

STUDENTS' SKILLS IN MAKING QUESTIONS, ARE THEY INDICATORS OF THEIR THINKING SKILLS?

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Abstract

This study aimed to analyze higher order thinking skills of the students, based on the quality of the questions they make. This type of research was qualitative and quantitative descriptive. The research subjects were 26 undergraduate Culinary Education students of Home Economics Department, Universitas Negeri Surabaya, Indonesia. The topics studied were social and humanistic learning theories. The study was conducted in two meetings. Data were collected by observation and documentation. There were 109 questions. The questions were analyzed based on the cognitive taxonomy. The results indicated that 77.88% of the questions were at the low and moderate cognition levels. 20.18% of questions were at the high ones. No questions led to the levels of evaluating and creating. 3.67% were unclear, incomplete, and ambiguous questions. Based on the nature of the question, 48.62% of questions were classified as ill-defined and 47.71% well-defined. In conclusion, if the quality of questions is a picture of students' thinking skills, then the high-level thinking skills of students were still relatively low, and therefore they needed to be trained more intensively and sustainably.

Key words: thinking skills, making questions

Introduction

Developing higher-order thinking skills in students is an important task for higher education. Students who have the competence to analyze, synthesize, and evaluate, will better be prepared to face the challenges of the work they will face (Brierton, et.al, 2010). Higher-order thinking skills also enable students to attain intellectual freedom (Limbach & Waugh, 2010). In addition, the higher-order thinking skills constitute the basis in critical thinking, creative, and problem solving (Nurlaela & Ismayati, 2015; Nurlaela, 2017; Nurlaela, 2019). In an era of uncertainty as it is today, the thinking skills become a provision for survival and even ability to develop in any situation and change. In line with Sutarto (2017), graduates must equip themselves with the knowledge and skills required in accordance with personal interests and goals, develop leadership skills, and become members of a qualified and competent workforce. This is essential, in particular, to face the Fourth Industrial Revolution which is dominated by digital technology and automation in the world of work as it is today.

Preparing students to be able to think critically is one of the main goals for the majority of professionals in higher

education, and is also the quality sought by most university-graduate entrepreneurs (Sulaiman, Rahman, & Dzulkifli, 2008). But in reality, it is not easy to develop the students' high-level thinking skills. This is consistent with a recent study evaluating the logical thinking and analytical skills from 6,235 students in ten provinces in Thailand. The results revealed that the average final score was only 36.5%, with only 2.09% of the students passed the exam (Rujivanarom, 2016).

Basically the higher order thinking skills can be applied in various disciplines. The high-level thinking skills can support student academic achievement with optimum outcomes (Conklin & Manfro, 2012). Further, the main characteristics of the higher order thinking skills were critical and creative. The students will get used to thinking critically and creatively both in decision making and problem solving in relation to analyzing, evaluating and creating (Anderson & Krathwohl, 2001).

According to Brookhart (2010) the higher level thinking skills fall into three categories. They are: (1) "... define higher order thinking in terms of transfer"; (2) "... define it in terms of critical thinking"; and (3) "... define it in terms of problem solving". In line with this, Conklin & Manfro (2012) also suggest that "characteristics of higher order thinking skills encompass both critical thinking and creative thinking". Based on these opinions, the high level thinking skills constitute a process of profound and broad thinking skills that involves critical and creative information processing in dealing with and solving complex problems and involving the skills of analyzing, evaluating, and creating.

As previously illustrated, the higher order thinking skills (HOTS) consist of two aspects namely critical and creative. Referring to Bloom's revised taxonomy, Rofiah, Aminah & Ekawati (2013) suggest that the aspects of critical thinking cover analyzing and evaluating; whereas creative thinking is creating. According to Setiawati, et. al. (2018), the dimension of the thought process in Bloom's Taxonomy as improved by Anderson & Krathwohl (2001), consists of the ability to know (C1), understand (C2), apply (C3), analyze (C4), evaluate (C5), and create (C6). HOTS questions generally measure the ability in the realm of analyzing (C4), evaluating (C4), and creating (C6).

Regarding the questions that the teacher can use as a reference to guide students to think at a higher level, there are several sample questions according to Krulick & Rudnick (1995). They are: *what's if ...?*; *what's wrong ...?*; *what would you do ...?* And *what's another ways ...?* These four question sentences can be the key to starting students asking in

accordance with high-level thinking, not just asking "what" but also "why something happened", "how to find solutions", "what solutions should be done" and "are there other solutions can be done".

