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The Role of Self-Regulated Learning and Student Engagement in Academic Activities towards Math Achievement

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ABSTRACT

This research aims to empirically examine the role of self-regulated learning and student engagement in academic activities in math achievement. The research design used was a correlational survey. The subjects were students at Madrasah Aliyah Negeri in Yogyakarta. The research sample was selected using a proportional stratified random sampling technique with 96 students. Math achievement was determined from students' daily evaluations, and data were collected using a self-regulated learning scale and a scale of student engagement in academic activities. Data were analyzed using multiple regression analysis. According to the findings, self-regulated learning and student engagement in academic activities significantly predicted math achievement. Both self-regulated learning and student engagement in academic activities positively influenced math achievement. The combined contribution of self-regulated learning and student academic engagement to mathematics achievement was 37.1%. Self-regulated learning contributed more (17.39%) than academic engagement (19.77%) to mathematics achievement. This study recommends that students, teachers, and parents pay attention to self-regulated learning and student engagement factors.

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INTRODUCTION

Education is a means to guide individuals toward gradually improving their skills and knowledge. According to Indonesian Law No. 20 of 2003 in Chapter I, "Education is a conscious and planned effort for learning and learning so that participants actively develop their potential to have religious, spiritual strength, self-control, personality, intelligence, noble character, and skills that are needed by individuals, society, the nation, and the state" (National Education System Law, 2009). Education is also highly valued for producing superior and high-quality future generations.

A perfect education can be seen through the students' research abilities. Kpolovie et al. (2014) defined performance as the ability of students to learn by remembering facts and effectively communicating their knowledge through writing and speaking, even while studying. Performance is measured by cognitive, affective, and psychomotor abilities after students have undergone a series of learning processes, which are assessed through relevant instruments or midterm and end-of-semester exams, with results provided by the teacher (Rosyid et al., 2019; Syafi'i et al., 2018).

Students' cognitive performance is measured in various ways, including written and oral tests, which can be categorized into five levels: knowledge, understanding, application, analysis, and synthesis (Syah, 2001; Syaodih, 1996). According to Syah (2004), the affective measurement of students' perceptions can be observed through persuasion, interest, emotion, or refusal towards a subject, as well as appreciation (attitudes), internalization (deepening), and characterization (understanding). Psychomotor learning is measured through movements that lead to complex skills, such as drawing, assembling, disassembling, and using tools. This research focuses on cognitive learning.

Students face various challenges and expectations of achievement, both academic and non-academic. Some students see these demands and expectations as motivation, while others struggle with learning and achieving the minimum standards set (Suci, 2016). It applies to students at all levels who may still fall short of the expectations set by the school, their parents, and even themselves. One area where achievement is particularly low at the bachelor's level is mathematics. According to Prastyo (2020), Indonesian students' performance in mathematics is still quite poor, with most only being able to solve simple math problems, as seen from a survey conducted by PISA (Programme for International Student Assessment) in 2018, which ranked Indonesia 73rd in reading, 70th in science, and 72nd in mathematics out of 78 countries (OECD, 2018). The latest PISA scores for 2022 were not available at the time of this study.

Additionally, the 2015 TIMSS (Trends in International Mathematics and Science Study) data report showed that Indonesia ranked 44th out of 49 countries in mathematics. Unfortunately, TIMSS data 2019 is unavailable as Indonesia did not participate in the survey. Research on mathematical achievement is important because it is a key factor for success in academics and other areas of life. It is

closely tied to success in fields requiring logical and axiomatic reasoning, which involves making conjectures, creating models, drawing analogies, and generalizing through observation (Claessens & Engel, 2013; Sumarmo, 2013). Logical thinking is crucial for individuals in academic settings and their social lives when making decisions, drawing conclusions, and solving problems they encounter.

The important role of mathematics also affects other fields, such as geography, physics, chemistry, statistics, economics, and others. Mathematical concepts derive formulas for studied subjects (Karim, 2011). According to Baroody (1993), there are two important reasons for learning mathematics: mathematics as a language and mathematics learning as a social activity. Mathematics is not just a tool for thinking, finding patterns, drawing conclusions, or solving problems. It is also an invaluable tool for communicating various ideas precisely and succinctly.

