Comparison of Effect Size Independent and Disciplined Character on Students’ Mathematics Success in Elementary Schools

Abstract

Character values are very important to be instilled in elementary school students. There have been many studies that reveal the value of independent character and discipline related to the success of students' mathematics learning, so this study aims to compare the effect size of the value of independent and disciplined character on the success of learning mathematics at the elementary school level. Types of meta-analysis research. A total of 18 artifacts that were used as data were obtained through a Google Scholar search using predetermined keywords. Data analysis using the help of JASP 0.14.1.0 application. The results of the study obtained an effect size of independent character values (0.43) with a moderate effect category. Effect size discipline character value (0.69) with sufficient effect category. The effect size of the discipline character value is greater than the independent character value. The results of this study have shown that the value of the character of discipline at the elementary school level is more developed and entrenched than the value of independent character. These two character values have a positive and significant relationship in increasing students' success in learning mathematics at the elementary school level.

Keywords: character values, independent, disciplined, successful in learning mathematics, effect size
A. Introduction

Trends in the International Mathematics and Science Survey (TIMSS) and the International Student Achievement Mathematics Program (PISA) aim to provide information on student performance in mathematics. Both PISA and TIMSS assess students' achievement levels in Mathematics and Science (Wu, 2009). Students' mathematical performance emphasizes analyzing, reasoning, and communicating ideas (OECD, 2009).

Indonesia's PISA lesson scores in 2018 showed a decline in science, reading and math. In the field of mathematics, in 2015 it scored 386 while in 2018 it scored 379 (Figure 1). The decline that occurred in mathematics scores was influenced by many factors. One of the factors in students or internal factors. The internal factor in question is the attitude/character of students in learning mathematics. The better the attitude of students in learning mathematics, the students have a good character in learning mathematics. Based on the research results of Khadijah et al., (2021) that the value of character education in schools has an impact on the success of students' mathematics learning. The research of Harun et al., (2021) that students' attitudes have an impact on the success of learning mathematics. Student attitude variables are very important in the success of learning mathematics (Diggs & Akos, 2016). Learning outcomes and student achievement in learning mathematics are influenced by the attitudes or character of the students themselves.

![Figure 1. Comparison of PISA Scores 2012, 2015, and 2018](https://indonesiapisa.com/profile/)

Once the importance of character values, so strengthening character education needs to be implemented at the elementary school level. Students at the elementary school level have good character strengths, must be able to implement the character values they have in everyday life (Putri et al., 2020). Trustworthiness, fairness, respect, caring, responsibility, and civic duty-citizenship are universal character values that can be instilled and developed in elementary school students (Zamroni, 2011). There are five national character values in the character education strengthening program, namely independent, nationalist, mutual cooperation, integrity, and religious (Setiawan et al., 2021). From the research results Aningsih et al., (2022). Finding that the values of character education implemented in elementary schools include discipline, religion, leadership, responsibility, cooperation, love, tolerance, neatness, cleanliness, courtesy, perseverance, self-confidence, courage, economy, independence, diversity of acceptance, honesty, nationalism, creativity, achievement award and fairness. Many character values are instilled in elementary school students, the values of independent character and discipline are character
values that relate to oneself. These two values have had a good impact on the success of learning mathematics.

The value of independent character and discipline can be used as the strength of student character values in learning mathematics. There have been many research results that reveal the positive and significant impact of the value of independent character and discipline on student learning success in mathematics. Research by Rahmawati (2016), Egok (2016), Aliyah (2019), Susintoi et al., (2019), Muliyanti et al., (2020), Siagian et al., (2020), Larasati et al., (2020), Aglistya (2020), and Riyanti et al., (2021) that the value of independent character has a positive and significant impact on the success of students' mathematics learning. In addition, the value of the discipline character has a positive and significant impact on the success of learning mathematics. This statement is reinforced by the results of research by Pamungkas (2017), Rusni and Agustan (2018), Prihandir (2018), Fitria et al., (2018), Utama (2020), Naibaho et al., (2020), Fernandes (2021), and Novita & Akhsan (2022). The results of previous research on the value of independent and disciplined characters are only limited to revealing positive and significant relationships or impacts on learning outcomes or learning achievement in mathematics, but have not revealed the effect size. It is necessary to do a meta-analysis research, to reveal the effect size comparison of independent and disciplined character values on the success of learning mathematics at the elementary school level.

