning. Although the percentage was not high, we did find that 25% of students experienced their mind going blank during mathematics class. One explanation for this stage is the way math teachers set the class and choose their teaching strategy; these can be a factor behind student difficulty in understanding math. This finding is important for encouraging mathematics educators to change their teaching strategies and put more effort into improving student self-efficacy beliefs in mathematics learning. The second finding of this study establishes that self-efficacy correlates positively with students' attitudes towards mathematics. This finding is in line with previous research by Kundu and Ghose (2016), who found a relationship between the two (r =.72). In the Indonesian context, the correlation between self-efficacy and attitude varies. Mastery experience, vicarious experience, and social persuasion do significantly correlate with attitude towards mathematics. In other words, student self-efficacy, such as the statement "I do well on mathematics assignments", is associated with their feelings, such as the statement "I like working on math." A significant negative relationship has been identified between physiological state and attitudes (r = -.14). In other words, students' moods, such as those expressed in the statement "I often get depressed during mathematics classes," are negatively related to their attitudes towards mathematics. The more negative student self-efficacy becomes in mathematics learning, the less positive their attitudes will be towards mathematics. Third, researchers find a significant relationship between source of self-efficacy and intrinsic motivation. This finding was in line with previous studies, such as the finding by Skaalvik et al. (2015) showing a significant correlation between the two (r =.66). Researchers found motivation correlating positively with mastery experience (r = .33), vicarious experience (r =.36), and social persuasion (r = .33). In the Indonesian context, students who perceive themselves as having positive experience with mathematics were more likely to have high levels of intrinsic motivation.

Self-efficacy in mathematics also positively correlates with students' perception of the role of their mathematics teacher in the class. This means the way students perceive their mathematics teacher is associated with students' experience in mathematics. Therefore, it is important for mathematics educators to provide a positive experience for students because students' experience in the class is associated with their perception of the role of their teacher.

Limitations and suggestions

Some limitations of this study should be considered for future research. This research measures the relationship between the source of self-efficacy and other relevant factors. There is space to confirm the extent to which self-efficacy in mathematics influences mathematics achievement. However, the findings of this study contribute to providing empirical evidence of studen' self-efficacy in the Indonesian context.

Implication for teaching practice

For mathematics educators, it is important to use this finding as a foundation for improving student achievement. The finding of this study also contribute to unpacking the relationship between self-efficacy, attitude, intrinsic motivation, and students' perception of the function of teachers in mathematics learning. Mathematics education should try to organize their classes to increase student self-efficacy beliefs. This could be achieved by, for instance, arranging the class into working groups. It is also suggested that teachers appreciate each student's effort, since the findings of this study indicate that when teacher or parents appreciate their children, this shapes their children's efficacy in mathematics.

References

Aiken, L. R. (1970). Attitudes toward mathematics. *Review of Educational Research*, *40*(4), 551–596. https://doi.org/10.3102/00346543040004551

Bandura, A. (1997). *Self-Efficacy: The exercise of control*. New York : W. H. Freeman and Company.

Bandura, A. (2001). Social Cognitive Theory: An Agentic Perspective. *Annu. Rev. Psychol.*, *52*, 1–26.

Chong, W. H., Liem, G. A. D., Huan, V. S., Kit, P. L., & Ang, R. P. (2018). Student perceptions of self-efficacy and teacher support for learning in fostering youth competencies: Roles of affective and cognitive engagement. *Journal of Adolescence*, *68*(July), 1–11. https://doi.org/10.1016/j.adolescence.2018.07.002

De Corte, E. (2015). Mathematics-related beliefs of Ecuadorian students of grades 8-10. *Mathematics Educator*, *72*(2), 1–13. https://doi.org/10.1016/j.ijer.2015.03.006

Di Martino, P., & Zan, R. (2011). Attitude towards mathematics: A bridge between beliefs and emotions. *ZDM - International Journal on Mathematics Education*, *43*(4), 471–482. https://doi.org/10.1007/s11858-011-0309-6

Ellez, M. (2020). Self-efficacy beliefs of students of primary school teaching department regarding mathematics and teaching mathematics. *African Educational Research Journal*, *8*(4), 747–753. https://doi.org/10.30918/aerj.84.20.165

Gao, J. (2020). Sources of Mathematics Self-Efficacy in Chinese Students: a Mixed-Method Study with Q-Sorting Procedure. *International Journal of Science and Mathematics Education*, *18*(4), 713–732. https://doi.org/10.1007/s10763-019-09984-1

Garofalo, J. (1989). Beliefs and Their Influence on Mathematical Performance. *The Mathematics Teacher*, *82*(7), 502–505. https://doi.org/10.5951/mt.82.7.0502

