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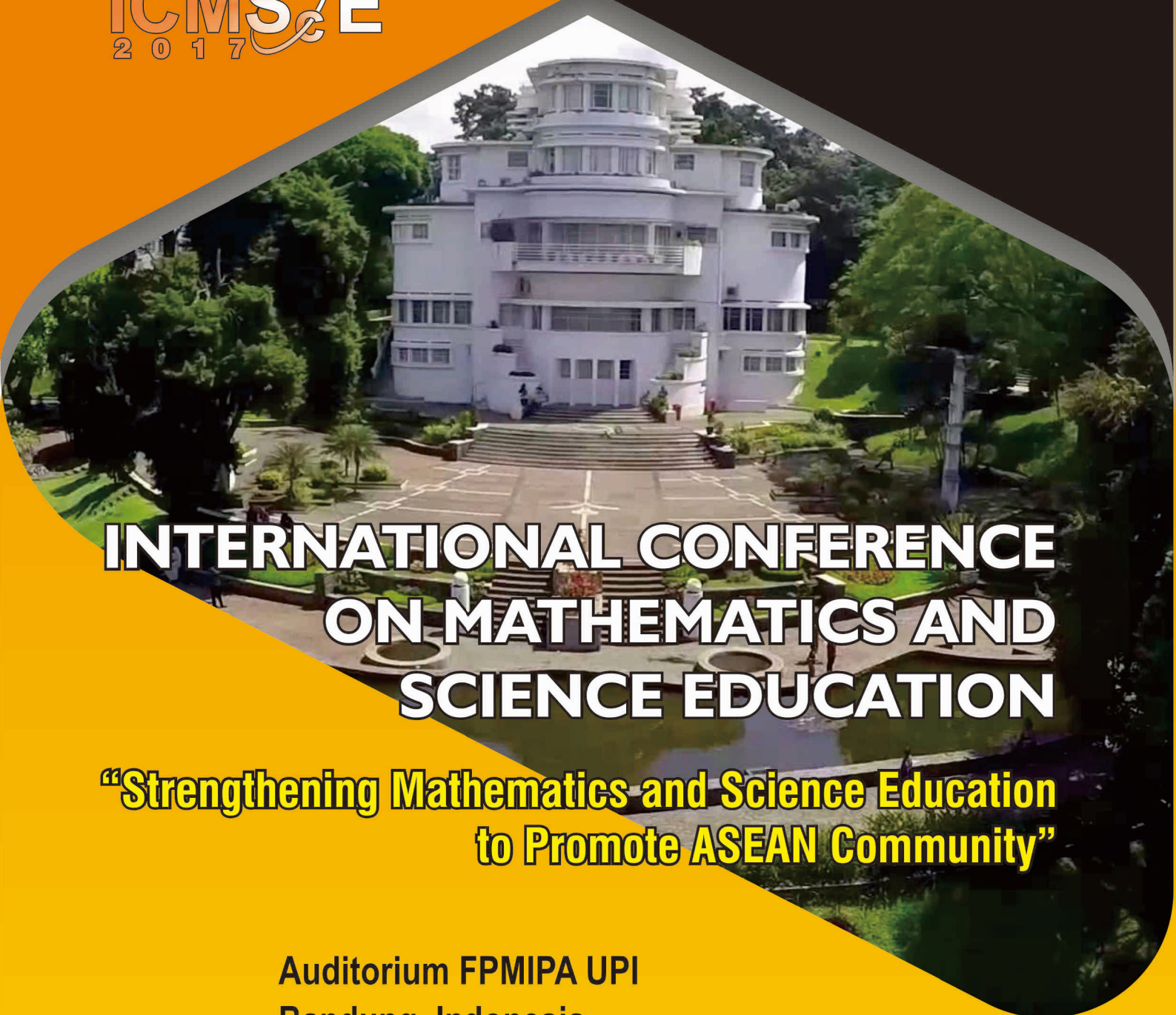
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PROCEEDING

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ICMS&E
2017



**INTERNATIONAL CONFERENCE
ON MATHEMATICS AND
SCIENCE EDUCATION**

**“Strengthening Mathematics and Science Education
to Promote ASEAN Community”**

Auditorium FPMIPA UPI
Bandung, Indonesia.
Wednesday, May 24th, 2017



**Sekolah Pascasarjana
Universitas Pendidikan Indonesia**

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**PROCEEDINGS
INTERNATIONAL CONFERENCE ON MATHEMATICS
AND SCIENCE EDUCATION
“Strengthening Mathematics and Science
Education to Promote ASEAN Community”**

Editor

Dr. Ade Ghaffar Abdullah, M.Si.

Dr. Eng. Asep Bayu Dani Nandiyanto, S.T., M..Eng.

Lala Septem Riza, MT, Ph.D

Dr. Riandi, M.Si.

Rika Rafikah Agustin, M.Pd

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Indonesia. Wednesday, May 24th, 2017**

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Sekolah Pascasarjana

Universitas Pendidikan Indonesia

Jl. Dr. Setiabudi No. 229 Bandung, 40154 INDONESIA

PREFACE

Sekolah Pascasarjana, Universitas Pendidikan Indonesia proudly presents International Conference on Mathematics and Science Education (ICMScE) 2017. The theme of the conference this year is **Strengthening Mathematics and Science Education to Promote ASEAN Community**. The conference was motivated by the demand on high quality human resource implied by the establishment of ASEAN Economy Community (AEC) in 2015.

