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THE ROLE OF PARENTAL INVOLVEMENT AND MATHEMATICS SELF-CONCEPT OF ELEMENTARY SCHOOL STUDENTS IN ONLINE MATHEMATICS LEARNING

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Abstract. *Introduction.* Learning mathematics from home during the COVID-19 pandemic is a challenge for both parents and students to manage to engage in learning. Therefore, it is important to examine the involvement of parents in learning mathematics from home and students' mathematics self-concepts and their relationship to mathematics performance.

Aim. This study is *aimed* to analyse parental involvement and students' mathematical self-concept, the relationship between the two, and their effect on students' mathematical performance in online learning.

Methodology and research methods. A cross-sectional survey was used to achieve the research objectives. There were 56 elementary school students in rural areas who were involved in this study. To assess parental involvement and mathematics self-concept, the authors employed questionnaires. Meanwhile, the results of the mid-semester test were used to assess student math performance. The answers to the research questions were reported using descriptive analysis, correlation, regression, and the t-test.

Results. Based on the results of the analysis, parental involvement, both in terms of support and control aspects, has a significant influence on mathematics performance. On the other hand, mathematics self-concept and performance positively influence each other. The findings of the present research also show that the gender group and grade level group did not have significant differences for each variable.

Practical significance. This study has implications for schools to maximise parental involvement in their children's mathematics learning effectively. Communication between schools, teachers, and children, in particular, becomes critical to maximise children's potential, including their math self-concept.

Keywords: COVID-19, learning from home, parental involvement, online mathematics learning, elementary school, mathematics self-concept.

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РОЛЬ РОДИТЕЛЬСКОГО УЧАСТИЯ И ОЦЕНКА УЧАЩИМИСЯ НАЧАЛЬНОЙ ШКОЛЫ СВОИХ ЗНАНИЙ ПО МАТЕМАТИКЕ ПРИ ОНЛАЙН-ОБУЧЕНИИ

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Аннотация. *Введение.* Изучение математики дома во время пандемии COVID-19 является сложной задачей как для родителей, так и для школьников, которым необходимо научиться участвовать в образовательном процессе. Поэтому важно исследовать участие родителей в изучении математики дома, а также оценивание школьниками своих знаний по математике и их отношение к успеваемости по этому предмету.

Цель исследования – проанализировать участие родителей в изучении математики, оценивание школьниками своих знаний по этому предмету, роли и взаимосвязи между данными аспектами, а также влияние на успеваемость учащихся по математике при онлайн-обучении.

Методология и методы исследования. Для достижения поставленной цели был использован перекрестный опрос. В исследовании приняли участие 56 учащихся начальной школы из сельской местности. Для оценки участия родителей и оценивания школьниками своих знаний по математике авторы использовали анкеты. Между тем результаты тестов в середине семестра использовались для оценки успеваемости учащихся по математике. Ответы на вопросы исследования сообщались с использованием описательного анализа, корреляции, регрессии и t-критерия Стьюдента.

Результаты. По результатам анализа участие родителей с точки зрения как поддержки, так и контроля оказывает существенное влияние на успеваемость по математике. С другой стороны, оценивание школьниками своих знаний по математике и успеваемость положительно значимо влияют друг на друга. Результаты исследования также показывают, что гендерная группа и группа класса в этом исследовании не имели существенных различий по каждой переменной.

Практическая значимость. Это исследование имеет значение для школ, чтобы максимизировать участие родителей в эффективном изучении математики их детьми. Общение между школами, учителями и детьми, в частности, становится критически важным для максимального раскрытия потенциала детей, включая оценивание школьниками своих знаний по математике.

Ключевые слова: COVID-19, домашнее обучение, участие родителей, онлайн-обучение математике, начальная школа, оценивание школьниками своих знаний по математике.

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Introduction

Learning from home has been implemented more than two years after the COVID-19 pandemic spread. At the end of 2021, the Indonesian government has allowed some schools to conduct limited face-to-face learning. However, there are still many students, parents, and schools, who are still cautious about opening their schools and prefer to keep learning from home mixed with learning in class limited to a maximum of 50%.

