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Parental Involvement in Online Mathematics Learning: Examining Student Report and Links with Engagement

DOI: 10.15804/tner.2021.66.4.10

Abstract

In learning mathematics online, parental involvement and student engagement are very crucial for student learning development. Therefore, the purpose of this study was to examine the relationship between parental involvement and student engagement in online mathematics learning. The participants of this study were 251 students in fourth and fifth grade from five elementary schools in Bantul, Yogyakarta, Indonesia. This study employed a cross-sectional survey to achieve the research objectives. The research instruments used in this study were two sets of questionnaires: on parental involvement and student engagement adapted from previous research. This study's findings indicated a significant relationship between parental involvement and student engagement in the online mathematics learning. The need to maximize the role of parents in learning mathematics online is the key to success in bringing students to be actively involved cognitively, socially, and emotionally.

Key words: *parental involvement, student engagement, online mathematics learning, elementary school, COVID-19*

Introduction

The COVID-19 pandemic has spread across the globe, including Indonesia, where the outbreak of COVID-19 continues to increase in various regions. The government has implemented various policies to suppress the spread of COVID-19. These policies have had a significant impact on various areas of life, including education. One of the impacts on the education sectors is that learning has to be conducted online, as implementation of traditional learning has been rendered almost impossible. Online learning in this context is learning in an online setting using an internet connection without face-to-face interaction in the physical classroom. Online learning may not be effective if it relies only on the knowledge and teaching skills of teachers. It requires the active role of both parents and their children.

Online learning can help parents strengthen their role as their children's first teachers. Parental involvement takes various forms, including providing support and control of learning activities, becoming the primary source of learning for children, or acting as a substitute teacher during learning activities from home. The parents' involvement in their children's learning is one of the most important factors to promote their children's learning success (Cui et al., 2021; Mo & Singh, 2008; Silinskas & Kikas, 2019) children completed math tests, evaluated own math self-concept, and their mothers (n = 420). This is indeed very challenging for parents in terms of having to allocate time in their busy schedule, and having the appropriate attitude, knowledge and skills in supporting their children's learning. Mathematics is a subject that is both difficult to teach and learn in the classroom, let alone via online platform. The inability to embrace these challenges would definitely limit parents' involvement in supporting their children's learning Mathematics online.

Apart from parental involvement, student engagement while learning mathematics online needs to be considered as well. A large amount of literature reveals that many researchers, practitioners, and policymakers focus on increasing student engagement (Bobis et al., 2016; Fredricks et al., 2004; Watt & Goos, 2017). Several studies have also provided empirical evidence of a strong correlation between students mathematics engagement and their achievement (Fung et al., 2018; Robinson & Mueller, 2014). However, student engagement in online mathematics learning may be more challenging and requires an approach that is different from the traditional one.

Present study

Several researchers (e.g., Din et al., 2016; Fan & Williams, 2010; Mireles-Rios & Romo, 2010; Yuen & Cheung, 2014) have examined the relationship between parental involvement, student engagement and achievements. Din et al. (2016) studied the relationship between parental involvement, peer support, and mathematics engagement among middle school students in Malaysia. Their findings revealed a strong relationship between parental involvement and peer support on students' mathematics engagement. In another study, Mireles-Rios and Romo (2010) have investigated how children perceive their parents and their interactions with teachers; these variables are associated with girls' scores in mathematics and reading as well as how much they like these academic subjects. In summary, the results showed that elementary school Latina girls received messages from mothers and teachers about education that positively affected their academic performance and engagement in mathematics and reading subjects. However, there is still a dearth of studies relating to parental involvement and student engagement in online mathematics learning in the context of elementary schools. In this context, there is a need to know the forms of parental involvement and the ways to effectively engage students emotionally, socially and cognitively. Therefore, this study focused on examining involvement of parents and engagement of students in online mathematics learning. The question that guided this research was: what is the relationship between parental involvement and student engagement in online mathematics learning?

Methodology of Research

The research method applied in this study was a cross-sectional survey. Due to the Covid-19 pandemic, data collection was carried out via online questionnaire using Google Forms, which were distributed to students via class WhatsApp Groups with the intermediary of their respective class teachers.

Sample of Research

The participants in this study were fourth and fifth graders at five elementary schools in Bantul, Yogyakarta, Indonesia. Participants were selected using a convenience sampling technique where the researcher directly specified the research subjects. The total research participants were 251 students with age ranging from 9 to 13 years. They consisted of 43.4% male and 56.6% female. The highest level of

education of 83.6% of their parents was a high school diploma, while 55.8% were housewives.