Grootenboer, P., & Marshman, M. (2016). Students' Beliefs and Attitudes About Mathematics and Learning Mathematics Abstract. In *Mathematics, Affect and Learning : Middle School Students' Beliefs and Attitudes About Mathematics Education* (pp. 55–74). Springer : Singapore. https://doi.org/10.1007/978-981-287-679-9

Hair, Joseph F. , Black, Jr, William C. Babin, Barry J. & Anderson, R. E. (2009). Pearson - Multivariate Data Analysis, 7/E - Joseph F. Hair, Jr, William C. Black, Barry J. Babin & Rolph E. Anderson. In *Pearson New International Edition*. Upper Saddle River: Prentice Hall.

Hatlevik, O. E., Throndsen, I., Loi, M., & Gudmundsdottir, G. B. (2018). Students' ICT self-efficacy and computer and information literacy: Determinants and relationships. *Computers and Education*, *118*(December 2017), 107–119. https://doi.org/10.1016/j.compedu.2017.11.011

Hu, L. T., & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling*, *6*(1), 1–55. https://doi.org/10.1080/10705519909540118

Jiang, Y., Song, J., Lee, M., & Bong, M. (2014). Self-efficacy and achievement goals as motivational links between perceived contexts and achievement. *Educational Psychology*, *34*(1), 92–117. https://doi.org/10.1080/01443410.2013.863831

Karimi, S., Ahmadi Malek, F., & Yaghoubi Farani, A. (2022). The relationship between proactive personality and employees' creativity: the mediating role of intrinsic motivation and creative self-efficacy. *Economic Research-Ekonomska Istrazivanja*, *35*(1), 4500–4519. https://doi.org/10-.1080/1331677X.2021.2013913

Klassen, R. M. (2004). A cross-cultural investigation of the efficacy beliefs of South Asian immigrant and Anglo Canadian nonimmigrant early adolescents. *Journal of Educational Psychology*, *96*(4), 731–742. https://doi.org/10.1037/0022-0663.96.4.731

Kundu, A., & Ghose, A. (2016). *The Relationship Between Attitude And Self Efficacy In Mathematics Among Higher Secondary Students*. *21*(4), 25–31. https://doi.org/10.9790/0837-2104052531

Li, L. K. Y. (2012). A Study of the Attitude, Self-efficacy, Effort and Academic Achievement of CityU Students towards Research Methods and Statistics. *Discovery-SS Student E-Journal*, *1*(54), 154–183. http://ssweb.cityu.edu.hk/download/RS/E-Journal/journal8.pdf

Nja, C. O., Orim, R. E., Neji, H. A., Ukwetang, J. O., Uwe, U. E., & Ideba, M. A. (2022). Students' attitude and academic achievement in a flipped classroom. *Heliyon*, *8*(1), e08792. https://doi.org/10.1016/j.heliyon.2022.e08792

OECD. (2018). *PISA 2018 results: Brazil: Vol. I*. https://www.oecd.org/pisa/publications/PISA2-018_CN_BRA.pdf

Op't Eynde, P., and De Corte, E. (2003). Students' Mathematics-Related Belief Systems: Design and Analysis of a Questionnaire. Paper Presented at the Annual Meeting of the American Educational Research Association, 1–14.

Pajares, F. (2003). Self-efficacy beliefs, motivation, and achievement in writing: A review of the literature. *Reading and Writing Quarterly*, *19*(2), 139–158. https://doi.org/10.1080/10573560308222

Pajares, F., and Graham, L. (1999). Self-Efficacy, Motivation Constructs, and Mathematics Performance of Entering Middle School Students. *Contemporary Educational Psychology*, *24*(2), 124–139. https://doi.org/10.1006/ceps.1998.0991

Pajares, M. F. (1992). Teachers' Beliefs and Educational Research : Cleaning up a Messy Construct. *Review of Educational Research*, *62*(3), 307–332. http://www.jstor.org/stable/1170741

Patahuddin, S. M., Rokhmah, S., and Lowrie, T. (2020). Indonesian Mathematics Teachers' and Educators' Perspectives on Social Media Platforms: The Case of Educational Facebook Groups. *Asia-Pacific Education Researcher*, *29*(6), 519–528. https://doi.org/10.1007/s40299-020-00503-3

Raufelder, D., Nitsche, L., Breitmeyer, S., Keßler, S., Herrmann, E., and Regner, N. (2016). Students' perception of "good" and "bad" teachers-Results of a qualitative thematic analysis with German adolescents. *International Journal of Educational Research*, *75*, 31–44. https://doi.org/10.1016/j.ijer.2015.11.004

