The Gender Equality in CLIS Model and Brain Gym Technique: A Review of Cognitive Learning Outcomes

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Abstract
This study aims at finding out the cognitive learning outcomes of the equality of male and female students in Children Learning in Science (CLIS) that was combined with a Brain Gym. This study is a comparative research. The population of this study were the students of grade XI MIA SMA Negeri 7 Kupang in the academic year of 2018/2019 and the sample of this study were the students of grade XI MIA 1. The instrument used was a test of cognitive learning outcomes. The data obtained were analyzed using Anakova. The result of anova test showed that the significance value is 0.675 or greater than alfa value 5%. This means that there are not differences in cognitive learning outcomes between male and female students in CLIS combined with a brain gym. It means that by combining CLIS and Brain Gym technique, the equality of cognitive learning outcomes for male and female students can occur. Providing the same opportunities, the same tasks and the same responsibilities during Children Learning in Science combined with a Brain Gym learning, can minimize the differences in characteristics between genders so that the learning outcomes obtained are equivalent.

How to Cite
INTRODUCTION

Education is an important process that determines the quality of a nation. Education includes all efforts aimed at growing student awareness of their potential so that the utilization of these potentials can be used as provisions in making adjustments to various situations and challenges that may be encountered in life (Sele et al, 2016; Shilvock, 2018; Dimyati et al, 2018). The quality of the education process must be further improved so that the education can prepare students to enter the industrial revolution 4.0. This is in line with the opinions of Aulbur & Bigghe (2016), Hartmann & Bovenschulte (2013) and Pfeiffer (2015) who explain that with good education, students are expected to be able to face various challenges arising from technological developments in the industrial revolution 4.0.

In an effort to maximize the achievement of educational goals, one important topic that needs attention in learning is the problem of student pluralism (Pambudiono et al, 2015). Student pluralism can be interpreted as unique characteristics according to the background of each student (Lerman, 2010; Kantzara, 2013; Colombo, 2013). Among the various diversity of students, a quite visible difference is the difference in gender (Colombo, 2013; Juhannis, 2012). Related to the influence of gender on students’ abilities in learning, there have been several studies that have been conducted to uncover these facts. Soraya (2010), Manahal (2011) and Pambudiono et al (2015) revealed that student learning outcomes and other learning outcome variables such as meta-cognitive skills and critical thinking skills can be influenced by gender differences.

The difference in learning outcomes of male and female students can be explained by the facts revealed by previous studies. Elliot, et al (2000), explained that based on memory capacity, language skills and ability to solve mathematical problems, male students have higher visual-spatial abilities whereas in verbal abilities, female students have higher abilities. This is in line with reports from Sasser (2010) and Davison (2012) who explained that in verbal abilities, female students are superior compared to male students. Furthermore, Zaidi (2010) proposed that there were differences between the learning process and the language development of male and female students.

The fact that there are differences between male and female students means that in learning including the implementation of the learning model, an equalization effort between students of different gender needs to be done. One of learning models that can be applied is the CLIS learning model. CLIS is a learning model that is based on constructivism theory. The learning based on constructivism theory is a good learning to apply because in such learning, students are encouraged to be actively involved in building their own knowledge and understanding (Oliver, 2000; Driscoll, 2000; Olusegun, 2015; Budiarto, 2015; Fernando&Marikat, 2017). In CLIS learning, students are required to be actively involved in learning where students are encouraged to actively seek information related to learning material, students are encouraged to build new knowledge, students are encouraged to interpret that knowledge and ultimately students are expected to be able to deduce various facts about new concepts and ideas based on knowledge they have. CLIS learning is done through hands-on/mind-on activities that are expected to develop physical skills and thinking skills of students in reconstructing their ideas. CLIS model consists of several stages: orientation stage, elicitation of ideas stage, restructuring of ideas stage, application of ideas stage and review change in ideas stage (Widiyarti et al, 2012; Pada, 2010; Rustaman, 2010; Hidayati et al, 2015; Budiarto, 2015; Windarwati, 2017).