Several alternatives are carried out by schools in an effort to maximise effective learning from home, from the application of e-learning, online learning, to flipped learning. Massive development and training was carried out to equip teachers and support learning from home. However, empirical evidence shows that students feel uncomfortable with learning from home [1]. Based on experience and observations [1], in addition to having an impact on increasing children's stress, losing their sensitivity to school (learning loss or schooling loss), and other negative impacts on children, learning from home with a long duration has an impact on stress and emotions of parents in controlling and supporting their children's learning. It is especially hard for parents when they

have more than one schoolchild; parents need to deal with difficult disciplines, and to work. This situation is certainly a challenge for parents to communicate effectively and efficiently with their children, teachers, and schools [2].

In the context of learning from home, the role of parents is very important in the success of their children's learning and related to the psychological development of their children. Several studies have revealed that parental involvement in learning mathematics affects attitudes [3–5], engagement [2], and the success of their children in learning mathematics [6–9].

Purnomo and colleagues [2] state, despite having many shortcomings, online learning is able to create a situation where the relationship between students, parents, and the school is increasing in intensity. This situation is positive for the emotional, cognitive, and social development of students. Furthermore, several studies that have been mentioned have empirically proven the effect of parental involvement on students' performance in mathematics. However, these studies are in normal situations and conditions before COVID-19 pandemic, while our research is in the midst of the COVID-19 pandemic which has implications in the way parents involve themselves in learning from home and how it relates to mathematics student's performance.

For two reasons, the terms "learning from home" and "online learning" are used interchangeably in this study. To begin, Indonesian language and culture are more akin to the term "online learning" than to the terms "distance learning" or "e-learning" to represent learning from home. Second, the definition of online learning itself does not have a complete consensus, which only refers to being wholly online, but also related to the media or the context of the technology used [10].

In addition to examining the involvement of parents and student performance in learning mathematics, this study also examines students' self-concept about mathematics. Studies on the relationship between self-concept and parental involvement, including on student performance, have been widely found in the literature [8, 11, 12]. However, in the context of learning mathematics, especially online, these variables are still rarely found [8, 13]. We also want to relate it to gender and grade level, which some researchers [8, 14, 15] draw different conclusions, so it is necessary to justify in the context and sample of our study, and also still rarely found in the context of research in Indonesia.

The purpose of this study is to examine the relationship between parental involvement and student self-concept on student performance in learning mathematics during the COVID-19 period. The following are details of research questions to achieve the research objectives.

1. Is there a significant relationship between parental involvement and students' mathematics performance in learning mathematics from home?

2. Is there a significant relationship between parental involvement and students' self-concept in learning mathematics from home?

3. Is there a significant relationship between students' self-concept in mathematics and students' mathematical performance?

4. Is there a significant difference between parental involvement, self-concept, and students' mathematical performance in terms of gender and grade level of students?

Literature Review

Parental Involvement in Online Mathematics Learning

During the COVID-19 pandemic, the emphasis of research on parental involvement has increased, particularly in their involvement in online learning. Parental involvement is critical for their children's learning progress in cognitive, affective, behavioural, and social aspects. Parental involvement is important in online mathematics learning because students' learning from home require a more significant amount of parental support and control. This is consistent with empirical evidence that parental involvement influences how students engage in online mathematics learning, whether cognitive, affective, or behavioural [2].

There are numerous constructs of parental involvement in the literature [8, 16, 17]. For example, Desforges and Abouchaar [17] summarise parental involvement in parenting, communicating, volunteering, at-home teaching, decision making, and community collaboration. Meanwhile, according to self-determination theory, Dumont and colleagues [18] employ three aspects of parental involvement in homework: control, responsiveness, and structure. Dumont and colleagues [18] focused on negative forms of parental involvement such as pressure, intimacy, and dominance by using control factors. Then there is responsiveness as a form of interpersonal involvement, with a natural approach, while the structure is more of a form of guidance. Silinskas and Kikas take Dumont and colleagues' concept and modify it into two constructs: control and support [8]. In other words, Silinskas and Kikas employ two components from Dumont and colleagues: control and structure [8]. Silinskas and Kikas's framework is used in this study. Although the study focuses on parental involvement in homework, it is compatible with our study, which focuses on learning from home during COVID-19.

Mathematics Self-Concept

Mathematics self-concept is a set of beliefs and attitudes of individuals towards their abilities and competencies in mathematics [8, 13]. Mathematics self-concept is often perceived similar to self-efficacy, but the two are different. Self-concept is more backward-oriented, while self-efficacy is forward-oriented

based on experience. In addition, self-concept is aimed at more general domains, while self-efficacy is aimed at more specific domains and tasks [19].

