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Educational Research to Endorse Productive and Innovative Generation in the 21st Century

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“Educational Research to Endorse Productive and Innovation Generation in The 21th Century”

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October 16-17, 2017

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Preface

The 2nd Annual International Seminar on Transformative Education and Educational Leadership (AISTEEL with web link is http://aisteel2017.unimed.ac.id/) was held on October 16-17, 2017 in Medan City, Indonesia. This conference was organized by Postgraduate School, State University of Medan (Unimed) and is the routine agenda at Unimed now. The Second Annual International Seminar on Transformative Education and Educational Leadership’ is realized this year with various presenters, researchers, lecturers and students from universities both in and out of North Sumatera participate in the theme of which is “Educational Research to Endorse Productive and Innovative Generation in the 21st Century.”

2nd AISTEEL is the annual international seminar with main aim is to discuss of recent research special for Transformative Education and Education Leadership. Several topics like: Teachers Education Model, Research Global Issue in Education, Mathematics and Science Education, Social, Language Education, Vocational Education, Curriculum, Economic, History and Management Education have been discussed at the 2nd AISTEEL 2017. 2nd AISTEEL international seminar provided experts’ view on transformative education and educational leadership as well as curriculum article presentation. There were five keynote speakers have been came Professor Keiichiro Yoshinaga, Dr. Bambang Sumintono, Dr. Sitti Maesuri Patahuddin, and Dr. Yulia Rahmawaty. The organizer had been use online submission system to receive all abstract, full paper and also communication with authors. All of information include with comment of reviewer can be checked real time by author.

Chairperson

Dr. Rahmad Husein, M.Ed
Welcoming Speech of Director of Postgraduate School State University of Medan

The Second Annual International Seminar on Transformative Education and Educational Leadership (AISTEEL)

The honorable,
- Rector of State University of Medan, Prof. Dr. Syawal Gultom, M.Pd.
- Vice Rectors of UNIMED
- Professor Keiichiro Yoshinaga, PhD, Institute of Liberal Arts and Science, Kanazawa University – Japan
- Dr. Bambang Sumintono, M.Ed., University Malaya – Malaysia
- Dr. Sitti Maesuri Patahuddin, Faculty of Education, Science, Technology and Mathematics, University of Canberra – Australia
- Yuli Rahmawati, Chemistry Education Program, Universitas Negeri Jakarta
- Deans of Faculties of Education, Languages and Arts, Social Sciences, Natural Sciences and Mathematics, Engineering, Sports Sciences, and Economics
- Vice Directors of Postgraduate School of UNIMED
- All speakers, lecturers, researchers, students, and participants

Good Morning

Welcome the honorable guests speakers Professor Keiichiro Yoshinaga, Dr. Bambang Sumintono, Dr. Sitti Maesuri Patahuddin, Assoc. Prof. Emilia Zulmira de FAN, and other speakers, lecturers and students from outside and inside Unimed to this international seminar which is the routine agenda at Postgraduate program of Unimed now. I’m glad that ‘The Second Annual International Seminar on Transformative Education and Educational Leadership’ is realized this year with various presenters, lecturers and students from universities both in and out of North Sumatera and participate in the theme of which is “Educational Research to Endorse Productive and Innovative Generation in the 21st Century.”

Ladies and Gentlemen,

In this second seminar excels the first one related to the administration by online and the publication index by either Thomson Reuters or Google Scholar. By the new policy on student’s publication, postgraduate program really matches the system, particularly for the students who will sit in the oral defence examination. Through the seminar, the postgraduate students improve their article journal writing and it is proved by many articles are submitted by the students.

The plenary speakers coming from 15 provinces in Indonesia will present topics covering multi disciplines. They will contribute a lot of inspiring inputs and new knowledge on current trending educational research topics all over the world. The expectation is that all potential lecturers will share their research findings to educational scientists and researchers as well for improving their teaching process and quality. Thus, this will contribute to the next young generation researchers to produce innovative research findings in education and educational leadership contexts.