Meta-analytical research combines several or many studies and is statistically analyzed (Hedges, 1987). Meta-analysis is a statistical procedure that integrates the results of several studies (Egger et al., 1997). According to Crombie and Davies (2009) meta-analysis is one technique in statistics to combine several findings from independent studies. Meta-analysis is a statistical synthesis method by combining and analyzing quantitative results from many empirical studies (Glass, 1976). In the meta-analysis there is hypothesis testing using inferential statistics to draw conclusions about the overall results of the study (Cooper, 1989). Meta-analysis is encouraging to determine the extent to which the attributes of a combination of several studies support the hypothesis (Caird et al., 2008). Meta-analysis is a way to get the average from a combination of various studies and get a measure of effect size (Barendregt et al., 2013). Meta-analysis in this study is to collect the results of research on the relationship between independent character values and discipline with the success of students' mathematics learning at the elementary school level. The research has been published in the form of an article or thesis. Research results that have been published are called artifacts. The collected artifacts will be statistically analyzed.

B. Methodology

The type of research used is meta-analysis. The theory of meta-analysis refers to the opinion of Hedges (1987) by combining several or many studies (artifacts) about the value of independent character and discipline with learning outcomes or student achievement in mathematics in elementary schools. The artifacts were statistically analyzed.

Artifacts as research data were collected through searching the Google Scholar link. The Publish or Perish application is used to make it easier to search on Google Scholar links. Artifact search keywords are used to speed up the discovery of artifacts that match the intended variable. The keywords used in Indonesian are:

1. The value of independent character with elementary school students' mathematics learning outcomes
2. The value of independent character with mathematics learning achievement of elementary school students
3. The value of discipline character with elementary school students' mathematics learning outcomes
4. The value of discipline character with elementary school students' mathematics learning achievement

There are two variables in the study, namely the value of independent character and discipline as the first variable. Learning outcomes or mathematics learning achievement of elementary
school students as the second variable. Learning outcomes and learning achievement is called the success of learning mathematics. There are several criteria used in collecting artifacts containing these two variables, namely:

1. It's on the Google Scholar link or open access
2. Are the results of research in Indonesia
3. Presented in Indonesian
4. Published in the form of articles or thesis
5. Loading both research variables
6. Year of publication (2016 – 2022)
7. Have a value of F, t or r
8. Have sample size (N)

The collected artifacts are tabulated into an Excel file, using a coding approach. Coding is required in the meta analysis (Decoster, 2009). The coding procedure carried out is that the desired characteristics of the artifact are coded and write down the specific coding scheme such as correlation (r), value (t), value (F), and sample size (N), Effect Size (ES), and Standard Error (SE). The tabulated artifacts were statistically analyzed with the help of the JASP 0.14.1.0 application to obtain the effect size and summary effect size of the artifact. According to Cohen (2007) effect size and summary affect size are 0 - 0.20 (weak), 0.21 - 0.50 (fair), 0.51 - 1.00 (moderate), and > 1.00 (strong).

C. Findings and Discussion

1. Findings

Searching for artifacts on the Google Scholar link with the help of the Publish or Perish application, obtained 18 artifacts consisting of 9 artifacts related to independent character values, and 9 artifacts related to discipline character values. The artifacts obtained have met the specified criteria. Artifacts have been published in the form of articles and theses (Table 1 and Table 2).