Silinskas and Kikas's framework [8] is used in this study to assess math self-concept. The items proposed are not only brief but also relatively simple for children to interpret. The three items include students' beliefs and attitudes about their math abilities.

Methods

Context and Participants

This research adopts cross-sectional survey to achieve the research objectives. The participants of this study were 56 students in one elementary school in a rural area of the Kebumen district in the 2020/2021 academic year. There were 22 lower elementary grade students and 34 upper elementary grade students (25 male students and 31 female students) involved in this study. Their age range is 8–11 years.

Instrument and Data Collection

Parental involvement in learning mathematics is measured using a "perceived parental involvement in homework" questionnaire. This questionnaire was adapted from Silinskas and Kikas [8], who developed this instrument based on the Dumont and colleagues' instrument [18]. There are 8 items, which are included in the two factors forming the scale, namely the control factor and the support factor. Details of the statements on this scale can be seen in Table 1. The validity and reliability of this instrument have been tested in two groups, namely in the third grade in 2010 and 2011 with a sample of 379 students and in the sixth grade in 2013 and 2014 with a sample of 512 students, consisting of 249 male students, 263 female students, the reliability is 0.92.

Mathematical self-concept was measured using a short questionnaire which was adapted from Silinskas and Kikas [8]. This questionnaire consists of three items, which explore how students are convinced in their ability in mathematics.

Information about students' mathematical performance data was obtained using the results of their midterm test. This related documentation was obtained from their classroom teachers. Performance scores are in the range 0-100, so the minimum score is 0 and the maximum is 100.

Data Analysis

The two datasets in this study were analysed descriptively in the form of mean, standard deviation, minimum, and maximum scores using SPSS version

24.0. In addition to descriptive statistics, correlation tests and regression tests were used to see the significance of the relationship among the variables. Meanwhile, to address the fourth question, we employed the t-test.

Results

Descriptive Data

In this section, we present descriptive data from the research results that include mean, standard deviation, minimum, and maximum. The summary of descriptive data for each variable can be seen in Table 1.

Table 1

Descriptive data on parental involvement, students' self-concept, and students' performance in learning mathematics

Factor	Mean	SD	Min	Max	Alpha	Skewness		Kurtosis	
						Statistic	SE	Statistic	SE
Control	3.451	0.748	2.96	4.55	0.625	-0.107	0.319	-1.074	0.628
Support	3.161	0.896	2.80	3.34	0.786	0.128	0.319	-0.895	0.628
Math self-concept	2.988	0.711	2.34	3.44	0.525	0.282	0.319	-0.055	0.628
Math performance	78.16	13.300	40	98		-0.761	0.319	0.530	0.628

Based on Table 1, the control variable has a mean of 3.451 (SD = 0.748) which is higher than the support factor of 3.161 (SD = 0.896). Students' mathematical self-concept got a mean of 2.988 (SD = 0.711) and mathematics performance got 78.16 (SD = 13.300) with the lowest score was 40 and the highest was 98.

Cronbach's alpha coefficient for parental involvement was at an adequate level, while the mathematical self-concept was rated as adequate. Table 2 also shows Skewness and Kurtosis data which shows that the data are relatively in a normal distribution with a limit of ±2 [20]. In addition, we also performed a t-test to see a significant difference between the two factors of parental involvement. Although higher, the mean of the control factor was not significantly different from the support factor, with $t(110) = 1.860$, $p > 0.05$. While the average details of each item can be seen in Table 2.

Table 2 shows that the lowest mean for the control variable is 2.96 obtained by item Control3 "When I do mathematics tasks, my parents ask me if I need some help". While the highest mean was obtained by item Control2 "My parents get involved when I do mathematics tasks". In the support factor, the

highest mean is obtained by item Support4, which states that parents help their children in doing mathematics when they have difficulty, while the lowest mean is obtained by item Support2, which is related to the willingness of parents at any time. On the other hand, the mathematical self-concept variable has the lowest average than the others on the Self-concept1 item which states the student's self-position compared to the others.