This second seminar continues the promotion of the first sequel ‘Developing Future Teachers’ Education Model. Therefore, the propose of this second seminar on the transformative education and educational leadership research will trigger the young professional lecturers and educators to compete in the invention of innovative educational teaching and learning strategies, techniques and leadership.

I hope that the scientific attitude and skills through research will promote Unimed to be a well-known university which persists to be developed and excelled in the future.

Thank you the Rector of Unimed who always supports us in organizing the seminar. Thank you all guest and plenary speakers. Special thanks to both steering and organizing committee who have well-coordinated and collaborated in actualizing the seminar.

Director of Postgraduate Unimed

Prof. Dr. Bornok Sinaga, M.Pd
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Daulat Saragi
The Effectiveness of Contextual Inquiry-Based Worksheet on the Matter of Fungi on Food Towards Students’ Higher-Order Thinking and Science Process Skills of Biology Education

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Abstract— Learning material is one of the main components for students to achieve their learning purposes in higher education. Nowadays, the most innovative learning material commonly used is a student’s worksheet. This study aimed to find out the effectiveness of a worksheet on the matter of fungi on food based on the contextual inquiry learning model towards students’ higher-order thinking skills of Microbiology in Muhammadiyah University of South Tapanuli (UMTS). The research method applied in this study was a quasi-experimental technique. The population was all the fourth semester students of biology education program in UMTS. The sample consisted of two classes, namely: class A (control group) was taught by applying a conventional learning strategy with a conventional worksheet and class B (experimental group) was taught by applying a contextual inquiry-based worksheet and they were selected by a cluster random sampling technique. The results showed that students’ higher-order thinking skill of group treated by using a contextual inquiry-based worksheet were better than the control ones, in which the score was 83.33 compared to 73.33 on the standard deviation of 14.76. Furthermore, students who were given the treatment have also affected their own science process skills, it was proved by achieving a higher score of experimental group, (89.44 compared to 73.45) on the significance level of α = 0.05. It was clearly revealed that the contextual inquiry-based worksheet was very effective on students’ higher-order thinking skills and science process skills of Microbiology as well.

Keywords— worksheet, fungi, higher-order thinking, science process skill

I. INTRODUCTION

On the teaching and learning process, an educator will definitely require a learning material [1] [9] [7]. One of the learning materials commonly used is a worksheet. 34 students in Muhammadiyah University of South Tapanuli (UMTS) who had completed the lecture matter of microbiology were given a questionnaire to find out any obstacles during the learning process occurs. 90% of students mentioned that except books, they have been using worksheets as the learning media. The use of worksheets on the learning process was that 90% of students claimed that any worksheets in which they usually have used was still incomplete, 73% of students claimed that they required worksheets to be able to improve their self-participation in investigating what they have experienced in the world directly.

Besides, to increase students’ science process skills, the use of contextual inquiry-based worksheet has also increased their higher-order thinking skills [2] [6] [8]. According to the study of that learning steps or indicators of inquiry learning model could develop or improve students’ science process skills [4] [7] [11] [12]. The results of this observation proved that students’ science process skills and higher-order thinking skills in UMTS were classified in low category on the average of 46.03 towards their higher-order thinking skills and science process skills on the average of 14.49 respectively. It was expected that the use of contextual inquiry-based worksheet on the matter of fungi on food could improve students’ science process skills and higher-order thinking skills of Biology Education in UMTS, Padangsidimpuan.
From the description aforementioned above, the researcher has conducted a study in the title of “The effectiveness of contextual inquiry-based worksheet on the matter of fungi on food towards students’ science process skills and higher-order thinking skills in Muhammadiyah University of South Tapanuli, Padangsidimpuan.

II. METHOD

2.1. Research Method

The research method was a quasi experimental technique with all the fourth semester students of Biology Education in UMTS [3]. The sample consisted of two classes, namely Class A was treated as control group and Class C was treated as experimental group with cluster random sampling [3]. The learning process on the experimental group applied the contextual inquiry based-worksheet on the matter of fungi on food, and the control group applied a conventional worksheet on the matter of fungi on food. Those treatments were conducted for four sessions or eight hours per semester credit.

