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The Effect of Self Concept, Self Efficacy and Self Esteem on the Ability to Understanding Mathematics

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Abstract: ***The purpose of this study was to determine the direct effect of three latent variables (self-efficacy, self-concept and self-esteem) on mathematical understanding skills. This is a survey research conducted in high schools throughout the City of Bengkulu. The sample of this study amounted to 104 students. There are three questionnaires and one test as a research instrument. All three are questionnaires for self-efficacy, self-concept and self-esteem. One test is a test of mathematical comprehension skills. Results:there is a positive direct effect of self-concept on mathematical understanding skills. But there is no positive direct effect of self-efficacy on mathematical comprehension skills. Also, there is no direct effect of self-esteem on mathematical understanding skills.***

Keywords: self concept, self efficacy, self esteem, understanding mathematics

1. Preliminary

Mathematics is a fundamental part of human knowledge and one of the central planks of the modern technological revolution(Ernest, 2015).Senior high school students must have the ability to understand mathematics(Widada, Herawaty, & Lubis, 2018)(Herawaty, Widada, Novita, Waroka, & Lubis, 2018). These are compulsory subjects in senior high school. Therefore, students must have thoughts and beliefs which are individual knowledge about themselves. This is a self-concept.According to (Lee & Kung, 2018), the previous self-concept of mathematics significantly predicted mathematical achievement.The importance of self-concept and motivation to academic achievement(Sikhwari, 2014).Students' self-concept is felt positively by students; although, this self-concept does not directly predict student academic performance(Laryea, Saani, Coast, & Dawson-brew, 2014).The results of this study recommend that teachers, parents and stakeholders to consider self-concept become part of efforts to improve mathematical understanding skills.To achieve a good level of understanding, students must also have self-efficacy for their initial abilities.To achieve a good level of understanding, students must also have self-efficacy (Bandura, 1994) for their initial abilities. Also, has a personal assessment of his own worthiness (ieself esteem) (Kalouti-Mekky, 2012).

There exists a strong positive correlation between self-esteem and academic achievement in students. It can be said that high level of self-esteem leads to good academic performance. Also, the male students had higher self-esteem as compared to female students(Arshad, Zaidi, & Mahmood, 2015).The self-esteem is positively related to academic performance. Therefore, teachers should increase and maintain pupils' self-esteem by assisting them feel and think positively(Carew, 2014).There are positive relationship between self-esteem and academic engagement and social interaction, while they revealed weak correlation between self esteem and academic achievement(Kalouti-Mekky, 2012).This shows that consistently, self-esteem has a positive effect on mathematical understanding skills.According to (Doodman, Zadeh, & Changizi, 2017), there are relationship between academic achievement with self-esteem; higher self-esteem results in better academic achievement and vice versa. lower the self-esteem, academic achievement is weaker. Therefore, it is necessary for parents and teachers to raise the self-esteem in the students using appropriate methods.According to (Rosli et al., 2012), the students with higher self-esteem perform better in their academic ($p< 0.0005$, $r=0.32$); self esteem score and body area satisfaction was significant ($p< 0.05$, $r=0.016$) and self esteem and stress is inversely significant ($p< 0.05$, $r=-0.198$). The self-esteem is one of the key factors in affecting an individual's academic performance, more significant than other contributing factors including stress and body image.

According to (Obilor, 2012), that mathematics self-concept is significantly related to mathematics achievement, general academic achievement and general academic self-concept. the self-concept and mathematics, and general academic achievement of students are so strongly related that a change in self-concept facilitates a change in achievement.The self-concept of students influence students' academic performance in schools indirectly through students' effort in learning(Laryea et al., 2014).There are contribution of students' mathematics self-concept to students' mathematics achievement, general academic achievement and general academic self-concept(Obilor, 2004)(Zhang, 2016).There are differences in academic achievement between teenagers with a high level of academic self-concept with a low level of academic self-concept. A more comprehensive academic self concept is the most important because this construct governs cognitive strategies involved in learning and academic performance(Ordaz-villegas & Reyes-lagunes, 2014).The result of (Rajagukguk, 2016), that there was a positive relationship between self-concept and mathematical communicative ability.There are a close relationship between academic self-concept and academic performance. Academic self-concept powerfully and positive predicts general performance in literature and mathematics(Dabbagh, 2011).There are directly and indirectly effects from levels of appreciation, positive thinking ability, and self-concept to students' mathematics

learning achievement(Leonard, 2012).Results of (Koshkouei, Shahvarani, & Behzadi, 2016), there is influence of mathematics self-concept, motivation to learn mathematics and self-regulation learning on mathematics academic achievement was confirmed. It was revealed that mathematics self-concept had influence on motivation to learn mathematics, and motivation to learn mathematics had effect on self-regulation learning.

