The reflective thinking skills of preservice biology teacher in histology lectures

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Abstract. Reflective thinking as integral to the development of professional teaching practices was important developed on preservice biology teacher, including in histology lectures. The purpose of this study was to explore the reflective thinking levels of preservice biology teacher. Survey research used in this study was conducted on third year preservice biology teacher who attended histology lectures (n=36). ‘Reflective Thinking Questionnaire’ (RTQ), which was developed by Kember et al (2000) was used as data collection tool. It includes 16 items measuring four types of reflective thinking: Habitual Action (HA), Understanding (U), Reflection (R), Critical Reflection (CR). Descriptive statistics were used to analyse the data. The results showed that among the comprising factors of reflective thinking, U received the highest mean followed by R, CR, and HA.

Keywords: Reflective Thinking Skills, Habitual Action, Understanding, Reflection, Critical Reflection, Preservice Biology Teacher, Histology Lectures.

1. Introduction
Teacher in higher education (lecturer) must development thinking skills for the student in their teaching because development thinking skills is the goal of modern education. Reflective thinking skills is one of HOTS (higher order thinking skills), that must be mastered by the preservice teacher. Reflective thinking a part of the critical thinking process that specifically refers to the process of analyzing and making decision about something that has happened [1]. Reflective thinking is often equated with critical thinking, but reflective thinking comes up with new idea that actually based on Dewey, such as reflective of application and reflective or reflection application [2]. There are many definitions about reflective thinking skills. One of the first educational theorists to explore of reflective thinking is Dewey (1933). He described reflective thinking as “active and continuous thinking of any subject” [3]. Schön continuing exploration of the process and product of reflective thinking by Dewey, but Schön focus on the outcomes. The 2 key-concepts has been developed by him: reflection-in-action and reflection-on-action. reflection-in-action is the reflective thinking one is doing while one is doing the action, while reflection-on-action refers to after the experience has taken place, occurs in contrast to reflection in-action. Taagard and Wilson mentioned reflective thinking is a process making informed and logical decision [4]. Atay (as cited in Tuncer and Ozeren) assessed reflective thinking as a remembering, thinking over and assessing with a particular purpose of any experience process [5].

Teachers’ reflective thinking skills and learners’ reflective thinking skills are equally important [5], so does preservice teacher’s reflective thinking skills [6],[1]. There are many studies in the literature about reflective thinking on teachers, preservice teachers, or student. Among these, study’s Tican and
Taspinar (2015) was determined that the class with reflective thinking-based teaching activities is higher than the class with traditional teaching in: academic achievement, reflective thinking, critical thinking, achievement democratic attitude, and post-test mean scores [7]. There was a significant difference in the class variable of prospective teachers in the: question dimension, evaluation dimension, reasoning dimension and whole of the scale [5]. Research and development has been carried out by Sekarwinahyu (2018) about development of problem based learning for online tutorial program in plant development using Gibb’s reflective cycle and e-portfolio to enhance reflective thinking skills, and the result that the design of programs and instruments can be used as references in the development of the program with some improvements and based on the trial of the program, the results obtained that the program needs to be improved in terms of setting access between sub-initiation and between initiations [1]. The effect of reflective thinking in teaching practice of preservice physical education teacher was preservice physical education teachers displayed professional development in proper planning, time management, and use of school facilities [6]. Lee (2005), however, approached reflective thinking from the teacher education perspective and suggested that reflective teacher education could contribute to their development, not only during their education but after their graduation from the program as well [8]. Before conducting research on quasi experiment, research and development, action research, etc., it is better to do analytical research to find out reflective thinking of preservice teacher. From the studies above, there is no research was found to determine reflective thinking skills in histology lectures.