Table 2

Item means, SD and CICT of parental involvement and mathematics self-concept

Item	Description	Mean	SD	CICT
Parental involvement				
Control1	When I do mathematics tasks, my parents always help me without being asked.	3.018	1.228	0.428
Control2	My parents get involved when I do mathematics tasks.	4.554	0.893	0.291
Control3	When I do mathematics tasks, my parents ask me if I need some help.	2.964	1.159	0.476
Control4	My parents give me opportunity to do mathematics tasks with them.	3.268	1.053	0.435
Support1	My parents help me doing mathematics tasks only when I ask them.	3.232	1.079	0.521
Support2	When I do mathematics tasks, I can ask for my parents' help anytime.	2.804	1.327	0.574
Support3	When I do mathematics tasks, I can ask for my parents' help when I find something confusing.	3.268	1.120	0.651
Support4	My parents help me doing mathematics tasks if I have trouble.	3.339	1.049	0.648
Mathematics self-concept				
Self-concept1	I do well in mathematics compared to my classmates.	2.34	1.032	0.226
Self-concept2	I am capable in mathematics.	3.34	0.959	0.303
Self-concept3	I am good at mathematics.	3.29	0.986	0.509

The Effect of Parental Involvement and Mathematics Self-Concept on Mathematical Performance

In this section, the results of hypothesis testing are presented to determine the effect of control and support factors on the variables of parental assistance, mathematics self-concept and gender on mathematical performance. This calculation uses simple regression analysis, which previously also displayed the

results of the Pearson correlation test. The results of the correlation analysis can be seen in Table 3, while the results of the regression analysis can be seen in Table 4. Both analyses used SPSS version 24.0.

Table 3

Summary of Pearson product correlation analysis results

	Control	Support	Math self-concept	Math performance
Control	1	0.739**	0.309*	0.757**
Support		1	0.258	0.715**
Math self-concept			1	0.593**
Math performance				1
**. Correlation is significant at the 0.01 level (2-tailed).				
*. Correlation is significant at the 0.05 level (2-tailed).				

Based on Table 3, the correlation value of the control factor to other variables is significant, as well as the strongest than the other variables, namely 0.739, 0.309, and 0.757 to be paired with the support factor, math self-concept and math performance respectively. This is followed by a significant support factor for math performance, but not for math self-concept. Meanwhile, math self-concept has a significant relationship with math performance. Only the gender variable did not have a significant relationship to each variable.

Table 4

Summary of the results of the regression analysis

Predictor	Math performance			Math self-concept			Control			Support		
	B	SE B	β	B	SE B	β	B	SE B	β	B	SE B	β
Control	7.13	1.82	0.40**	-0.20	0.17	-0.21	–	–	–	–	–	–
Support	4.73	1.49	0.32**	-0.20	0.13	-0.26	–	–	–	–	–	–
Math self-concept	7.25	1.34	0.39**	–	–	–	-0.23	0.11	-0.22*	-0.32	0.14	-0.26*
Math performance	–	–	–	0.05	0.01	0.93**	0.05	0.01	0.88**	0.06	0.01	0.87**
*. Regression is significant at the 0.05 level (2-tailed).												
**. Regression is significant at the 0.01 level (2-tailed).												

As summarised in the results of the analysis in Table 4, the control factor is also the most powerful factor influencing mathematical performance ($\beta = 0.401$, $p < 0.01$), followed by math self-concept ($\beta = 0.387$, $p < 0.01$) and support ($\beta = 0.319$, $p < 0.01$). Meanwhile, gender does not have a significant

effect on mathematical performance. On the other hand, none of the control, support, gender factors had a significant influence on students' self-concept of mathematics. However, the mathematical performance factor had a significant effect on mathematics self-concept (β = 0.934, p < 0.01).

Table 4 also shows that mathematics self-concept affects the way parents are involved in learning mathematics in both control (β = -0.215, p < 0.05) and support (β = -0.257, p < 0.05). In other words, the higher the mathematics self-concept is, the lower the parental control and support is, and vice versa. On the other hand, mathematics performance is unidirectional in predicting the way parents are involved in learning mathematics. Students with low performance find low parental control and support and vice versa.

Gender and Grade Level in Parental Involvement, Math Self-Concept, and Math Performance

We also examined gender group differences as well as grade level group differences in each of the variables. The summary of the results of the analysis can be seen in Table 5 and Table 6.