The conference included experts' view on mathematics and science education as well as research paper presentation. It was held in Bandung, Indonesia on May, 24th, 2017. There were five keynote speakers who came from Indonesia, Netherlands, Australia, Singapore and Thailand.

More than 400 delegations joined the conference. All the paper presented in the conference were in line with the following scope: 1) Models of Mathematics and Science Teaching 2) Media and Multimedia in Mathematics and Science Teaching 3) Mathematics and Science Curriculum 4) Assessment in Mathematics and Science Teaching and Learning 5) Mathematics and Science Teacher Professional Development and Other Relevant Topics.

We would thank to all the organizing committee, keynote speakers, presenters and participants who joined this conference. Finally, we wish this conference proceeding will give benefits to strengthen mathematics and science education.

Bandung, August 2017

The ICMScE Organizers

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The implementation online tutorials and the level of reflective thinking of students of biology education study program on the open and distance education

M Sekarwinahyu^{1,2a)}, N Y Rustaman¹, A Widodo¹ and Riandi¹

¹ Program Studi Pendidikan IPA, Sekolah Pascasarjana, Universitas Pendidikan Indonesia, Jl. Dr. Setiabudi No. 229, Bandung 40154, Indonesia

² Program Studi Pendidikan Biologi, Universitas Terbuka, Jl. Cabe Raya Pondok Cabe, Pamulang Tangerang Selatan 15418, Indonesia

^{a)}E-mail: tika@ecampus.ut.ac.id

Abstract. This paper discusses the results of online tutorial implementation analysis and reflective thinking level of biology education students who participated in online tutorial. Participants are students who are biology teachers, therefore they should already have the skills as professional teachers that can be obtained through lifelong learning process. In order for the lifelong learning process to be effective, the teachers must also get used to reflective thinking that will assist them to improve professional skills. This research was conducted on 2015.2 term and 2016.2 term. The procedure of this study consisted of observation of student activities in the online tutorials and measurement of the level of student reflective thinking. The instruments used were the online tutorial program evaluation questionnaire and the reflective thinking questionnaire of Kember et al. The results showed that online tutorial sections that need to be improved: the interaction between students and tutors, initiation material, the interaction among students and the assesment. The student's reflective thinking level in 2015.2 term is at the level of understanding, followed by reflection, critical reflection, and habitual action, while in 2016.2 term is at the reflection level, followed by understanding, critical reflection, and habitual action.

1. Introduction

Distance education is an educational system that has the characteristic of separation between individual learners and teachers [1][2]. Therefore, in interacting with one another, they depend on several forms of communication technology. In order to succeed in using communication technology, they must understand various messaging techniques related to the technology. Along with the development of information technology, since 2002, Universitas Terbuka provided learning assistance services in the form of online tutorials using moodle as a learning management system (LMS), in addition to a face-to-face tutorial (TTM) which was first known.

Student of Biology Education Program at the Faculty of Teacher Training and Educational Sciences, Universitas Terbuka (FKIP-UT) are students who have become Biology teachers, thus they already have teaching experience. Therefore, the tutorial approach used should pay attention to their experience and or knowledge both in the field of learning and in material of biology. A teacher must has the skills as a professional educator. One such skill is reflective thinking skills that will help learn advanced, improve professional skills and other skills. Reflective thinking is a part of the critical thinking process that specifically refers to the process of analyzing and making decisions about

something that has happened. Reflective thinking is an active, persistent, and cautious consideration of the belief or form expected of knowledge, of the reasons that support that knowledge, and the further conclusions leading to that knowledge [3].

Problem Based Learning (PBL) encourages the development of reflective thinking [4]. The evaluation of prospective teachers in using reflective thinking skills to solve problems indicates that in all dimensions of scale, significant differences are not determined between the teacher's skill level in reflective thinking on problem solving [5]. The reflection model using video based on the Gibbs cycle concept in electronic portfolio can improve the students' reflective thinking level [6]. The Effect of e-Portfolio on Development of Reflective Thinking and Self-Directed Learning Readiness, shows that there are significant differences between the two groups regarding reflective thinking and self-directed learning [7]. Blogs can play an important role in fostering the development of reflective thinking skills [8]. The e-service learning program delivered to interdisciplinary students provides an extensive opportunity for reflective and collaborative learning [9]. Reflective thinking encourages learners to be more active and helps them to express their opinions in a more democratic environment, and lays the groundwork for student-centered learning [10].

Online tutorial model with approach the concept map assignment shows that concept maps can be used as an online tutorial task in generating meaningful learning for students [11]. The ICARE model in online learning is effective in maximizing the quality of participation and achievement of student learning outcomes [12]. Implementation of PBL in the online tutorial of mathematics curriculum course can improve students' critical thinking ability [13]. In online tutorial activities using the PBL approach, although the online Chemistry Environment tutorial activity has been built by discussion and is turned on by active interaction, but if the discussion does not go completely, it can not provide a thorough understanding for students [14].