<table>
<thead>
<tr>
<th>Author</th>
<th>Publication</th>
<th>Indexing</th>
<th>N</th>
<th>r</th>
<th>t</th>
<th>F</th>
<th>Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Muliyanti et al., (2020)</td>
<td>Journal</td>
<td>-</td>
<td>50</td>
<td>0.54</td>
<td>-</td>
<td>-</td>
<td>Class V Elementary School</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>15</td>
<td>0.29</td>
<td>-</td>
<td>-</td>
<td>Class IV Elementary School</td>
</tr>
<tr>
<td>Aglistya (2020)</td>
<td>Thesis</td>
<td>-</td>
<td>4</td>
<td>0.40</td>
<td>-</td>
<td>-</td>
<td>Class V Elementary School</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>10</td>
<td>2.69</td>
<td>-</td>
<td>-</td>
<td>Class IV, V, VI Elementary School</td>
</tr>
<tr>
<td>Aliyah (2019)</td>
<td>Thesis</td>
<td>-</td>
<td>4</td>
<td>0.39</td>
<td>-</td>
<td>-</td>
<td>Class V Elementary School</td>
</tr>
<tr>
<td>Rahmawati (2016)</td>
<td>Thesis</td>
<td>-</td>
<td>85</td>
<td>0.56</td>
<td>-</td>
<td>-</td>
<td>Class V Elementary School</td>
</tr>
<tr>
<td>Egok (2016)</td>
<td>Journal</td>
<td>-</td>
<td>3</td>
<td>0.40</td>
<td>-</td>
<td>-</td>
<td>Class V Elementary School</td>
</tr>
<tr>
<td>Susintoi et al., (2019)</td>
<td>Journal</td>
<td>-</td>
<td>84</td>
<td>0.45</td>
<td>-</td>
<td>-</td>
<td>Class III Elementary School</td>
</tr>
<tr>
<td>Larasati et al. (2020)</td>
<td>Journal</td>
<td>Sinta 4</td>
<td>26</td>
<td>0.39</td>
<td>-</td>
<td>-</td>
<td>Class IV Elementary School</td>
</tr>
<tr>
<td>Riyanti et al., (2021)</td>
<td>Journal</td>
<td>Sinta 4</td>
<td>31</td>
<td>2.02</td>
<td>-</td>
<td>-</td>
<td>Class IV Elementary School</td>
</tr>
<tr>
<td>Siagian et al., (2020)</td>
<td>Journal</td>
<td>Sinta 3</td>
<td>45</td>
<td>0.95</td>
<td>-</td>
<td>-</td>
<td>Class V Elementary School</td>
</tr>
</tbody>
</table>

Artifacts of independent value character values come from articles published in journals (N=6) and thesis (N=3). There are articles published in reputable journals Sinta 3 and Sinta 4. Number of students for all artifacts (N=1255). Artifacts that have a correlation value (N=7) and which only have a t value (N=2), after the transformation process were obtained (t=2.965 and r=0.258) and (t=2.029 and r=0.296). Characteristics of students are in class III, IV and VI.
Table 2. Artifact Characteristics of Disciplinary Character Value

<table>
<thead>
<tr>
<th>Author</th>
<th>Publication</th>
<th>Indexing</th>
<th>N</th>
<th>r</th>
<th>t</th>
<th>F</th>
<th>Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Naibaho et al., (2020)</td>
<td>Journal</td>
<td>Sinta 3</td>
<td>32</td>
<td>0.75</td>
<td>2</td>
<td>-</td>
<td>Class V Elementary School</td>
</tr>
<tr>
<td>Fitria et al., (2018)</td>
<td>Journal</td>
<td>Sinta 4</td>
<td>80</td>
<td>0.38</td>
<td>5</td>
<td>-</td>
<td>Class V Elementary School</td>
</tr>
<tr>
<td>Utama (2020)</td>
<td>Thesis</td>
<td>-</td>
<td>2</td>
<td>0.57</td>
<td>0</td>
<td>-</td>
<td>Class IV Elementary School</td>
</tr>
<tr>
<td>Novita &amp; Akhsan (2022)</td>
<td>Journal</td>
<td>Sinta 4</td>
<td>84</td>
<td>0.48</td>
<td>6</td>
<td>-</td>
<td>Class IV Elementary School</td>
</tr>
<tr>
<td>Rusni and Agustan (2018)</td>
<td>Journal</td>
<td>Sinta 4</td>
<td>36</td>
<td>0.79</td>
<td>9</td>
<td>-</td>
<td>Class IV, V, VI Elementary School</td>
</tr>
<tr>
<td>Fernandez et al., (2021)</td>
<td>Journal</td>
<td>-</td>
<td>30</td>
<td>0.60</td>
<td>8</td>
<td>-</td>
<td>Class IV Elementary School</td>
</tr>
<tr>
<td>Pamungkas (2017)</td>
<td>Thesis</td>
<td>-</td>
<td>19</td>
<td>0.99</td>
<td>5</td>
<td>-</td>
<td>Class IV Elementary School</td>
</tr>
<tr>
<td>Prihandir (2018)</td>
<td>Thesis</td>
<td>-</td>
<td>64</td>
<td>0.44</td>
<td>0</td>
<td>-</td>
<td>Class IV Elementary School</td>
</tr>
</tbody>
</table>

The artefacts of character values of discipline come from articles published in journals (N=5) and thesis (N=4). There are articles published in reputable journals Sinta 3 and Sinta 4. Number of students for all artifacts (N=480). Artifacts that have a correlation value (N=8) and which only have a t value (N=1), after the transformation process were obtained (t=2.392 and r=0.395). Characteristics of students are in grades IV and VI.

