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SELF-CONCEPT AND INTEREST AS PREDICTORS OF MATHEMATICS ABILITY

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Abstrak

Meningkatkan kemampuan matematika dianggap penting saat ini. Karena kemampuan matematika dapat mendorong individu untuk dapat memecahkan masalah di tengah-tengah masyarakat. Sejumlah penelitian telah membuktikan bahwa konsep diri sangat berpengaruh terhadap kemampuan matematika. Oleh karena itu, penelitian ini ingin membuktikan kembali apakah konsep diri dan minat berpengaruh terhadap kemampuan matematika. Untuk membuktikan pertanyaan tersebut, penelitian ini menggunakan jenis penelitian kuantitatif dengan pendekatan penelitian ex-post facto. Sampel dalam penelitian ini berjumlah 24 siswa (laki-laki = 3 dan perempuan = 21). Instrumen yang digunakan dalam penelitian ini adalah konsep diri, skala minat dan kemampuan matematika individu yang diambil dari Indeks Prestasi Kumulatif. Penelitian ini menggunakan teknik analisis regresi linier. Hasil penelitian menunjukkan bahwa konsep diri sangat berpengaruh terhadap kemampuan matematika sebesar 0,04 ($p<0,05$). Artinya, untuk meningkatkan kemampuan matematika individu harus memiliki kematangan konsep diri dan minat terhadap matematika.
Kata kunci: Kemampuan matematis; Konsep diri; Penelitian ex-post facto

Abstract

Improving math skills is considered important today. Because mathematical abilities can encourage individuals to be able to solve problems in the midst of society. A number of studies have proven that self-concept is very influential on mathematical ability. Therefore, this study wants to prove again whether self-concept and interest have an effect on mathematical ability. In order to prove this question, this study uses a quantitative type of research with an ex-post facto research approach. The sample in this study amounted to 24 students (male = 3 and female = 21). The instrument used in this study is the self-concept, interest scale and individual mathematical abilities were taken from the Grade Point Average. This study uses linear regression analysis techniques. The results showed that self-concept is very influential on the mathematical ability by 0.04 ($p<0.05$). That is, to improve the individual's mathematical ability must have self-concept maturity and interest in mathematics.
Keywords: Ex-post facto research; Mathematical ability; Self-concept

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INTRODUCTION

Mathematics is considered a difficult subject. Therefore, so that mathematics is not considered difficult, some experts suggest that teacher-student interactions should take place well (Alsa et al., 2015), anxiety about mathematics needs to be minimized (Susanti & Rohmah, 2011; Ghufron & Suminta, 2013), method Mathematics learning needs to be updated using digital technology (Purwanto & Yudiarso, 2021), and provide a comfortable classroom environment so that individual attitudes towards mathematics are positive (Limpo et al., 2013). All suggestions from several experts were attempted to overcome negative assumptions about mathematics. This is because mathematics is important for every individual because, with mathematical abilities, individuals can solve problems in the midst of society (Mohamed & Waheed, 2011; Limpo et al., 2013; Purwanto & Yudiarso, 2021). If life problems are resolved, this will have an impact on improving the quality of society in the future. The increasing quality of people's lives is certainly correlated with the progress of the nation in the future.

Although mathematics is important in overcoming problems in society, so far based on a report from PISA in 2018 shows that the mathematical ability of Indonesians is still far below Malaysia and Brunei Darussalam (OECD, 2019). In fact, the mathematical ability of Indonesians is still far below the average being in the bottom 6 of the 78 countries that were surveyed (OECD, 2019). This shows that something must be done to improve the mathematical ability of Indonesians. If these efforts are not carried out, it will have an effect on the decline of society in the future. As previously explained, the progress of a nation is strongly influenced by many factors, one of which is the mathematical ability, because mathematics plays an important role in solving problems in society (Limpo et al., 2013; Purwanto & Yudiarso, 2021). Therefore, a number of experts suggest that to improve math skills it is necessary to provide a comfortable classroom environment (Limpo et al., 2013), program school wellbeing (Alsa et al., 2015), increase self-efficacy (Ghufron & Suminta, 2013; Alsa et al., 2013). al., 2015), forming self-concept (Ahmed et al., 2012), and an interest in mathematics (Sproesser et al., 2016).

