

Students' Thinking Ability Predicted Through Questioning Skills

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ABSTRACT

The more experience a person has in learning or has more knowledge, the more complex the questions will be. Based on this, an individual's thinking ability influences questioning skills. This research aims to investigate the skills of asking questions related to thinking skills in the learning process in the classroom, which Bloom's taxonomy theory can explain. This research is associative explanatory research with a quantitative predictive approach. Analysis of research data uses regression analysis techniques. The study concludes that there is an influence between the thinking ability and the questioning skills of high school students.

ABSTRAK

Semakin banyak pengalaman seseorang dalam belajar atau memiliki pengetahuan yang lebih maka akan lebih kompleks pula pertanyaan yang akan disampaikan. Berdasarkan hal tersebut, kemampuan berpikir seseorang memiliki pengaruh terhadap keterampilan bertanya. Riset ini bertujuan untuk melakukan investigasi keterampilan bertanya siswa berkaitan dengan keterampilan berfikir dalam proses belajar di kelas yang dapat dijelaskan oleh teori Taksonomi Bloom. Penelitian ini merupakan penelitian eksplanatif asosiatif dengan pendekatan kuantitatif prediksi. Data penelitian dianalisis menggunakan teknik analisis regresi. Kesimpulan dari penelitian adalah terdapat pengaruh antara kemampuan berpikir dengan keterampilan bertanya siswa SMA.



Introduction

Questions contain many mysteries (Ceballos & Ziegler, 2012; Coleman, 2000). Many meanings are implied in a question that is thrown. These questions can describe the extent to which the individual's knowledge of a case (Adams et al., 2006; Pohl & Carstensen, 2013). It could even be that this question is the beginning of forming a new theory (Berger & Calabrese, 1975). When reaching the stage of understanding a thesis, a person tends to criticize by comparing the idea that is being or has been studied and the life he has experienced. Whether we realize it or not, this criticism begins with a question.

Of course, the more experience someone has in learning or has more knowledge, the more complex the questions will be. The learning experience is reflected by the level of one's knowledge or understanding of the material. So the higher a person's level of performance, the more complex the questions that will arise. Carol Boswell (2006) states that lower cognitive questions reflect questions at the level of knowledge and understanding or more factually. At the same time, higher cognitive questions seek to demand answers at the level of application, analysis, synthesis, and evaluation. This statement is also in line with the results of Savage's research (1998) that students' thinking ability is directly proportional to the level of questions asked.

In the learning process, students often find it difficult to ask questions related to the teaching material not because they already understand the material. According to the confession of most of the students, they felt confused in asking questions. This is because they do not master the teaching material that has been delivered. This statement is supported by the report of Mucher (2007) in his journal that questions are abilities that can be acquired and improved through education, not innate qualities.

The Special Region of Yogyakarta, a student city, also has low questioning skills. Based on observations in several public and private schools, as many as 108 students became the statement's object. Only seven students, or 6.48% of students, asked questions. The tendency of students to ask questions is only limited to translating material. During the learning process, students tend to be reluctant to ask questions. They ask questions when they want to confirm what they have not heard clearly so that the teacher just repeats what has been previously conveyed.

Based on the taxonomic classification of questions submitted by Jos Danial Parera (1986), the tendency of the students above is between level II, namely between remembering/memorizing and translating. These findings are also supported by the results of Catherine Cornbleth, which also states that the tendency of junior and senior high school students in social science subjects to ask a lot of memory questions (knowledge reminders) (Cornbleth, 1975). If you look at the results of the 2015 national exam, the Special Region

of Yogyakarta, especially the Sleman Regency in economic subjects, has a D . category (Pusat Penilaian Pendidikan, 2015). Understanding the material that tends to be common causes students to lack input to develop the material they have so that the production of questions is less than optimal. Luise B. Savage (1998), in 1980, 70-80% of students asked queries limited to factual recall. Students tend to only "read it and repeat it," so they tend to only remember without any higher thinking processes. This underlies 80-90% of students quickly forgetting the material being taught. Furthermore, his research also states that questions with a high level also show a high cognitive level.

On the other hand, questioning skills are part of critical thinking, which is equivalent to analyzing and evaluating in the cognitive realm (Elder & Paul, 2007; Suhadi et al., 2016). So if critical thinking is equal or starts from the level of analysis and evaluation, there is no questioning skill at a level below it. Students who have low thinking skills cannot be detected using questioning skills. In other words, students' low-level thinking skills can be described by asking questions.