Additionally, mathematics serves as a vehicle for student interaction and a communication tool between teachers and students. Sumarmo (2005) stated that mathematical skills are essential to meet students' current and future needs. These skills include understanding the concepts needed to solve mathematical and other science problems and the reasoning abilities needed in society. Mathematically proficient individuals can utilize their knowledge in various contexts to solve complex problems (Martineau, 2017). Researchers conducted preliminary observations on April 6, 2021, at a high school (SMA) in Yogyakarta showed that students had low mathematics achievement. The intended mathematical achievements have not reached the minimum completeness criteria. Specifically, four students scored below 50, five students scored between 51 and 65, eight students scored between 66 and 75, and 16 other students scored 75 and above. Mathematics learning data in this study were obtained at MAN 1 Yogyakarta through the results of the students' year-end assessments. Five students scored below 40, seven scored below 50, 19 scored below 75, and two scored 75 and above. These results indicated that some students still had low achievement in learning mathematics.

Setiana (2016) mentioned several factors influencing student learning: intelligence (intellectual), attention, interest, talent, motivation, maturity, and readiness. Andri et al. (2017) stated that student achievement in mathematics is influenced by school facilities, family, student psychology, student abilities, student interaction, electronic media, and student discipline. The factors that affect learning achievement are observed in student learning management, such as being diligent in learning, having a study schedule, completing assignments, and maintaining discipline in learning (Sulasmi, 2019).

Based on the previous explanation, several factors influence student achievement. In this study, self-regulation in learning was one factor that significantly affected mathematics achievement. Wiguna et al. (2019) suggested that the ability to self-regulate learning is a key factor in determining student

achievement.

Self-regulation in learning refers to effectively using learning strategies and knowing when and how to apply them (Slavin, 2011). Zimmerman (2012) defined self-regulated learning as the process in which individuals independently regulate their learning by setting goals, planning, and achieving them. Self-regulation in learning encompasses various aspects, such as metacognition, motivation, and behavior, in any learning context, whether online, blended, or face-to-face (Zimmerman, 1989; 2008). According to Zimmerman (2008), there are three key aspects of self-regulation in learning: metacognition (planning, goal-setting, and evaluating tasks), motivation (belief and enthusiasm for completing tasks), and behavior (choosing, organizing, and creating an optimal learning environment). Barnard et al. (2009) further developed six dimensions of self-regulated learning, including goal setting, environment structuring, task strategies, time management, seeking help, and self-evaluation. For this study, the dimensions developed by Barnard et al. (2009) are utilized to assess students' self-regulation skills in learning.

Many previous researchers have studied the relationship between self-regulated learning and mathematics achievement. Alsa (2006) showed a significant positive correlation ($r = 0.228$; $p < 0.05$) between metacognitive regulation (an aspect of self-regulation in learning) and mathematics achievement in three public high schools in the city of Yogyakarta. Khalik and Alsa (2015), from their research at SMK 'X' in Situbondo, found that self-regulation in learning and social support jointly contributed to mathematics achievement (F regression = 70.161 with $p < 0.01$), with a partial correlation coefficient of $r = 0.151$ between regulation in learning and math achievement. Furthermore, Anas and Alsa (2016), who researched grade 8 students of SMP Negeri 10 Yogyakarta, also found a significant positive correlation ($r = 0.361$, $p < 0.01$) between regulation in learning and mathematics learning achievement. Wibowo (2018) also found that self-regulation positively affects mathematics learning achievement.

Certain knowledge and skills are considered to optimize performance in specific subjects, but self-regulation skills can impact student achievement in any subject (Ormrod, 2008). Self-regulation in learning helps students achieve success in the learning process (Zimmerman & Kitsantas, 2014). Self-regulated learning is not the only factor that influences achievement; another factor that directly affects student engagement in academic activities (Willms, 2003). Student engagement in academic activities is the time and energy students devote to meaningful educational activities (Chapman, 2003). Student engagement in academic activities is a multidimensional variable that involves effective relationships in the academic environment, including positive relationships between educators and students, among fellow students, and students' active behaviors such as effort, attendance, prosocial behavior, and participation (Appleton et al., 2008). Engagement can also be defined as a student's self-realization, observed through behavior and physical presence (Finn & Zimmer, 2012). Finn and Zimmer (2012)

proposed a four-dimensional model of engagement, including academic engagement (such as attention and task completion), social engagement (such as appropriate interactions with teachers and peers), cognitive engagement (such as reading more than assigned material), and affective engagement (such as a sense of belonging). Furthermore, Zhoc et al. (2018) expanded on these dimensions and identified five aspects of student engagement: academic engagement, cognitive engagement, social engagement with teachers, social engagement with peers, and affective engagement.