Self-concept is one of the psychological variables that strongly influence the improvement of an individual's mathematical ability (Ahmed et al., 2012; Cai et al., 2018). This is because self-concept can reduce individual anxiety so that the ability to mathematics increases (Ahmed et al., 2012). In particular, the review refers to Bandura's (1997) socio-cognitive theory that understanding oneself, namely self-concept, can help individuals control the stressors they experience when facing difficult jobs such as mathematics. In other words, self-concept plays an important role in improving an individual's ability in mathematics. In addition, according to expectancy-value theory, self-concept positively encourages individuals to be fully involved in math lessons and makes individuals more focused and adaptive to engage in math tasks (Cai et al., 2018). That is, individuals who have a self-concept toward mathematics will encourage individuals to continue to be involved in mathematical tasks, in other words, that self-concept can improve an individual's ability in mathematics.

In the study of psychology, self-concept is part of the perception of oneself (Rahman, 2020). Self-concept is very strong shape our daily behavior. Rahman (2020) defines self-concept as our attempt to understand ourselves so as to produce knowledge about ourselves. That is, self-concept is more related to our efforts to define ourselves with the question "who we are". This self-understanding is for example how we understand ourselves when we come into contact with mathematics. Whether mathematics is a part of us or not are things that are studied in self-concept theory. Regarding the individual's self-concept toward mathematics, Clem et al (2021) define it as the ability of individuals to evaluate themselves related to mathematics lessons. The process of self-evaluation is an individual's effort to understand his ability in mathematics, so according to Clem et al (2021) that it will predict individual interest in mathematics, and success in mathematics, and minimize the level of concern for mathematics. Based on these reviews, the self-concept is an individual's effort to evaluate himself against mathematics so that an understanding of himself emerges that he is capable in the field of mathematics. A number of studies have shown that self-concept is positively related to mathematical ability (Ahmed et al., 2012; Cai et al., 2018; Clem et al., 2021). That

is, this self-concept is very important in improving an individual's ability in mathematics.

In addition to self-concept, mathematical ability is also very dependent on interest in mathematics. Sproesser et al (2016) defines interest as a high readiness of individuals to acquire new knowledge and skills. Sproesser, et al (2016) continued that the newly acquired skills and knowledge encourage individuals to implement them in everyday life. That is, interest is highly correlated with individual actions to solve problems in society after individuals acquire these skills and knowledge. For example, when an individual has a high interest in mathematics, he will try to learn mathematical knowledge and skills so that in the future he is able to implement them in everyday life. The implementation of knowledge related to mathematics is to solve problems in society. This is in accordance with the opinion of Limpo et al (2013) that the mathematical knowledge obtained by the individual will later be used to solve problems in the midst of society. That is, high interest can encourage individuals to understand mathematics and implement this knowledge in everyday life.

Based on the review above, it can be said that self-concept and interest strongly influence mathematical ability. However, studies on the relationship between self-concept and interest in predicting mathematical ability are still minimally researched by experts. Moreover, in Maluku itself, so far there has been no study that examines the influence of self-concept and interest on mathematical ability. So far, similar research has been carried out by Sproesser et al (2016), but these results have never been replicated in Indonesian research subjects, especially in Maluku. Recently the Puspendik of the Kementerian Pendidikan dan Kebudyaan (Kemendikbud) of the Republik Indonesia released the 2016 Asesmen Kompetensi Siswa Indonesia (AKSI) report showing that the mathematical abilities of Maluku and North Maluku people are still below Papua, South Sulawesi, and Gorontalo (Kemendikbud, 2016) . This means that the mathematical ability of the Moluccans needs to be improved. Therefore, replication of research on self-concept and interest in influencing mathematics ability is important to do in Maluku, because so far this

topic has never been studied in Maluku while the condition of students' abilities in Maluku mathematics needs to be improved.