Table 5

Differences in gender groups in each variable

	Gender	N	Mean	SD	*T*
Math performance	Female	31	79.29	13.442	t (54) = 0.704, p = 0.484
	Male	25	76.76	13.261	
Control	Female	31	3.524	0.708	t (54) = 0.814, p = 0.419
	Male	25	3.360	0.801	
Support	Female	31	3.202	0.912	t (54) = 0.377, p = 0.707
	Male	25	3.110	0.893	
Math self-concept	Female	31	3.065	0.540	t (54) = 0.851, p = 0.400
	Male	25	2.893	0.880	

Table 6

Differences in class level groups in each variable

	Grade	N	Mean	SD	T
Math performance	Lower	22	78.23	14.771	t (54) = 0.030, p = 0.976
	Upper	34	78.12	12.489	
Control	Lower	22	3.375	0.680	t (54) = -0.607, p = 0.546
	Upper	34	3.500	0.795	
Support	Lower	22	3.136	0.875	t (54) = -0.162, p = 0.872
	Upper	34	3.177	0.922	
Math self-concept	Lower	22	3.046	0.758	t (54) = 0.483, p = 0.631
	Upper	34	2.951	0.687	

Based on Table 5, it can be seen that the male group has a higher math self-concept than the female group; however, the p-value shows that the difference is not statistically significant. The same finding in the gender group for each variable also did not have a significant difference. This is indicated by the p-values, which are all more than 0.05.

The same finding occurred in the class level group, which did not differ significantly between each variable. These findings are shown in Table 6. Visually, on the mathematics self-concept variable, high grade students do better than lower grade students, but unfortunately this is not statistically significant.

Discussion

This study aimed to examine the relationship between parental involvement, mathematics self-concept, and students' mathematics performance. This study also examined each of these variables based on gender and class groups.

The first finding of this study indicates that there is a significant influence of parental control factors on students' mathematics performance during this pandemic. Correspondingly, the support factor also has a significant influence on mathematics performance (see Table 4). Although the control factor is higher than the support factor, the two are not significantly different.

The role of parental involvement that has a positive and significant effect on student performance is in line with some previous relevant research [21, 22]. Purnomo and colleagues [2] stated that learning from home forces parents to be involved in their children's learning, especially their supervision of their children's work. This is indicated by student statements, saying that their parents are often involved when they do mathematics. Of course, this is an important part of the way parents help their children do mathematics. Teachers, schools, students and parents need to be aware that the orientation of the tasks/activities of learning mathematics at home needs to be directed not only to the results of their children's work, but to focus on how the interactions between parents and children and their teachers are meaningful. A meaningful approach in this context is to emphasise how students do not just finish work, get satisfactory results, but how students build mathematical concepts guided by their parents. Teachers need to bridge their tasks in that direction.

Parental control and support in online learning tend to include preparation for learning, behaviour during learning and how to interact with friends, teachers, and parents themselves. Thus, children, who are controlled and supported by their parents, are proportionally more likely to follow the learning process regularly and play an active role in interacting and discussing in online math learning activities [2]. Regarding the second finding, our study found that there was insufficient evidence for parental involvement to significantly influence

students' mathematical self-concept, both for support and control factors. This study contradicts the results of research by Silinskas and Kikas [8], which shows that parental control can inhibit mathematical self-concept abilities, especially boys. But on the other hand, study by Silinskas and Kikas [8] also shows that low self-concept in mathematics is predicted to increase parental control, which in turn is associated with low math performance. Our findings also state that the lower the mathematics self-concept is, the higher the parental supervision (and support) is, and vice versa. Our findings tend to be more adapted to the context of online learning, which is not only in the form of support, but also supervision to follow learning and the accompanying tasks.

Consistent with our hypothesis, the findings of this study suggest that mathematics self-concept and mathematics performance have a significant effect on each other during this pandemic. This reciprocal relationship can also be found in the study by Arens et al. [19], who found that the mathematics self-concept of 3,209 German secondary school students was influenced by their mathematical performance. Likewise, their mathematical self-concept has a significant relationship to mathematical performance. This reciprocal relationship is also strengthened by Lee and Kung's study on a sample of more than 1000 junior high school students in Taiwan [15].