However, compared to the previous statement, several statements support the questioning skills equivalent to thinking skills, both from the level of knowledge and understanding or, more factually or higher at the level of application, analysis, synthesis, and evaluation. Therefore, this research aims to investigate students' questioning skills related to thinking skills in the learning process in the classroom, which Bloom's Taxonomy theory can explain. In this way, it can be ascertained whether LOTS and HOTS can be detected based on the questioning skills possessed by the questioner.

Literature review

Etymologically, according to the Big Indonesian Dictionary, questioning skills can be broken down into two words: skillful and questioning. According to the Big Indonesian Dictionary, "skilled" means being able to complete tasks or being capable and agile. And "ask" or "ask," which means, among other things, a request for information. Therefore, the skill of asking can be defined as a skill or ability of a person to ask for information or explanations from other people or parties who are interlocutors. Asking questions can also be used as an effective stimulus to encourage someone to think critically (Chan, 2013; Cojocariu & Butnaru, 2014; Setiana et al., 2021; Zhang & Toker, 2011).

A taxonomy is used as a benchmark for measuring the achievements obtained (Crowe et al., 2008). In Indonesia, the well-known taxonomy is Bloom's taxonomy. Taxonomy in asking can be based on that, too (Parera, 1986). Bloom's taxonomy has only one dimension. However, the revision taxonomy has two dimensions: cognitive

process and knowledge (L.W. Anderson & Krathwohl, 2001; Yuliati & Lestari, 2018). The mental process dimension contains six categories, namely remembering, understanding, applying, analyzing, evaluating, and creating, while the knowledge dimension consists of factual, conceptual, procedural, and metacognitive (Aly Amer, 2006; Cannon & Feinstein, 2005).

Cognitive measurement is also in line with questioning skills. Menurut Yesil & Ozgen (2010) remember that understanding and applying are included in low-order thinking skills (LOTS), while analyzing, evaluating, and creating are included in high-order thinking skills (HOTS). The more students have HOTS, the more opportunities for these students to excel (Rahmawatingrum et al., 2019; Zohar et al., 2001; Zohar & Dori, 2003). In this way, student achievement, reflected in learning outcomes, can be identified with the ability to think.

Method

The type of research that has been carried out is associative explanatory research with a quantitative predictive approach. This research was conducted in a high school that uses the 2013 curriculum in the Sleman district, Special Region of Yogyakarta. The population in this study was class XI students from the social sciences (IIS) and mathematics and natural sciences (MIA) specialization programs who took economics classes. The population is 647 students, with 484 students from the IIS program and 163 from the MIA program. With these different amounts, Disproportional Stratified Random Sampling was used to determine the sample used. All students from the MIA program were sampled, and students from the IIS program were tested. For the example used for multiple regression analysis, it is good if the number is 400 or above (Anglim, 2011). With this, the sample for the IIS program is 237 respondents.

In collecting data, initial observations were carried out, interviews with related parties regarding the number of students, student conditions, materials that have been and are in progress, and measurement of student learning achievement. To complement the results of the initial observations, students were given a questionnaire on the skills to ask questions to ascertain whether the research problem was relevant to the respondent—a questionnaire on questioning skills in the form of a scoring table according to the revised taxonomy. The more questions that are raised and the higher the questions identified in the fixed Bloom's Taxonomy category and the questions are following the material that has been determined, the higher the student's asking skills. The quality control test scores were obtained from each school to measure students' understanding. For the questioning skills data, and analysis of the categorization of questions was conducted before being processed.

Outlier data analysis was carried out to get the correct data for analysis. The prerequisite tests performed before performing multiple regression analysis are normality test, linearity test, multicollinearity test, and heteroscedasticity test. These data were then analyzed using regression analysis techniques.

Results and Discussion

The analysis was conducted on 479 respondents. However, seven respondent data had to be removed after analyzing the outlier data, so the data analyzed amounted to 472. The results of each prerequisite test stated that the data were usually linearly distributed and free from heteroscedasticity. By looking at the results of the prerequisite test, it is known that the data met the requirements for descriptive and multiple regression analysis. The descriptive study found that 7.6% of students attended economics tutoring outside school hours, and 3.6% did not live with their parents. With that, most students have the same conditions, so the results of this study are not biased.

Table 1. Prerequisite Test

Prerequisite Test	Sig.	Information
Normality test	0,716	Normal Distribution
Linearity Test	0,188	Linear
Heteroscedasticity Test	0,394	There is no heteroscedasticity

To measure students' questioning skills using an open questionnaire. In this case, students are asked to make questions related to the material price index and inflation. From 472 students managed to make 2,659 questions. Based on the questioning skill scoring matrix used in this study adapted from Bloom's Taxonomy which has been revised with a minimum score of 1 and a maximum score per item of 24 (Lorin W Anderson & Krathwohl, 2006; Nappi, 2017; Wilen, 1991).