Therefore, the research that we do this time is to answer this problem with the formulation; (1) Does self-concept affect mathematical ability?; (2) Does interest affect mathematical ability?; and (3) Is self-concept related to interest as a predictor of mathematical ability? If the answer is yes, then this can be a recommendation in the future, that to improve math skills is to mature self-concept and individual interest in mathematics. In addition to answering these formulations, this study aims to re-examine the theory of self-concept and interest in influencing mathematical abilities, especially for research subjects from Maluku so that they can be alternative recommendations from a psychological perspective for Maluku people in the future.

METHOD

The population in this research is students from the Program Studi Matematika, Fakultas Ilmu Tarbiyah dan Keguruan (FITK), Institut Agama Islam Negeri (IAIN) Ambon. Based on the distribution of the questionnaires that we distributed to a number of students From different semesters!, we obtained a sample of 24 students who were willing to take part in this study. The sampling technique we use is purposive sampling with the consideration that this study examines self-concept, interest and mathematical abilities on subjects who really understand mathematics (Sugiyono, 2017). This is in accordance with the approach in this study, namely ex-post facto research, we believe that the variables of self-concept and mathematical ability are inherent in the subject before we conduct the research. Therefore, the most appropriate sampling technique is purposive sampling. The samples we obtained were 3 men and 21 women. A number of students who were sampled in this study came from Different semester, (8 peoples at second grade), (1 person at third grade), (1 person at four grade), and (13 peoples at sixth grade). The sample in this study is not fixed, meaning that we do not only focus on samples that come from one particular class that have passed each semester in one academic year, but we focus on all samples that are scattered in each semester that are being

studied by research subjects (students). Therefore, this research was not carried out in one academic year, but in different academic years depending on the distance of the semester the research subject (student) is currently undertaking.

The number of samples has met the requirements in quantitative research by implicitly referring to the opinion of Sugiyono (2017) that there is no minimum and maximum limit in determining the sample. Sugiyono (2017) said that the determination of the sample depends on the amount of error the researcher wants by considering energy and time. Therefore, the sample that we used in this study was 24 students with a percentage rate of 12% male students and 88% female students, while the tolerance level of error used was 5% (0.05). In addition, the sample used in this study can also be said to be representative because it is classified as individuals who are proficient in mathematics, namely all of them come from the Mathematics Study Program. That is, the sample in this study is representative to explain self-concept and mathematical ability, relevant to the ex-post facto research approach used in this study.

The self-concept scale used in this study was adapted from Sproesser et al (2016) consisting of 6 question items such as "I am talented in mathematics". Then the subject was asked to give a score following the Likert model from strongly disagree (1) to strongly agree (5). This instrument was distributed to subjects using Google Form information technology (figures 1 and 2). Based on the results of the validity test referring to the corrected item-total correlation table, it ranges from 0.67 to 0.83. The validity level score refers to the opinion of Azwar (2015) that the minimum value of validity is 0.3, which means that all items are valid. In addition, this self-concept scale has also been through a reliability test with the alpha formula. The results of the reliability test showed a score of 0.92, which means this instrument has a high level of consistency so that it can be used in the sample in this study (table 1).

