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Development of a Reflective Learning Program in Online Tutorials for the Biology Education Department

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Abstract: This study aims to produce a reflective learning program that can be applied to the online tutorial in the Biology Education Department which can improve the reflective thinking skills of Biology Education students. The study was conducted in three years with using the research and development (R & D) which adapts the 4 D model from Thiagarajan et al. The research steps carried out preliminary studies, program design, program development -which includes program trials and program revisions-, and program implementation. What will be discussed in this paper is limited to how the program development process goes from the start until the right prototype is obtained to help students hone their reflective thinking skills. Reflective learning programs in online tutorials require several stages to arrive at the most appropriate prototype that is able to increase student participation in reflection which has the potential to increase reflective thinking skills. After going through several stages of testing and revising the placement of the most appropriate reflection activities, reflection activities are given every two sessions, namely in the second, fourth and sixth sessions.

Keywords: Online Tutorial; Reflection; Reflective Learning; Reflective Thinking Skills

Introduction

In general, Biology Education Students in the Biology Education Department at the Universitas Terbuka (The Indonesian Open University) (UT) are inservice teacher. As teachers, students must have skills as professional educators, which can be obtained through a lifelong learning process. When the teacher realises the importance of refection to lifelong learning, he or she will be more likely to align the class activities to students' development of refective thinking (Akerson et al., 2018; Al-Husban, 2020; Perdana et al., 2019; Sultana et al., 2020). Reflective thinking skills are one of the skills that are in line with 21st century skills which include self-direction, risk taking and creativity, communication, reflection, and application. real world knowledge (Akpur, 2020). 21st century skills have a strong metacognitive component, one of which is reflecting on the process (Kim et al., 2019; Reaves, 2019; Salido & Dasari, 2019).

Referring to the 21st century skills where reflection is one of the skills promoted, online learning as a form of learning aid used by Distance Education students should be able to support reflective thinking skills. To encourage reflection, students can be assigned to make learning journals during the learning process or make questions related to content throughout learning so that it encourages students to reflect and process information in a relevant and meaningful way (Erdoğan, 2020; Nückles et al., 2020) enhance their understanding, and enrich lifelong learning (Jarvis & Baloyi, 2020).

Reflective learning is a type of learning that involves students' critical processes towards situations in which learning occurs. Reflective learning allows students not only to develop critical thinking skills but also to foster self-awareness of their own learning. Students engage in reflective learning by stepping back from their learning and analyse their experiences (Fergusson et al., 2019; Marshall, 2019; Yaacob et al., 2020; Yuan & Mak, 2018). It isnecessary for students to revisit what they have learned for improvement and for in-depth learning (Chang, 2019). This means that students can critically evaluate their learning, identify areas of their learning that are needed for further development, and make them more independent learners.

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From several attempts made to develop reflective thinking skills such as the use of PBL, e-portfolio, layered curriculum, concept maps, feedback dialogue, and collaborative reflective learning, in general, the results show that these efforts can encourage and improve students' reflective thinking skills (Ajjawi & Boud, 2018; Evin Gencel & Saracaloğlu, 2018; Noer et al., 2020; Sultana et al., 2020; Yaacob et al., 2020) .

Regarding a problem-based online learning program on Plant Development with the reflective Gibbs cycle and electronic portfolio to improve students' reflective thinking skills, in general students give a positive impression of the program they use, but they feel that this program is too complex. Based on this, it is fundamental to carry out further research to get a less complex online learning model in online tutorials for subjects in the Biology Education Department that can make strides students reflective thinking skills.

Method

This research lasted for three years and was carried out in the Biology Education Department. The method used in this study is research and development (R & D) which adapts the 4 D) by taking into account the essence that must be fulfilled in conducting research. The research steps - can be seen in Figure 1- carried out are as follows: preliminary studies, program design, program development which includes program trials and program revisions, and program implementation.