Previous research, such as that conducted by Sa'adah and Ariati (2020), has found a significant positive correlation between student engagement and student achievement. Learning achievement positively correlates with students' behavioral and emotional engagement (King, 2015). Lei et al. (2018) showed a strong and positive correlation between overall student engagement and academic achievement. Analysis of the behavioral, emotional, and cognitive engagement domains revealed correlations with student achievement. Achieving academic success requires effort, hard work, time, and strong motivation, considering student engagement in academic activities at school (Utami & Kusdiyati, 2019).

Students who possess self-regulated learning skills and actively participate in academic activities can achieve their desired mathematical achievement. Students can create a conducive learning environment and actively engage with their surroundings by setting goals, planning actions, and evaluating their progress. This progress is typically reflected in test scores or numerical evaluations given by teachers (Tu'u, 2004). Based on the information above, this research aims to empirically examine the role of self-regulated learning and student engagement in academic activities on mathematics achievement. The main hypothesis is that self-regulated learning and student engagement in academic activities play a role in mathematics achievement. The minor hypotheses are that self-regulated learning positively influences mathematics achievement and that student engagement in academic activities positively impacts mathematics achievement.

METHODS

This study employed a correlational survey design to explore the relationship between variables or data sets. Researchers administered a questionnaire or scale to subjects to measure this relationship (Alsa, 2023).

Population and Research Sample

The study focused on students at Madrasah Aliyah Negeri 1 Yogyakarta, specifically those in classes XI and XII, totaling 515 students. Class X was excluded from the study due to curriculum readiness issues. The sample was selected using proportional stratified random sampling, which allows for sampling from different tiers or strata in proportion to the population (Azwar, 2021).

The sample selection procedure involved dividing the population into strata (class XI and class XII) and selecting samples from each group to represent the sub-groups in the population proportionally (Purwanto, 2020). According to Azwar (2021), the number of subjects in each group was determined first, and then the sample size as a percentage of the entire population was calculated. At least 20% of subjects were randomly selected from each group to obtain a sample of 96 students. The selection was done using a scientific calculator tool.

Measurements

The data for this research relied on the student's daily test scores in mathematics. Additionally, two scales were used: Mutiara & Rifameutia's (2021) Self-Regulation in Online and Blended Learning Scale, adapted from Barnard et al.'s (2009) scale with 24 items, and the student engagement scale in academic activities, adapted from Zhoc et al.'s (2018) Education Student Engagement Scale with 28 items.

Seven experts assessed the feasibility of these scales. Aiken's V scores, ranging from 0 to 1 for each item, were used to determine the validity of the items. With seven expert judgments and five answer choices for each item, the critical value of Aiken's V for a significance level of 5% was set at 0.75. The analysis revealed that all items on both scales had a critical value of Aiken's V greater than 0.75, indicating their validity.

Reliability estimation and item discrimination index calculation were conducted based on testing with 40 subjects. The discriminating power index for all items on the self-regulated learning scale ranged from 0.323 to 0.766. The Cronbach alpha reliability coefficient for this scale was 0.920. As for the student engagement scale in academic activities, 27 items met the discriminating power index, while one item (item number 3) was deemed invalid. The discriminating power index for the remaining items ranged from 0.333 to 0.779. The Cronbach Alpha reliability coefficient for this scale was 0.914.

Assumption Test

Assumption tests include normality, linearity, and multicollinearity tests using the SPSS 26.0 for the MS Windows program. The data normality test in this study showed that the data were normally distributed with a ZK-S number of 1.122 and a significance value of 0.161 ($p > 0.05$). The linearity test of this study also showed a linear relationship between variables; the variables of self-regulated learning and mathematics achievement had a deviation from linearity value of $F = 1.429$ with a significance value of 0.111 ($p > 0.05$), and the variable student engagement in academic activities and mathematics achievement had a deviation from linearity value of $F = 1.495$ with a significance value of 0.086 ($p > 0.05$).