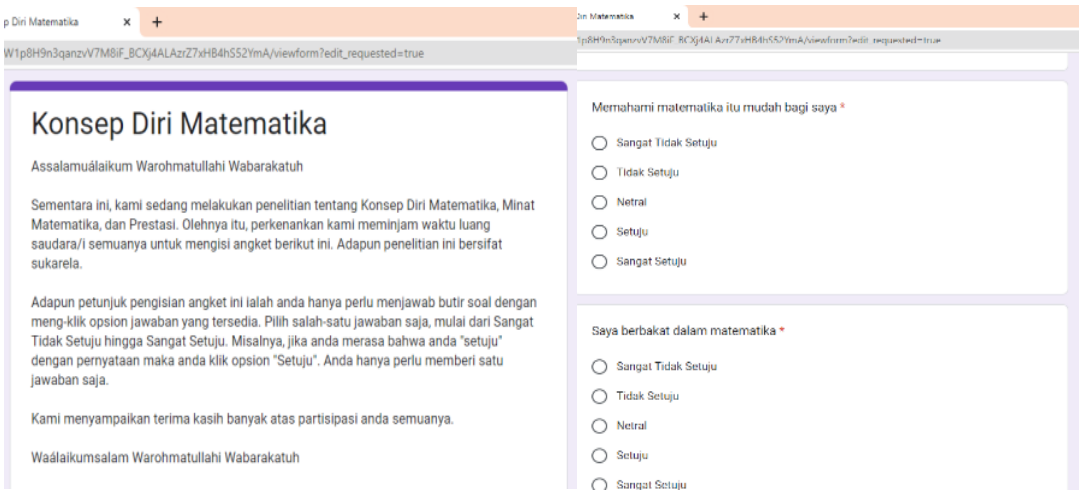

Figure 1. Questionnaire distribution using Google Form

Table 1. Self-concept scale reliability scores

Cronbach's Alpha	N of Items
.924	6

The interest scale used in this study was adapted from Sproesser et al (2016) consisting of 6 question items such as "I do math assignments because I like this course". Then the subject was asked to give a score following the Likert model from strongly disagree (1) to strongly agree (5). This instrument was distributed to subjects using Google Form information technology (figures 1 and 2). Based on the results of the validity test, referring to the corrected item-total correlation table, it ranges from 0.41 to 0.81. The validity level score refers to the opinion of Azwar (2015) that the minimum value of validity is 0.3, which means that all items are valid. In addition, this interest scale has also been through a reliability test with the alpha formula. The results of the reliability test showed a score of 0.89 which means this instrument has a high level of consistency so that it can be used in the sample in this study (table 2).

Table 2. Interest scale reliability scores

Cronbach's Alpha	N of Items
.897	6

Identifying our mathematical abilities using the Grade Point Average of the students who were the subjects of this study. The calculation of the GPA is based on the academic manual of the Ambon State Islamic Institute. Referring to the manual that the GPA calculation is obtained by dividing the total number of grades each semester by the total number of credits. The results of the GPA obtained by the student are what we mean by the level of mathematical ability of the research subject. In this study we did not specifically focus on mathematical abilities in certain subjects, but we focused on general mathematical abilities, so we are of the opinion that GPA is a general mathematical ability because students have taken every subject on mathematics according to the FITK IAIN Mathematics Study Program curriculum. Ambon.

In this study using an ex-post facto research approach. That is, the influence of the independent variable (self-concept) on the dependent variable (mathematical ability) has occurred before the researcher conducted the research. This refers to Kerlinger's opinion (Pelupessy & Dimyati, 2019) that in this ex-post facto research study, the independent and dependent variables had appeared before the research was conducted. Therefore, researchers do not need to control the independent variables as in research with experimental designs. In accordance with the approach used in this study, and referring to the formulation and research hypotheses, the researchers used linear regression analysis techniques.

RESULT AND DISCUSSION

After we distributed questionnaires using Google Form information technology to students of the Mathematics Study Program FITK IAIN Ambon, the research data obtained showed that the semester level taken by the research subjects was very varied, starting from semester 2 to 6 with an average of 4.39 and a standard deviation of 1 ,92. The descriptive data of the self-concept variable obtained a

minimum value of 6 and a maximum of 24, an average of 17.54 with a standard deviation of 4.501. The interest variable obtained a minimum value of 10 and a maximum of 28, an average of 21.08, with a standard deviation of 4.149. Finally, for the Cumulative Achievement Index (GPA) variable, the minimum value is 2.28 and the maximum is 3.90 with an average of 3.40 and a standard deviation of 0.46. Based on these descriptive results, it can be said that the data we obtained from the research sample were very varied (table 3.

