

## Use of Questioning Techniques and the Cognitive Thinking Processes Involved in Student-Lecturer Interactions

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### Abstract

*Questioning is an essential strategy for effective communication and instruction in academic settings. This study examined questioning techniques used by university lecturers and students and the cognitive thinking processes involved in questioning. There was also an attempt to find out the differences between the patterns of using questions between the two groups. Data were sourced from IDERN conference presentations and workshops through audio and video taping the sessions and were analyzed using Bloom's taxonomy. Findings indicated that lecturers asked higher cognitive level questions such as open-ended, interpretive, evaluative, inquiry, inferential, and synthesis, while most students raised lower cognitive questions including facts, closed, direct, recall, and knowledge type questions. It is suggested that using higher level questioning technique, more frequently used by lecturers as more competent speakers in comparison to students, can foster learning and students are required to attend higher levels of questioning techniques to enhance their speculative, inferential and evaluative thinking ability.*

**Keywords:** questioning technique; cognitive thinking process; university lecturer; IDERN; Bloom's taxonomy.

## **Introduction**

Questioning is an essential strategy for effective communication and instruction in academic settings. There is no conversation without questions, unless one wants to indulge in a monologue (Wallace, 2003). Asking the right question shows not only the questioner's skill in language and social interaction, but also it reveals the extent to which the questioner is involved in the cognitive thinking process related to the topic. Kachru & Smith (2008) state that by asking a question, the way a questioner thinks is revealed. In the same token, Postman (1992) contends that "All our knowledge results from questions, which is another way of saying that question-asking is our most important intellectual tool" (p.140). In the field of language studies, various definitions can be found for the concept of "question". The dictionary of applied linguistics, for instance, defines this term as "an utterance that is addressed to a listener or reader and ask for an expression of fact, opinion, belief, etc." (Richards & Schmidt, 2002, p. 456). The dictionary of Cambridge, defines a question as "to express doubts about the value of something or whether something is true". Based on these definitions a question can be regarded as either a linguistic expression for information requesting, or a request itself to make sure about something which is made by such an expression. In other words, by asking questions, the questioner reveals his or her thoughts, or inquires about others' thoughts, which may not be revealed without engagement in this conversational act.

In order to understand the importance of raising questions, one may trace the historical path to the time of Socrates. In those days, questions were considered as promising tools to following, knowing and acting. Quite similarly, scientists and scholars of modern sociology and psychology try to reach their interactional aims by posing several questions based on their knowledge grounded in systematic ways. Educators too, have found that using the system of questions and answers is an appropriate way for teaching and learning. For example, Gose (2009) asserts that teachers must talk and at the same time listen to students and help them to make connections between what they are thinking and what others are thinking as well as teachers' goal during the same experience.

## **The problem**

Questions are the undeniable elements of each conversation transcending age, culture, nation, sex and etc. Most studies examining questions have been restricted to classroom settings especially to elementary and high school levels (Wilen, 1987; Carlsen, 1991; Huang, 2005; Bolen, 2009; Rüttemann and Hants, 2010). Additionally, the focus of these studies has been on the role of the interactants involved in the questioning process rather than the cognitive processes involved in such a task. Hence, addressing this relatively under-researched area, the current study aims to examine the patterns of questioning techniques and the thinking processes that students and lecturers are involved in while posing questions. As the data are sourced from interactants differing in their levels of linguistic competence (i.e., non-native postgraduate students vs. native

or native like English speaking supervisor lecturers), the study will add to our current understanding of how the level of linguistic competence influences our thinking processes when we are engaged in questioning, as a linguistic act. In the same vein, the out-of-class context of the study, in contrast to inside-class context, that has been the focus of most previous research, can provide insights into the role of context in the interactants' thinking processes thereby on the questioning techniques employed. Hence, this study, attempts to contribute the body of research on the role of question and questioning techniques in academic setting, and the extent to which interactants' competence level could affect their questioning skills, which has not been adequately investigated by previous research.

