MATHEMATICS' SELF-EFFICACY AND PEER RELATION AS A PREDICTOR OF MATHEMATICS ACHIEVEMENT

Aniq Hudiyah Bil Haq[1] and Asmadi Alsa[2]

[1]Muhammadiyah University of Surakarta, Faculty of Psychology,
Pabelan, Surakarta, Indonesia

[2]Gadjah Mada University, Faculty of Psychology,
Bulaksumur, Yogyakarta, Indonesia

chi.anique@yahoo.com

Abstract

Well-educated human resources will enable them to have the necessary competence to compete in this modern world since education and achievement remain an important standard for knowing their resourceness. This research is based on less number of Mathematics achievements of Senior High School Students in Indonesia. At the same time, mathematics is important subject in the development of communication and information technology. Therefore, this research aims to analyze and investigate Mathematics achievement on Senior High School students, which are observed based on Mathematics self-efficacy and peer relationship. This research is conducted by employing quantitative approach with regression analysis. Subjects used in this research are 143 students of Senior High School in Surakarta, who are measured for their Mathematics achievements by using cognitive final marks on report of odd semester of academic year 2013/2014. The variables of Mathematics self-efficacy and peer relationship are measured by using scales. Based on data analysis results, the conclusion obtained states that both Mathematics self-efficacy and peer relationship can predict Mathematics achievement.

Key Words: Mathematics self-efficacy, peer relationship, Mathematics achievement, Predictor.

Aniq Hudiyah Bil Haq S.Psi M.A. The author of this papper, is currently working at Muhammadiyah University of Surakarta, as a lecturer in Faculty of Psychology. She was born in Bekasi, West Java, Indonesia, on 10 February 1989. Now she lives at Colomadu, Karanganyar, Indonesia. She was concerned in education psychology; and her latest research is about school well-being.

Mathematics' Self-Efficacy and Peer Relation As A Predictor Of Mathematics Achievement

1. Introduction

Mathematics is universal science which serves as the basic of modern technology development. Mathematics also has important role in various other science disciplines and able to develop human's mind power. One of Mathematics achievement in Indonesia can be shown based on the results of National Examination. In 2012, Senior High School students who did not passed the examination reached 7,579 students out of 1,524,704 National Examination participants. Based on that data, many

of students have bad marks on Bahasa Indonesia and Mathematics. In 2013 and 2014 there are no more change suggesting to improvement because Mathematics is still judged as a difficult subject for National Examination [1].

There are many factors that encourage students to maximize their academic achievement. [2] revealed some factors affecting achievement such as intrinsic and extrinsic factors; the intrinsic factor is self-efficacy and the extrinsic factor is peer relationship Based on the research conducted [3] concerning about peer relationship, this research showed that peer social participation of Senior High School students could improve their Mathematics achievement and self-efficacy also made them confident in learning and success to finish assignment of Mathematics. The research focus is based on intrinsic factor such as self-efficacy and extrinsic factor such as peer relationship.

Students in school need self-efficacy as believed in their performance to manage their desire to success upon their action. When someone has self-efficacy, s/he will have better understanding what they need and what they want to do. Therefore, it would have direct impact to create their dream [4].

The definition [5] of the mathematic self-efficacy is believe of the people about their ability and can success in mathematic performance or can succeed in mathematic task from teachers. In the research [6] and [7] title is *The Impact of Self-efficacy on Mathematics Achievement of Primary School Children*, that she made a research about Self-efficacy on Mathematics Achievement in Pakistan. The results showed that mathematics self-efficacy has significant correlation with mathematics and self-efficacy have different level in age of the students.

Peer relationship positively can mean there is interaction which happen positive naturally among two or more students. In the school, students create positive relationship such as getting attention from peer, sharing and ability to share their belong selves and also good words in communication in order to not hurt them. Research [8] about self-efficacy and peer showed that peer and self-assessment in mathematics learning can enhance the achievement of the student. Positive peer relationship and support would affect in teaching and learning process, which will consequently bring good result of academic achievement [9]. In this research, academic achievement would concern on Mathematics achievement.

