INFLUENCE OF EDUCATIONAL QUALIFICATION AND PROFESSIONAL COMPETENCE ON EARLY CHILDHOOD TEACHERS ABILITY IN SCIENCE EDUCATION

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Abstract
The purpose of this research was to provide additional thought the influence of educational qualifications (Science/IPA and Social Studies/IPS) and professional competence on the performance of early childhood teachers in Science education. The ability of early childhood teachers in Science education is the behavior in their Efforts to Achieve outcomes when carrying out their duties as instructors and educators. This research uses descriptive statistical analysis. The method of the data collection is done by simple random sampling. The number of samples is determined as many as 200 teachers who are considered to represent the entire population. There are 100 teachers with IPA/science backgrounds and 100 teachers or prospective teachers with IPS/social studies in Jabodetabek region of West Java. Test results shows there is an influence of the interaction of two independent variables on the ability of early childhood teachers in science education. So, the ability of early childhood teachers in science education is greatly influenced by educational qualifications and professional competence. The ability of early childhood teachers in science education also can be influenced by other variables.

Keywords: Early childhood teacher, educational qualifications, professional competence, learning science

1.Introduction
Early Childhood Education is a form of non-formal education, focuses on growth and physical development, intelligence, socio emotional, language, and communication, in accordance with the uniqueness and passed by early childhood.

The competence of an early childhood teacher should be in accordance with national education standards. Permendikbud 137/2014, Competency Standards for early childhood educators includes four components : (1) pedagogical competencies, (2) personality competencies, (3) social competencies, and (4) professional competencies. In carrying out their duties, they must have educational qualifications and competencies that appropriate for early childhood (Langdon, 2016).

The policy on early childhood education is very important, it is also in line with the goals of sustainable development to develop the intellectual skills, creativity, and welfare become healthy and productive adults (Selina, 2017).

Good skills and knowledge must be possessed by a teacher to be more confident in teaching (Nolan 2017). From the 2012 Dapodik data, the number of National Early Childhood Education

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teachers is 275,099, whose qualifications are lower than Bachelor's Degree (71.29%) and those Bachelor's or higher qualifications are only 28.71%) (Kemendikbud, 2012).

Early childhood teachers should be adapted to educational qualifications, professional competencies, existing curriculum, and characteristics of early childhood. In this research, will be explained how the influence of educational qualifications, professional competence on the ability of early childhood education teachers.

2. Research methods
This study uses a causal connection established through so-called ex post facto with 2x2. There was no independent variable.

Data analysis techniques used in this research include:
1. Descriptive statistical analysis on the trends that converged data such as average scores, median, mode, and distribution of data in the form of standard deviation, variance and range of data, and preparation of data frequency distribution table. Data are also presented with pictures or histogram.
2. Testing Requirements analysis; normality test and homogeneity variance test.
3. Hypothesis testing; Tests performed after analysis prerequisite test, when the data were expressed from normally distributed populations and homogeneous. Hypothesis testing using two-way analysis of variance (two-Way ANOVA).

Statistical hypothesis in this study:
1. H0: μA1 = μA2
   H1: ≠ μA1 μA2
2. H0: μA1B1 = μA2B1
   H1: μA1> μA2
3. H0: μA2B2 = μA1B2
   H1: ≠ μA2B2 μA1B2
4. H0: Interaction of A x B = 0
   H1: Interaction of A x B ≠ 0

Information:
μA1 : The average score of early childhood teachers ability in science education, education qualifications (IPA/science)
μA2 : The average score of early childhood teachers ability in science education, education qualification (IPS/social studies)
μA1B1 : The average score of early childhood teachers ability in science education, high professional competence
μA2B1 : The average score of early childhood teachers ability in science education, IPS/social studies qualification group of high professional competence
μA1B2 : The average score of early childhood teachers ability in science education, IPA/science qualifications group of professional competence
μA2B2: The average score of early childhood teachers ability in science education, IPS/social studies qualification group of lower professional competence

Interact A x B: The influence of interaction between educational qualifications and professional competence in the ability of early childhood teachers ability in science education,