To improve the reflective thinking skills of Biology Education students through an appropriate model of online tutorial program, preliminary research is needed to obtain data related to the general profile of online tutorial on Biology Education study program of FKIP-UT, online tutorial implementation on Biology Education study program of FKIP-UT, and the level of reflective thinking of students who participated in the online tutorial on Biology Education study program of FKIP-UT.

2. Methodology

This research was conducted in South Tangerang, in 2015.2 term and 2016.2 term. The research method is qualitative research, by observation, document study, and questionnaire. Observation and document study is used to get information about general profile of online tutorial of Biology Education Study Program, observation, study document and online tutorial evaluation questionnaire is used to get information about the implementation of online tutorial on Biology Education program of FKIP-UT in 2015.2 term and 2016.2 term, and the reflective thinking questionnaire of Kember et al (2000) is used to get the information about the level of reflective thinking of FKIP-UT Biology Education students who participated in online tutorial in 2015.2 term and 2016.2 term. Data type in this research is qualitative and quantitative data. The research data is sourced from the document of the online tutorial implementation and the questionnaire answer from the student. Data collection techniques in this study in the form of a questionnaire implementation of online tutorials and questionnaires reflective thinking and observation. Further data is processed descriptively qualitative.

3. Result and Discussion

3.1. General Profile of Online Tutorial of Biology Education Study Program

The online tutorial consists of 8 initiates and 3 tasks. At each initiation there is giving of material and discussion. It is generally material in the form of material to clarify the material descriptions contained in the Basic Material Book (known as Modules) and discussions on the topic given by the tutor. In this case, it appears that the discussion of materials and the initiation of discussion material is dominated by tutor. In fact, when viewed from the essence of online tutorials is a learning assistance service for students where the tutor acts as a facilitator. Tutorials should discuss the things that are considered difficult and very important for students to understand. The materials covered in the tutorial activities

include essential competencies or important concepts, problems students find in studying modules, problems related to the application of science in everyday life. Thus, it should be more dominant to initiate the material to be discussed is derived from the problems of students in studying the material. The assignment given to the students is in the form of an essay where students are asked to provide answers to the questions given. From the answers received describes the student answers according to the assigned task and the student answers tend to have the same answer pattern, and there are often some students who give the exact same answer, so this does not reflect the actual student's understanding of the material being studied.

3.2. Implementation of Online Tutorial of Biology Education Study Program

3.2.1. Number of students who participated in online tutorials

The number of students of online tutorial participants in the 2015.2 term as many as 1244 students and in the 2016.2 term as many as 1549 students. The number of students active in online tutorials in the 2015.2 term is 795 students or 64%, while the number of students active in online tutorial in the 2016.2 term is 679 students or 44%. The online tutorial participants are said to be active when they read initiation, respond by asking questions or responses, discussing and doing tasks. The online tutorial participants are categorized as inactive if they only activate online tutorials at the time of registration of online tutorials without following the initiation of online tutorial. Assignment is given to find out to what extent the students understanding of the concepts that have been studied.

3.2.2. Log-in Student On Online Tutorials

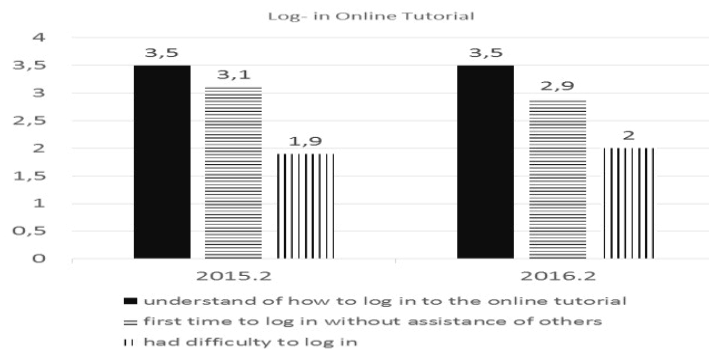


Figure 1. Average Scale of Likert Scale Student's Opinion on Online Tutorial Log-In for 2015.2 term and 2016.2 term

At the time of implementation, students expected can use the applications provided for the implementation of online tutorials, including can do "log-in" online tutorials and access to classes taken courses. Figure 1 shows that students of online tutorials in the 2015.2 term and 2016.2 term strongly agree that they understand how to log-in into online tutorials. This proves that the students have fully understood how to log in and without the help of others. They generally have no trouble in logging in online tutorial activities

3.2.3. Student Access In Class Courses

Figure 2 shows that students of online tutorials in the 2015.2 term and 2016.2 term in accessing online tutorial courses strongly agree that they understand how to access to the course classes that are followed and access the class of courses followed without the help of others, and they do not find it difficult to access the classes that are followed.