Rohatgi, A., Scherer, R., and Hatlevik, O. E. (2016). The role of ICT self-efficacy for students' ICT use and their achievement in a computer and information literacy test. *Computers and Education*, *102*, 103–116. https://doi.org/10.1016/j.compedu.2016.08.001

Ryan, R. M., and Deci, E. L. (2020). Intrinsic and extrinsic motivation from a self-determination theory perspective: Definitions, theory, practices, and future directions. *Contemporary Educational Psychology*, *61*(April). https://doi.org/10.1016/j.cedpsych.2020.101860

Schukajlow, S., Rakoczy, K., and Pekrun, R. (2017). Emotions and motivation in mathematics education: theoretical considerations and empirical contributions. *ZDM - Mathematics Education*, *49*(3), 307–322. https://doi.org/10.1007/s11858-017-0864-6

Simamora, R. E., Saragih, S., and Hasratuddin, H. (2019). Improving Students' Mathematical Problem Solving Ability and Self-Efficacy through Guided Discovery Learning in Local Culture Context. *International Electronic Journal of Mathematics Education*, *14*(1), 61–72. https://doi.org/10.12973/iejme/3966

Skaalvik, E. M., Federici, R. A., and Klassen, R. M. (2015). Mathematics achievement and self-efficacy: Relations with motivation for mathematics. *International Journal of Educational Research*, *72*, 129–136. https://doi.org/10.1016/j.ijer.2015.06.008

Suryadi, B., and Santoso, T. I. (2017). Self-Efficacy, Adversity Quotient, and Students' Achievement in Mathematics. *International Education Studies*, *10*(10), 12. https://doi.org/10.5539/ies.v10-n10p12

Tanaka, M. (2015). Exploring motivational changes for short in-class extensive reading. *Journal of Asia TEFL*, *12*(4), 61–91. https://doi.org/10.18823/asiatefl.2015.12.4.3.61

Usher, E. L., and Pajares, F. (2009). Sources of self-efficacy in mathematics: A validation study. *Contemporary Educational Psychology*, *34*(1), 89–101. https://doi.org/10.1016/j.cedpsych.2008.09.002

Wang, Y. S., Sun, J., and Liu, L. (2017). Effects of applying virtual reality to adventure athletic education on students' self-efficacy and team cohesiveness. *Journal of Interdisciplinary Mathematics*, *20*(3), 895–908. https://doi.org/10.1080/09720502.2017.1358889

Yarin, A. J., Encalada, I. A., Elias, J. W., Surichaqui, A. A., Sulca, R. E., and Pozo, F. (2022). Relationship between Motivation and Academic Performance in Peruvian Undergraduate Students in the Subject Mathematics. *Education Research International*, *2022*, 1–11. https://doi.org/10.1155/2022/3667076

Yıldırım, M., and Güler, A. (2020). COVID-19 severity, self-efficacy, knowledge, preventive behaviors, and mental health in Turkey. *Death Studies*, *46*(4), 1–8. https://doi.org/10.1080/07481187.2020.1793434

Authors:

Dr. Sulthon Amien, MM
Assistant Professor, Universitas Muhammadiyah Surabaya, JI. Surorejo 59 Surabaya, Indonesia, e-mail: sulthon.amien@um-surabaya.ac.id
Docent, Univerza Muhammadiyah Surabaya, JI. Surorejo 59 Surabaya, Indonezija, e-pošta: sulthon.amien@um-surabaya.ac.id

Dr. Ratno Abidin, M.Pd
Assistant Professor, Universitas Muhammadiyah Surabaya, JI. Surorejo 59 Surabaya, Indonesia, e-mail: ratnoabidin@um-surabaya.ac.id
Docent, Univerza Muhammadiyah Surabaya, JI. Surorejo 59 Surabaya, Indonezija, e-pošta: ratnoabidin@um-surabaya.ac.id

Dr. Achmad Hidayatullah
Assistant Professor, Universitas Muhammadiyah Surabaya, JI. Surorejo 59 Surabaya, Indonesia, e-mail: achmadhidayatullah@um-surabaya.ac.id
Docent, Univerza Muhammadiyah Surabaya, JI. Surorejo 59 Surabaya, Indonezija, e-pošta: achmadhidayatullah@um-surabaya.ac.id

Dr. M. Ridlwan, Muhammad
Associate Professor, Universitas Muhammadiyah Surabaya, JI. Surorejo 59 Surabaya, Indonesia, Email Address: ridlwan@pps.um-surabaya.ac.id
Izredni professor, Univerza Muhammadiyah Surabaya, JI. Surorejo 59 Surabaya, Indonezija, e-pošta: ridlwan@pps.um-surabaya.ac.id