To hone students' reflective thinking skills, reflective thinking is integrated into reflection activities using the Gibbs' reflective cycle which is preceded by discussion activities. The core of the activities carried out by students in the Gibbs reflective cycle consists of six steps that support reflection activities and at the same time encourage reflective thinking (Figure 2).

Figure 2 shows that the 1st stage of reflection is the description. It gives the information of what happened during the discussion. The 2nd stage is feeling, which portrays what was thought and felt previously, during, and after the circumstance happened, and depicts student responses in the circumstance. The 3rd stage is evaluation, which gives an outline of what worked out positively and went poorly and how the circumstance finished. The 4th stage is analysis, which clarified why things worked out in a good way and things went poorly and what the outcomes were. The 5th stage is the conclusion, which clarified what lessons were gained from the circumstance and things that can be changed to advance the circumstance. The 6th stage is an action plan, which clarifies how will be dealt with managing a similar circumstance later on and advance the circumstance.

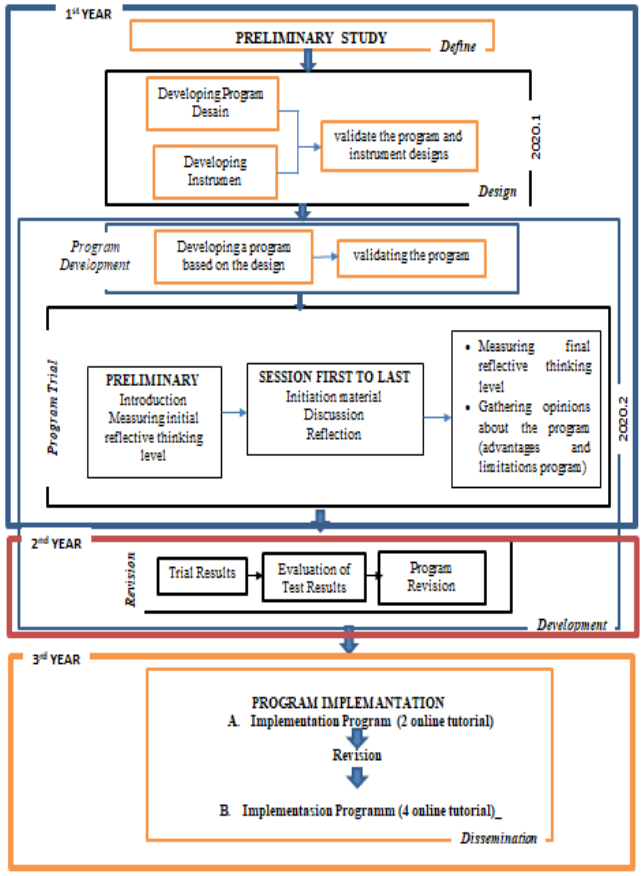

Figure 1. Research Procedure

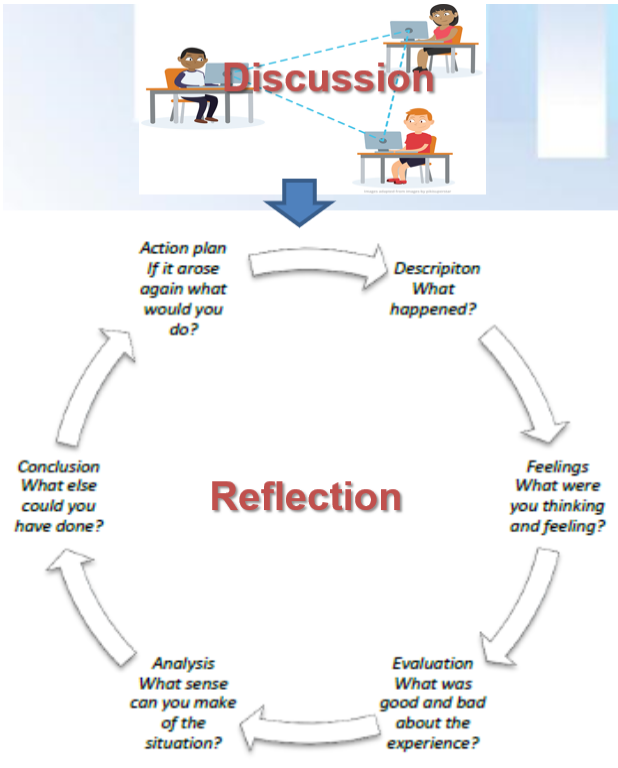

Figure 2. Discussion and Reflection Activities

What will be discussed in this paper is limited to how the program development process goes from the start until the right prototype is obtained to help students hone their reflective thinking skills.

Result and Discussion

Preliminary Study