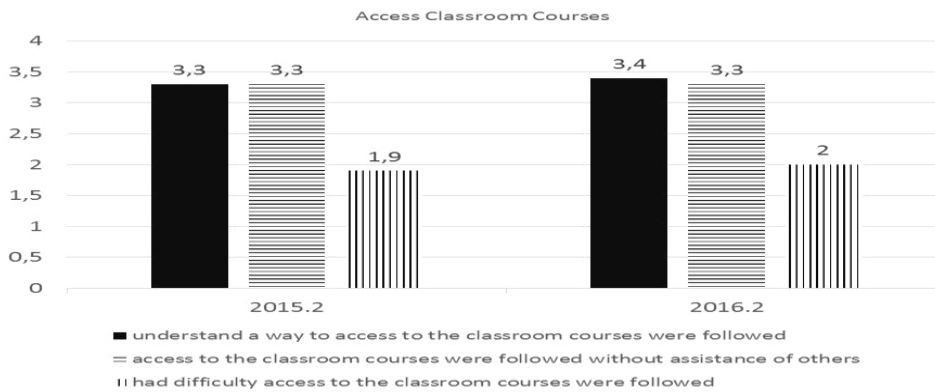


Figure 2. Average Scale of Likert Scale on Access to Classroom Online Tutorials in 2015.2 term and 2016.2 term

3.2.4. Initiation Materials

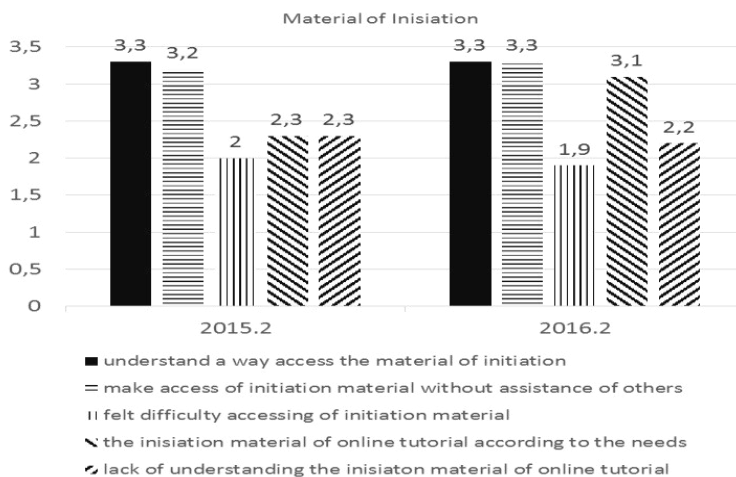


Figure 3. Average Scale of Likert Scale Student's Opinion on Initiation Material of 2015.2 term and 2016.2 term

Figure 3 shows the student's opinion of initiation materials. In accessing initiation materials, both students of online tutorial in the 2015.2 term and 2016.2 term strongly agree that they understand how to access initiation materials and can access initiation materials without the help of others. In addition, they do not find it difficult to access initiation materials. Students disagree on the claim that online tutorial initiation materials match their needs and understand the initiation materials of online tutorials. In other words, the online tutorial material doesn't suit their needs and they don't understand the initiation materials.

3.2.5. Discussion Forum

Figure 4 shows students' opinions about the discussion forum. Students agree that they understand how to access discussion forums, access discussion forums without the help of others, do not find it difficult to access discussion forums, they seek answers to tasks and engage in online discussions. Students are not hesitate to express their opinions in online discussions and they understand how to comment on discussion forums. However, in contacting the tutor for consulting the student feels it is not easy to do so.