The learning mathematics are developing a higher level of orientation and ability including mathematical beliefs; mathematical creativity through problem solving; social empowerment through mathematics contributes to critical citizenship; and broader appreciation of mathematics, its nature, and its main ideas(Ernest, 2015).Therefore, students must be equipped with self-confidence, and mathematical thinking logically.According to (Fang, Angie, Ricci, & Mathematical, 2016), students can develop this ability when confronting mathematical problems, identifying possible solutions and evaluating and justifying their reasons for the results, thereby allowing students to become confident critical thinkers.Another study found that mathematical abilities have a direct and indirect effect (through mathematical self-efficacy) on mathematical performance. The model determines mathematical abilities and mathematical performance (Zarch & Kadivar, 2006).There is effect of high achievement and self- efficacy, structural equation modeling revealed positive effects of mathematics self-efficacy on later mathematics achievement and of reading achievement on later reading self-efficacy(Schöber, Schütte, Köller, Mcelvany, & Gebauer, 2018).The analysis has shown the direct effect of self-efficacy and indirect influence of achievement motivation and self learning strategies on participants' academic accomplishment(Yusuf, 2011).The fact that students with self-efficacy were able to analyze and control their impulses and thrive in the face of challenge, they excelled academically(Köseo, 2015).Based on the description, we conclude theoretically that self-efficacy has a positive direct effect on mathematical understanding skills; self-concept and self-esteem too. There are three main indicators of self-concept, namely the dimensions of knowledge, dimensions of expectations, and dimensions of judgment.There are three indicators of self-efficacy, namely magnitude, strength, and generality.In this paper we state that the indicators of self-esteem in mathematics are students' assessment of themselves including their own abilities, successes, and goodness in mathematics.Whereas mathematical understanding ability has seven indicators, namely restating a concept; classify objects according to certain concepts according to; give examples and not examples of a concept; present concepts in various forms of representation; develop necessary requirements or sufficient requirements from a concept; use and utilize and select certain procedures or operations; and apply concepts or algorithms in problem solving.

2. Method

To determine empirical conclusions we conducted survey research. Samples were randomly selected from 104 students, from all high school students in the city of Bengkulu as a population. There are four latent variables, namely abilities: mathematical understanding, self-efficacy, self-concept and self-esteem. The research instrument was a test of mathematical comprehension ability, three questionnaires. The three are each questionnaire for self-efficacy, self-concept and self-esteem. Data were analyzed by using Structural Equation Modeling and Confirmatory Factor Analysis..

3. Results and Discussions

The data of the test were the ability to understanding mathematics,self-efficacy,self-concept, and self-esteem in mathematicsas latent variables. The variable indicators of self-efficacy (SEF) are magnitude (X1), strength (X2), and generality (X3).The variable indicators of self-concept(SCON) are the knowledge (X4), expectations (X5), and judgment (X6).The indicators of self-esteem in mathematics (SEST) are students' assessment of themselves including their own abilities (X7), successes (X8), and goodness in mathematics (X9).Whereas mathematical understanding ability (MATH) has seven indicators, namely restating a concept (X10); classify objects according to certain concepts (X11); give examples and not examples of a concept (X12); present concepts in various forms of representation (X13); develop necessary requirements or sufficient requirements from a concept (X14); use and utilize and select certain procedures or operations; and apply concepts or algorithms in problem solving (X15).

Data were analyzed by using the help of the Lisrel 8.8 application program. The results of data analysis are presented in Figure 1 and Figure 2.The Figure 1 is diagram of the Confirmatory Factor Analysis (CFA) for Basic Model Standardized Solution, and The Figure 2 is diagram of the CFA for Basic Model T-Values.