Students who do positive relationship with their peer (have a lot of friends and in the good grace by classmate) have good academic achievement [10, 11]. Students who get rejection from their peer early would face difficulties in the future. The students who have good acceptance in their class will have good achievement and lower probability move to down class [12].

Mathematics achievement is knowledge capability or skill that developed by Mathematics field [13]. Therefore, achievement as result which gained after someone learned and usually showed by test marks or marks which given by Mathematics teacher. Study achievement usually state in the form individual marks such as report, STTB or performance indexes [14]. Related with the predictor of mathematics achievement in [15] research showed that the variables used as predictor of mathematics achievement such as math anxiety, demography (gender, race, and social economy condition).

Giving marks in the schools in the form of students' achievement report have marking system selves; the marks classified are cognitive, affective and psychomotor marks. Cognitive marks of students can be known by doing mathematical problems examination in the school, affective and psychomotor marks can be known by observing that conducted by teachers. In this research, subject report marks consist of cognitive, affective and psychomotor marks. Therefore, it can be used as learning achievement report are cognitive final marks of Mathematics at semester one. Bandura identified self-efficacy as believe on individual ability for training amount of controlling dimension toward self-function and phenomenon in their environment. Self-efficacy also refers to individual subjective perception on her/his ability to perform in current situation [4].

Hartup said that relationship is sequence interaction between two people which could happen many times and every interaction is limited its duration. However, the previous interaction will affect the next interaction and in the future [16]. Peer relationship can be defined as continuous interaction among peers. Hypothesis in this research are Mathematics self-efficacy and peer relationship can be role as predictor of Mathematics achievement.

2. Research Method

Subjects used in this research are students of XI IPA degree at SMAN 2 Surakarta that have five classes with subjects total 143 students. However, in section of subjects who concerned by their ages, the chosen subjects are those of 17 to 18 year olds.

Variables of Mathematics achievement obtain from report book marking documentation of Mathematics. in the report book, the teacher would include cognitive, affective and psychomotor marks, but final cognitive marks only that aggregate from daily test, assignments, mid and final semester marks in one semester 2013/2014 academic year. The variables of Mathematics self-efficacy is measured by scale of Mathematics self-efficacy based on theory [4], it uses three dimensions (Level, Generality and Strength). The variables of peer relationship is measured by scale of peer relationship based on theory constructed by using five aspects [17]; they are Cooperative, Communication and Interaction, Emotional understanding and Self regulation, Social problem solving, and Conflict resolution. The reliability of Mathematics self-efficacy scale is 0.823 at dimension one, next 0.800 at dimension two and 0.768 at dimension three. It means that Mathematics self-efficacy scale is reliable. Coefficient estimated result of reliability on peer relationship scale is 0.892. The research design used in this research is quantitative approach with multiple regression analysis. It uses three variables and there are two variables as predictor (Mathematics self-efficacy and peer relation) and one variable of criteria (Mathematics achievement).

3. Result and Discussion

Subject who taken their data are 143 students from SMAN 2 Surakarta who students from class XI IPA 1 to class XI IPA 5. The subjects are 56 males and 87 females.

Tab. 1. Subjects Description base on classes

Class	Quantity	Percentage (%)
XI IPA 1	27	18.9
XI IPA 2	31	21.7
XI IPA 3	30	20.9
XI IPA 4	28	19.6
XI IPA 5	27	18.9
Total	143	100

The subject characteristics involved are maximum marks, minimum marks, mean, and standard deviation in empirical and hypothetical data statistics.

Tab.2 Description of Empirical and Hypothetical Data of Research Variables

(n = 143 students)

Variables	Hypothetical Data				Empirical Data			
	Marks		Mean	DS	Marks		Mean	DS
	Min	Max			Min	Max		
Mathematics Self-Efficacy	25	100	62.5	12.5	50	90	69.9	7.34
Peer relationship	34	136	85	17	81	135	102.1	8.83
Mathematics Achievement	0	100	50	16.6	71	91	78.6	3.2

Correlations of linierity testused are used to examine the correlations of linierity between predictor variable with criterion variable. The result of linierity test in this research is presented in table 3.