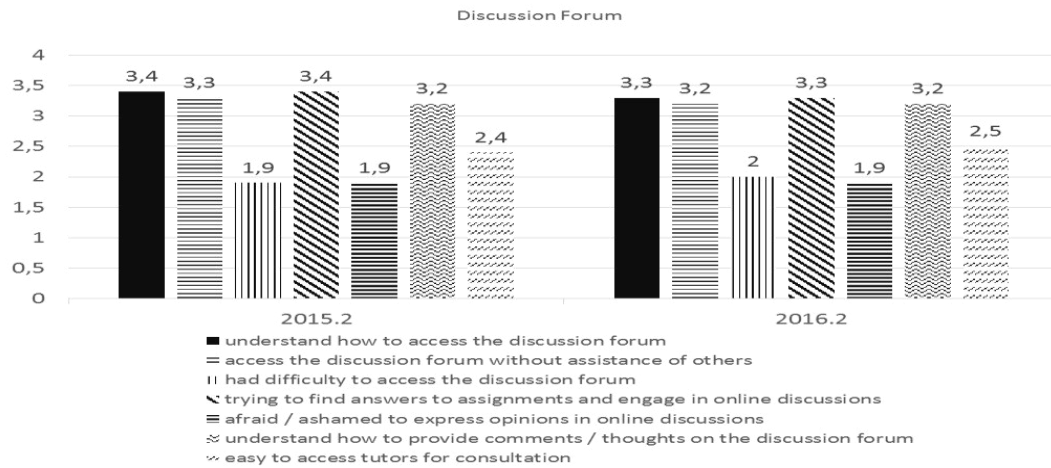


Figure 4. Average Scale of Likert Scale Student's Opinion on Discussion Forum

3.2.6. Online Tutorial Tasks

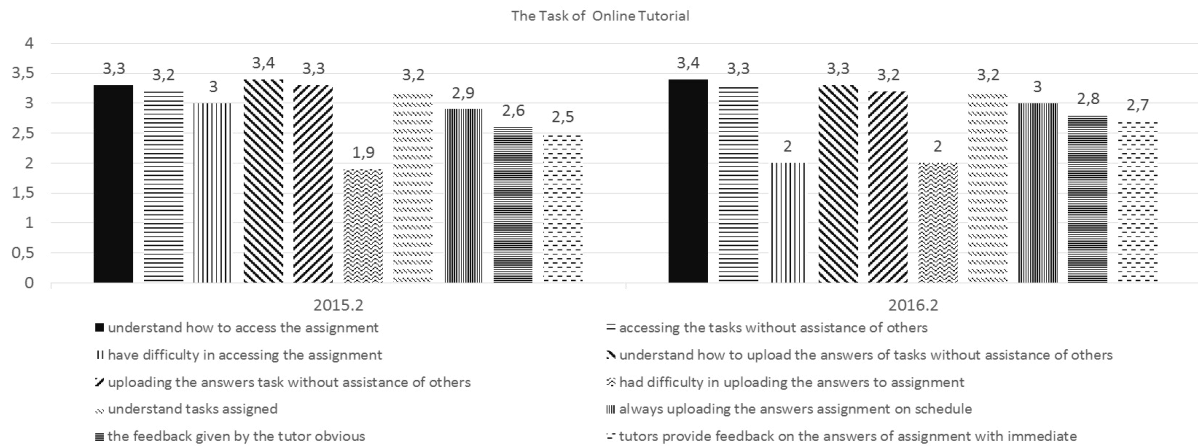


Figure 5. Average Scale of Likert Scale Student's Opinion on Online Tutorial Tasks

Figure 5 shows student opinions about online tutorial tasks. Tutorial tasks are given at week 3, 5 and week 7. Both students in the 2015.2 term and 2016.2 term agree to understand how to access assignments given in online tutorials and access assignments without the help of others. Students of the online tutorial in the 2015.2 term agree that they have difficulty accessing this task, but the students of the online tutorial in the 2016.2 term have no difficulty in accessing the assignment. Nevertheless, they still understand how to upload task answers and they do not find it difficult to upload tasks and upload task answers without the help of others. Students agree that they understand the assignment and always upload the answer to the task on schedule. However, they do not agree that the provision of feedback from the tutor is clear and the tutor provides feedback on the answer to the task immediately. In other words, the provision of feedback given by the tutor is unclear and the tutor does not immediately provide feedback on the answer to the task.

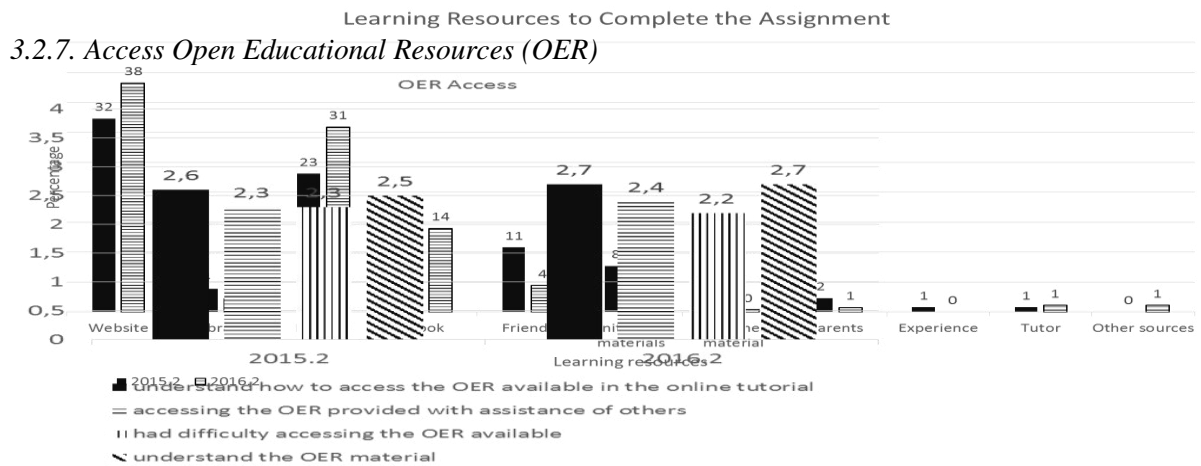


Figure 6. Average Scale of Likert Scale Student's Opinion on OER in Online Tutorial

In giving initiation, tutor adds OER to increase student insight. Figure 7 shows that students have not really understood how to access the OER provided by the Tutor, they find it difficult to access available OERs and lack of understanding of OER material. Students agree that they access available OERs with the help of others.

3.2.8. Utilization of Online Tutorial Facility

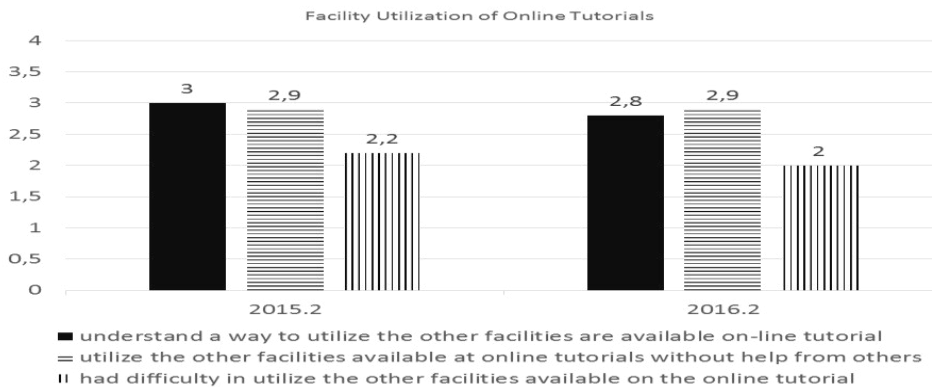


Figure 7. Average Scale of Likert Scale Student's Opinion on Online Tutorial Facility Utilization

Figure 7 shows students' opinions about the utilization of online tutorial facilities. Students agree that they understand how to take advantage of the other facilities available in online tutorials, and utilize other facilities in online tutorials without the help of others. However, they still find it difficult to take advantage of other facilities in online tutorials.