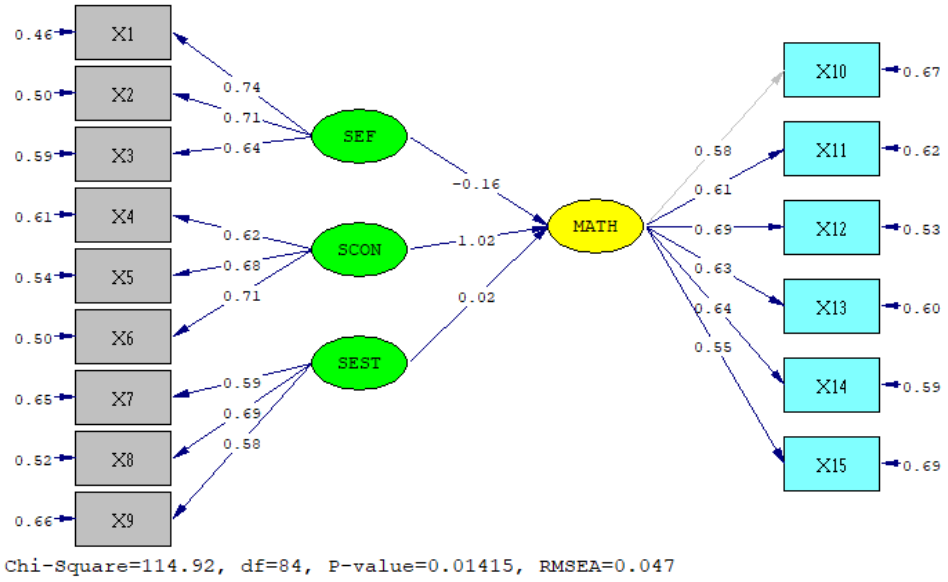

Figure 1: Basic Model Standardized Solution

The path diagram in Figure 1 and Figure 2 is used to test the validity of each indicator variable and instrument reliability. While the t-value on the path diagram between latent variables is used to determine the significance of the direct and indirect influence between these latent variables. This is a statistical hypothesis test.

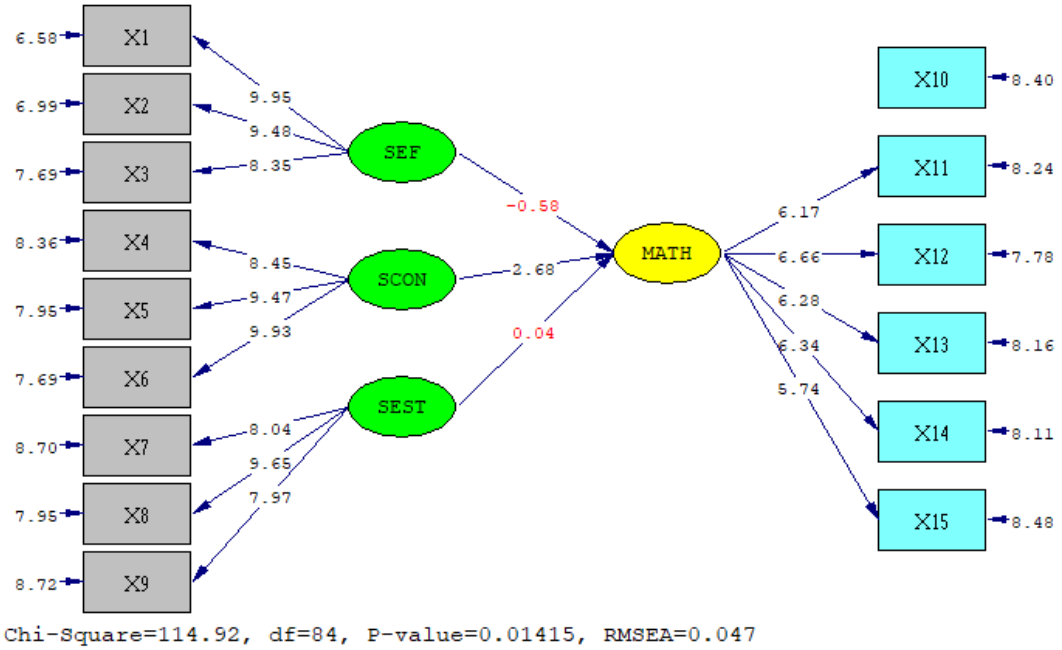

Figure 2: Basic Model T-Values

We have calculated the validity of each indicator variable and the reliability of each latent variable based on the Basic Model Standardized Solution and the Basic T-Values Model (Figures 1 and 2). This calculation, we have summarized in Table 1 (Validity & Reliability of Problem Solving Ability), Table 2 (Validity & Reliability of Mathematics Communication Ability), Table 3 (Validity & Reliability of Math Connection Ability) and Table 4 (Validity & Reliability of Math Understanding Ability.