There are several learning methods that can possibly be implemented to train students to think at a higher level, for example, by using the scientific methods combined with the Problem Based Learning (PBL) model. A study by Pramukti, Usodo and Subanti (2015) revealed that learning that used a scientific approach combined with PBL increased the student achievement. In addition, PBL can train the students to solve complex problems and develop alternative answers, and these are all characteristics of the higher-level thinking.

Basically, in classes that implement learning using HOTS, the teacher provides or provokes challenging questions. In addition, this constitutes a strategy for developing HOTS. Some strategies that can be used according to King, Goodson & Rohani (2010) include: (1) learning that provides opportunities for repetition, elaboration, organization, and metacognition, (2) student-centered learning, (3) presentation is no more than fifteen minutes and is adjusted between the process of exploring knowledge and practice in learning, (4) the teacher or the student generates questions, new problems, and new approaches and obtains answers that have not been studied before, (5) giving direct, specific, and informing the students' progress, (6) learning uses small group discussions, peer tutoring, and cooperative learning, and (7) activities in learning involve tasks that challenge the students' desires, the teacher motivates the students to work on assignments and provides feedback on the student work.

The HOTS questions are instruments used to measure the ability to think at a higher level, namely the ability to think that is not just to remember (recall), restate, or refer without doing processing (recite). The HOTS questions in the context of the assessment measure the ability of: (1) transferring one concept to another, (2) processing and applying information, (3) looking for links from different information, (4) using information to solve problems, and (5) analyzing ideas and information critically.

Viewed from the dimension of knowledge, generally the HOTS questions measure the metacognitive dimensions, do not just measure the factual, conceptual, or procedural dimensions. The metacognitive dimensions describe the ability to connect several different concepts, interpret, solve problems (problem solving), choose a problem solving strategy, find (discovery) new methods, argue (reasoning), and take the right decision.

The skill to ask with the HOTS questions is important if it is associated with opinions saying that "thinking itself is asking". Asking is an effective stimulus that encourages thinking ability.

Regarding the types of questions or problems, Jonassen (2000) and Samani, et al (2016) provide classifications that include well-defined and ill-defined problems. The well-defined problems usually present all elements of a situation; demanding a number of skills, rules and principles; and requires the right solution specified in the well-defined knowledge domain.

Conversely, problems that are not clear (ill-defined) require students to interpret several elements of the problem and may have several solutions or approaches. Because the rules and principles needed to complete may not be clear, the students

need to think strategically, employ metacognitive skills, and maintain solutions.

This research is the result of analysis of the questions made by students. The writing of the questions was carried out after discussion of the topic of social learning theory and humanistic learning theory in the Theory of Learning. The level of student questions is thought to be in line with the level of their thinking skills.

Method

This research is a qualitative and quantitative descriptive research type. The research subjects were 26 students of the Food Management Education Study Program, Universitas Negeri Surabaya, who were taking theoretical learning courses. The topics studied were Social Learning Theory and Humanistic Learning Theory. The study was conducted in two meetings. The data were gathered by observation and documentation. The observation was used to observe the learning process, and the documentation was utilized with recorded notes in the form of student questions during the discussion. The data analysis technique employed a descriptive with percentage and qualitative analysis.

The learning used in this study was strategies according to King, Goodson & Rohani (2010). The lectures were carried out by sharing cooperative groups with members of 4-5 students. Each group was assigned for a different topic. Then the group was given time to have a group discussion, in order to prepare the presentation materials in accordance with the topic in which they were assigned.

During the presentation, there was intense discussion between the presenting groups and the students in the class. The lecturer becomes the moderator and facilitator in the discussion. Every question, response, and suggestion from the class was responded by the presenting group. If there were students outside the presenting group who wanted to add, refute, and respond in any form, the presenting group welcomed them. Thus the discussion became very intense. In this circumstance, the students were not only trained to develop their thinking skills, but also their collaboration and communication skills.

The questions asked by students during the discussion were recorded and classified according to the level of cognition according to Anderson and Krathwohl (2001) and the types of questions according to Jonassen (2000). Based on these records, this study produced a classification of student questions in terms of the level of cognition and types of questions.