Tab. 3 Result of linierity test, relevance for each independent variable with mathematic achievement

Variable Independent	**Variable Dependent**	**Linierity Test**			**Conclusion**
		Deviasi	**F value**	**p value**	
Mathematics Self-efficacy	Mathematics Achievement	1,749	1,886	0.000 (deviation)	(p>0.05)
Peer relations		1,116	1,094	0.327 (linierity)	(p<0.05)

The hypothesis of this study is that mathematics self-efficacy and peer relationships may serve as predictor for mathematics achievement. Correlation test between mathematic self-efficacy and mathematics achievement is r = 0.272 (p<0.01), and correlation test between peer relations and mathematics achievement is r = 0.045 (p>0.01). The results showed that self-efficacy and mathematics achievement have significant correlations; and there is no significant correlations between peer relations and mathematics achievement. In this research, peer relation cannot predict the mathematics achievement.

Mathematics Self-efficacy as a single variable, which has R^2 = 0.074 or effective contributions 7.4%; and then mathematics self-efficacy and peer relations if together have R^2 = 0.077 or effective contributions 7.7%. F test in mathematics self-efficacy as a single variable has F= 11,255 (p<0.01); and then mathematics self-efficacy and peer relations if together have F= 5,800 (p<0.01). Based on the data, mathematics self-efficacy can predict the mathematics achievement. Combined together, mathematics self-efficacy and peer relations can predict the mathematics achievement. Multiple regression model in this study is Y= 78,685 + 0.342 X1. Constanta value 78,685coevisien b_1 for mathematics self-efficacy is 0.342.

The results of this study indicate that mathematics self-efficacy was positively correlated with mathematic achievement. Therefore, these findings support previous research stating that students who have high self-efficacy will have higher mathematics achievement. Significant relationships have been found in several studies on mathematics achievement with mathematics self-efficacy [20, 21].

Significant positive correlation between mathematics self-efficacy and academic achievement for students of mathematics is important in order to improve performance in mathematics. Students can improve the efficacy of himself through various ways, such as when students acquire efficacy information about themselves based on their appearance, observation of models (vicarious experience), other forms of social persuasion, and physiological factors, the efficacy of these sources can be a way to improve the mathematics self-efficacy of students themselves. Students are able to assess their ability and then choose an activity that is able to improve the performance with the help of social persuasion from those around so that makes it a calm and confident in doing his work. Self-efficacy affects students in selecting activities [22]. Students with low self-efficacy may avoid lessons with many assignments, especially for challenging tasks, while students with high self-efficacy has a great desire to do his assignments. With self-efficacy, students will form the behavioral choices he will do in order to achieve things that he is convinced will succeed.

The results of this study were associated with previous studies stating that children who undergo positive relationships with their peers (have many friends and liked by classmates) have good academic achievement [10, 23, 24]. Children who get rejection from their peers since early still may face academic difficulties in subsequent years [24]. Longitudinal study conducted Wentzel and Caldwell [24] on the student from level 6 to level 8 shows that peer acceptance can be a strong predictor in improving academic achievement. The above results show that in early childhood and childhood, good relationships with peers are characterized by the presence of self-acceptance from peers, which becomes a very important impact on students' achievement. Relationships with peers can

be a relationship with both positive and negative impacts. In previous studies [25, 26, 27, 28, 29, 30) it is mentioned that the primary school and early secondary school is associated either with friends, which can contribute to academic achievement. But if it is associated with adolescents as their research subjects, the presence of peers do not have positive impact on students' academic achievements [28].

Basically the kids' experience of peers changes according to the developmental age. This is because the mixture to the growing awareness of intrapersonal (understanding change and more concerned about interpersonal), interpersonal (change in frequency or specific forms of behavior), dyadic (quality changes of friendship engagement or friendship) and group (change in form cliques and crowds). Interactions that occur between peers in childhood will continue to increase during adolescence, teens spend 29% of their time to interact with their peers than with parents and other adults [31].

In adolescence, rejection occurs on very few friends. Teenagers have a tendency to behave in line with their peer group. This is because a teenager will perform a variety of ways in order to be accepted as part of the group. High school students have a good relationship with their friends and are more interested in friends who are able to focus on academic tasks that can benefit the academic achievement of the maximum but peers in adolescence may increase or decrease the adjustment of students with schools that have an impact on academic achievement [32].