Table 1: Validity & Reliability of Problem Solving Ability

Indicator	*Standardized Loading Factors (SLF)≥ 0.50*	*Standard Errors*	*t-value > 1.96*	declaration	Reliability
					CR≥0.70
X1	0.74	0.46	9.95	Good validity	**0.74**
X2	0.71	0.5	9.48	Good validity	
X3	0.64	0.59	8.35	Good validity	

Table 1 shows that there are three variables observed from latent self-efficacy variables (i.e., magnitude (X1), strength (X2), and generality (X3).) The latent self-efficacy variable has passed the validity test, because it meets the requirements, namely the value of loading factor ≥ 0.50 and t-value ≥ 1.96. While the construct of reliability (CR) is

0.74> 0.70. This shows that the reliability test of the self-efficacy variable produces good values, and self-efficacy has good consistency.

Table 2: Validity & Reliability of Mathematics Communication Ability

Indicator	*Standardized Loading Factors (SLF)≥ 0.50*	*Standard Errors*	*t-value > 1.96*	declaration	Reliability
					CR≥0.70
X4	0.62	0.61	8.45	Good validity	0.70
X5	0.60	0.54	9.47	Good validity	
X6	0.71	0.5	9.93	Good validity	

In Table 2 presents a calculation of the validity and reliability of indicator variables for self-concept. This table confirms the validity of all observed variables (i.e., knowledge (X4), hope (X5), and assessment (X6)) is valid. Note that the loading factor value for each indicator variable is ≥ 0.50 and t-value is 96 1.96. Because the value of the reliability construct (CR) is 0.70, the reliability of the self-concept variable produces a good value. Thus, self-concept has good consistency.

Table 3: Validity & Reliability of Math Connection Ability

Indicator	*Standardized Loading Factors (SLF)≥ 0.50*	*Standard Errors*	*t-value > 1.96*	declaration	Reliability
					CR≥0.70
X7	0.59	0.65	8.04	Good validity	0.70
X8	0.69	0.52	9.65	Good validity	
X9	0.58	0.66	7.97	Good validity	

Table 3 presents the calculation of the validity and reliability of indicator variables for self-esteem. This table confirms the validity of all observed variables (ie, their own abilities (X7), successes (X8), and goodness in mathematics (X9)) is valid. In the table shows that the value of the loading factor for each indicator variable is ≥ 0.50 and the value of t> 1.96. Also, the value of the reliability construct (CR) is 0.70, so the reliability of the self-esteem variable produces a good value. Thus, self-esteem has good consistency.

Table 4: Validity & Reliability of Math Connection Ability

Indicator	*Standardized Loading Factors (SLF)≥ 0.50*	*Standard Errors*	*t-value > 1.96*	declaration	Reliability
					CR≥0.70
X10	0.58	0.67	**	Good validity	0.81
X11	0.61	0.62	6.17	Good validity	
X12	0.69	0.23	6.66	Good validity	
X13	0.63	0.60	6.28	Good validity	
X14	0.64	0.50	6.34	Good validity	
X15	0.55	0.69	5.74	Good validity	

The last latent variable (see Table 4) is the ability to understand mathematics. Based on the table, all indicator variables have a loading factor value of ≥ 0.50, and each indicator variable has a value of t> 1.96. This shows that each indicator variable is valid While CR = 0.81> 0.70, this means that the variable of mathematical comprehension ability is reliable and has good consistency.

To answer the research problem, we test the statistical hypothesis. Consider the path diagram in Figure 2. The path diagram shows the t-value used to determine the statistical hypothesis test of Ho. The alternative hypothesis is H1: There is a positive direct effect of self-efficacy on the mathematical understanding abilities. H2: There is a positive direct effect of self-concept on the mathematical understanding abilities. Also, H3: There is a positive direct effect of selt-esteem mathematics on the mathematical understandingabilities.

Consider Figure 2, the t-value for the effect of self-efficacy on mathematical comprehension is -0.50. This shows that there is no positive direct effect of self-efficacy on mathematical comprehension skills. The same was found for the relationship between self-esteem and mathematical abilities. The value of t is 0.04 <1.96 this is the area Ho is accepted. This means that there is no direct effect of self-esteem on mathematical understanding skills. The different thing we found is that the t-value for the relationship between self-concept and mathematical ability. The value is t = 2.68> 1.96, meaning that Ho is rejected with a 95% confidence level. Thus there is a positive direct effect of self-concept on mathematical understanding skills.