The gender group and grade level group in our study did not have significant differences for each variable: math performance, support factor, control factor, and math self-concept. Regarding parental involvement, there was no difference in treatment between girls and boys in terms of parental support and control in online mathematics learning. This finding is reasonable because the role of parents in their child's learning is focused on how the task is completed; moreover, it does not depend on the gender of their child and their grade level. We also highlight findings related to mathematics self-concept, which states that there are no differences between gender groups and grade levels. No difference in mathematics performance between gender and grade levels may be a consequence of no group difference in mathematics self-concept [23]. This finding contradicts previous studies, such as Erdogan and Sengul [14], who found that both gender and grade level groups differed significantly from their mathematics self-concept, as well as other studies [15, 23], which found that the male group had higher self-concept mathematics than the female group.

Conclusion

This study identified several findings related to the research question posed. First, parental involvement has a significant effect on mathematics performance, both support factors and parental control factors. However, neither significantly

affected students' mathematics self-concept; this is our second finding. On the other hand, their self-concept influences the way parents involve themselves in their children's mathematics learning. Third, this study identifies that students' mathematics self-concept significantly affects students mathematics performance. Finally, in both gender and grade level group categories, each did not have significant differences in mathematics performance, self-concept, and parental involvement.

Based on our findings, it is important to focus on how to provide opportunities for parents to be effectively involved in learning mathematics, especially in the context of our study when learning is online and students have low math self-concepts. Parents should be maximal in their involvement, both in the aspects of support and control as well as in cognitive, affective, social, and even pedagogical formats, so that their child's math self-concept and math performance improve. Schools can bridge by building frequent communication between teachers, students, parents, and the school. Building a model of communication between them is also a potential study for future researchers so that student learning success can be encouraged by all involved. Apart from that, we acknowledge that our sample is small and based on only one characteristic of the sample being in rural areas. Therefore, to increase diversity and generalisability, further researchers can use surveys with a more diverse sample both from geographic location, culture, and relevant characteristics.

References

1. Purnomo Y. W., Salsabila J. L., Nafisah A., Rahmawati R. D., Mawaddah F. Pembelajaran Matematika Secara Daring Membosankan Bagi Siswa Sekolah Dasar: Studi Self-Report Siswa. *AKSIOMA: Jurnal Program Studi Pendidikan Matematika* [Internet]. 2021 Oct 01 [cited 2022 Jan 15]; 10 (3): 1351–1359. Available from: https://ojs.fkip.ummetro.ac.id/index.php/matematika/article/view/3533 (In Indonesian)

2. Purnomo Y. W., Safitri E., Rohmah N., Rahmawati R. D., Abbas N. Parental involvement in online mathematics learning: Examining student report and links with engagement. *The New Educational Review* [Internet]. 2021 [cited 2022 Jan 15]; 66 (4): 120–130. Available from: https://tner.polsl.pl/e66/a10.pdf

3. Cui Y., Zhang D., Leung F. K. S. The influence of parental educational involvement in early childhood on 4th grade students' mathematics achievement. *Early Education and Development.* 2021; 32 (1): 113–133.

4. Silver A. M., Elliott L., Libertus M. E. When beliefs matter most: Examining children's math achievement in the context of parental math anxiety. *Journal of Experimental Child Psychology* [Internet]. 2021 Jan 01 [cited 2022 Jan 15]; 201: 104992. Available from: https://linkinghub.elsevier.com/retrieve/pii/S002209652030446X

5. Wilder S. Parental involvement in mathematics: Giving parents a voice. *Education 3-13.* 2017; 45 (1): 104–121.

6. Jay T., Rose J., Simmons B. Finding "Mathematics": Parents questioning school-centered approaches to involvement in children's mathematics learning. *School Community Journal* [Internet]. 2017 [cited 2022 Jan 15]; 27 (1): 201–230. Available from: http://www.schoolcommunitynetwork.org/SCJ.aspx

7. Jay T., Rose J., Simmons B. Why is parental involvement in children's mathematics learning hard? Parental perspectives on their role supporting children's learning. *SAGE Open.* 2018; 8 (2). DOI: 0000-0003-4759-9543

8. Silinskas G., Kikas E. Parental involvement in math homework: Links to children's performance and motivation. *Scandinavian Journal of Educational Research.* 2019 Jan 02; 63 (1): 17–37. DOI: 10.1080/00313831.2017.1324901

9. Zhou S., Zhou W., Traynor A. Parent and teacher homework involvement and their associations with students' homework disaffection and mathematics achievement. *Learning and Individual Differences.* 2020: 77: 101780. DOI: 10.1016/j.lindif.2019.101780