### **Objectives of the Study**

This study aimed to examine the questioning techniques used by university lecturers and students and the cognitive thinking processes involved in questioning while participating in interactions in academic settings such as supervision sessions, conference presentations and workshops. There was also an attempt to find out the differences between the patters of using questions between the two groups. More specifically, this study was carried out to answer the following research questions:

### **Research Questions**

1. What questions and questioning techniques are used by students and lecturers in academic settings?
2. What cognitive processing levels are involved in students and lecturers' questions based on Bloom's taxonomy?

### **Literature Review**

#### **Questioning techniques**

The term "questioning technique" was first proposed by Richard (1992) referring to various procedures teachers used in the classroom by asking different kinds of questions in different ways to meet the objectives of the curriculum. Previous research has documented the role of questioning in educational settings (Papadopoulos *et al.*, 2008; Sullivan, 2008; Bolen, 2009; Rüttemann & Hants, 2010, Grant, 2015). In the field of applied linguistics, which encompasses the scope of the present study, questioning techniques have mainly been studied from two perspectives: sociolinguistics (Carlsen, 1991) and psycholinguistics. These studies have revealed that questioning can be used to make distinctions between passive and active students (Wilen, 1987) ,to prepare students for having the ability of self-questioning mechanism (Huang, 2005) and to make students think critically (Dumteeb, 2009) and meta-cognitively (Wilson and Smetana, 2009)

Asking the right question is central to effective communications and interactions. By asking the right questions in a particular situation, can enhance a whole range of communications skills: for example, we can gather better information and learn more; we can build stronger relationships, manage people more effectively and help others to learn too. Some of the most common questioning techniques are as follows:

#### Open and Closed Questions

Closed questions usually need a single word or very short, factual answer. For instance, "Do you know English?" The answer is "Yes" or "No". Open questions, however- that normally begin with what, why, how- need longer answers. An open question is often used to elicit respondents' knowledge, opinion or feelings. They may begin with expressions such as "Tell me", "describe" and "elaborate".

#### Funnel Questions

This technique involves starting with general questions, and moves into more detailed point in each answer. Examples of such technique are used by investigators and detectives taking a statement from a witness. These question types are useful tools to gather information and narrow down to come up with a decision or conclusion.

#### Probing questions

Probing questions are good tools to gather detailed information. These are used to clarify doubts or misunderstandings and help to drawing information from people who are hiding something. For example, "What exactly do you mean by X?"

#### Leading or reflective questions

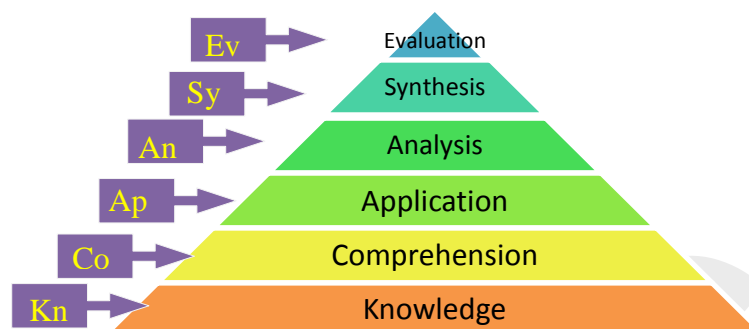
Leading questions are used to lead the person whom you are talking to. This leads the speaker to give you answers, while they know that you are giving them a choice.

#### Rhetorical questions

Rhetorical questions aren't really questions at all, in that they don't expect an answer. They're really just statements phrased in question form: "Isn't this building so beautiful?"

### **Bloom's taxonomy of questioning**

In pedagogical contexts, students' level of cognitive processing can be identified by asking several questions representing different levels of individual's cognitive processing. Bloom (1956) proposed a six-level hierarchical taxonomy of how different "questions" are processed in mind (see Figure 1). The taxonomy describes our thinking process to be engaged in six levels as: knowledge, comprehension, application, analysis, synthesis, and evaluation.