Table 3. Research descriptive data

	N	Min	Max	M	Std. Dev
Gender	23	1	2	1.87	.344
Semester	23	2	6	4.39	1.924
IPK	22	2.28	3.90	3.4032	.46419
Self-concept	24	6	24	17.54	4.401
Interest	22	10	28	21.08	4.149

The assumption test used to fulfill the requirements of the linear regression test in this study used the normality, linearity, and heteroscedasticity tests. The results of the normality test refer to the results of Kolmogorov-Smirnov that self-concept variables are normally distributed (0.076; $p<0.05$) and interest variables are also normally distributed (0.194; $p<0.05$). In addition, based on the linearity test of the variable of interest referring to the Anova table, it shows a significance of 0.05 ($p <0.05$), which means that the data is spread linearly. Meanwhile, the self-concept variable shows that it is 0.31 ($p>0.05$), which means that the data is not spread linearly. However, the self-concept data were normally distributed. The results of the heteroscedasticity test also show that the interest variable contains high heteroscedasticity (0.023; $p<0.05$) while the self-concept variable has low heteroscedasticity (0.396; $p>0.05$

Referring to the fulfillment of the assumption test, we continue to test the hypothesis in this study using linear regression. The results of the hypothesis test show that self-concept is very influential on mathematical ability by the value of R (0.22) and Rsquare (0.049). That is, the correlation level of self-concept with

mathematical ability is 0.22 with a percentage of 0.49% (table 4). This shows that there are 99.51% of other variables that also affect mathematical ability, such as teacher-student interactions (Alsa et al., 2015), low anxiety (Susanti & Rohmah, 2011; Ghufron & Suminta, 2013), methods of mathematics learning (Purwanto & Yudiarso, 2021), and the comfort of the classroom environment (Limpo et al., 2013) which all variables were not examined in this study.

Table 4. The level of influence of self-concept on mathematical ability

Variabel	R	Rsquare
Self concept* Math skills	0,22	0,049

In addition, based on the Anova table shows that the effect of self-concept on mathematical ability is 1.040 with a significance of 0.320 (p>0.05). This shows that the hypothesis in this study is not accepted, that there is no influence of self-concept on mathematical ability (table 5).

Table 5. The effect of self-concept on mathematical ability

Variabel	F	Sig
Self concept*Math Skills	1,040	0,320

The results of hypothesis testing indicate that interest greatly influences mathematical ability by the value of R (0.50) and Rsquare (0.253). That is, the level of correlation between interest and mathematical ability is 0.50 with a percentage of 25.3% (table 6). This shows that there are 74.7% of other variables that affect mathematical ability.

Table 6. The level of influence of interest on mathematical ability

Variabel	R	Rsquare
Self concept* Math skills	0,50	0,253

In addition, based on the Anova table, it shows that the effect of interest on mathematical ability is 6.789 with a significance of 0.01 (p <0.05). This shows that the hypothesis in this study is accepted, namely that there is an influence of interest on mathematical ability (table 7).

Table 7. The effect of interest on mathematical ability

Variabel	F	Sig
Interest* Math skills	6,789	0,01

The results of the hypothesis test show that self-concept and interest greatly affect mathematical ability by the value of R (0.53) and Rsquare (0.282). That is, the correlation level of self-concept and interest with mathematical ability is 0.53 with a percentage of 28.2% (table 8). This shows that there are 71.8% of other variables that affect mathematical ability.