The preliminary study aims to capture how online tutorials are implemented in the Biology Education Department and what is the reflective thinking level of students participating in the online tutorials in the Biology Education Department. The results show that there are continuous improvements to the strategy for delivering the material for online tutorial courses, both carried out based on the initiative of the course supervisor or based on the rules set by the UT learning assistance management unit. In general, the reflective thinking level of Biology Education students was generally still at the level of understanding as shown in Table 1.

Table 1 shows that students are still at understanding level. This is in line with the results of research conducted by (Davoudi & Heydarnejad, 2020) which show that the level of reflective thinking of EFL students is still dominated by the level of understanding. The students with a level of understanding reflective thinking act to understand and apply knowledge within contextual boundaries, and without considering personal meaning and application to extend learning. Therefore, learning efforts are still needed to direct students to reach a higher level of reflective thinking, namely the level of reflection and critical reflection.

Table 1. Average Score of Reflective Thinking Level of Biology Education Students

Academic Year	Reflective Thinking Level Score			
	Habitual Action	Understan-ding	Reflecti-on	Critical Reflection
2015/2016.1	2.09	3.50	3.41	3.18
2016/2017.1	2.23	3.11	3.12	2.97
2017/2018.1	2.30	3.30	3.10	3.10
2017/2018.2	2.19	3.28	3.17	2.97
2018/2019.1	2.55	3.39	3.18	3.05
Average	2.27	3.32	3.20	3.05

Program and Instrument Design Development

A reflective learning program design was developed in an online tutorial as shown in Figure 3.