3 Results and Discussion
A. Description of Data
The results obtained descriptions of data.

<table>
<thead>
<tr>
<th>Group</th>
<th>Average</th>
<th>standard deviation</th>
<th>The amount of data</th>
<th>variance</th>
</tr>
</thead>
<tbody>
<tr>
<td>A1</td>
<td>64.3</td>
<td>3.83</td>
<td>50</td>
<td>14.87</td>
</tr>
<tr>
<td>A2</td>
<td>63.22</td>
<td>4:10</td>
<td>50</td>
<td>16.8</td>
</tr>
<tr>
<td>A1B1</td>
<td>67.76</td>
<td>3.96</td>
<td>25</td>
<td>15:56</td>
</tr>
<tr>
<td>A1B2</td>
<td>63.04</td>
<td>4:30</td>
<td>25</td>
<td>18:49</td>
</tr>
<tr>
<td>A2B1</td>
<td>64.84</td>
<td>5:29</td>
<td>25</td>
<td>27.96</td>
</tr>
<tr>
<td>A2B2</td>
<td>66.28</td>
<td>3.66</td>
<td>25</td>
<td>13:40</td>
</tr>
</tbody>
</table>

1. The ability of early childhood teachers in science education of IPA/science background (group A1). Class interval having the greatest absolute frequency is the interval 64-66 (34%), the interval 61-63 (20%) and the smallest is 55-57 and 73-75 respectively are the same percentages (2%),

2. The ability of early childhood teachers in science education with educational qualifications IPS/social studies (A2). Class interval having greatest absolute frequency is the interval 64-66 (30%); 61-63 interval (24%) and the smallest is 73-75 (2%).

3. The ability of early childhood teachers in science education and science education qualifications with high professional competency (A1B1). Class interval having the greatest absolute frequency is the interval 66-69 (48%) and the interval 62-65 (24%) and the smallest is 58-61 dan 78-81 with the same absolute frequency (4%).

4. The ability of early childhood teachers in science education with educational qualifications IPS with High Professional Competence (A2B1). Class interval having the greatest absolute frequency is the interval 60-63 (28%) and the interval 64-67 (24%) and the smallest is 72-75 (12%).

5. The ability of early childhood teachers in science education and qualifications IPA with low professional competence (A1B2). Class interval having the greatest absolute frequency is the interval 60-63 (28%) and the interval 62-65 (40%) and the smallest is 58-61 (24%) and the smallest interval is 70-73 and 74-77 with absolute frequency (4%).
6. The ability of early childhood teachers in science learning with educational qualifications IPS with Low Professional Competence (A2B2). Class interval having the greatest absolute frequency is the interval 71-75 (44%) and the interval 76-80 (28%) and the smallest is the class interval 61-65 (4%).

B. Testing Requirements Analysis Data
Liliefors test for normality test and homogeneity of variance using Bartlett test.

1. Normality test
Normality test is done by Liliefors test:
Ho: normal distribution of data
H1: the data are not normally distributed
If the test results show the significant value is smaller than \( \alpha = 0.05 \) then accept Ho. Conclusions calculation normality test data group A1, showing that Lcount = (0.145697) < Ltab = (0.145805) Conclusions calculation normality test data group A2 shows that Lcount = (0.1282192) < Ltab = (0.145805). Further testing A1B1 group data: Conclusion the normal test calculation data group A1 B1 shows Lcount = (0.102668) < Ltab = (0173), Conclusions calculation data group A2B1 normality test showed Lcount = (0.099 777) < Ltab = (0173), Conclusions calculation data group A2B1 normality test showed Lcount = (0.099 777) < Ltab = (0173), Conclusions calculation data group A2B2 normality test showed Lcount = (0.09738) < Ltab = (0173). So samples were normally distributed at \( \alpha = 0.05 \). Finally, the results summary of the normality test data can be shown in Table 2.