3.2.9. Learning Resources For Completing The Assignments

Figure 8 shows the learning resources used by online student participants in the 2015.2 term and 2016.2 term in completing online tutorial tasks. The three most commonly used sources of learning by students are websites, modules, and books. Meanwhile, only 1% utilize the tutor as a learning resource. This is in line with student answers that they find it difficult to contact the tutor for consultation.

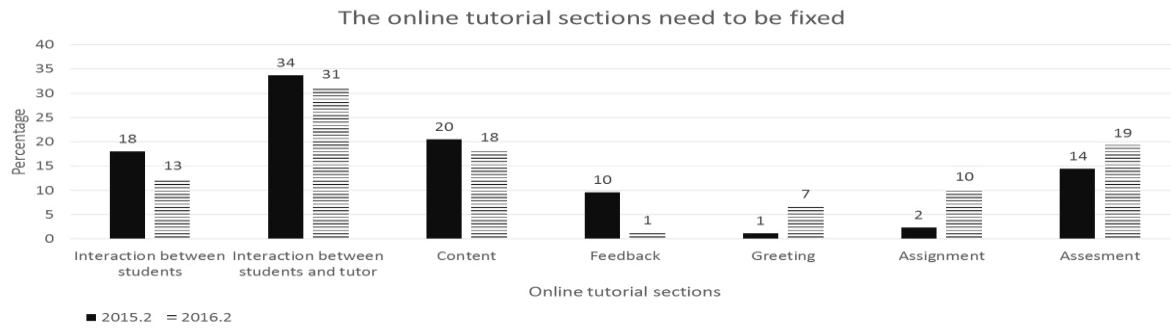


Figure 8. The Learning Resources Used To Complete The Assignments.

3.2.10. The Online Tutorial Sections Need To Be Fixed

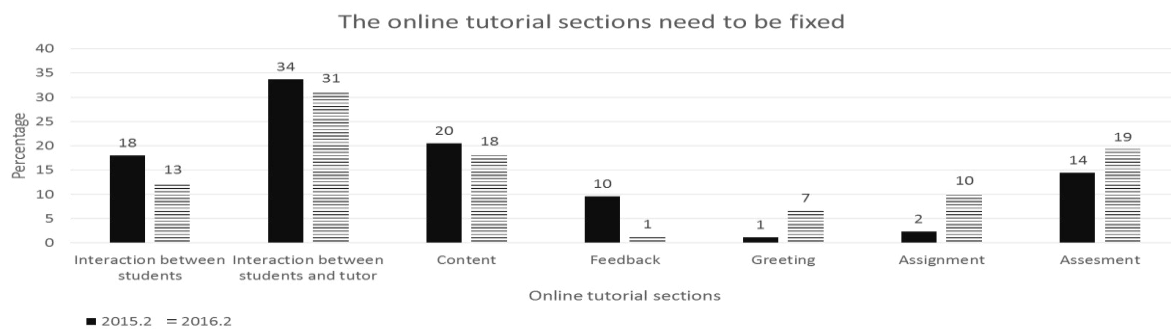


Figure 9. Online Tutorial Section Needs Fixed

There are several online tutorial sections in the 2015.2 term and 2016.2 term that need to be improved as shown in Figure 9. In the 2015.2 term, the interaction between students and tutors is the highest order to be improved (34%), followed by content (21%), interaction between students (18%), assessment (14%), feedback (10 %), Assignments (2%), and greetings (1%). In the 2016.2 term it appears that interaction between students and tutors is the highest order for improvement (32%), followed by assessment (19%), material (18%), interaction among students (13%), 10%), greetings (7%), and feedback (1%). The interaction between students and tutors is the highest order for improvement, in line with students' opinions that they find it difficult to contact the tutor for consultation.

3.2.11. The Average Value of Online Tutorials

Figure 10 shows the average value of online tutorials obtained by online tutorial students in the 2015.2 term and 2016.2 term. The average value of online tutorials in 2015.2 term is 59 and the average value of online tutorials in the 2016.2 term is 63. The highest average online tutorial score in the 2015.2 term is in the Environmental Education course which is 96, and the lowest average online tutorial score is in the Biology Learning Renewal course of 30. Meanwhile, for the 2016.2 term, it is seen that the highest average online tutorial score is in the subject of High School Biology Curricular Material course which is 81, and the lowest average online tutorial score is in the Biometri course which is 42.