The multicollinearity test on self-regulated learning and student engagement in academic activities obtained a tolerance value for self-regulated learning variables of 0.328, greater than 0.10, and a VIF value of 3.049, less than 10. Similarly, the tolerance value for the student engagement in academic activities

variables is 0.328, greater than 0.10, and the VIF value is 3.049, less than 10. Therefore, it can be concluded that there are no symptoms of multicollinearity between the two variables.

RESULTS AND DISCUSSION

Results

This study examined the role of self-regulated learning and student engagement in academic activities on mathematics achievement. The data were analyzed using multiple regression analysis with two predictors. The regression F value was 27.473, with a significance (p) value of 0.00 (<0.01) and an R2 value of 0.371. Self-regulated learning and student engagement in academic activities contribute to learning achievement in mathematics, supporting the major hypothesis. The two independent variables account for 37.1 percent of the variance in mathematics achievement. To predict students' high and low scores in mathematics achievement, the regression line equation is:

$$Y \text{ predicted} = 57.970 + 0.173\ X1 + 0.136\ X2$$

Furthermore, the individual contributions of self-regulated learning and student engagement in academic activities to mathematics achievement can be seen in Table 1.

Table 1. Coefficients of Self-Regulated Learning and Student Engagement in Academic Activities and Their Significance

Variable	T	*p*	Beta	r
Mathematics achievement * Self-regulated Learning	2.354	.021	.338	.585
Mathematics Achievement * Student Engagement in Academic Activities	2.095	.039	.301	.578

Based on Table 1, the t-value for self-regulation in learning is 2.354, with a significance level (p) of 0.021 (<0.05). Self-regulation in learning plays a positive role in mathematics achievement (the first minor hypothesis is accepted). Furthermore, the t-value for student engagement in academic activities is 2.095, with a significance level (p) of 0.039 (<0.05). Student engagement in academic activities also partially contributes to mathematics achievement (the second hypothesis is accepted). The contribution of self-regulation in learning to mathematics achievement is 0.1977 (0.338 x 0.585), or 19.77 percent, while student engagement in academic activities contributes 0.1739 (0.301 x 0.578), or 17.39%, to mathematics achievement. Comparing the contributions of these two independent variables to mathematics achievement reveals that self-regulation in learning has a greater impact on mathematics learning achievement than student engagement in academic activities.

Discussion

The multiple linear regression analysis results indicated that the regression F value is 27.473, with a significance value of 0.000 ($p < 0.01$). Self-regulated learning and student engagement in academic activities significantly predict mathematics achievement. These findings support the main hypothesis. According to Ali and Hanna (2021), student achievement can be predicted by self-regulation in learning and student engagement during class. The ability to self-regulate learning and engage in academic activities contributes to academic competence and shapes students' perceptions of their future selves (Park et al., 2022). Consistent with Al Mutawah et al. (2017) research, mathematics academic achievement is positively correlated with self-regulation skills and student engagement in learning mathematics. Academic achievement depends not only on cognitive factors but also on non-cognitive factors such as learning goal orientation, self-regulation, and other similar factors.

The results demonstrated that self-regulated learning played a positive role in high school mathematics achievement, which aligns with Leon et al.'s (2015) research, indicating that self-regulation in learning predicts high mathematics achievement. Bol et al. (2016) also found that students with self-regulation in learning had significantly higher mathematics achievement levels. Self-regulation in learning is positively correlated with mathematics achievement; higher levels of self-regulation lead to higher levels of achievement (Feliarosa & Simanjuntak, 2021).

Furthermore, student engagement in academic activities in this study was found to predict mathematics achievement. Dharmayana and Shinta (2019) reported a significant positive correlation between student engagement and learning achievement. Student engagement influences learning outcomes and student achievement (Utami & Kusdiyati, 2019; Lasantu, 2018). Engels et al. (2021) also demonstrated that student engagement in school predicts students' mathematics achievement.