To increase the effectiveness of CLIS learning, the learning model can be integrated with learning techniques such as Brain Gym technique (Sele, 2019). Brain Gym is a technique that can be implemented easily but can provide great benefits in improving the quality of learning. In the application of Brain Gym, students are directed to make some simple movements that can stimulate the integration of the work of the right and left brain so that brain functions can be coordinated harmoniously. With harmonious brain coordination, the body’s physiological abilities will increase. These abilities include, for instance, memory skills, body coordination abilities, fine and gross motor skills, stress management abilities, and increased individual learning abilities. Several previous studies have reported that Brain Gym is effective to be applied in learning because with easy movements, a cheerful and enjoyable learning atmosphere can be created and at the same time can increase student’s learning abilities (Dennison, 2002; Demuth, 2008; Macias et al, 2009; Cahyanto et al, 2016).

Related to the potential of learning models in empowering male and female students’ learning outcomes, Ciascai et al. (2011) reported that it was related to students’ learning outcome variables. Some studies show that there are differences in learning outcomes between male and
female students in learning patterns with certain models but there are also those who report that there are no differences in learning outcomes. As an example, Siswati & Corebima (2017) and Sele (2019) report that in Think Pair Share learning, male and female students have the same metacognitive skills but Pambudiono (2015) reported that in Jigsaw learning, female student learning outcomes are higher. This can indicate that the equality of male and female student learning outcomes in a learning model can be influenced by the characteristics of the learning model used.

Based on these descriptions, the research of the gender equality in Children Learning In Science Model and brain gym technique is important to reveal the facts about the equality of cognitive learning outcomes between male and female students in Children Learning In Science learning combined with a Brain Gym.

**METHOD**

This study is a comparative research. The design of the study can be seen in Table 1.

<table>
<thead>
<tr>
<th>Group</th>
<th>Pre test</th>
<th>Learning models</th>
<th>Post test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male Student</td>
<td>O1</td>
<td>X</td>
<td>O2</td>
</tr>
<tr>
<td>Female Student</td>
<td>O3</td>
<td>X</td>
<td>O4</td>
</tr>
</tbody>
</table>

Notes: O1 and O3 = score/value of pre-test, O2 and O4 = score/value of post-test, X=CLIS combined Brain Gym

The study was conducted from October to November 2018. The population of this study were the students of class XI MIA SMA Negeri 7 Kupang in the academic year 2018 / 2019, consisting of 5 classes. By using simple random sampling technique, the students of Class XI MIA 1 were determined to be the research sample. Students of class XI MIA 1 consist of 12 male students and 18 female students. Data on cognitive learning outcomes of students before and after treatment were collected with a test of cognitive learning outcomes. The data obtained were then tested for the normality and homogeneity of the data. If after analysis it was known that the data meet the assumption of normal and homogeneity, then the test was carried out with ANCOVA. But If the data did not meet the assumption of normal and homogeneity, then the data analysis would be transferred using the Quade’s Rank Analysis of Covariance test as a type of non-parametric analysis. Data analysis was carried out using IBM statistics 24 software with a significance level of 5%.

**RESULT AND DISCUSSION**

Description of the cognitive learning outcomes of male and female students taught by using CLIS combined with a Brain Gym can be seen in Figure 1.

Based on the data showed in Figure 1, it can be seen that there is an increase in the cognitive learning outcomes of male and female students taught by using CLIS combined with a Brain Gym. The average value of pre-test cognitive learning outcomes of male students was 48.33 and the average value of post-test was 75. This value indicates that an increase of 55.18%. While the average value of pre-test cognitive learning outcomes of female students was 53.06 and the average value of post-test was 77.22. This value indicates that an increase of 45.53%.

![Figure 1. Profile of the average value of pre-test and post-test cognitive learning outcomes](image)

Furthermore, the normality test uses the Kolmogorov-Smirnov One-Sample Test and the homogeneity test uses the Levene’s Test of Equality of Error Variances. The results of normality and homogeneity test data can be seen in Table 2. The data in Table 2 shows that the significance value obtained from the One-Sample Kolmogorov-Smirnov Test and Levene’s Test is greater than 0.05 for both pre-test and post-test data. Therefore, it can be concluded that the data obtained from this study was normal and homogeneous data so that it can be analyzed using Ancova. Ancova test results of this research data are presented in Table 3.