2.2. Test Instruments

The test of higher-order thinking skills contains 15 multiple choice and the test of scientific process skills contains 15 essay tests.

2.3. Technique of Data Analysis

Before the test instruments used, those instruments had been initially tried out to students which were excluded to the research samples. Data had been analyzed from the result of instrument test in which validity, reliability, item discriminant index and item difficulty level of those tests had been completely conducted.

2.4. Hypotheses Testing

After students’ pretest and post-test obtained, so that data testing had applied the test of normality, test of homogeneity and the test of hypotheses, respectively.

III. RESULTS AND DISCUSSION

3.1. The Results of Instrumental Testing

To be capable of being used as the instruments in this study, those instruments which were made by researcher must be tested either any validity, reliability, discriminant index and also difficulty level as well. Those instruments were initially validated its content and construct aspect by three expertised lecturers in Microbiology and then they had been empirically validated to the students of sixth semester who had completed the lecture topic of microbiology in UMTS.

3.2. Pretest

Pretest was given to students before the treatment conducted to find out the scores of students’ higher-order thinking skills and science process skills of both classes. The average score of higher-order thinking skills in control group was 46.03, with standard deviation of 14.28. Meanwhile the experimental group had the average score of 49.17, with standard deviation of 6.56.

Students on experimental group, 49.17±6.56 (X±SD) showed that their own higher-order thinking skills were almost similar with the control group, 46.03±14.28 (X±SD), (t = 0.74(<1.681)).

The results of pretest on students’ higher-order thinking skills of both classes were calculated by a student’s t-test showed that both classes did not possess any significant differences, so that both classes were used as the objects of this study.

3.3. Post-test

The average score of students’ higher-order thinking skills in control group was 73.33, with standard deviation of 14.76. Meanwhile the experimental group had the average score of 83.33, with standard deviation of 11.63.
Students on the experimental group, 83.33±11.63 (X±SD) showed that their own higher-order thinking skills were higher than control group, 73.33±14.76 (X±SD), (t = 2.5411 (>1,681)).

The results of post-test that were visualized in Figure 3 showed that higher-order thinking skills on the experimental group taught by using a contextual inquiry-based worksheet were much better than control group taught by using a conventional worksheet in Microbiology.

The average score of students’ science process skills in control group was 72.14, with standard deviation of 8.517. Meanwhile the experimental group had the average score of 89.17, with standard deviation of 6.29.

Figure 4. Post-test of students' science process skills

Students on experimental group, 89.17±6.29 (X±SD) showed that students’ science process skills were higher than the control group, 72.14±8.517 (X±SD), (t = 7.53 (>1,681)).

The results of post-test that were visualized in Figure 4 showed that science process skills on the experimental group taught by using a contextual inquiry-based worksheet were much better than control group taught by using a conventional worksheet in Microbiology.

3.4. Test of Normality

Test of normality was conducted by using liiliefors test. The results of normality test could be seen in Table 1.

Table 1. The Calculation of Normality Test

<table>
<thead>
<tr>
<th>NO</th>
<th>Data Pretest</th>
<th>UNT</th>
<th>ITAL</th>
<th>Kemipulan</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Kelas kontrol</td>
<td>Pretest</td>
<td>0.14</td>
<td>0.19</td>
</tr>
<tr>
<td></td>
<td>Komarmpuan</td>
<td>Pretest</td>
<td>0.17</td>
<td>0.19</td>
</tr>
<tr>
<td></td>
<td>berpikir</td>
<td>Pretest</td>
<td>0.09</td>
<td>0.19</td>
</tr>
</tbody>
</table>

From the result of normality test described in Table 2 could be concluded that all the L_count was higher than L_table. It means that the entire data was normally distributed.

3.5. Test of Homogeneity

Test of homogeneity was conducted by dividing the highest variant score with the lowest ones on the control and experimental group using two similar data. The result of homogeneity test could be seen in Table 2.