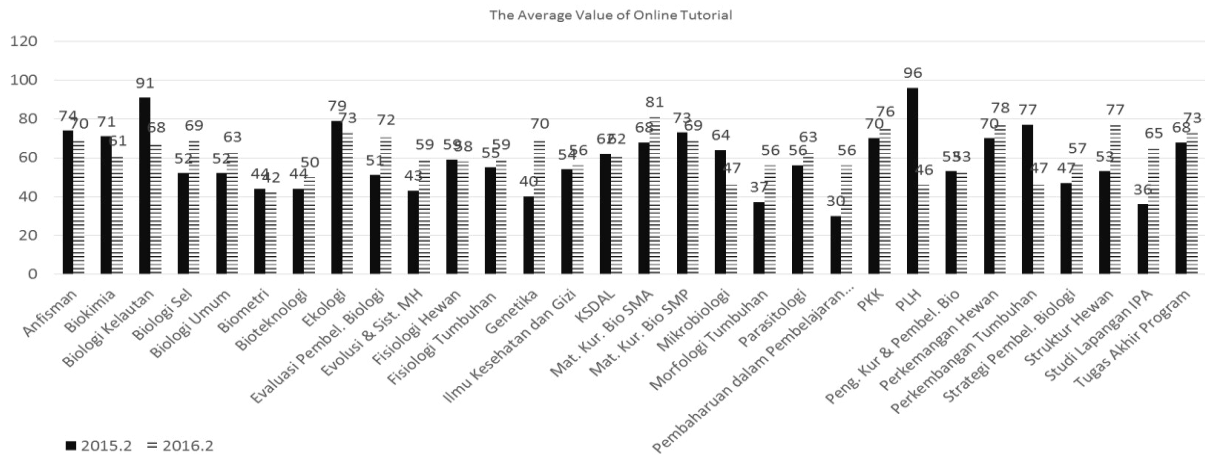


Figure 10. The Average Value of Online Tutorials

3.3. Reflective Thinking Level of Online Tutorial Students In Biology Education Study Program

The reflective thinking level is measured by using questionnaire to measure students' reflective thinking level from Kember et al (2000). Students' reflective thinking levels can be grouped into four levels: Habitual Action, Understanding, Reflection, and Critical Reflection. Figure 11 shows a general overview of the reflective thinking level of Biology Education Study Program students by using Likert scale (1-4).

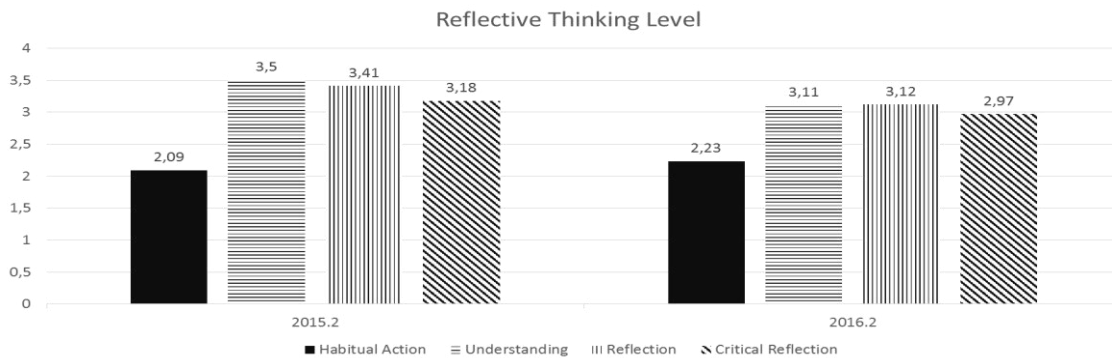


Figure 11. Overview of Student Reflective Thinking Levels Using the Likert Scale

Figure 11 shows that in general the reflective thinking level of students of online tutorials in the 2015.2 term consecutively occupy the level of understanding, followed by reflection, critical reflection, and habitual action. Meanwhile, the reflective thinking level of online tutorial students in the 2016.2 term consecutively occupy the level of reflection, understanding, critical reflection and habitual action. In detail the sub-scale of each level can be studied in Figure 12 to 15.



Figure 12. Level of Habitual Action

Figure 12 shows the opinion of online tutorial students in the 2015.2 term and 2016.2 term on the sub scale of the habitual action level. They generally disagree that when they work on some activities, they do so without thinking about what they are doing. In doing things on the online tutorial, they start doing it by thinking about it. Students disagree that for exam material they do not need to think too much. They also disagree that if they follow what the tutors explain they do not have to think much about the courses they follow.