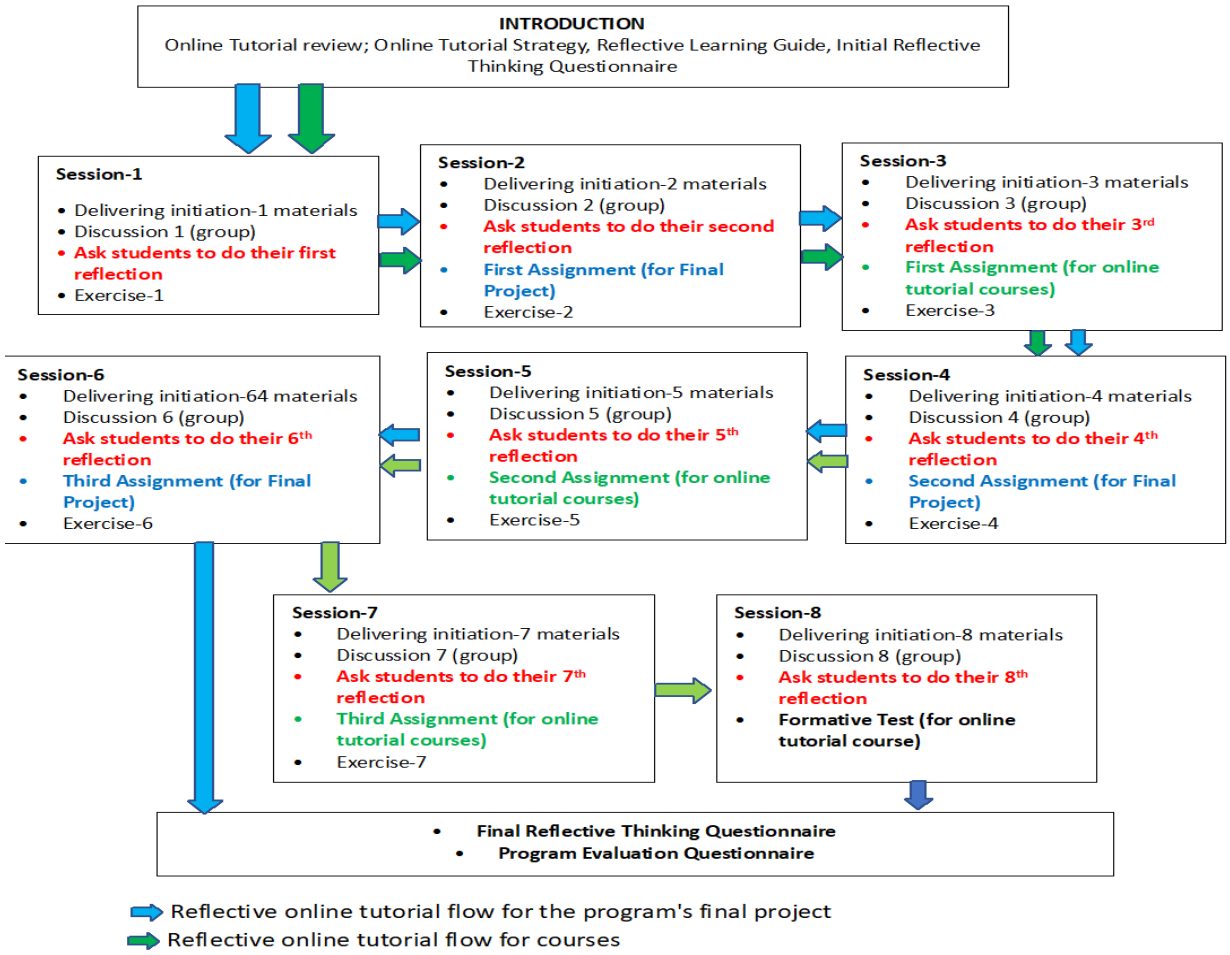

Figure 3. Reflective online tutorial flow

Figure 3 shows that before entering the first session students must study the lesson review, the lesson strategy, reflective learning, and fill out a reflective thinking questionnaire. From the first session to the last session students must participate in group discussions and at the end of each discussion each individual student must reflect on the process and results of the discussion that's been done. After participating in online tutorial activities from the first session to the last, students must fill out a reflective thinking questionnaire and fill out a questionnaire related to the tutor program they have attended.

The results of an internal expert's review of the reflection format adapted from Gibbs' reflection as a guide for students to reflect, obtained input that the guidelines for answering questions needed to be more detailed so that in reflecting students were really focused on answering each reflection question so that their answers would not be widened. This is in line with the challenges faced by Greenberger (2020) developing Guide for Reflective Practice (GRP). Creating the GRP presented many challenges, including interpreting Dewey's seminal work on reflective thinking, discerning where to deviate from his work to meet the project objectives, and determining an effective way to support faculty engagement that is both personally and professionally rewarding.

The program design developed in this study, in addition to covering program flow, also includes Reflective Online Tutorial Activity Design (ROTAD) for one subject, Reflective Online Tutorial Activity Unit (ROTAU) for each session, and Reflective Online Tutorial Material (ROTM) for one course and other instruments. From the design of the program and instruments developed, we obtained tutor guides and student guides that can be used as guidelines in carrying out reflective learning activities in online tutorials. From the results of expert validation, recomendation was obtained on program design and instruments packaged as tutor guides and student guides, which can be seen in Table 2.