Therefore, based on the above description it can be concluded that peer relationships has more impact on childhood than in adolescence. Positive and supportive peer relationships can be a predictor for future mathematics learning achievement at primary school compared to high school students. Some of the above calculation show that this hypothesis is accepted and the value of R = 0.277 Fregresi = 5.800 ($p<0.01$). In other words, the factors of mathematics self-efficacy and peer relationships together can be a good predictor in improving math achievement. Both variables (self-efficacy in mathematics and relationships with peers) together provide an effective contribution to the achievement of learning mathematics by 7.7%.

This study has limitations in terms of math achievement scores, the researchers first wanted to get the score of the test results based on the scores obtained by the students in completing the exam in a semester. However, due to the remedial system to make the students who take remedial obtain a minimum value limits the KKM, the values are not directly based on the scores of students working on the exam. Based on the research conducted, mathematics self-efficacy and peer relationships together can be a predictor in improving math achievement. Both predictor variables (self-efficacy in mathematics and relationships with peers) provide an effective contribution to the achievement of learning mathematics by 7.7%. In another analysis peer relations without mathematic self efficacy did not have any correlations with math achievement.

Based on the research conducted and the conclusions obtained, the researcher proposes some suggestions. First, the subjects included in this study, which were students of SMA Negeri 2 Surakarta, are expected to further improve their mathematics learning achievement by improving the efficacy of students in the fields of mathematics. Second, various parties associated with practice of education, mathematics is an important part of science for one's life. Therefore, it is expected that it will improve learning achievement in the subjects of mathematics. Learning about mathematics should be done comprehensively because good mark in mathematics studies influence the students' graduation. Third, to further research; research in the same field can also add other relevant variables, picking subjects in different cities or even of different ages and stages of development. Hence, the differences found in further research will be additional information to be discussed in development era. In addition, the researcher can make their own test not only from the teacher who has to be subject, so it can make the mark from the students' real ability in math.

Reference

[1] Sulistyo, H. S. *Hasil UN 2012,* from harian Jogja www.harian-jogja.com. (2013,1 September), 2012.

[2] Suryabrata, S. *Psikologi pendidikan.* Jakarta: Raja Grafindo Persada, 2002.

[3] Winheller, S., Hattie, J. A., &Brown, G. T.L. Factors influencing early adolescents' mathematics achievement: High-quality teaching rather than relationships. *Journal of Learning Environ Res* 16, 49–69 DOI 10.1007/s10984-012-9106-6. Springer, 2013.

[4] Bandura, A. *Self-efficacy: The exercise of control.* New York: W.H Freeman and Company, 1997.

[5] Sengul, S. Effect of concept cartoons on matematics self-efficacy of 7th grade students. *Education Science: Theory and Practice,* 11(A), 2305-2313, 2011.

[6] Anjum, R. The impact of self-efficacy on mathematic achievement on primary school children. *Pakistan Journal of Psycological Research,* 21(3-4), 61-78, 2006.

[7] Purzer, S. The Relationship between team discourse, self-efficacy, and individual achievement: A sequential mixed-methods study. *Journals of Enginering Education,* 100(4), 655-679, 2011.

[8] Adeyemi, A. A. Effect of peer and self-assessment on male and female students self-efficacy and self-autonomy in the learning of mathematics. *Journals of Gender and Behaviour*. Ife Center for Psychological Studies/Services, Ile-Ife, Nigeria, 10(1), 4492-4508, 2012.

[9] Jones, V., & Jones L. *Manajemen kelas komprehensif edisi ke-9.* Jakarta: Kencana Prenada Media Group, 2012.

[10] Fantuzzo, J., Sekino, Y., & Cohen, H. An examination of the contribution of interactive peer play to salient classroom competencies for urban head start children. *Psychology in school,* 41(3), 323-370, 2004.

[11] Moriyama, J., Yasushi, K., Aoki, Y., Kito, A., Behnoodi, M., Miyagawa, Y., & Matsuura, M. Self-efficacy and learning experience of information education: In case of junior high school. *Journal of AI and Soc,* 23, 309-325, 2009.

[12] Lubbers, M. J., Margaretha, P. C., Werf, V. D., Snijder, T. A., Cremers, B. F., & Kuyper, H. The impact of peer relations on academic progress in junior high. *Journal of School Psychology,* 44, 491-512, 2006.