**Figure 1:** Bloom’s taxonomy of cognitive processing

As shown in Figure 1, “Knowledge” level represents the lowest level of thinking when the learning process occurs. At this level, student recall, repeat and memorize the information. In the second level, learners explain, interpret, and paraphrase the information, where they already know the basic information so they have the ability of using their own words to paraphrase and explain them. Next, students can apply their information in a real situation to solve the problem. Identifying connections and relationships and how they apply is very important in this step. In the subsequent step- analysis- students compare, contrast, classify, categorize, and derive what they have learned with other information or other experiences. Then, they create, invent, predict, construct, design, imagine, improve, produce, and propose the new experience based on their information at the synthesis step. And finally, judgment and decision making happen about the real situation or experience. As Bloom proffers, at this cognitive level, students can evaluate the information and recommend about how they can improve things in the highest level of critical thinking. This taxonomy underlies the analytical framework of the study. Anderson and Krathwohl (2001) have revised the original taxonomy and have developed a new design. Although Bloom’s taxonomy has been successfully used for many years, there was an emerging movement to update the taxonomy especially in the field of cognitive psychology (Anderson, et al., 2001). The new revision proposed some major changes. The comparison of the new and original taxonomy is shown in table 1.

**Table 1.** New and original taxonomy of cognitive thinking

Cognitive Level	Original taxonomy (Bloom 1957)	Revised taxonomy (Anderson, et al., 2001)
1	Knowledge	Remember
2	Comprehension	Understand
3	Application	Apply
4	Analysis	Analyze
5	Synthesis	Evaluate
6	Evaluation	Create

Despite these two hierarchies being very similar in appearance, contemporary taxonomy has modified the original hierarchy in two dimensions. First, focus on behavior and second, metacognitive emphasis. In respect to behavior, Anderson (2001) changed noun to verb for example; he proposed that using 'apply' instead of 'application' can reflect the learner's behavior which is more important than the content of the material. In other words, the focus in this revision was on equipping learners with a functional use as opposed to theoretical uses.

They also proposed that 'syntheses' should switch places with 'create' "because for 'syntheses' to be demonstrated there needed to be a new creation (Cochran, 2007, p. 23), in another comment on the order of hierarchy. They believed that in the evaluation process, learners need to think inductively, however being creative needs to involve learners in to deductive thinking. Therefore they recommended changing the position of these two processes, since they consider deductive thinking as a lower level and inductive thinking as a higher level cognitive process.

Secondly, in the realm of metacognitive emphasis, Anderson (2001) expressed that there are three different levels at which learners process an issue or a problem: declarative which includes both functional and conceptual), procedural, and metacognitive. Thinking metacognitively has a significant role in the use of technology. Learners or users need to think and determine how they can chose the best tool for that problem and how they can apply it or how can benefit from their previous knowledge and experience to solve that problem. Metacognitive thinking is a part of high level cognitive process. In other word (Anderson *et al.*, 2004) proposed a new way of thinking by opening the 'metacognitive' avenue.

Analysis of the questioning technique vis-a-vis Bloom's taxonomy was carried out by Surjosuseno and Walts (1999) to classify cognitive level in the field of critical reading in EFL class. They believed that if this taxonomy applied in appropriate situation, this taxonomy and classification could be really beneficial to teachers. All six levels were used in the process of teaching. Surjosuseno and Walts (1999) claimed that the taxonomy has a significant role in developing critical reading and thinking abilities of learner. Although all these levels have an interdependent relationship to each other, it can highlight the important issues for teachers. Therefore, teachers can use this taxonomy as a framework in their classroom to have a plan for learning activities in order to force learners to think critically.

### **Critical thinking**

Understanding the concept of critical thinking is one of the salient features of being a successful critical thinker. Now what is critical thinking? Many scholars have tried to define critical thinking by different terms, such as: problem solving, evaluation, rational thinking, decision making. But critical thinking is a process which will enable people to overcome their problems and think about their lives and their choices in life with combination of components. Based on a definition



which is proposed by Barell (1995), critical thinking is responses to unexpected problems. Lipman (1988) also claimed that ‘critical thinking is skillful, responsible thinking, that facilitate good judgment because it (1) relies upon criteria, (2) it is self-correcting, and (3) is sensitive to context (p; 39). It must be emphasized that critical thinking differs from thinking. In the process of critical thinking, people think about how they think (Nosich, 2005). In this process learners need to engage in metacognitively (Bolen, 2009).