Instrument and Procedures

The research instruments consisted of two sets of questionnaires: one related to parental involvement and the other to student engagement during online mathematics learning. Both instruments used a 4-point Likert scale from Strongly Agree, Agree, Disagree, Strongly Disagree with a score range of 1-4. The parental involvement questionnaire was adapted from a study by Silinskas and Kikas (2017) on the perceived parental homework involvement during math homework questionnaire. This questionnaire consists of 2 factors, namely support and control, that have been developed from previous research (Dumont et al., 2014). This questionnaire asks students how their parents help them with their homework. However, in our research, we used a more general context to help learn mathematics from home. There were eight adapted items, four were control factors, and the other four were supporting factors. Each had an adequate reliability coefficient of 0.79 and 0.74, respectively. The second questionnaire was a questionnaire on student engagement in online mathematics learning. This questionnaire was adapted from Rimm-Kaufman et al. (2015). This questionnaire consisted of 13 items, five of which were on emotional engagement, four on cognitive engagement, and another four on social engagement. We adapted it in the context of online mathematics learning. Previously this questionnaire was tested with adequate reliability coefficients for cognitive engagement, emotional engagement, and social engagement of 0.78, 0.91, and 0.74, respectively.

Data Analysis

The data that had been collected was analyzed using Microsoft Excel and SPSS 23. The first and second questions were analyzed using descriptive statistics, including mean, standard deviation, and additional information related to the correlation between factors in one construct and the reliability coefficient in each factor. Reliability was analyzed using the SPSS application with Cronbach's alpha formula. A correlation test using Pearson Product Moment, which previously met the analysis prerequisites, was carried out on the variables of parental involvement and student engagement, including between the components between the two. In addition to correlation, we also used multiple regression to see the effect of parental involvement on students' engagement in online mathematics classes.

Results of Research

Descriptive Data of Parental Involvement and Student Engagement

The descriptive data and correlation for parental involvement and student engagement are shown in Table 1. There is no missing value in this data. Table 1 also shows the reliability coefficients for the two scales as well as the components within them. Both scales, namely parental involvement, obtained a coefficient of 0.852 and the student engagement scale obtained 0.828, which means that both are at an adequate level. Each factor on parental involvement obtained 0.743 and 0.823 for control and support factors, respectively. For factors in student engagement, we obtained 0.828 for social factors, 0.738 for cognitive factors, and 0.642 for emotional factors. Thus, each of these factors obtained a relatively adequate reliability coefficient.

Table 1. Descriptive Statistics and Correlation among Variables

Factor	1	2	3	4	5
Parental involvement					
1. Control	-				
2. Support	0.643**	-			
Student engagement					
3. Cognitive	0.066	0.154*	-		
4. Social	0.294**	0.277**	0.252**	-	
5. Emotional	0.105	0.190**	0.791**	0.276**	-
α	0.743	0.823	0.738	0.828	0.642
M	3.023	3.248	3.008	2.788	2.843
SD	0.638	0.562	0.617	0.731	0.579

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

* . Correlation is significant at the 0.05 level (2-tailed)

Table 1 shows that the parental control factor obtained a mean of 3.023, with a standard deviation of 0.638, while the support factor obtained an average of 3.248 and a standard deviation of 0.562. In other words, the mean obtained by the support factor was higher than the control factor. We assume that parents tend to have high sensitivity verbally to ensure and encourage their children to continue focussing on their learning, but their control aspect was relatively low on their children's learning. In student engagement factors, the cognitive factor obtained

a mean of 3.008 with a standard deviation of 0.617. This mean score was the highest of all other factors. Emotional factors obtained an average of 2.843 with a standard deviation of 0.579, followed by an average of 2.788 for social factors with a standard deviation of 0.731. Social engagement was the lowest because online mathematics learning would rarely give them the opportunity to discuss and construct concepts from their environment.

Table 1 also shows a significant positive correlation ($p < 0.01$) between aspects of parental control and aspects of parental support of 0.643. The correlation among student engagement factors was also significant at the 1% level, with the highest correlation obtained by cognitive and emotional factors.

As indicated in Table 1, the support factor was significantly correlated with each of the three factors of student engagement: cognitive engagement ($r = 0.154, p < 0.05$), social engagement ($r = 0.277, p < 0.01$), and emotional engagement ($r = 0.190, p < 0.01$). While the control factor was only significantly correlated with the social engagement factor of students ($r = 0.294, p < 0.01$). On the other hand, only social engagement factor was significantly correlated with each parental involvement factor. In addition to the information in Table 1, the correlation between the total score of parental involvement and student engagement was also significant ($r = 0.257, p < 0.01$).

Results on multiple regression on parental involvement and students’ engagement

The relationship between parental involvement and student engagement was studied further by looking at the effect. Table 2 shows the results of multiple regression with parental involvement and its factors as predictors.