Table 2. Expert Validation Results for Program and Instrument Design

Indicators	Score (range 1 – 4)
Learning Flow	
The integrity of the learning flow	3.50
Ease of following by students	2.50
Leads to the habit of reflection	4.00
Directs the ability to think reflectively	3.5
Discussion Activities	
The discussion material contains problems that direct students to reflect	2.00
Discussions require each member to participate actively	3.00
Reflection Activities	
Directing students to describe in detail what happened in the process and the results obtained in the discussions that followed	4.00
How to invite students to express what they think and feel about the process and results obtained in the discussion	3.50
Directing students to evaluate the good and bad things from their experience regarding the process and results of the discussion	4.00
Directing students to analyze what can be made of the situation	3.50
Direct students to look for other things they can do	3.50
Challenging students' thinking to plan actions if the same event occurs again. (score: 4)	4.00
Tutors Guide	
This tutor guide is suitable for use, with minor improvements in just a few points	
Maybe it would be better if the ROTAD was supplemented with material or sub-topics that were discussed in each session to ensure that the material presented could be more optimally studied with either tutors or students.	
Links or other materials should also be attached so that the tutons have the same understanding	
Student Guide	
This guide is suitable for use, but it is necessary to pay attention to the following notes: please give the examples given enough space to explore critical and creative thinking skills by giving full freedom to express opinions in each reflective stage	
The majority is self-explanatory and systematic. There are several parts that must be completed or added so that the learning process can run even better such as rules, examples or other things that require students to participate and in accordance with the desired expectations in the activities requested in this research.	

From Table 2 it can be seen that the learning flow still needs to be improved so that students can easily follow it. For discussion activities, it is necessary to provide material that allows all participants to reflect as a whole and in the guide it is necessary to include material or sub-topics that will be discussed in each session. Based on suggestions from experts, the program

design, tutor guidelines and student guides were improved.

Program Development And Program Trials

Based on the improved program design, the program is developed. After the program has been completed, the program trials were carried out on the final project online tutorial for 6 weeks. After the program has been tested, an evaluation of the components related to the reflective learning program is carried out through online tutorials which include evaluation of the guidebook, discussion activities, reflection activities, and evaluation of the program as a whole.

Table 3. Evaluation of the guidebook, discussion activities, reflection activities, and evaluation of the program

Reflective Learning Guide Book		Yes	No
Study the Guidebook		95%	5%
Understand the reflective learning guide in online tutorials			3.27
the reflective learning guide on online tutorials helps to participate in online tutorial activitie			3.32
Discussion Activities		Positive statement	Negatif statement
		68%	32%
The Task of Reflecting		73%	27%
Things that need to be improved in the reflective learning program	Materials		22%
	Reflection		14%
	Feedback from tutor		64%

Guidebook

The online tutorial program produced in this study has different characteristics from the existing tutorial programs. The activity of reflecting using the Gibbs' reflective cycle on the process and results of the discussions carried out is a new thing that aims to hone students' reflective thinking skills. So that students can understand the course of the tutorial and what tasks they have to do in participating in reflective learning through the online tutorial for the final project of this program, a Reflective Learning Guidebook is provided which is kept in the introductory online tutorial section for students to study.

Based on the results of the questionnaire (n = 22) it was found that 95% of students studied the guidebook as shown in Table 3 shows that the placement of the guidebook at the initial introduction is quite effective in inviting students to study the guide before entering the initial session. This is inline with (Ramdani et al., 2021) it is necessary to create a guidebook that facilitates and becomes a guide for teachers to carry out adaptive learning. Students agree that by studying the guidebook they can understand the reflective learning guide in online tutorials, this can be seen from the average score of the level of agreement at 3.27. Likewise, the reflective learning guide on online tutorials helps to participate in online tutorial activities on the final project program, which is indicated by the level of agreement at 3.32.

Discussion Activities

Student opinions about the discussion activities carried out, as many as 68% gave positive statements and 32% gave negative statements as shown in Table 3. Students participating in the program's final assignment online tutorial gave positive and negative statements about the discussion activities. Positive statements are mainly associated with responses from students, communication between students, and the benefits of discussions such as comments made by the following students.