## **Method**

### **Participants**

The participants comprised postgraduate students and supervisors who attended the International Doctoral Education and Research Network (IDERN) conference held in Malaysia at a state university in 2010. Majority of participants were international students studying at different Malaysian universities. Students were of differing levels of proficiency in English language and had different cultural backgrounds. Participating lecturers were all high profile postgraduate supervisors from around forty different countries. Majority of the supervisors were native or native like speakers of English.

### **The Setting**

Data were collected from the second International Doctoral Research Education Network (IDREN) conference, which included several workshop and seminar sessions and presentations by the supervisors. The event took place at Universiti Putra Malaysia. It lasted for 5 days from April 19th to April 23rd. Each session had been scheduled for one and a half to two hours with the ten to twenty final minutes allocated to Q and A. All sessions were video-recorded and content analyzed based on the objectives of the study?

### **The data**

A qualitative research design was employed to investigate questions and questioning techniques used by lecturers and students. Data were collected through audio and video taping all the presentation sessions including the workshops and expert meetings that took place before the main sessions. The event lasted for 6 days and all the sessions, some of them held in parallel, were recorded and saved on a computer. The study analyzed a corpus of 50 hours of video-recordings conducted over the six-day academic event. The researcher’s field notes and observation vignettes provided extra data sources.

Upon completion of data collection, the analysis began by reviewing all the recorded sessions and spotting the instances of “questions” in the data. All the questions used in the verbatim were classified, coded and analyzed using the criteria for analysis shown in figure (1). The coding

scheme applied in this study was proposed by Bloom (1956). As stated earlier, the taxonomy consisted of six cognitive levels involved in questioning process. Based on this scheme, participant’s questions were grouped and assigned to 6 categories briefly clipped as: Kn (knowledge), Co (comprehension), Ap (application), An (analysis), Sy (synthesis), and Ev (Evaluation).

**Findings and Discussion**

**Questioning techniques used by university lecturers and students**

Table 2 demonstrates the frequency distribution of the question types initiated by each group of participants (postgraduate students and lecturers) in rank order.

**Table1.** Frequency distribution of question types by students and lecturers in rank order

Student Initiated Items		
Question Type	Frequency	Percentage
Knowledge	17	36.1
Comprehension	9	19.1
Analysis	7	14.8
Evaluation	6	12.7
Synthesis	5	10.6
Application	3	6.3
Total	47	
Lecturer Initiated Items		
Evaluation	19	19.6
Comprehension	14	14.5
Knowledge	12	12.9
Analysis	10	10.8



Synthesis	9	9.8
Application	4	4.1
Total	68	
Grand Total	115	

As presented in table 2, of a total of 115 questions were identified in the data. Students asked 47 questions, comprising 40.3% of the whole items, while lecturers, raised 68 questions, comprising 59.5% of the overall questions in the corpus. The three most frequently used questions by students were knowledge (36.1%), comprehension (19.1%), and analysis (14.8%), whereas evaluation (19.6%), comprehension (14.5%), and knowledge (12.9%) level questions were the three most frequently items by the lecturers. Questions corresponding to “application” level comprised the least frequently used items (6.3 % and 4.1%) by lecturers and students, respectively.

A comparison of the frequency distribution of questions used by the two groups of interactants indicates that among all question types, knowledge level questions (n=29) are the most frequently used question type. The second most frequently used category belongs to comprehension category (n=21). However, lecturers used evaluation questions (n=19) more than other types. Conversely, the most frequently used questioning type by students was of “knowledge” questions. The highest frequency of knowledge level questions in student initiated interactions, in contrast to the lecturers’ use of “evaluation” questions, may suggest that the interactants’ overall competence and proficiency level in the target language influences their cognitive processing in employment of questioning techniques.