[13] Masrun & Martaniah, S.M. *Psikologi pendidikan.* Yogyakarta: Yayasan Penerbitan Fakultas Psikologi Universitas Gadjah Mada, 1984.

[14] Azwar, S. *Tes prestasi: Fungsi dan pengembangan pengukuran prestasi belajar* (edisi ke 2). Yogyakarta: Pustaka Pelajar, 2000.

[15] Cheema, J. R., & Galluzo, G. Analyzing the gender gap in math achievement: Evidence from a large-scale US sample. *Research in Education,* (90) 98-112, 2013.

[16] Hartup, W. W. Having friends, making friends, and keeping friends. ERIC Digest. Urbana, IL: ERIC *Clearinghouse on Elementary and Early Childhood Education,* 1992.

[17] Terzian, M. A. Assessing peer relations: A guide for out–of-school time program practitioners. *Reseacrch-to-Result, Wasington, DC: Child Trends,* 2012.

[18] Caprara, G. V., Vecchione, M., Alessandri, G., Gerbino, M., & Barbaranelli, C. The contribution of personality traits and self-efficacy beliefes to academic achievement: A longitudinal study. *British Journal of Educational Psychology,* 81, 78-96, 2011.

[19] Nasiriyan, A., Azar, H. K., Nuruzy, A., & Dalvand, M. R. A model of self-efficacy, task value, achievement goals, effort and matematic achievement. *International Journal of Academic Research,* 3(2), 612-618, 2011.

[20] Migray, K. *The relationships among math self-efficacy, academic self-concept and math achievement*(Unpublished doctoral thesis), Arizona State University, Arizona, 2002.

[21] Moore, N. M. *Constructivism using group work and the impact on self-efficacy, intrinsic motivation and group workskills on middle-school mathematics students*(Unpublished doctoral thesis). Arizona State University, Arizona, 2005.

[22] Schunk, D. H. *Learning theories. An educational perspectve*. Boston: Pearson, 2008.

[23] Ladd, G. W., Birch, S. H., & Buhs. E. S. Children's social and scholastic lives in kindergarten; Related spheres of influence? *Child development*, 70(6), 1373-1400, 1999.

[24] Wentzel, K. R., & Caldwell, K. Friendships, peer acceptance, and group membership: Relations to academic performance in middle school. *Child Development, 68(*6), 1198-1209, 1997.

[25] Alttermatt, E. R., & Pomerantz, E. M. The implications of having high-achieving versus low-achieving friends: A longitudinal analysis. *Social Development, 14*, 61-81, 2003.

[26] Berndt, T. J., & Keefee, K. Friends' influence on adolescents' adjustment to school. *Child Development, 66*, 1312-1329, 1995.

[27] Cook, T. D., Deng, Y., & Morgano, E. Friendship influences during early adolecence: The special role of friends'grade point average. *Journal of Research on Adolescence*, 17, 325-356, 2007.

[28] Veronneau, M. H., Vitaro, F., Pedersen, S., & Tremblay, R. E. Do peer contribute to the likehood of secondary school graduation among disadvantaged boys? *Journals of Education Psychology, 100*, 429-442, 2008.

[29] Vitaro, F., Brendgen, M., & Warnner, B. Patterns of affiliation with delinquent friendsduring late childhood and early adolecence: Correlates and consequences. *Social Development, 14*, 82-108, 2005.

[30] Woolley, M. E. Kol. K. L.,& Bowen, G. L. The social contex of school success for latino middle school: Direct and indirect influences of teachers, family and friends. *Journal of Early Adolescence, 29*, 43-70, 2009.

[31] Rubin, K. H., Bukowski, W. M., & Parker, J. G. Peer interactions, relationship, and Groups. Dalam W. Damon (Series Eds) & N. Eisenberg (Vol. Eds), *Handbook of Child Psychology (6th edition).*New York: John Wiley & Sons, 2006.

[32] Hamm, J. V. Do birdsof a feather flock together? The variabel bases for African American, Asian American, and the european American Adolescents'selection of similar friends. *Developmental Psychology, 36*, 209-219, 2000.