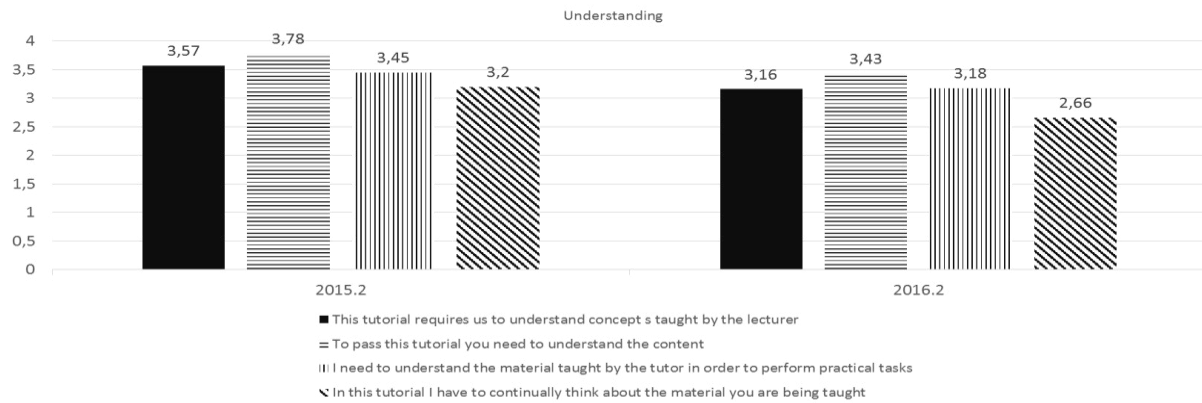


Figure 13. Level of Understanding

Figure 13 shows the opinion of students of online tutorial participants in the 2015.2 term and 2016.2 term on the sub scale of the level of understanding. Students of online tutorial participants in the 2015.2 term strongly agree that the online tutorials they follow require them to understand the concepts taught by the tutor and to pass on the courses they follow they must understand the contents. Students agree that they must understand the material taught by the tutor to do practical tasks, and in the tutorial they must constantly think about the material being taught. Meanwhile the students of online tutorial in the 2016.2 term agree that the online tutorials they follow require them to understand the concepts taught by the tutor and to pass on the courses they follow they must understand the contents. They also agree that they must understand the material taught by the tutor to perform practical tasks, and in the tutorial they must constantly think about the material being taught.



Figure 14. Level of Reflection

Figure 14 shows the student opinions of online tutorial participants in the 2015.2 term and 2016.2 term on the sub scale of the reflection level. Students in the 2015.2 term and 2016.2 term agree that they sometimes question the way other people do things and try to think of a better way. Students also agree that they like to think about what they have done and think of other ways to do it. Students agree that they often reflect on their actions to see whether they can improve what they have done, and also often reassess their experience so they can learn from it and improve their next performance.

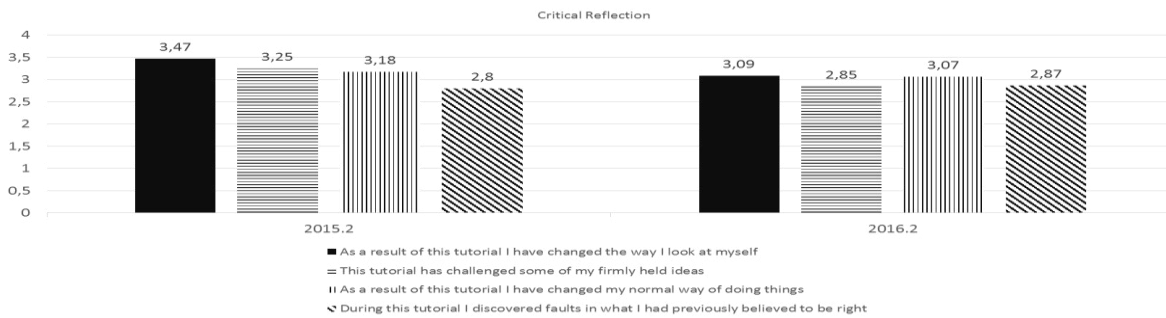


Figure 15. Level of Critical Reflection

Figure 15 shows the student's opinion on the sub-scale of the critical reflection level. Students in the 2015.2 term and 2016.2 term agree that as a result of the tutorials they have followed have changed their perspective in looking at themselves. The tutorial challenged some of their ideas, and as a result of the tutorial they have changed their habit of doing things. They also seem somewhat agree that during the tutorial they discovered faults what they previously believed to be right. When viewed from the average value of online tutorials, the level of reflective thinking does not seem to be related to the average value of online tutorials that are generally still low, 59 in the 2015.2 term and 63 in the 2016.2 term.

From the results of this preliminary study, obtained some things that need attention are:

- Initiation materials of online tutorials do not suitable with the needs of students;
- Students need the immediate feedback to their assignments' answers from the tutor and the clear feedback from the tutor;
- OER and other facilities in the online tutorial have not been optimized utilized by students;
- The three most commonly used learning resources for students to do the task: 1) Website; 2) Module; and 3) Books. While the use of tutors as a source of learning is in the last sequence
- Online tutorial sections that need to be improved: 1) Interaction between students and tutors; 2) Initiation materials; 3) Interaction between students; and 4) assessment
- Reflective thinking level of students of online tutorials in the 2015.2 term consecutively occupy the level of understanding, followed by reflection, critical reflection, and habitual action. Meanwhile, the reflective thinking level of online tutorial students in 2016.2 term consecutively occupy the level of reflection, understanding, critical reflection and habitual action.
- The level of reflective thinking does not seem to be related to the average value of online tutorials.

4. Conclusion

Based on the research findings, several theoretical developments can be proposed:

- The initiation materials based on the assumptions of the tutors required to clarify the material on the module do not always match the needs of the students. Students will feel the need of material if the material discussed comes from the problems that come from the students.
- The tutors who difficult to contact by students may cause tutors not to be considered as a source of learning even the tutor's function as a facilitator becomes invisible.
- The student's reflective thinking level does not affect the average value of online tutorials. This happens because reflective thinking of students is not directed in this online tutorial activity.

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