As noted earlier, questions used by lecturers’ commonly belonged to higher levels of thinking process suggesting that university lecturers and professors enjoy higher levels of thinking process and try to encourage students to move towards higher steps of thinking pyramid, as proposed by Bloom’s (1956) taxonomy of questions. Students, on the other hand, commonly used questions to gain new information, enhance self-visibility relationship with superiors, challenge lecturers’ mastery over subject, provide support for more inferences, exchange experiences, highlight cultural discrepancies and sensitivities, demonstrate their proficiency and critical thinking power/skill, undermine the lecturers’ belief, and comprehend and decode the lecturers’ utterances.

**Cognitive processing levels are involved in students and lecturers’ questions**

Based on the analysis criteria- Bloom’s taxonomy (1956)- all questions can be grouped into six categories. Each category, also, has some verbal cues. Table 3 shows the six types of questions based on Bloom’s taxonomy and the sample extracted from the data representing each level.

**Table 3.** Question types and their representing examples from the data

Question Category	Verbal Cues	Examples from the Data
<b>1. Knowledge</b>	repeat, recall, memorize, list, describe, relate, locate, write, find, state, who, name, what, when, where	<ul style="list-style-type: none"> <li>- <i>Do you have any activity that you brought outside but also in a peer group?</i></li> <li>- <i>I want to ask if your activity is more in the campus area</i></li> <li>- <i>What might be some fruitful lines of inquiry for international research projects?</i></li> </ul>
<b>2. Comprehension</b>	explain, interpret, paraphrase, outline, discuss, distinguish, restate, translate	<ul style="list-style-type: none"> <li>- <i>Can you provide a definition for epistemology?</i></li> <li>- <i>What is the main idea in this paragraph?</i></li> <li>- <i>What is the big difference between master and PhD?</i></li> <li>- <i>What is going to happen beyond this happening?</i></li> </ul>
<b>3. Application</b>	solve, show, use, construct, complete, examine, classify, illustrate, example	<ul style="list-style-type: none"> <li>- <i>Can qualitative methods be applied to such research questions?</i></li> <li>- <i>How people coming into this discipline they have not yet formed within a discipline is also a question?</i></li> </ul>
<b>4. Analysis</b>	analyze, advertise distinguish, examine, compare, contrast, separate investigate, categorize, identify,	<ul style="list-style-type: none"> <li>- <i>Can you find any similarity between a thesis and body parts?</i></li> <li>- <i>How are thesis chapters similar to the parts of our body?</i></li> <li>- <i>The question her is to recognize the turning point in the state of the art from a theory oriented stand to research-based findings?</i></li> </ul>
<b>5. Synthesis</b>	synthesis, create, invent, predict, construct, design, imagine, improve, suggest, produce, propose	<ul style="list-style-type: none"> <li>- <i>What solutions would you suggest for this problem? Why not compile a biannual publication of IDERN activities?</i></li> <li>- <i>As if start with what are you doing now and to imagine how that might be done either on cross cultural context or a cross national context?</i></li> </ul>
<b>6. Evaluation</b>	judge, select, choose, decide, justify, debate, verify, argue, recommend, assess,	<ul style="list-style-type: none"> <li>- <i>How do you handle negative questions?</i></li> <li>- <i>What would you advice students who are at this stage of their studies?</i></li> <li>- <i>How can you resolve it?</i></li> </ul>

- discuss, rate, prioritize, and determine
- *How do you think we can manage our time so effectively?*
  - *Do you think that a mixed method is a good or a bad choice in methodology?*
  - *How effective have these decisions been?"*

## Discussion

Bloom (1956) contends that cognitive skills play a crucial role in the appropriate identification, discovery, encoding, and organizing of information. The cognitive process needs the recall or recognition of specific facts, procedural patterns, and concepts that serve in the development of intellectual abilities and skills. Bloom (1956) claims that thinking is a constant re-examination of what we hold as truth or knowledge. Brown (2004) asserts that the most important aspect of Bloom's taxonomy is that it teaches and encourages thinkers to be critical of their own thinking.