"Discussion activities are very useful, reading the responses from each student makes me rich in knowledge and very useful" (S-2); "The discussion went smoothly and there was communication between students" (S-3); "Discussion activities are very good and help students learn the material" (S-11); "This discussion activity is very beneficial to me as an educator because this activity discusses the weaknesses and strengths that sometimes occur in the learning process and so on" (S-17); "It is very helpful because the discussion activities give us broad knowledge" (S-6)

Negative statements were mainly related to the lack of feedback received by students, the tutor's role in discussions and discussion time, such as comments made by the following students. "It would be nice for Tutor to act as a moderator in the discussion. It is better if the discussion is scheduled for 1 certain day and all participants are expected to be able to express their opinions" (S-12); "The process is good but there is no feedback and no reinforcement from the tutor" (S-15).

Reflection Activities

The opinion of students regarding the reflection activities carried out in the online tutorial for the final project as much as 73% gave positive statements and 27% gave negative statements as shown in Table 3. Positive statements are mainly related to the benefits of

reflection such as comments made by the following students.

"Reflection activities are carried out to evaluate the advantages and disadvantages of learning" (S-3); "For task and reflection activities, provide an understanding related to what has been learned" (S-4); "Reflection activities really provide motivation to be even better" (S-6); "It is very good to evaluate ourselves how far we have done the task" (S-7); "Doing reflection is a must for a teacher, we learn to evaluate ourselves about strengths and weaknesses during learning, so that we become professional educators" (S-8); "Doing reflection is very good to do in order to find out what things have been understood or what has been done, not yet and what will be implemented" (S-17); "Doing reflection can change my mindset as a teacher for improvement in conducting learning in the classroom." (S-21)

Negative statements about reflection activities are mainly related to the benefits of reflection, the form of questions, how to fill in reflections, and the tutor's role in reflection activities, such as the following comments made by several students. "at first glance the questions asked seemed the same so I felt confused about the answers I should write for each item of the reflection" (S-1); "I was a little confused about filling out the reflection assignment. At least there is an example of how fill in the reflection first" (S-11); "I have some difficulty in reflecting because the questions are almost the same" (S-13).

Negative statements from students when viewed from the products they produce are very reasonable. Several students who answered questions not related to the process and results of the discussion but related to the material in the discussion. This shows that the sentences used in the reflection assignment for some students are unclear and need to be corrected.

Reflective Learning Program

Opinions and input from student participants (n =22) regarding things that need to be improved in the reflective learning program can be grouped into three main things, namely related to feedback from tutors, materials, and reflection activities as shown in Table 3. Tutor feedback occupies the top place for improvement (64%) this can be seen from the following student statement.

"We hope that the response to our answers will be more detailed, so that we can improve the answers we give in the discussion forum" (S-2); "what needs to be improved is the need for a more role from tutors to guide students in drawing conclusions" (S-3); "There needs to be feedback, especially from tutors so that we know the correct answers, or responses to the answers that have been given" (S-9); "it still need improved further, namely in the form of feedback to students so that students can find out what needs to be improved". Meanwhile for reflection things that need to be improved are related to how to provide answers for reflection.

The opinions of students participating in final project online tutorial towards reflective learning can be seen in Table 4 shows that overall students have no difficulty participating in reflective learning activities through online tutorials.

Based on the results in the trial activities, it can be concluded that the program can be used as a forum for honing students' reflective thinking skills. However, there needs to be improvement in the discussion and reflection implementation strategy and needs to be supported by a more optimal tutor role so that the program runs according to the goals to be achieved.

Program Revision

Based on the evaluation results of the programs that have been trialed in semester 2020/21.1, it is known that the implementation of reflection which is carried out in each session after the completion of the discussion session results in a wastage of students' time for reflection and students tend to answer reflections with answers that are relatively the same as the answers to reflections in these sessions (Ramdani et al., 2021), previous sessions and students tend to get bored if reflection is done in each session. Boredom is considered one of the prevalent negative emotions in the academic context (Dumančić, 2018) One way to enhance learners' boredom regulation is through strategy instruction (Nakamura et al., 2021). Based on this, revisions were made to the implementation of reflections which were not carried out in each session.