Table 2 Questioning Skills Scoring Matrix

Dimension of Knowledge	Dimensions of Cognitive Process					
	Remembering	Understanding	Applying	Analyzing	Synthesizing	Evaluating
Factual Knowledge	1	2	3	4	5	6
Conceptual Knowledge	2	4	6	8	10	12
Procedural	3	6	9	12	15	18

Knowledge Metacognitive Knowledge	4	8	12	16	20	24
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After the analysis, the minimum score for the questioning skill was two, and the maximum score was 64. The empirical average of students' asking skills was only 27.57. This shows that the overall questioning skill tends to be low. To see the amount of data distribution, each of these scores is divided into five categories, namely shallow (with a minimum score interval of – 38), low (with a gap of 39 – 59), moderate (with a break of 60 – 81), high (with an interval of 60 – 81). 82 – 102), and very high (with a gap of 103 – Xmax).

Table 3. The Relationship between High School Students' Understanding and Questioning Skills

Category	Student Understanding	Student Questioning Skills
Very low	0,2 %	81,1 %
Low	2,8 %	18,4 %
Currently	32,2 %	0,4 %
Tall	46,6 %	0
Very high	18,2 %	0

To measure students' thinking ability, this study used the results of the students' Quality Control Test (TKM) in the previous semester. The local MGMP published the test with a total of 50 items with a score range of 0 to 100. Of all respondents, the lowest score was 23, and the highest was 90. The empirical average of students' thinking skills was only 63.72. This shows that the overall thinking ability tends to be high. To see the amount of data distribution, each of these scores is divided into five categories, namely shallow (with a minimum score interval of – 24), low (with a gap of 25 – 41), moderate (with a break of 42 – 58), high (with an interval of 42 – 58). 59 – 75), and very high (with a gap of 76 – Xmax). To prove the relationship between the two variables, a statistical t-test is needed. Based on the test, the significance value obtained is 0.000. The deal is smaller than 0.05 so that there is an influence between thinking skills and high school students' questioning skills with the following regression function:

$$Y = 0,278X$$

One's understanding is obtained not only by being silent. They should try to gain that understanding. Understanding can be interpreted as a person's ability to analyze, translate or state a concept or theory in their way, both in the cognitive and affective domains. Someone who already has his understanding of something may make his

theoretical formulation. This is because one's understanding constantly develops over time, adding new information or knowledge.

To get this understanding, one is required to find out for themselves. Either through listening to other people's explanations, reading, or asking to find out more. Before asking, of course, someone already has the initial information to ask them. And will be continued with other questions as the knowledge is continued and the abilities possessed by the questioner. In that way, a person's understanding of something will affect the questioning skills of the questioner.

Based on statistical data, it can be described that the understanding of economic material tends to be high. As many as 47% of students know financial material. On the other hand, statistical data on students' questioning skills tend to be low compared to the ideal average. All students have deficient questioning skills. Thus, it is not sure whether understanding economics material affects students' questioning skills.

The hypothesis test results show a direct and significant effect on understanding economic material on the questioning skills of high school students in Sleman Regency. The estimation of the impact of understanding financial material on students' questioning skills seen in the beta coefficient value is 0.278, which is positive. Therefore, understanding economic material is statistically positive for students' questioning skills, so the higher the understanding of financial material, the higher the students' questioning skills.

The findings of this study are reinforced by the opinion of Clasen, quoted by Luise B. Savage, which states that the level or ability of students' thinking has the same proportion as the ability to think (Savage, 1998). Carol Boswell has the same opinion. He stated that lower cognitive questions reflect the level of knowledge and understanding (C1 and C2). In comparison, higher cognitive questions reflect higher performance which demands answers in the application, analysis, synthesis, and evaluation (Boswell, 2006).

Furthermore, Ozgen and Rustu emphasized that understanding the material affected questioning skills. This is because the skill of asking is the result or outcome of the ability to think (Yesil & Ozgen, 2010). This opinion is supported by Catherine Cornbleth, who states that students' questions also show information about their understanding, the process of gaining experience, and their feelings about something (Cornbleth, 1975). In asking questions, students must follow the context being discussed. Before asking, the student already has the material mixed into a question. In this way, the more knowledge and understanding of a subject or material, the more complex a person can ask questions, not only about the meaning of a topic.

Conclusion

Based on the description above, it can be concluded that there is an influence between thinking skills and high school students' questioning skills. In this way, students' thinking skills (LOTS and HOTS) can be detected based on the questioning skills raised by students. In the learning process, if the teacher finds students asking questions, the extent to which these students master aspects of knowledge can be identified. These findings imply that questioning skills can be used as an alternative for assessing learning outcomes.

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