Table 2. The Calculation of Homogeneity

<table>
<thead>
<tr>
<th>NO</th>
<th>Data Pretest</th>
<th>UNT</th>
<th>ITAL</th>
<th>Kemipulan</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Komarmpuan berpikir Pretest</td>
<td>1.05</td>
<td>1.634</td>
<td>Homogen</td>
</tr>
<tr>
<td>2</td>
<td>tingkat tinggi Posttest</td>
<td>1.6</td>
<td>1.634</td>
<td>Homogen</td>
</tr>
<tr>
<td>3</td>
<td>Keterampilan proses Pretest</td>
<td>1.9</td>
<td>1.634</td>
<td>Homogen</td>
</tr>
<tr>
<td>4</td>
<td>sani Posttest</td>
<td>1.851</td>
<td>1.634</td>
<td>Homogen</td>
</tr>
</tbody>
</table>

From the data result of homogeneity test described in Table 3 could be concluded that all the F_count was lower than F_table, it means that the entire data was homogenous on the significance level of 0.05

3.6. Hypotheses Testing

On the pretest of students’ higher-order thinking skills, the average score of control group was 46.03 with standard deviation of 14.28 and the average score of experimental group was 49.17 with standard deviation of 13.87. The score of t_count was 0.658. The score of t_table with the significance level of α = 0.05 and df = (n1 + n2) - 2 = (21 + 24) - 2 = 43, was 1.681. The comparison between the value of t_count and t_table was that t_count < t_table (0.74<1.681). This condition has stated that the average score of students’ higher-order thinking skills on the pretest of both classes did not have any significant differences and possess the same capability.

On the post-test of students’ higher-order thinking skills, the average score of control group was 73.33 with standard deviation of 14.76 and the average score of experimental group was 83.33 with standard deviation of 11.63. The value of t_count was 2.5411. The value of t_table with the significance level of α = 0.05 and df = (n1 + n2) - 2 = (21 + 24) - 2 = 43, was 1.681. The comparison between the value of t_count and t_table was that t_count < t_table (2.5411>1.681) showed that H0 was rejected and Ha was accepted for sure.

In the manner of this case could be concluded that there were any differences of students’ higher-order thinking skills on the class taught by using a contextual inquiry-based worksheet on the matter of fungi on food rather than taught by using a conventional worksheet on the matter of fungi on food of Microbiology in UMTS, Academic Year 2016/2017.

On the pretest of students’ science process skills, the average score of control group was 14.44 with standard deviation of 4.753 and the average score of experimental group was 14.79 with standard deviation of 6.56. The value of t_count was 1.17. The value of t_table with the significance level of α = 0.05 and df = (n1 + n2) - 2 = (21 + 24) - 2 = 43, was 1.681. The comparison between the value of t_count and t_table was that t_count < t_table (or 1.17<1.681). This condition has stated...
that the average score of students’ science process skills on pretest of both classes did not have any significant differences and possess the same capability.

On the post-test of students’ science process skills, the average score of control group was 72.14 with standard deviation of 8.517 and the average score of experimental group was 89.17 with standard deviation of 6.29. The value of \( t_{\text{count}} \) was 7.53. The value of \( t_{\text{table}} \) with the significance level of \( \alpha = 0.05 \) and \( df = (n_1 + n_2) - 2 = (21 + 23) - 2 = 43 \), was 1.681. The comparison between \( t_{\text{count}} \) and \( t_{\text{table}} \) was that \( t_{\text{count}} > t_{\text{table}} \) (7.53 > 1.681) showed that \( H_0 \) was rejected and \( H_a \) was accepted for sure.

In the manner of this case could be concluded that there were any differences of students’ science process skills on the class taught by using a contextual inquiry-based worksheet on the matter of fungi on food of Microbiology in UMTS, Academic Year 2016/2017.

IV. CONCLUSION

There were the effects in using the contextual inquiry-based worksheet on the matter of fungi on food towards students’ higher-order thinking skills and science process skills of Biology Education in Muhammadiyah University of South Tapanuli in academic year 2016/2017. Students on the experimental group taught by using a contextual inquiry-based worksheet on the topic of fungi on food showed that their higher-order thinking and science process skills were much better than the control group taught by using a conventional worksheet on the topic of fungi on food in Microbiology [10].

REFERENCES