The calculated F value of gender that show in Table 3 is 0.180 with a significance value of 0.675 or greater than alfa value 5%. This means that there are not differences in cognitive learning outcomes between male and female student in CLIS combined with a brain gym.
The result of ancova test show that in CLIS combined with a Brain Gym learning, there is equality in cognitive learning outcomes between male and female students. This shows that the CLIS learning model combined with a Brain Gym can reduce the gaps that might occur due to differences in the cognitive characteristics of students. Wang and Wang (2008) and Chung & Chang (2016) explain that there are significant differences between the cognitive aspects of male and female students. More detail, Riding and Grimley (1999) revealed that female tend to have a more complete understanding of information than male because female are willing to spend more time to processing the new information and linking that information with the prior knowledge. On the other hand, although male have a lower ability to understand the new information, male are able to process more information than female. Therefore, the equality that occur shows that CLIS learning combined with a Brain Gym can encourage students of different gender to maximize their abilities. This is in accordance with the opinion of Brasilita et al (2018) which explains that with appropriate learning can minimize differences in characteristics between genders so that cognitive learning outcomes achieved will be equal.

Facts about the equality of cognitive learning outcomes can be explained that CLIS learning combined with a Brain Gym can provide equal opportunities for male and female students to engage in learning. This is in line with Sahin (2014) and Hadjar et al (2014) who explained that the essence of gender equality in education is providing equal opportunities to engage in learning. These conditions make students feel be a part of learning and feel facilitated to develop their abilities and qualities.

Providing equal opportunities in CLIS learning can be seen from the process of implementing the learning phase which includes the orientation stage, the elicitation of ideas stage, the restructuring of ideas stage, the application of ideas stage and the review change in ideas stage. In the orientation stage, students are encouraged to focus their attention, realize the importance of the topic of learning and realize the benefits of learning the topic. In the elicitation of ideas stage, students are encouraged to express their initial knowledge and this stage also allows the teacher to explore student’s knowledge. These two stages are the stage where each student both male and female students, is given personal responsibility to carry out the learning process. In the third stage, which is the restructuring of ideas stage, each student is given the opportunity to have discussions with other students in a small group. After that students are given the responsibility to report the results of their discussions in class discussions. This stage allows all students, both male and female students to clarify the truth.

Table 2. The Result of the Normality and Homogeneity Test of the Cognitive Learning Outcomes

<table>
<thead>
<tr>
<th>Data</th>
<th>Statistical Test</th>
<th>Sig</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-test cognitive learning outcomes</td>
<td>One-Sample Kolmogorov-Smirnov Test</td>
<td>0.427</td>
</tr>
<tr>
<td></td>
<td>Levene's Test</td>
<td>0.182</td>
</tr>
<tr>
<td>Post-test cognitive learning outcomes</td>
<td>One-Sample Kolmogorov-Smirnov Test</td>
<td>0.074</td>
</tr>
<tr>
<td></td>
<td>Levene's Test</td>
<td>0.055</td>
</tr>
</tbody>
</table>

Table 3. The Summary of Ancova Test of the Male and Female Students’ Cognitive Learning Outcomes

<table>
<thead>
<tr>
<th>Source</th>
<th>Type III Sum of Squares</th>
<th>Df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corrected Model</td>
<td>76.442</td>
<td>2</td>
<td>38.221</td>
<td>.150</td>
<td>.861</td>
</tr>
<tr>
<td>Intercept</td>
<td>19231.473</td>
<td>1</td>
<td>19231.473</td>
<td>75.580</td>
<td>.000</td>
</tr>
<tr>
<td>Pre-test cognitive learning outcomes</td>
<td>40.886</td>
<td>1</td>
<td>40.886</td>
<td>.161</td>
<td>.692</td>
</tr>
<tr>
<td>Gender</td>
<td>45.810</td>
<td>1</td>
<td>45.810</td>
<td>.180</td>
<td>.675</td>
</tr>
<tr>
<td>Error</td>
<td>6870.225</td>
<td>27</td>
<td>254.453</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>181750.000</td>
<td>30</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Corrected Total</td>
<td>6946.667</td>
<td>29</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

R square = .011 (Adjusted R Squared = .062)
of ideas that they have made in the previous stage. Then in the fourth stage, each student reflects on changes in ideas by comparing initial knowledge and final knowledge after learning.