Table 8. The level of influence of self-concept and interest on mathematical ability

Variabel	R	Rsquare
Self-concept and interests* Math skills	0,53	0,282

In addition, based on the Anova table, it shows that the effect of self-concept and interest on mathematical ability is 3.728 with a significance of 0.04 (p<0.05). This shows that the hypothesis in this study is accepted, namely that there is an influence of self-concept and interest on mathematical ability (table 9).

Table 9. The effect of self-concept and interest on mathematical ability

Variabel	F	Sig
Self-concept and interests* Math skills	3,728	0,04

Based on the results of the hypothesis test above, it shows that self-concept and interest greatly affect mathematical ability. This finding confirms

previous research such as that studied by Sproesser et al (2016) that self-concept and interest greatly determine one's involvement in new knowledge such as mathematics. The question is why self-concept and interests affect mathematical ability? According to Nagy et al (2006) that self-concept and interest make individuals willing to be fully involved in learning activities such as mathematics. In addition, self-concept and interests also make individuals more motivated to engage in certain activities such as mathematics (Sproesser et al., 2016). Therefore, self-concept and interest are the two most important variables that determine a person's involvement in mathematics lessons so that he can master it and make him capable of it.

Self-concept is a person's ability to evaluate himself (Clem et al., 2021). In relation to mathematics, self-concept makes individuals express their belief in their competence in mathematics (Sproesser et al., 2016). That is, self-concept in mathematics can encourage individuals to be fully involved in it in order to improve their competence. According to Sproesser et al (2016) that the factors that shape an individual's self-concept towards mathematics are comparisons with others, comparisons with previous achievements, and comparisons between perceived achievements so far. The point is that when a person compares his ability with the abilities of others, the results of the comparison then encourage him to form a self-concept related to mathematics so that his ability increases. In addition, self-concept is also formed because individuals compare current achievements with previous achievements. For example, in this study, the mathematical ability achieved by the current research subjects was better than before, so this experience resulted in their self-concept related to mathematics increasing. This is what makes self-concept very decisive for someone to be involved in mathematics so that the ability of the subject is higher.

Interest is also very influential on individual mathematical abilities. Interest is a person's readiness for certain objects of knowledge such as mathematics so as to make individuals fully involved in it and even encourage individuals to implement the knowledge obtained in the midst of society (Krapp, 2007; Sproesser et al., 2016). According to Sproesser et al (2016) that interest is one of the

psychological variables that experience continuous development. Interest develops as individuals come into contact with a positive environment, for example a mathematics learning environment (Sproesser et al., 2016). That is, if the individual continues to be in a mathematics learning environment from time to time, this situation will shape the individual's interest in mathematics. This shows that one of the factors that shape individual interest is situational experience. In this study, it is most likely that the research subject has a high interest in mathematics because the subject's environment is people who are interested in mathematics. This interest then affects the individual to be fully involved in mathematics lessons so that it affects his ability to mathematics.

Based on the above review confirms the current findings that self-concept and interest are strongly correlated with predicting an individual's mathematical ability. This means that the hypothesis in the study is accepted, namely that there is an influence of self-concept and interest on mathematical ability. However, this finding shows that the percentage of this influence is very small, namely 28.2%. That is, there are about 71.8% individual mathematical ability is determined by other variables. These other variables such as a comfortable classroom environment (Limpo et al., 2013), school wellbeing programs (Alsa et al., 2015), and self-efficacy (Ghufron & Suminta, 2013; Alsa et al., 2015) are variables which also affects the individual's mathematical ability. Therefore, for further research, it is necessary to explore these variables which are then associated with self-concept and interest in mathematics.

CONCLUSION

Based on the results and discussion above, it can be concluded that self-concept and interest greatly affect mathematical ability. The results of this study can be a recommendation in the future that in order to improve mathematical abilities there needs to be self-concept and interest in mathematics. However, in this study there are limitations, namely mathematical ability is not always influenced by self-concept and interests, but there are other variables that also increase mathematical abilities such as a comfortable classroom environment, school

wellbeing programs, and self-efficacy. A number of these variables need to be investigated in further research.

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