Table 2. Summary of Normality Test Data Group A1, A2, A1B1, A2B1, A1B2 and A2B2

<table>
<thead>
<tr>
<th>The sample group</th>
<th>Lhit</th>
<th>Ltab</th>
<th>Conclusion</th>
</tr>
</thead>
<tbody>
<tr>
<td>A1</td>
<td>0.145597</td>
<td>0.145805</td>
<td>distributed Normal</td>
</tr>
<tr>
<td>A2</td>
<td>0.1282192</td>
<td>0.145805</td>
<td></td>
</tr>
<tr>
<td>A1B1</td>
<td>0.102668</td>
<td>0173</td>
<td></td>
</tr>
<tr>
<td>A2B1</td>
<td>0.099677</td>
<td>0173</td>
<td></td>
</tr>
<tr>
<td>A1B2</td>
<td>0.129632</td>
<td>0173</td>
<td></td>
</tr>
<tr>
<td>A2B2</td>
<td>0.09738</td>
<td>0173</td>
<td></td>
</tr>
</tbody>
</table>

Thus, it was concluded that the data of each group came from a normal distributed population.

2. Homogeneity of Variance Test
Otherwise homogenous group when the significance of data obtained from Barlett test calculation is greater than \( \alpha = 0.05 \) (accept Ho). Conversely, if the significance is not homogeneous obtained from the calculation is smaller than \( \alpha = 0.05 \) (reject Ho). Based on calculations obtained Bartlett homogeneity with typically uses a table as follows:
Test criteria homogeneity Barlett test data based on the variance, as follows:
Ho : Variance in each group of data homogeneous
H1 : Variance in each group of heterogeneous data

Table 3. Test Results Homogeneity Using Data Group Bartlett test
A1B1, A1B2, A2B1 and A2B2

<table>
<thead>
<tr>
<th>samples</th>
<th>dk</th>
<th>1/dk</th>
<th>Si^2</th>
<th>Log S^2</th>
<th>(Dk) log S^2</th>
</tr>
</thead>
<tbody>
<tr>
<td>A1B1</td>
<td>24</td>
<td>0.042</td>
<td>15.6816</td>
<td>1.195</td>
<td>28.68</td>
</tr>
<tr>
<td>A1B2</td>
<td>24</td>
<td>0.042</td>
<td>18:49</td>
<td>1.267</td>
<td>30.41</td>
</tr>
<tr>
<td>A2B1</td>
<td>24</td>
<td>0.042</td>
<td>27.9841</td>
<td>1.4469</td>
<td>34.73</td>
</tr>
<tr>
<td>A2B2</td>
<td>24</td>
<td>0.042</td>
<td>23.1361</td>
<td>1.3643</td>
<td>32.74</td>
</tr>
<tr>
<td>amount</td>
<td>96</td>
<td>0167</td>
<td>126.56</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Variant combined = s^2 = 21.322925; log 21.322925 = 1,329; B = 96 x 1329 = 127 584; chi squared = (2.3026) {127 584 - 126.56} = 2.3579; to a = 0.05 and df = 24-1 23. chi squared = 36.4. chi count 2.3579 <chi table 36.4; then accept Ho, means all four data groups comes from homogeneous population.

C. Hypothesis test
1. First hypothesis
Ho: μA1 = μA2
H1: ≠ μA1 μA2
The first hypothesis is to test differences in ability of early childhood teachers with IPA/science and IPS/social studies education qualifications.
Table 4. Analysis of Two Way ANOVA from SPSS (Test of Between-Subjects Influential Dependent Variable: Y)

<table>
<thead>
<tr>
<th>Source</th>
<th>Type III Sum of Square</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corrected Model</td>
<td>1665.640</td>
<td>3</td>
<td>555.213</td>
<td>55.637</td>
<td>.003</td>
</tr>
<tr>
<td>Intercept</td>
<td>396144.360</td>
<td>1</td>
<td>396144.360</td>
<td>3.970E4</td>
<td>.000</td>
</tr>
<tr>
<td>A</td>
<td>207.360</td>
<td>1</td>
<td>207.360</td>
<td>20.779</td>
<td>.001</td>
</tr>
<tr>
<td>B</td>
<td>104.040</td>
<td>1</td>
<td>104.040</td>
<td>10.426</td>
<td>.002</td>
</tr>
<tr>
<td>A * B</td>
<td>1354.240</td>
<td>1</td>
<td>9.979</td>
<td>135.707</td>
<td>.001</td>
</tr>
<tr>
<td>Error</td>
<td>958.000</td>
<td>96</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>398768.000</td>
<td>100</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Corrected Total</td>
<td>2623.640</td>
<td>99</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

R Square = .635 (Adjusted R Square = .623)

interpretation table
For A (educational qualification), obtained F count/hit= 20,779 with a p-value (sig.) = 0.01 <value α = 0.05 thus reject Ho; educational qualification gives effect on the ability of early childhood teachers in science education; so there is no difference in the ability of early childhood teachers in science education with educational qualifications (IPA/science and IPS/social science).