Lower cognitive level questions demands only routine or mechanical application of previously memorized and acquired knowledge and information, and this might not challenge students to interpret, analyze, or manipulate their own responses and information. Thus, in the language classroom, teachers should be ensured that they have a clear purpose for their questions to encourage students' responses and their critical thinking skills rather than just determining what knowledge is learned.

Researchers have paid attention and examined teachers' questions for years. And among these, several studies have concluded that teachers ask low-level and factual knowledge questions in the classroom (Stevens, 1912; Dillon, 1978; Ross, 1997; Hamm & Perry, 2002). Low-level questions are good for checking the factual knowledge and these questions cannot boost the way students think. Asking low-level questions makes a dialogue curt and there is a possibility of making choppy ideas for students, too. So they may unable to find a reasonable link among their factual knowledge and therefore, they cannot understand and apply their knowledge (Dillon, 1978). While, researcher blamed asking these kinds of questions, they emphasized on good questioning techniques. Researchers believe that effective questions in class boost high-level thinking in students. Teachers should use of clarifying, creating, justifying, deciding, arguing, modeling, and supporting questions to improve students in the process of thinking (Dantonio, 1990). Using Open-ended and high-level questions are highly recommended by researcher, although, it is difficult for teachers to ask such questions (Dantonio and Beisenherz, 2001).

Wu (1993) has suggested another way of classifying questioning techniques. He posits that his taxonomy of questioning techniques is an essential tool in encouraging students' interaction and thinking skills through five different questioning techniques: repetition, rephrasing, simplification, decomposition, and probing.

With regard to the questioning techniques used by the lectures in the context of IDERN conference presentations and workshops, data shows that lecturers used a variety of questions for various purposes. Further analysis of the data revealed that lecturers use questions for the purpose of: helping to maintain control of a conversation, expressing interest in issues or people, disambiguation and clarification on a point, to obtain new information exploring students or other lecturers' perceptions, checking understanding and knowledge of others, grabbing audience attention, encouraging further thought and reconsideration, persuading the questioner and other recipients, reasoning and defending a point, managing challenges and masking inability to provide adequate reasons, provide further support for learning and insight, redirecting to an already mentioned point, paraphrasing and re-paraphrasing, evaluation of student achievement, stimulating higher levels of thinking, and fostering students' critical thinking skills.

These findings also reveal that although it is important to note that the type of question is to be consistent with the level of cognitive processing, there might be other factors that can influence the frequency of occurrence of question types. For example, in an instructional setting, highly competent users of the language might use low-level questions for the purpose of educating the learners. In light of this view, and with regard to the fact that a large number of questions have been extracted from workshop sessions, which are similar to instructional settings in nature, some of the questions used by supervisors may not reflect the actual level of mental processing. Hence, the suggested taxonomy needs to take into account the context of questioning as a complementary factor in describing correspondence between one's levels of competence with their level of cognitive processing.

Another factor that might influence the questioning technique is characteristics of the audience. As the data shows, in situations where the audience were exclusively supervisors (data receded in lecturers' expert sessions), the type of questions were mostly higher-order questions. Hence, a set of predominantly analytic, synthetic and evaluative questions were used when the addressees were all professional and experienced supervisors. In contrast, when the recipients comprised mostly student audiences, the same supervisors used lower-order questions often times. The assumption here is that characteristics of the audience plays an instrumental role in the formulation of a question thereby the cognitive processing involved in it.

In sum, what becomes evident from the above results is that both students and supervisors use various types of questions representing different levels of thinking in their interactions to solicit information from the addressees; however, the frequency of the use of questions indicates some dissimilarity between the two groups of interactants. One major difference is that lecturers/supervisors, who represented high-competent users of language in this study, predominantly use questions that belong to higher-order processing in the suggested taxonomy. Students, on the other hand, who represent low-competent speakers of language in this study, mostly ask questions that signal lower-order cognitive processing as stated in the taxonomy. It is suggested that using higher level questioning technique, more frequently used by lecturers as

more competent speakers in comparison to students, can foster learning and students are required to attend higher levels of questioning techniques to enhance their speculative, inferential and evaluative thinking ability.

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