This study indicated that self-regulated learning contributed 19.77% to the variable, while student engagement in academic activities contributed 17.39%. Together, these two variables accounted for a total contribution of 37.16%, meaning that the remaining 62.84% of the variables were responsible for the student's mathematical achievement. It is worth noting that the contribution of self-regulated learning was higher than that of student engagement in academic activities because self-regulation helps students manage the challenges they face in learning and excel in specific areas, while student engagement is achieved through hard work and active participation in the learning process (Martinez-Pons, 2002; Weinstein, 1994; Wolters & Taylor, 2012). Other variables may also influence students' mathematical achievement, such as school facilities, family background, student psychology, student abilities, student interactions, electronic media, and student discipline (Andri et al., 2017). Alsa (2015) suggested that five variables can predict mathematics achievement: parental

support, teacher-student relationships, self-efficacy, student engagement, and school climate. Furthermore, an effective combination of these predictors includes self-efficacy and teacher-student relationships.

It is important to note that high intelligence does not necessarily guarantee high mathematics achievement if students lack self-regulation in learning (Alsa, 2005). However, self-regulation can be developed. Teachers can promote self-regulation in students by guiding them through the cognitive process, setting learning targets, monitoring their progress, evaluating their learning outcomes, and encouraging self-reflection. Another effective strategy is to encourage students to ask themselves questions before, during, and after learning (e.g., What will I learn? Do I understand the material? Did I achieve my learning target?). Training sessions can also be conducted in the classroom to develop self-regulation skills (Leidinger & Perels, in Alsa, 2018). These training sessions may include goal setting, strategic planning, emphasizing the intrinsic value of the subject matter, focusing students' attention, and providing internal attributions for success or failure.

Additionally, positive student engagement in learning is crucial as it provides valuable and meaningful experiences. To ensure students are engaged in academic activities, schools must consistently enforce rules and discipline, preventing students from skipping or being late for class. Teachers should also implement reward and punishment systems to motivate students to complete assignments and actively participate in class activities. Furthermore, teachers should maintain professionalism in teaching to keep students focused, motivated, and interested in the lessons.

CONCLUSIONS

The current study found that self-regulation in learning and student engagement in academic activities played a significant role in mathematics achievement. The regression coefficient for each independent variable is positive, indicating that self-regulated learning and student engagement in academic activities positively impact mathematics achievement. Self-regulated learning contributes more to mathematics achievement than student engagement in academic activities. Self-regulated learning and student engagement in academic activities can predict student achievement in classroom learning. Higher levels of self-regulated learning are associated with higher levels of mathematics achievement, whereas lower levels of regulation in learning are associated with lower levels of mathematics achievement.

Similarly, higher student engagement in academic activities is associated with higher mathematics achievement levels. In comparison, lower levels of engagement in academic activities are associated with lower levels of mathematics achievement. There are two concrete suggestions for schools based on these findings. First, schools should prioritize increasing self-regulation in student learning, as it positively impacts mathematics achievement. Second,

schools should focus on increasing student engagement in academic activities, as this also positively affects mathematics achievement.

This study has limitations as it relied on daily assessments of standardized mathematics subjects conducted by classroom mathematics teachers. These daily assessments were based on the senior secondary education learning curriculum covering various topics. In future studies, researchers could explore topics related to the same curriculum materials and actively participate in developing mathematical problem instruments.

REFERENCES

Al Mutawah, M. A., Thomas, R., & Khine, M. S. (2017). Investigation into self-regulation, engagement in learning mathematics and science, and achievement among Bahrain secondary school students. *International Electronic Journal of Mathematics Education*, *12*(3), 633-653. https://doi.org/10.29333/iejme/639

Ali, A. D., & Hanna, W. K. (2022). Predicting students' achievement in a hybrid environment through self-regulated learning, log data, and course engagement: A data mining approach. *Journal of Educational Computing Research*, *60*(4), 960-985. https://doi.org/10.1177/07356331211056178

Alsa, A. (2005). *Program belajar, jenis kelamin, belajar berdasar regulasi diri dan prestasi belajar matematika pada pelajar SMA Negeri di Yogyakarta* (Doctoral Dissertation, Universitas Gadjah Mada, Yogyakarta).

Alsa, A. (2018). *Regulasi diri dalam belajar dan pengembangannya*. Orasi Ilmiah. Disampaikan pada Rapat Senat Terbuka Dies Natalis Fakultas Psikologi Universitas Gadjah Mada pada tanggal 8 Januari 2018.

