Between mathematical intelligence and social relationship

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Abstract. The process of mathematics learning in elementary school level should establish the affiliation of mathematical intelligence, mathematical dispositions and good social relationships. This study aims to discover the learning outcomes of mathematics learning process by investigating the affiliation of mathematical intelligence, mathematical dispositions, and social relationships between students and their peers. This study is associative quantitative research with product moment correlation analysis technique. The subjects of this study were fourth-grade students of SD Laboratorium. The data was collected using sociometric questionnaires, mathematical dispositions questionnaires, written tests, interviews with homeroom teachers, and student documents analysis. The results of this study revealed that good mathematical intelligence did not have an effect on mathematical dispositions and good social relationships. The results of sociometry questionnaire also showed that students who had good mathematical intelligence were not always liked by their friends.

1. Introduction
Logical mathematical intelligence is the ability of a person to handle numbers, calculations, and patterns, as well as to think logically and scientifically. This intelligence also includes the ability to process numbers, mathematics, and also other things related to numbers [1]. Children who have mathematical intelligence usually have sufficient ability to process numbers, analyze and solve problems [2]. They are also very interested in mathematics and natural science subjects. Mathematical intelligence is crucial to be possessed by students as a provision to develop problem-solving abilities in their lives [3].

In addition to mathematical intelligence, factors that influence mathematics learning processes and outcomes are mathematical dispositions (mathematical attitudes). Katz states that the mathematical dispositions relate to attitudes shown by students in solving mathematical problems such as self-confidence, diligence, interest, and flexibility in thinking to find solutions to problems [4]. Another opinion from Wardani states that the mathematical disposition is an attitude that shows interest in and appreciation of mathematics [5]. Students appreciate mathematics and realise that mathematics is useful in their daily lives. Thus, students not only can understand the theory but also will be more aware and understand the use and usefulness of mathematics in everyday life [3,6,7].

Mathematical intelligence and mathematical dispositions are different things even though they can influence each other. Someone who has good mathematical intelligence does not necessarily have a good mathematical disposition and vice versa. This is in accordance with Carr's statement, which states that mathematical dispositions and mathematical abilities are two different things. With this in mind, in order to reach success in learning mathematics, it is necessary to know the level of students' mathematical disposition [8].
In everyday life, a person cannot only rely on his intelligence but also on his social abilities. Aristotle states that humans are social creatures or social beings [9]. Human beings cannot live alone even though they are considered very intelligent. Humans live in relationships of mutual dependence and connect with others. They cannot solve the problems of their lives alone. There are always people who help them in achieving their goals and fulfilling their needs. Therefore, elementary school-age children must begin to learn to interact socially, especially with their peers [10,11].

However, the reality in elementary schools shows that someone who has good mathematical intelligence does not necessarily have good social relationships with their peers. So as, someone who has good mathematical intelligence does not necessarily have a good mathematical attitude, or maybe someone who has a good mathematical attitude will have good social relationships. Therefore, it needs to do research to uncover the association between mathematical intelligence, mathematical attitudes and social relationships with their peer of fourth grade students in elementary school.

2. Research method
The research method used associative quantitative research method with symmetrical associative. The study aims to examine the relationships between mathematical intelligence, mathematical attitudes, and peer social relationships of fourth-grade elementary school students. Data collection techniques used were mathematics attitude questionnaires, sociometry, written tests, interviews with homeroom teacher, and student documents analysis. The study was conducted in the fourth grade in SD Laboratorium in Tasikmalaya. The school was chosen as a place of research because it is one of the favorite private schools in Tasikmalaya and has students with above average intelligence. Data analysis technique used was a descriptive and inferential analysis of product moment correlation.

3. Results and discussion
3.1. Mathematical intelligence with mathematical disposition
Carr states that mathematical disposition and mathematical intelligence are two different things [6]. Mathematical intelligence refers to students’ ability in processing numbers, while mathematical disposition relates to students’ ability to appreciate, respond to, and realise the usefulness of mathematics in everyday life. Although they are different, mathematical intelligence and mathematical disposition can be related. The following table 1 presents the results of the analysis performed by using the Pearson product moment correlation analysis.

|           | Intelligence | Disposition |
|-----------|--------------|-------------|
| Intelligence | Pearson Correlation | 1 | -235 |
|            | Sig. (2-tailed) | .305 |
|            | N          | 21 | 21 |
| Disposition | Pearson Correlation | -.235 | 1 |
|            | Sig. (2-tailed) | .305 |
|            | N          | 21 | 21 |

The data shows that the correlation coefficient between mathematical intelligence and the mathematical disposition is -0.235. The correlation is a negative correlation which means that good mathematical intelligence is not accompanied by a good mathematical disposition. Conversely, a good mathematical disposition is not accompanied by good mathematical intelligence.

This study can reveal that mathematical intelligence and mathematical disposition of students who obtain high math scores, have sufficient flexibility to think, good self-confidence, good persistence and perseverance, poor interest and curiosity and good monitors and evaluations. While students who have a low math score, have the ability to think flexibly, self-confidence, persistence and perseverance, interest and curiosity, and monitor and evaluate all of them are good.
3.2. Mathematical Intelligence with Social Relationship

Based on the observation results, not all students who had good intelligence had good social relationships. Not a few students who had good intelligence were even liked less by their friends. The following table 2. presents the results of the Product Moment correlation analysis between mathematical intelligence and students' social relationships.

| Table 2. Correlation of mathematical intelligence with social relationship. |
|-----------------------------------|----------|--------|
|                                   | Intelligence | Relationship |
| Pearson Correlation               | 1         | -0.065 |
| Sig. (2-tailed)                   | .780      |        |
| N                                 | 21        | 21     |
| Pearson Correlation               | -0.065    | 1      |
| Sig. (2-tailed)                   | .780      |        |
| N                                 | 21        | 21     |

The table 2 shows that the correlation coefficient value was -0.065 which means that, although very low. The negative sign means that the mathematical intelligence and social relationships move in the opposite direction. It means that there were some students who had good mathematical intelligence but have poor social relationships and vice versa.