Some instruments for measuring reflective thinking were developed by experts, such as: “Reflective Thinking Skill Scale Towards Problem Solving” which was developed by Kizilkaya and Askar (2009) (as cited in as cited in Tuncer and Ozeren, 2012) consisted of 14 items and 3 sub-dimensions (Questioning, Evaluating, and Causation [5]; ‘Reflective ThinkingQuestionnaire’ (RTQ) which was developed by Kember et al (2000) consisted 16 items and 4 sub-dimensions (Habitual Action, Understanding, Reflection, Critical Reflection) [9]; and “Reflective Thinking Tendency Scale” (RTTS) which was developed by Semerci (2007) (as cited in Turan and Koc, 2019) for teachers and preservice teacher [10].

Based on field study in the biology lectures (not education lectures) at Maritim Raja Ali Haji University, lectures are conducted with almost the same learning methods. Biology lectures consist of experiment activity in laboratory or field and theory in class. In experiment activities students carry out guided experiment by the lecturer, with the help of a guide or lab module. The lecturer has written the objectives, tools and materials, and how the lab works in the lab module. Free practice is very rare. Whereas biological concepts are taught in class. Lecturers tell students about the material or concepts that must be understood. Histology is one of biology lectures.

Histology is a traditional core basic science component of most biology education programs and presents a didactic challenge for many students. Histology is a branch of biology that studies the tissues of the body of living things. Therefore, the content of histology is very close with the real life. the biology lecture activities described above are predicted to affect the ability of reflective thinking students. This research question is how is the reflective thinking skills of students in histology lectures? Reflective thinking as integral to the development of professional teaching practices was important developed on preservice biology teacher, especially in histology lectures. Early intervention to support and encourage student’s learning success can be done by identifying them who tend to struggle with histology [11], especially their reflective thinking skills. The individuals who capable of reflective thinking would be more successful in life, so that it can help education policies to prepare the individuals for the future [5]. Therefore, the aim of this study is the determination of reflective thinking skills of preservice biology teachers in histology lectures.

2. Method
The study group of the present paper consists of third-year preservice biology teachers taking the course of histology lectures at the Teacher Training and Education Faculty, Maritim Raja Ali Haji University, in the 2018–2019 academic year. The study was conducted according to a descriptive
The general aim of this study was to explore the reflective thinking levels of preservice biology teachers who attended histology lectures. Sample was determined using total sampling method. Number of samples were 38. However, there were only 36 questionnaire returns with usable data.

Data in this study is reflective thinking skills. Reflective Thinking Questionnaire (RTQ) which was developed by Kember et al (2000) was used to collect the data. It includes 16 items measuring four types of reflective thinking: Habitual Action (HA), Understanding (U), Reflection (R), Critical Reflection (CR). Scale is scored according to Likert type 5. They were “definitely agree” = 5, “agree with reservation” = 4, “only to be used if a definite answer is not possible” = 3, “disagree with reservation” = 2, and “definitely disagree” = 1. To conduct the research, the scale was first translated into Indonesian. Having translated, a group of experts evaluated the quality of items of clarity and comprehensiveness. Validity and reliability of questionnaire were substantiated using SPSS 20.0 software. The reliability of the questionnaire estimated via Cronbach’s alpha was found to be 0.85. The validity of the questionnaire estimated via Pearson moment product test. 13 of 16 items was valid. 3 invalid items were revised. Overall, it can be concluded that the instrument of reflective thinking questionnaire had acceptable reliability and validity indices. The descriptive statistics were used to analyse the data about the minimal, maximal, average, and standard deviation of each types of reflective thinking.

3. Result and Discussion

3.1. Result
The findings obtained in relation to reflective thinking skills are presented in Table 1 below:

| Scale                      | Min | Max | Mean | SD  |
|----------------------------|-----|-----|------|-----|
| Habitual Action (HA)       | 6.00| 20.00| 12.92| 3.42|
| Understanding (U)          | 15.00| 20.00| 18.55| 1.46|
| Reflection (R)             | 13.00| 20.00| 16.69| 2.08|
| Critical Reflection (CR)   | 11.00| 20.00| 15.75| 2.40|

Table 1 shows that among the comprising factors of reflective thinking, there is Understanding (M=12.92, SD=1.46) received the highest mean followed by Reflection (M=16.69, SD=2.08), Critical Reflection (M=15.75, SD=2.40). While, Habitual Action (M=12.92, SD=3.42) receives the lowest mean score. In line with the mean of reflective thinking’s aspects, the minimal score of Understanding (15.00) is highest, followed by Reflection (13.00), Critical Reflection (11.00), and Habitual Action (6.00). The maximal score of each aspect is same, 20.00.