Alsa, A. (2023). *Pendekatan kuantitatif dan kualitatif serta kombinasinya dalam penelitian psikologi*. Pustaka Pelajar.

Alsa, A., Haq, A. H. B., Siregar, A. J., Kusumaningrum, F. A., Utami, H. D., & Bachria, R. D. (2015). Menyusun model yang efisien dan efektif dari dimensi-dimensi school wellbeing untuk memprediksi prestasi belajar matematika. *Jurnal Psikologi*, *42*(1), 15-33. https://doi.org/10.22146/jpsi.6940

Anas, P. S., & Alsa, A. (2016). Strategi self-regulated learning dalam meningkatkan prestasi belajar matematika pada siswa SMP. *Gadjah Mada Journal of Professional Psychology (GamaJPP)*, *2*(3), 142-155. https://doi.org/10.22146/gamajpp.41764

Andri, A., Zagir, Z., & Dores, O. J. (2017). Analisis faktor-faktor yang mempengaruhi rendahnya prestasi belajar siswa pada mata pelajaran matematika di SD Negeri 04 Bati Tahun Pelajaran 2016/2017. *Jurnal Pendidikan Dasar Perkhasa: Jurnal Penelitian Pendidikan Dasar*, *3*(2), 414-426. https://doi.org/10.31932/jpdp.v3i2.91

Appleton, J. J., Christenson, S.L., & Furlong, M. J. (2008). Student engagement with school: critical conceptual and methodological issues of the construct. *Psychology in the Schools*, 45(5), 369-386. https://doi.org/10.1002/pits.20303

Azwar, S. (2021). Penyusunan skala psikologi (Edisi 3). Pustaka Pelajar.

Azwar, S. (2021). *Reliabilitas dan validitas* (Edisi 4). Pustaka Pelajar.

Badan Standar Nasional Pendidikan. (2019). Prosedur operasional standar (pos) penyelenggaraan ujian nasional tahun pelajaran 2019/2020. http://repositori.kemdikbud.go.id/17175/1/%280053%29%20POS%20UN%202019-2020.pdf.

Barnard, L., Lan, W. Y., To, Y. M., Paton, V. O., & Lai, S. (2009). Measuring self-regulation in online and blended learning environments. *The Internet and Higher Education*, 12(1), 1-6. https://doi.org/10.1016/j.iheduc.2008.10.005

Baroody, A. J., & Coslick, R. T. (1993). *Problem solving, reasoning, and communicating, K-8: Helping children think mathematically*. Merrill.

Behaghel, L., DE Chaisemartin, C., and Gurgand, M. (2017). Ready for boarding? The Effects of a Boarding School for Disadvantaged Students. *American Economic Journal: Applied Economics*, 9(1), 140–164. https://doi.org/10.1257/app.20150090

Bol, L., Campbell, K. D., Perez, T., & Yen, C. J. (2016). The effects of self-regulated learning training on community college students' metacognition and achievement in developmental math courses. *Community College Journal of Research and Practice*, *40*(6), 480-495. https://doi.org/10.1080/10668926.2015.1068718

Claessens, A., & Engel, M. (2013). How important is where you start? Early mathematics knowledge and later school success. *Teachers College Record*, *115*(6), 1-29. https://eric.ed.gov/?id=EJ1020177

Dharmayana, I. W., & Shinta, L. A. (2019). Korelasi antara keterlibatan akademik dengan prestasi belajar siswa kelas X Di SMK Negeri 1 Kota Bengkulu. *TRIADIK*, *18*(1), 66-74. https://doi.org/10.33369/triadik.v18i1.11387

Engels, M. C., Spilt, J., Denies, K., & Verschueren, K. (2021). The role of affective teacher-student relationships in adolescents' school engagement and achievement trajectories. *Learning and instruction*, *75*, 101485. https://doi.org/10.1016/j.learninstruc.2021.101485

Feliarosa, D. D., & Simanjuntak, E. (2021). Self regulated learning dan prestasi belajar matematika pada siswa SMALB/BX. *EXPERIENTIA: Jurnal Psikologi Indonesia*, *9*(1), 63-70. https://doi.org/10.33508/exp.v9i1.3064

Finn, J.D. and Zimmer, K.S. (2012). Student engagement: What is it? Why does it matter?. *Handbook of Research on Student Engagement. Springer Science & Business Media*. https://doi.org/10.1007/978-1-4614-2018-7_5

Karim, A. (2011). Penerapan metode penemuan terbimbing dalam pembelajaran matematika untuk meningkatkan pemahaman konsep dan kemampuan berpikir kritis siswa sekolah dasar. *Seminar Nasional Matematika dan Terapan*, *30*(1), 21-32.