![Figure 2. Effect Size and Summary Size of Independent Character Value](image-url)

Figure 2. Effect Size and Summary Size of Independent Character Value
Based on data sourced from 18 artifacts, the effect size and summary effect size were calculated. Calculation of each character value is done separately. Based on 9 artifacts related to independent character values, the effect size and summary effect size are obtained. The forest plot of 9 independent character value artifacts shows the effect size and summary effect size (Figure 2).

The results of the analysis of effect size and summary size of discipline character values obtained artifacts that have an effect size in the medium category (N=9). Does not have an effect size in the moderate and strong categories. The resulting summary effect size (0.43) is in the sufficient category. The standard error generated from 9 artifacts of independent character values is in the range (0.05 – 0.15), meaning that the error value generated from 8 artifacts is very small (Figure 3).

**Figure 3. Standard Error of Independent Character Value**

Based on 9 artifacts related to the discipline character values obtained effect size and summary effect size. The forest plot of 9 artifacts of discipline character values shows the effect size and summary effect size (Figure 4).

**Figure 4. Effect Size and Summary Size of Discipline Character Value**
The results of the analysis of effect size and summary size of independent character values obtained artifacts that have an effect size in sufficient category (N=4), medium category (N=4), and strong category (N=1). The resulting summary effect size (0.69) is in the medium category. The standard error generated from 9 artifacts of independent character values is in the range (0.1 – 0.2) meaning that the error value generated from 8 artifacts is very small (Figure 5).

![Figure 5. Standard Error of Discipline Character Value](image)

2. Discussion

The success of learning mathematics at the elementary school level is measured by learning outcomes and learning achievement in mathematics. Mathematics learning outcomes are achievements obtained by students after gaining learning experience or after completing mathematical learning activities. Mathematics learning achievement is the result of an assessment after several mathematics learning outcomes are implemented. The success of students’ mathematics learning is influenced or related to the characters that are formed and developed in students. Based on the results of this study, it was found that there were two character values, namely independence and discipline which had an impact on students to achieve success in learning mathematics.

The results of the partial analysis of 18 artifacts obtained effect size and summary effect size independent character values and discipline character values. The effect size generated by the independent character values is spread in the medium category. The resulting summary effect size (0.43) is in the sufficient category Cohen et al.(2007) with a very small standard error. The results of the analysis of effect size and summary size of discipline character values are only scattered in the sufficient, medium and strong categories. The resulting summary effect size (0.69) is in the sufficient category (Choen et al. (2007) with a very small standard error. The difference in the resulting Summary effect size indicates that the value of the disciplined character is more developed or entrenched among elementary school students. The character value is independence shown by elementary school students, namely doing math assignments at the beginning without the help of friends or teachers and preparing or repeating the material that has been taught by the teacher (Riyanti et al., 2021). Student independence can be a determining variable for learning success (Krakauer, Ghilardi, & Ghez, 1999). Student independence as an important requirement in graduation at school (Kopzhassarova et al., 2016) Students who are independent in the learning process r without depending on their friends (Riyadi et al., 2021). Independence has a very important role in the success of elementary school students. Disciplined students have high independence, so the character values of independence and discipline are interconnected.
The value of independent character and discipline at the elementary school level continues to be instilled. Principals and teachers have a major role in developing and cultivating these two values. The approach that can be used is habituation and giving examples. The values of independent character and discipline that have been possessed since elementary school become a reference at the level of high school and college. At the secondary school level, it is used to face or follow the Trends in International Mathematics and Science Study (TIMSS) and Program International Student Assessment (PISA), so that it has a good impact on increasing Indonesian students’ math scores.

D. Conclusion

Based on 18 artifacts consisting of 9 independent character value artifacts, and 9 discipline character values artifacts, various effect size and summary effect size values were obtained. The effect size generated by the discipline character values is spread in the medium category. The resulting summary effect size (0.43) is in the sufficient category with a very small standard error. The effect size of the discipline character values is spread in the moderate, moderate, and strong categories. The resulting summary effect size (0.69) is in the medium category with a very small standard error. The resulting difference in Summary effect size shows that the value of disciplined character is more developed or entrenched among elementary school students. This finding is useful for principals and teachers in strengthening character education programs. The two character values can be used as a reference in participating in TIMSS and PISA when students are at the high school level. Future researchers can develop this research on the aspect of the number of artifacts used. Comparing the effect size and summary effect size of various character values that develop in elementary school students.

E. References