3.2. Discussion
Reflective thinking research on education in Indonesia is dominated by mathematics learning. Research on reflective thinking in science learning, especially biology is still very little. Though reflective thinking is part of critical thinking [1], while critical thinking is HOTS and also 21st century skills. The 21st century skills are very important for students to live in the future. Thus, reflective thinking skills must be provided for preservice biology teacher students.

The present study aimed at exploring the four components or aspects of reflective thinking namely: understanding, reflection, critical reflection, and habitual action on preservice biology teacher who attended histology lectures. To attain the goals of present research, the Indonesian version of reflective thinking questionnaire was administered to a sample of Indonesian university students. The results of Pearson moment product and Cronbach’s alpha test estimates substantiated the validity and reliability of the scale.
The results of the study show that understanding received the highest mean followed by reflection and critical reflection, while habitual actions have the lowest average score. This finding is in parallel with Ghanizadeh and Jahedizadeh who studies undergraduate student. The ability to critique information, apply the knowledge, and analyze at a high order level (understanding, reflection, and critical reflection), is demonstrated among higher education students more frequently than abilities associated with lower-order thinking such as memorization, explain, and rote-learning, i.e., habitual action [12].

Animal histology is a discipline concerning the study of microscopic structures of animal tissues and organs - with the aid of light or electron microscopes [13]. Histology lectures attended by preservice teacher students in Biology Education Department of UMRAH (in 2018–2019 academic year) used constructivist approach with problem based learning models. This lecture was different from traditional teaching of histology that composed of two separated components, theory and practice. Thus, it is not surprising if it’s student’s reflective thinking skills in higher order level (understanding, reflection, and critical reflection). Constructivist approach enables students learn in an inquiring and effective way, student to become active and motivated, so that it helps them to ascend to the top three steps (analyze, evaluate, and create) (according to Bloom’s Taxonomy) of the cognitive domain [10].

The above finding corroborates the contention that debriefing and the development of reflective thinking skills most often occur during higher education [14]. This related with research’s [12] and [14]. It was revealed that understanding score was the highest whereas habitual thinking had lowest score. Scholar contended that reflective thinking is a standard of intellectual excellence required for full and constructive participation in academic, individual, and social lives of students (Scriven & Paul, 2004, as cited in [12]).

Student of preservice teachers in Biology Education Study Program of UMRAH prepare themselves to teach histology material for students at school. They must master histological material well. The students lack the ability to reflect on their understanding, let alone reflect critically. Thus, it is not surprising that their understanding skills are higher than the two higher levels of thinking, reflection and critical reflection. We recommended such as: integrated teaching [13] and integrated approach [15] for better histology teaching. Integrated teaching indeed improved the student's histology learning outcomes [13]. While, study by Heidger et al about using real and virtual imaging to teaching and testing histology as the integrated approach [15]. Then, to increase reflective thinking of students, research can be continued by developing integrated teaching programs and also based on reflective thinking activities. Teaching based on reflective thinking activities, among others using Gibbs’ reflective cycle and e-portfolio in problem based online learning in plant development [1] and reflective thinking-based teaching activities [7].

4. Conclusion
The study about reflective thinking skills of preservice biology teacher in histology lectures was reveal that understanding score was the highest whereas habitual action had lowest score. The above finding corroborates the contention that the development of reflective thinking skills most often occur during higher education. Thus, teacher in higher education (lecturer), especially histology lecturer must development thinking skills for the student in their teaching, including the reflective thinking skills. Because of the reason: 1) development reflective thinking skills is the goal of modern education and 2) student in histology lectures must teach histology material for students at school.

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