Khalik, I dan Alsa, A. (2015). Belajar berdasar regulasi diri dan dukungan sosial sebagai prediktor prestasi belajar matematika. *Gadjah Mada Journal of Psychology, 1*(2), 74-81. https://doi.org/10.22146/gamajop.7345

Lasantu, M. (2018). *Upaya meningkatkan hasil belajar siswa dengan menggunakan model pembelajaran Number Head Together (NHT) pada kelas XI IPA-5 di SMA Negeri 1 Gorontalo* (Skripsi). Universitas Negeri Gorontalo, Gorontalo.

Lei, H., Cui, Y., & Zhou, W. (2018). Relationships between student engagement and academic achievement: A meta-analysis. *Social Behavior and Personality: An International Journal*, *46*(3), 517-528. https://doi.org/10.2224/sbp.7054.

León, J., Núñez, J. L., & Liew, J. (2015). Self-determination and STEM education: Effects of autonomy, motivation, and self-regulated learning on high school math achievement. *Learning and Individual Differences*, *43*, 156-163. 10.1016/j.lindif.2015.08.017.

Martineau, C. (2017). *What is mathematical literacy*. Retrieved from https://medium.com/literate-schools/what-is-mathematical-literacy-65775f3e5_ce3.

Martinez-Pons, M. (2002). A social cognitive view' of parental influence on student academic self-regulation. *Theory into Practice*, 61, 126-131.

Mutiara, T., & Rifameutia, T. (2021). Adaptasi alat ukur regulasi diri dalam belajar daring. Edcomtech: *Jurnal Kajian Teknologi Pendidikan*, 6(2), 301–309. https://doi.org/10.17977/um039v6i12021p301.

OECD. (2018). PISA (*Programme for International Student Assessment*). http://www.oecd.org/publications/pisa-2018-results-volume-i-5f07c754-en.htm, diakses pada 7 April 2021.

Ormrod, J.E. (2008). *Psikologi pendidikan membantu siswa tumbuh dan berkembang* (Jilid 2). Erlangga.

Pamungkas, B., Ismail, F., & Anggara, B. (2020). Studi komparatif self regulated learning siswa asrama dan non-asrama di SMA IT Izzuddin Palembang. *Jurnal PAI Raden Fatah*, *2*(4), 439-454. 10.19109/pairf.v2i4.4197.

Park, K., Moon, S., & Oh, J. (2022). Predictors of academic achievement in distance learning for nursing students. *Nurse Education Today*, *108*, 105162. 10.1016/j.nedt.2021.105162.

Permendikbud. (2016). Lampiran Permendikbud No. 22 tahun 2016. https://bsnp-indonesia.org/wp-content/uploads/2009/06/Permendikbud_Tahun2016_Nomor022_Lampiran.pdf.

Prastyo, H. (2020). Kemampuan matematika siswa Indonesia berdasarkan TIMSS. *Jurnal Padegogik*, *3* (2), 111-117. https://doi.org/10.35974/jpd.v3i2.2367.

Purwanto, E. (2020). *Metode penelitian kuantitatif*. Pustaka Pelajar.

Rosyid, M. Z., Mansyur, M., IP, S., & Abdullah, A. R. (2019). *Prestasi belajar*. Literasi Nusantara. https://books.google.co.id/books

Sa'adah, U., & Ariati, J. (2020). Hubungan antara student engagement (keterlibatan siswa) dengan prestasi akademik mata pelajaran matematika pada siswa kelas XI SMA Negeri 9 Semarang. *Jurnal EMPATI*, 7(1), 69-75. https://ejournal3.undip.ac.id/index.php/empati/article/view/20148.

Slavin, R. E. (2011). *Psikologi pendidikan: teori dan praktik Edisi Kesembilan*. Indeks.