Table 2. Results of multiple regressions of parental involvement on student engagement

Predictor	Cognitive			Social			Emotional		
	B	SE B	β	B	SE B	β	B	SE B	β
Control	-0.055	0.079	-0.057	0.227	0.090	0.198**	-0.027	0.074	-0.029
Support	0.210	0.090	0.191**	0.195	0.102	0.150*	0.215	0.084	0.209***
All (student engagement)									
All (Parental Involvement)	0.238	0.057	0.257****						

Note: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$, **** $p < 0.001$

As shown in Table 2, the overall score of parental involvement had a significant effect on student engagement ($\beta = 0.257, p < 0.001$). Then, the support factor had an effect on all student engagement factors and the strongest was on emotional engagement ($\beta = 0.209, p < 0.01$), followed by cognitive engagement ($\beta = 0.191, p < 0.05$), and social engagement ($\beta = 0.150, p < 0.1$). Meanwhile, the parental control factor only had a significant effect on students' social engagement ($\beta = 0.198, p < 0.05$).

Discussion

This study aims to explore the relationship between parental involvement and student engagement in online mathematics learning. There are four important points in the findings of our study. First, parents' involvement had a significant relationship and influence on their students' engagement in online learning of mathematics. Second, the cognitive engagement factor of students was significantly and strongly related to emotional engagement. Third, students' social engagement was significantly related to parental control and support for learning. Finally, the factor of parental support seemed to be more needed in the case of online mathematics learning in all of the cognitive, social, and emotional engagement.

The first point of the findings of this study indicates that learning mathematics online from home can be seen positively as an effort to strengthen parent-child relationships. Ceka and Murati (2016) stated that family, especially mother, is first teacher at home. Normally before the pandemic, parents' role would be to teach their children basic attitudes and skills. However, during the pandemic, their roles have increased significantly in different ways such as to be their children's companion in their academic education. The care, acceptance, understanding, attention, and guidance shown by the parents are very meaningful for their children's education. With the involvement of parents, students become more controlled and have the drive to achieve better mathematics learning achievements. This finding also concurred with previous studies (e.g., Deslandes & Barma, 2016; Gonida & Cortina, 2014) that parental involvement positively affects student development and success.

Optimal learning achievement is also supported by active student engagement in learning activities (Fung et al., 2018). Student engagement is a multifaceted construct that includes behavioral, cognitive, and emotional components (Fredricks et al., 2004). The social aspect refers to the behaviors and actions taken directly by students. The cognitive aspect shows the cognitive quality and students' learning

strategies towards mathematics learning tasks. The emotional aspect describes a sense of ownership, interest, perception of learning, reactions to teachers, friends, and learning activities (Fredricks et al., 2004; Wang & Holcombe, 2010). Regarding the second point of our research findings, students' cognitive engagement is strongly related to emotional engagement. Findings similar to Rimm-Kaufman et al. (2015) show a strong correlation between the two. It is very relevant to relate this relationship such as the relationship between students' motivation and mathematical performance. This emotional engagement describes positive emotions in the learning process and in the task of learning mathematics. This indicates that when students feel interested, happy, and enthusiastic when participating in academic activities, they will be able to understand and try to master what they are learning in mathematics.

Regarding the third finding, students' social engagement factors were related to parental control and support in learning at home. The control aspect carried out by parents is a subsystem related to the interaction of parents and their children, which encompasses the role of protecting, raising, and disciplining children (National Academies of Sciences Engineering and Medicine, 2016). Parental control and support in online learning tend to include preparation for learning, behavior during the learning and ways to interact with friends, teachers, and their own parents. 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 mathematics learning activities.

In our findings, the parental involvement factor that students preferred is the parental support factor. Parents can provide support by guiding and motivating children to stay enthusiastic in carrying out online mathematics learning activities. Basically, children have the motivation to do something if they obtain support from the closest people, such as their parents. According to Sarafino and Smith (2011), parental support is an interpersonal transaction. The parental support is in the form of emotional support (attention and affection), appreciation support (appreciating and providing positive feedback), informational support (suggestions, advice, information), and instrumental support (labor, money, and time). The existence of these four types of parental support will foster enthusiasm and interest in learning in children.

Conclusions

This study concludes that there is a significant effect of parental involvement on student engagement in online mathematics learning. The findings of this study also indicated that parental support is more desirable in online mathematics learning and affects student engagement in all of the emotional, social and cognitive aspects.

The findings of this study indicated the importance of optimizing programs to accommodate and provide opportunities for mutualistic relationships between schools, parents, and students. These programs certainly need to consider a number of aspects, especially the parental aspect. This is because of the diversities among parents in terms of their knowledge, perceptions, efforts, and practices in raising their children. Moreover, parents have different working schedules, socio-economic statuses, education levels, and other factors.

Jay et al. (2018) stated that if schools were to be successful in increasing the levels of parental involvement in their children's learning, it would be paramount to gain an insight on parents' construction of their roles. On the one hand, parents are more likely to respond positively to strategies that align with their conceptions. On the other hand, if the desired strategy is not in line with the existing parental conception, then it is crucial to develop a new strategy. Therefore, future direction on how parents conceptualize the learning of mathematics is recommended, including dealing with the online learning of mathematics, and the parents' psychological readiness in handling their children's learning.

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