The results of this study support previous statements, such asthe results of the research, state that there is a relationship between students 'mathematical self-concept and students' mathematics achievement, general academic achievement and general academic self-concept. A significant positive relationship was found at the 0.05 significance level(Obilor, 2012).Students' self-concept influences their academic performance in schools indirectly through student efforts in learning(Laryea et al., 2014).The studies have been conducted to test academic self-concept and academic achievement, the result of which is the influence of self-concept on mathematical understanding (Zhang, 2016).

Based on the results obtained in this study, it can be concluded that in accordance with the conditions of education, mathematics teachers can exploit strategies that are appropriate for the reconstruction of mathematical self-concepts and strengthen students' positive beliefs that can result in increased self-concept of mathematics and increased motivation to learn mathematics which ultimately leads on improving mathematics academic achievement (Koshkouei et al., 2016).Also, the ability to understand mathematics and the self-efficacy of students taught by problem-based learning models are interconnected. Therefore, there are differences in mathematical problem solving abilities between students who are given problem-based learning with students. There is a difference in self-efficacy between students who are given problem-based learning with students who are given other learning(Suci & Jepri, 2017).There are two results that have not been significant.Students' self-concept influences their academic performance in schools indirectly through student efforts in learning. Finally, we can conclude the results of this study.

4. Conclusion

The conclusion is that there is a positive direct effect of self-concept on mathematical understanding skills. But there is no positive direct effect of self-efficacy on mathematical comprehension skills. Also, there is no direct effect of self-esteem on mathematical understanding skills. It is suggested to teachers, parents and stakeholders to improve their mathematical understanding skills that they must take seriously the self-efficacy, self-concept and self-esteem.

References

[1] Arshad, M., Zaidi, S. M. I. H., & Mahmood, K. (2015). Self-Esteem & Academic Performance among University Students. *Journal of Education and Practice*, *6*(1), 156–162.

[2] Bandura, A. (1994). *Self-Efficacy* (Vol. 4). San Diego: Academic Press.

[3] Carew, F. C. (2014). Relationship between academic self-esteem and performance in English language and mathematics of primary school pupils. *Journal of Educational Foundations*, *4*(1), 9–21.

[4] Dabbagh, S. (2011). Relationships between academic self-concept and academic performance in high school students. *Procedia - Social and Behavioral Sciences*, *15*, 1034–1039. https://doi.org/10.1016/j.sbspro.2011.03.235

[5] Doodman, P., Zadeh, M. A., & Changizi, B. (2017). Study the Relationship between Self-Esteem and Academic Achievement among High School Students in Lamerd City. *International Journal of Scientific Study*, *5*(3), 221–226. https://doi.org/10.17354/ijssJuneI/2017/032

[6] Ernest, P. (2015). The Social Outcomes of Learning Mathematics : Standard , Unintended or Visionary? *International Journal of Education in Mathematics, Science and Technology Volume*, *3*(3), 187–192.

[7] Fang, H., Angie, H., Ricci, F. A., & Mathematical, M. (2016). Mathematical Teaching Strategies : Pathways to Critical Thinking and Metacognition Mathematical Teaching Strategies : Pathways to Critical Thinking and Metacognition. *International Journal of Research in Education and Science*, *2*(1), 190–200.

[8] Herawaty, D., Widada, W., Novita, T., Waroka, L., & Lubis, A. N. M. T. (2018). Students ' metacognition on mathematical problem solving through ethnomathematics in Rejang Lebong , Indonesia Students ' metacognition on mathematical problem solving through ethnomathematics in Rejang Lebong , Indonesia. *Journal of Physics: Conference Series*, *1088*(1), 1–7.

[9] Kalouti-Mekky, R. H. (2012). *The relationship between Self-Esteem and Academic Achievement of Grade Six Pupils in Private Schools in Jerusalem District*. Birzeit University-Palestine.

[10] Köseo, Y. (2015). Self-Efficacy and Academic Achievement – A Case From Turkey. *Journal of Education and Practice*, *6*(29), 131–141.