2. Second hypothesis
Ho: μA1B1 = μA2B1
H1: ≠ μA1B1 μA2B1
In Table 11 from the line Corrected Model, obtained F count = 55 637 with a p-value (sig.) = 0.003 <value α = 0.05 thus reject Ho; there is an average difference between the four groups in the research design. This means for the third and fourth hypothesis accept Ho.

3. Third hypothesis
Ho: μA2B2 = μA1B2
H1: ≠ μA2B2 μA1B2

4. Fourth hypothesis
Ho: Interaction of A x B = 0
H1: Interaction of A x B ≠ 0 /
For the A * B (educational qualifications and professional competence); obtained Fcount = 135 707 with a p-value (sig.) = 0.001 <value α = 0.05 thus reject Ho; this means that there is significant influence educational qualifications and professional competence of the ability of early childhood teachers in learning science
Table 5. Summary of Hypothesis Testing Results

<table>
<thead>
<tr>
<th>Hypothesis</th>
<th>Different test</th>
<th>F_{count}</th>
<th>Q_{count}</th>
<th>F_{table} (a = 0.05)</th>
<th>Q_{table}</th>
<th>Conclusion</th>
</tr>
</thead>
<tbody>
<tr>
<td>( H_0 : \mu_1 = \mu_2 )  ( H_1 : \mu_1 \neq \mu_2 )</td>
<td>Anova</td>
<td>20.779</td>
<td>-</td>
<td>6.86</td>
<td>-</td>
<td>Reject ( H_0 )</td>
</tr>
<tr>
<td>( H_0 : \mu_{A1B1} = \mu_{A2B1} )  ( H_1 : \mu_{A1B1} \neq \mu_{A2B1} )</td>
<td>Anova</td>
<td>55.637</td>
<td>-</td>
<td>6.86</td>
<td>-</td>
<td>Reject ( H_0 )</td>
</tr>
<tr>
<td>( H_0 : \mu_{A2B2} = \mu_{A1B2} )  ( H_1 : \mu_{A2B2} \neq \mu_{A1B2} )</td>
<td>Anova</td>
<td>55.637</td>
<td>-</td>
<td>6.86</td>
<td>-</td>
<td>Reject ( H_0 )</td>
</tr>
<tr>
<td>( H_0 : \text{Int. } A \times B = 0 )  ( H_1 : \text{Int. } A \times B \neq 0 )</td>
<td>Anova</td>
<td>135.707</td>
<td>-</td>
<td>6.86</td>
<td>-</td>
<td>Reject ( H_0 )</td>
</tr>
</tbody>
</table>

**D. Discussion of Results**

Based on the results of hypothesis testing through the Anova test, the findings in this study show there is a significant influence of educational qualification and professional competence on early childhood teachers ability in science education. This explained, an early childhood teacher who has an educational qualification (IPA/science) have the desire to do or try a series of science games in early childhood schools. If this can be done in a planned manner, it will be able to provide nuances of science education and will be liked by students. Science education in early childhood schools can be packaged in very interesting and fun games to achieve these goals, early childhood teachers need to be opened insight about their science for example carried out socialization or training or seminars on science education using materials which available in everyday life, for example water, soap, salt, vinegar, eggs, sugar, baking soda, spices, doormats, or children's toys can be used as material for learning education in early childhood.

Through this research, it is hoped that the community (parents or early childhood observers) will not prioritize science only (which science is difficult and dangerous) and provide insight that science is easy and close in our daily lives.

**CONCLUSION**

The ability of early childhood teachers in science education is strongly influenced by educational qualifications and professional competence. The ability of early childhood teachers in science education also can be influenced by other variables.
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