In this research, CLIS models are also integrated with Brain Gym techniques. The Brain Gym was conducted in opening activities, main activities and closing activities. The frequency of Brain Gym implementation that was adjusted to the conditions of students and learning time. Brain Gym in the opening activities aims to create an initial atmosphere of learning that makes students have a positive attitude to follow the learning. Similarly, Schor (1998), Williams & Stockdale (2004), Brdar et al (2006) and Putri (2018), explained that in opening activities, teachers are required to be able to create active, relaxed and positive learning situations that motivate students to be ready to participate in learning. Students who have good motivation will carry out the learning process with enthusiasm and have an interest to be actively participated in learning (Filak & Sheldon, 2008; Irvin et al., 2007; Saed & Zyngier, 2012; Taurina, 2015).

Brain Gym in the main activities is done to overcome the boredom of students. This is reinforced by the Priambodo report (2016) which explains that the application of Brain Gym makes students relaxed in following learning. Furthermore Dennison (2002) and Purwanto et al (2009) also explained that the implementation of Brain Gym has a positive impact on students because Brain Gym movements can stimulate brain function and have a positive impact on students' physical. Brain Gym allows students to be ready to accept lessons, improve concentration, improve memory and focus, improve communication skills and improve students' ability to manage emotions. While the Brain Gym in the closing activity serves to help students release fatigue so that students are able to conclude learning well. This is important because the closing activity is one of the most important stages of learning to note because at that stage students are given the opportunity to assimilate the lesson and interpret the importance of the lesson (Ganske, 2017).

The explanation of the implementation of the CLIS learning stages combined with a Brain Gym shows that each student gets the same opportunities and responsibilities. This is in accordance with Brasilita et al (2018) which explains that the learning model that results in equality is a learning model that does not differentiate tasks between female and male students and that every female and male student has the same opportunity to collect the value of cognitive results. Furthermore, the personal responsibility of each student will make the learning process better. Bandura (1991), Cook-Sather (2010) and Susetyarini et al (2019) explain that by having responsibilities each student will be able to control his thoughts, actions and personal desires so that students are able to regulate and determine their priorities in learning.

The effort to realize gender equality in CLIS learning combined with a Brain Gym through providing equal opportunities and responsibilities to students is also in line with the opinion of Gondek (2011) which explains that equivalent learning occurs when the teacher gives equal treatment to all students. The treatment given is a treatment that encourages each student to understand their own potential. In learning activities, students must also be given the same opportunity in understanding the material, analyzing the questions, interpreting new information obtained and formulating a new idea based on the learning process it does.

If students are not given the same opportunity in learning, it might be possible to create boredom in students who feel they don't get the teacher's attention. Daschmann (2013) and Al-shara (2015) explained that boredom is a negative response that causes students to not have the competencies needed in society because during learning students will not be able to develop cognitive potential and other potential possessed. Other consequences that might occur if boredom in learning is not properly paid attention to is the low ability of students to manage information, low student achievement, low efforts to become better, students become lazy to follow learning and even students drop out of school (Belton & Priyadharshini, 2007; Pekrundkk, 2010; Dube & Orpinas, 2009; Fallis & Opotow, 2003).

Information on the equivalent of the cognitive learning outcomes of male and female students obtained from this study is also in accordance with the report Kusuma (2014) and Brasilita (2016). This shows that in the implementation of learning teachers must try to choose the right learning model that is able to minimize the differences in characteristics between genders so that the learning outcomes obtained are equal learning outcomes between male and female students.

**CONCLUSION**

Based on the results of data analysis and discussion, it can be concluded that by combining CLIS and Brain Gym technique, the equality of
cognitive learning outcomes for male and female students can occur. Providing the same opportunities, the same tasks and the same responsibilities during Children Learning In Science combined with a Brain Gym learning, can minimize the differences in characteristics between genders so that the learning outcomes obtained are equivalent.

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