10. Moore J. L., Dickson-Deane C., Galyen K. E-Learning, online learning, and distance learning environments: Are they the same? *The Internet and Higher Education* [Internet]. 2011 Mar [cited 2022 Jan 15]; 14 (2): 129–135. Available from: https://linkinghub.elsevier.com/retrieve/pii/S1096751610000886

11. Chonge H. M., Barasa P. N., Chonge B. M. Influence of parenting styles and self-concept on students' achievement in mathematics: A case study of Kaplamai Divison, Trans Nzoia County, Kenya. *International Journal of Scientific Research and Innovative Technology* [Internet]. 2016 [cited 2022 Jan 15]; 3 (3): 2313–3759. Available from: https://www.researchgate.net/publication/302951166

12. Hung C. Family background, parental involvement and environmental influences on Taiwanese children. *Alberta Journal of Educational Research.* 2005; 51 (3): 261–276.

13. Bringula R., Reguyal J. J., Tan D. D., Ulfa S. Mathematics self-concept and challenges of learners in an online learning environment during COVID-19 pandemic. *Smart Learning Environments* [Internet]. 2021 Dec 16 [cited 2022 Jan 15]; 8 (1): 22. Available from: https://slejournal.springeropen.com/articles/10.1186/s40561-021-00168-5

14. Erdogan F., Sengul S. A study on the elementary school students' mathematics self concept. *Procedia – Social and Behavioral Sciences* [Internet]. 2014 Oct [cited 2022 Jan 15]; 152: 596–601. Available from: https://linkinghub.elsevier.com/retrieve/pii/S1877042814053166

15. Lee C. Y., Kung H. Y. Math self-concept and mathematics achievement: Examining gender variation and reciprocal relations among junior high school students in Taiwan. *Eurasia Journal of Mathematics, Science and Technology Education* [Internet]. 2018 Jan 10 [cited 2022 Jan 15]; 14 (4): 1239–1252. Available from: https://www.ejmste.com/article/math-self-concept-and-mathematics-achievement-examining-gender-variation-and-reciprocal-relations-5340

16. Panaoura R. Parental involvement in children's mathematics learning before and during the period of the COVID-19. *Social Education Research.* 2021; 2 (1): 65–74.

17. Desforges C., Abouchaar A. the impact of parental involvement, parental support and family education on pupil achievements and adjustment: A literature review [Internet]. Vol. 433. Nottingham; 2003 [cited 2022 Jan 15]. Available from: http://bgfl.org/bgfl/custom/files_uploaded/uploaded_resources/18617/Desforges.pdf

18. Dumont H., Trautwein U., Nagy G., Nagengast B. Quality of parental homework involvement: Predictors and reciprocal relations with academic functioning in the reading domain. *Journal of Educational Psychology.* 2014 Feb; 106 (1): 144–161.

19. Arens A. K., Frenzel A. C., Goetz T. Self-concept and self-efficacy in math: Longitudinal interrelations and reciprocal linkages with achievement. *The Journal of Experimental Education* [Internet]. 2020 Jul 08 [cited 2022 Jan 15]; 1–19. Available from: https://www.tandfonline.com/doi/full/10.1080/00220973.2020.1786347

20. Pituch K. A., Stevens J. P. Applied multivariate statistics for the social sciences. 6th edition. London, United Kingdom: Taylor & Francis Ltd; 2016. 814 p.

21. Huang F., Huang Z., Li Z., Zhang M. Relationship between parental involvement and mathematics achievement of Chinese early adolescents: Multiple mediating roles of mental health and mathematics self-efficacy. *International Journal of Environmental Research and Public Health* [Internet]. 2021 Sep 10 [cited 2022 Jan 15]; 18 (18): 9565. Available from: https://www.mdpi.com/1660-4601/18/18/9565

22. Liu Y., Leighton J. P. Parental self-efficacy in helping children succeed in school favors math achievement. *Frontiers in Education* [Internet]. 2021 Mar 25 [cited 2022 Jan 15]; 6. Available from: https://www.frontiersin.org/articles/10.3389/feduc.2021.657722/full

23. Mejía-Rodríguez A. M., Luyten H., Meelissen M. R. M. Gender differences in mathematics self-concept across the world: An exploration of student and parent data of TIMSS 2015. *International Journal of Science and Mathematics Education.* 2021 Aug 01; 19 (6): 1229–1250.

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