[11] Koshkouei, H. J., Shahvarani, A., & Behzadi, M. H. (2016). Structural Modeling for Influence of Mathematics Self-Concept , Motivation to Learn Mathematics and Self-Regulation Learning on Mathematics Academic Achievement. *Mathematics Education Trends and Research*, *2016*(1), 1–12. https://doi.org/10.5899/2016/metr-00083

[12] Laryea, J. E., Saani, A., Coast, C., & Dawson-brew, E. (2014). Influence of students self-concept on their academic performance in the elmina township. *European Journal of Research and Reflection in Educational Sciences*, *2*(4), 1–10.

[13] Lee, C.-Y., & Kung, H.-Y. (2018). 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*, *14*(4), 1239–1252. https://doi.org/10.29333/ejmste/82535

[14] Leonard. (2012). Level Of Appreciation, Self Concept And Positive Thinking On Mathematics Learning Achievement. *The International Journal of Social Sciences*, *6*(1), 10–17.

[15] Obilor, I. E. (2004). Relationship Between Self-Concept And mathematics Achievement Of Senior Secondary Students In Port Harcourt. In *Proceedings of the 1st International Technology, Education and Environment Conference, African Society for Scientific Research (ASSR) RELATIONSHIP* (pp. 924–932).

[16] Obilor, I. E. (2012). Relationship Between Self-Concept And Mathematics Achievement Of Senior Secondary Students In Port Harcourt. *Journal Plus Education*, *VIII*(1), 169–178.

[17] Ordaz-villegas, G., & Reyes-lagunes, L. I. (2014). Development Of An Academic Self Concept For Adolescents (Asca) Scale Académico Para Adolescentes (AAPA). *Journal of Behavior, Health & Social Issues*, *5*(2), 117–130. https://doi.org/10.5460/jbhsi.v5.2.42304

[18] Rajagukguk, W. (2016). Incorporating Learning Motivation and Self-Concept in Mathematical Communicative Ability. *International Education Studies*, *9*(4), 155–164. https://doi.org/10.5539/ies.v9n4p155

[19] Rosli, Y., Othman, H., Ishak, I., Lubis, S. H., Saat, Z. M., & Omar, B. (2012). Self-esteem and academic performance relationship amongst the second year undergraduate students of Universiti Kebangsaan Malaysia , Kuala Lumpur Campus. *Procedia - Social and Behavioral Sciences*, *60*, 582–589. https://doi.org/10.1016/j.sbspro.2012.09.426

[20] Schöber, C., Schütte, K., Köller, O., Mcelvany, N., & Gebauer, M. M. (2018). Learning and Individual Differences Reciprocal effects between self-efficacy and achievement in mathematics and reading. *Learning and Individual Difference*, *63*, 1–11. https://doi.org/10.1016/j.lindif.2018.01.008

[21] Sikhwari, T. D. (2014). A Study of the Relationship between Motivation , Self-concept and Academic Achievement of Students at a University in Limpopo Province , South Africa, *6*(1), 19–25.

[22] Suci, T., & Jepri, I. (2017). Differences in Mathematical Problem Solving Ability and Self- Efficacy Students Taught Using Problem Based Learning and Learning Type STAD. *IOSR Journal of Research & Method in Education (IOSR-JRME)*, *7*(6), 56–65. https://doi.org/10.9790/7388-0706045665

[23] Widada, W., Herawaty, D., & Lubis, A. N. M. T. (2018). Realistic mathematics learning based on the ethnomathematics in Bengkulu to improve students' cognitive level Realistic mathematics learning based on the ethnomathematics in Bengkulu to improve students' cognitive level. *Journal of Physics: Conference Series*, *1088*(1), 1–8.

[24] Yusuf, M. (2011). The impact of self-efficacy, achievement motivation , and self- regulated learning strategies on students ' academic achievement. *Procedia - Social and Behavioral Sciences*, *15*, 2623–2626. https://doi.org/10.1016/j.sbspro.2011.04.158

[25] Zarch, M. K., & Kadivar, P. (2006). The Role of Mathematics self-efficacy and Mathematics ability in the structural model of Mathematics performance. In *Proceedings of the 9th WSEAS International Conference on Applied Mathematics, Istanbul, Turkey, May 27-29, 2006* (pp. 242–249).

[26] Zhang, Q. (2016). *The Relationship between Academic Self-concept and Math Achievement Among Students without and with Learning Disabilities in Early and Late Adolescence*. University of Miami.