Besides that, it was found that mathematical intelligence and social relations of students who obtained high math scores, had good social relations in terms of friendship, cooperating, understanding people's perspective, and attitudes towards opponents. Have a good judgment in terms of trust from friends, social adjustment, interact and spend time interacting, participating, and social skills. For students who have a low math score, have a good social relationship in terms of interacting, participating, social skills, and attitudes towards opponents. Having a very good social relationship in terms of friendship, trusted friends, social adjustment, spending time interacting, collaborating, understanding people's perspective.

3.3. Mathematical disposition with social relationship

The results of the analysis by using product moment analysis showed that mathematical dispositions correlate with students' social relationships as presented in the following table 3.

| Table 3. Correlation of mathematical disposition with social relationship. |
|-----------------------------------|----------|--------|
|                                   | Disposition | Relationship |
| Pearson Correlation               | 1         | .492   |
| Sig. (2-tailed)                   | .023      |        |
| N                                 | 21        | 21     |
| Pearson Correlation               | .492      | 1      |
| Sig. (2-tailed)                   | .023      |        |
| N                                 | 21        | 21     |

The data show that the mathematical disposition is moderately correlated with social relations with a correlation coefficient of 0.49 and positive. It means that the mathematical disposition and social relationships have a unidirectional relationship. Thus, if students have a good mathematical disposition, they also have a good social relationship, and vice versa.

Attitudes in the mathematical disposition can be used as a basis for students' social relationship such as self-confidence, persistent, diligent, and open-minded. With those attitudes, students will have the courage to establish relationships with their friends, be persistent and diligent in maintaining friendships, and be open-minded to accept all opinions or characteristics of different friends. This is a strong reason for the formation of a positive relationship between mathematical dispositions and social relationships.
Based on the description of the correlation between intelligence, mathematical dispositions, and social relationships mentioned above, we can see that between mathematical intelligence and mathematical dispositions, and between mathematical intelligence and social relationships had negative correlations. It means that good intelligence is not necessarily accompanied by good mathematical dispositions and social relationships. Also, the mathematical dispositions and social relationships are not always accompanied by good mathematical intelligence. In contrast, the mathematical disposition and social relationships had a positive correlation. It indicates that teachers had taught the students the importance of behaving properly so that the correlation between students’ mathematical dispositions and social relations was quite good. However, this correlation has not been linked to mathematical intelligence.

4. Conclusion and recommendation
This study, showed that the correlation between mathematical intelligence and mathematical dispositions was low and had a negative value. Similarly, the correlation between mathematical intelligence and social relationships was very low and negative. On the contrary, mathematical dispositions with social relationships showed a moderate and positive correlation. However, these attitudes had not been linked to mathematical intelligence. It is believed that if a good attitude is also accompanied by good mathematical intelligence, it will be more meaningful for students. Students will become ideal human beings because they have a balance between attitudes and knowledge.

The suggestion for other researchers is to develop a learning model that can stimulate students to improve the balance between mathematical intelligence, mathematical dispositions, and social relations. Because it is evident that although students had good social relationships and mathematical dispositions, they had not good mathematical intelligence or vice versa.

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References
[1] Gardner Howard 2006 Multiple intelligences: New horizons (New York: Basic Books)
[2] Ozgen Korkmaz 2012 The Impact of Critical Thinking and Logico-Mathematical Intelligence on Algorithmic Design Skills Journal of Educational Computing Research 46(2) 173-193
[3] Scott A Chamberlin and Robert A Powers 2012 Assessing affect after mathematical problem solving tasks Validating the Chamberlin Affective Instrument for Mathematical Problem Solving Sage Journals: Gifted Education International 29(1) 69-85
[4] Maxwell K 2001 Positive Learning Dispositions [Onile]. Retrieved from: Mathematics.www.education.auckland.ac.nz/.../ACE_Paper_3_Issue_11.doc. Accessed on Juli 2018
[5] Margaret Walshaw and Glenda Anthony 2017 The Teacher’s Role in Classroom Discourse: A Review of Recent Research Into Mathematics Classrooms Sage Journals: Review of Educational Research 78(3) 516-551
[6] Rasyidin 2009 Filsafat Pendidikan (Bandung: UPI Press)
[7] Trisnowali A 2016 Profil Disposisi Matematis Siswa Pemenang Olimpiade pada Tingkat Provinsi Sulawesi Selatan Journal of EST 1(3) 47-57
[8] Sumarmo U 2013 Kumpulan Makalah Berpikir dan Disposisi Matematika serta Pembelajarannya (Bandung : Departemen Mathematics Education Universitas Pendidikan Indonesia)
[9] Arla Westenskow, Patricia S. Moyer-Packenham and Barbara Child 2017 An Iceberg Model for Improving Mathematical Understanding and Mindset or Disposition: An Individualized Summer Intervention Program Journal of Education 197(1) 1-9
[10] Marja-Liisa Hassi and Sandra L. Laursen 2015 Transformative Learning Personal Empowerment
in Learning Mathematics *Journal of Trasformative Education* **13**(4) 316-340

[11] Mohammad Niroo, Gholamreza Haji Hossein Nejhad and Mahmoud Haghani 2012 The effect of Gardner theory application on mathematical/logical intelligence and student’s mathematical functioning relationship *Procedia - Social and Behavioral Sciences* **47**(2012) 2169-2175