Table 4. Opinions of Final Project Online Tutorial Students About Reflective Learning Through Online Tutorials

Statement	Score (Range 1-4)
Initiation materials available in online tutorials are easily accessible	3.55
Discussion forums on online tutorials are easily accessible	3.50
I understand how to give comments/thoughts on discussion forums	3.36
I try to find answers to assignments and engage in discussions	3.55
I feel afraid / embarrassed to express my opinion in discussions	2.00
The assignments on online tutorials are easy to access	3.41
The assignments given in the online tutorial are easy to understand	3.32
I'm having trouble uploading assignment/ practice answers	1.91
I always upload assignments on schedule	3.55

Statement	Score (Range 1-4)
The tutor gave feedback on the answer to my assignment immediately	2.91
The feedback that the tutor gave to my answers was clear	2.86
I always do reflection assignments as directed by the tutor	3.41
I find it difficult to do reflection assignments	2.86
I understand how to access the Open Educational Resources (OER) provided in online tutorials	2.23
I understand the available OER materials	2.91
The online tutorial initiation material provided suits my needs	3.18
I understand the online tutorial initiation material that I study	3.32
I can easily contact tutors for consultations	2.91

Reflection was carried out three times, namely, after students answered discussion questions in session-2 (after students held discussions in sessions 1 and 2), in session-4 (after students held discussions in sessions 3 and 4), and in session-6 (after students carry out discussions in sessions 5 and 6). The reflective online tutorial flow that have been revised and to be the final prototype of the reflective online tutorial can be seen in Figures 4.

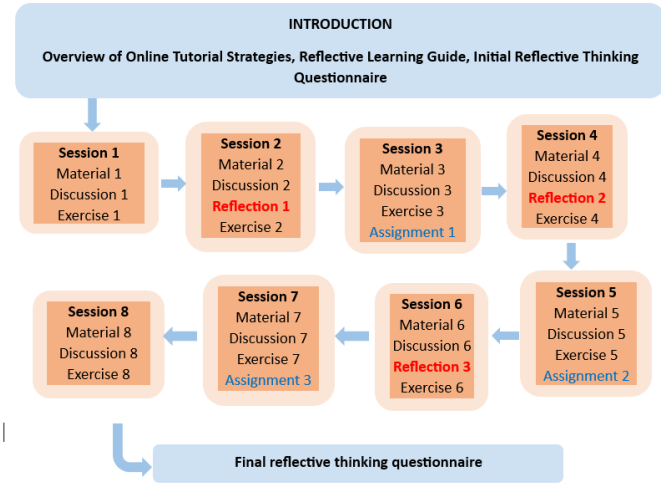

Figure 4. the final prototype of the reflective online tutorial

Conclusion

Reflective learning programs in online tutorials require several stages to arrive at the most appropriate prototype that is able to increase student participation in reflection which has the potential to increase reflective thinking skills. After going through several stages of testing and revising the placement of the most appropriate reflection activities in online tutorial - that has eight sessions - reflection activities are given every two sessions, namely in the second, fourth and sixth sessions.

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Author Contributions
Conceptualization, M.S., A.S. and U.R.; methodology, M.S.; validation, A.S. and U.R.; formal analysis, A.S.; investigation, M.S. and A.S.; resources, M.S. and U.R.; data curation, M.S,: writing—original draft preparation, M.S and A.S.; writing—review and editing, M.S.: visualization, M.S. and A.S..; supervision, M.S.; project administration, M.S.; funding acquisition, M.S. and U.R. All authors have read and agreed to the published version of the manuscript.

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Conflicts of Interest
The authors declare no conflict of interest.

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