Results and Discussion

Based on the results of recording the students' questions during two meetings, 109 questions were generated. Judging from the logical level, the classification of questions is as in Table 1

TABLE I
STUDENTS' QUESTIONS VIEWED FROM COGNITIVE LEVELS

No	Cognitive Levels	Frequ ency	Perce ntage	Sample Questions
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1	Remembering	3	2.75	What is meant by social learning theory according to Albert Bandura?	7	Unclear questions	4	3.67	Give positive reinforcement to students' confidence.	
2	Understanding	40	36.69	Explain the views of humanistic theories about teachers, students, and educational goals. What does "humanity as a person" mean in humanistic learning theory?					If someone is too ambitious about something, for example he is too ambitious in pursuit of GPA.	
3	Applying	31	38.44	How is the application of social learning theory by Bandura in the learning Food Management? If you are an educator, what efforts can you make to create self-enforcement for students?						
4	Analyzing	22	20.18	Someone who has gotten a moral justification (bad) will tend to accept and be indifferent / not care about it and continue to carry out activities as usual. Although sometimes what he does is considered bad, but in fact he does good. This certainly causes social deviations. How do you overcome this? In humanistic theory, there are characteristics prioritizing the occurrence of self-actualization and self concept. How do students actualize themselves in the learning process?						
5	Evaluating	0	0							
6	Creating	0	0						Give an example of positive reinforcement.	
					Total		109	100		

Table 1 show that 77.88 percent of the students' questions were at the level of remembering, understanding, and applying cognition. This means that the students' questions were at the lower order thinking skills (LOTS). A total of 20.18% of the questions included in the level of analyzing, and no question that le to the level of evaluating and creating.

Additionally, there were some questions that were not clear,. This could be caused by the unclear matter, or because the sentence was incomplete. This type of question was not included in the classification based on the cognitive levels. The unclear questions could constitute an indicator that the material had not been fully understood by the students, or the students cannot arrange the question sentences properly.

In addition to being reviewed from the cognitive level, the students' questions were also evaluated from the types of questions. The questions were grouped in self-defined and ill-defined, as in Table 2 below.

TABLE II
STUDENTS' QUESTIONS VIEWED FROM
TYPES OF PROBLEM

No	Nature of Questions	Frequency	Percentage	Sample Questions
1	Ill-defined	53	46.82	If the concept of social learning modeling is not applied, can it still be regarded as a social learning theory? What does it mean by the environment to shape behavior, and behavior to form the environment? Give examples of its application.
2	Well-defined	52	47.71	What are the characteristics of humanistic learning theory?
				Give an example of positive reinforcement.

3	Unclear questions	4	3.67	How do you deal with students who are aggressive and avoid the penalty environment that is applied?
Total		109	100	

Based on Table 1 and Table 2, it appears that the students' thinking skills still need to be improved. The main characteristics of the higher level thinking are the ability to think critically and creatively (Conklin & Manfro, 2012; Sutrio et al. 2018). Creative thinking is derived from habits that can be obtained by the students by finding and using new ideas that are not uncommon but are still rational in following learning (Gunawan et al. 2017). The creative thinking involves creativity which is a person's ability to produce a new product or a combination of things that already exist, which is useful, and can be understood (Ekasari et al. 2016). The high-level thinking will occur when someone associates new information with information already stored in his memory and relates it and/or rearranges and develops the information to achieve a goal or find a solution to a difficult situation to solve (Lewis & Smith, 1993). The process of linking new information to the one already stored in his memory is generally triggered in advance by a problem or question which certainly can trigger and involve one's thinking ability.

The questions raised by the students and lecturers can be classified into several sections. The questions can be classified into questions that are convergent or divergent as well as questions that are included in the high level or low level (low & high level questions) (McComas & Abraham, 2004). A student is said to be able to think at a high level if the student is able to make or complete high level questions that involve high level skills (HOTS) in the completion process.

Improving the students' higher-order thinking skills is a collective experience; one lecturer from a particular subject cannot alone improve the high-level thinking skills, and it is a collaborative process between all lecturer of various subjects or courses and can be taught for all levels of learning (Shellens, & Valcke, 2005). In addition, Benjamin (2008) argues that these skills can be developed cumulatively as the students' progress through their courses and other experiences they get from their institutions. In addition, by including problem solving skills, critical thinking activities and decision making in lectures, this will help students improve their high-level thinking skills (Abosalem, 2016).

Conclusion

The analysis shows that 77.88% of the questions were at the low and moderate cognitive levels (remembering, understanding, and applying). A total of 20.18% of the questions were at a high level of cognition (analysis). There were no questions that led to the level of evaluation and creation. The rest, 3.67% were unclear, incomplete, and ambiguous questions. Based on the nature of the questions, 48.62% of the questions were classified as unclear, and 47.71% were included in the good definition. In conclusion, if the quality of the question is a reflection of students' thinking skills, then the higher-order thinking skills of students are still relatively low, and therefore need to be trained more

intensively and continuously.

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