Suci, R. N. (2016). *Hubungan Stres Akademik dengan Prestasi Belajar pada Siswa SMA Negeri 1 Sawahlunto* (Doctoral Dissertation). Universitas Andalas, Padang.

Sulasmi, E. (2019). Analisis faktor-faktor yang mempengaruhi prestasi belajar siswa ditinjau dari aspek manajemen belajar siswa (Studi pada siswa SMP Gajah Mada Medan). *Jurnal Manajemen Pendidikan Dasar, Menengah dan Tinggi [JMP-DMT]*, *1*(1). https://doi.org/10.30596/jmp-dmt.v1i1.3920

Sumarmo, U., Hidayat, W., Zukarnaen, R., Hamidah, H., & Sariningsih, R. (2012). Kemampuan dan disposisi berpikir logis, kritis, dan kreatif

matematik. *Jurnal Pengajaran MIPA*, *17*(1), 17-33. https://doi.org/10.18269/jpmipa.v17i1.36048

Syafi'i, A., Marfiyanto, T., & Rodiyah, S. K. (2018). Studi tentang prestasi belajar siswa dalam berbagai aspek dan faktor yang mempengaruhi. *Jurnal Komunikasi Pendidikan*, *2*(2), 115-123. https://doi.org/10.32585/jkp.v2i2.114

Syah, M. (2004). *Psikologi belajar*. Raja Grafindo Persada.

Syaodih, R. N. (1996). *Perencanaan pengajaran*. Renika Cipta.

Tu'u, T. (2004). *Peran disiplin pada perilaku dan prestasi siswa*. Grasindo.

Undang Undang Sistem Pendidikan Nasional. (2009). *Undang-undang sistem pendidikan nasional no. 20 tahun 2003 tentang sistem pendidikan nasional*. Rhusty Publisher.

Utami, A. D., & Kusdiyati. (2019). Hubungan antara student engagement dengan prestasi belajar pada siswa kelas XI di Pesantren Persatuan Islam No 1 Bandung. *Prosiding Penelitian Sivitas Akademia Unisba (Sosial dan Humaniora)*. Bandung 18-20 Agustus 2015. 10.29313/.v0i0.1006.

Wibowo, D. E. (2018). Peran self regulated learning dan motivasi belajar terhadap prestasi belajar matematika siswa yang sering mengikuti lomba ekstrakurikuler olahraga sekolah. *e-Jurnal Mitra Pendidikan*, *2*(9), 877-894. https://e-jurnalmitrapendidikan.com/index.php/e-jmp/article/view/397.

Wiguna, A., Anggraini, G., & Apriyani, K. (2019). Regulasi diri pada mahasiswa berprestasi. *Jurnal Paedagogie Media Kependidikan, Keilmuan dan Keagamaan*, *7*(2), 65-71. https://core.ac.uk/download/pdf/327184875.pdf.

Willms, J.D. (2003). *Student engagement at school: a sense of belonging and participation*. OECD.

Zhoc, K. C., Webster, B. J., King, R. B., Li, J. C., & Chung, T. S. (2018). Higher education student engagement scale (HESES): Development and psychometric evidence. *Research in Higher Education*, *60*(2), 219-244. http://dx.doi.org/10.1007/s11162-018-9510-6.

Zimmerman, B. J. (2012). *Goal setting: A key proactive source of academic self-regulation.* In Schunk, D.H. & Zimmerman, B.J. (Eds.), Motivation and self-regulated learning theory, research, and applications (pp.267 295). Routledge Taylor & Francis Group.

Zimmerman, B. J., & Kitsantas, A. (2014). Comparing students' self-discipline and self-regulation measures and their prediction of academic achievement. *Contemporary Educational Psychology*, *39*(2), 145-155. 10.1016/j.cedpsych.2014.03.004.

Zimmerman, B. J., & Schunk, D. H. (2012). *Self-regulated learning and academic achievement: Theory, research, and practice*. Springer Science & Business Media. https://books.google.co.id/books

Zimmerman, Barry J. (1989). A social cognitive view of self-regulated academic learning. *Journal of Educational Psychology*.81 (3): 329-339. https://doi.org/10.1037/0022-0663.81.3.329