Self-Generated Questions for Critical Thinking

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Asking questions in the classroom has social and cognitive aspects, but teachers' questions outnumber those of students. This paper introduces an instructional program for Japanese university students that is based on Bloom's taxonomy (1956) and is focused on asking questions in English, to promote students' ability to ask high cognitive questions (Alcón, 1993). The paper starts with the course syllabus, which covers the instruction in 15 weeks. Then teaching procedures of six question types (i.e., questions for remembering, understanding, applying, analyzing, evaluating and creating) are described in detail. Information about what has worked when teaching is included as well as participants' sample questions. The results comparing the pre- and postinstruction tasks show that instruction is effective as students come to ask more high cognitive questions. Question asking encompasses the potential to develop one's ability to think critically, which is indispensable in this global age.

教室内の質問行動には社会的および認知的要素があるものの、教師の質問数は学習者の質問数を大幅に上回ることが問題視されてきた。本稿では日本人大学生を対象に、ブルームの分類法（Bloom's taxonomy; Bloom, 1956）に基づく質問の指導法を論じる。指導は大学生が英語で高次の質問ができることを目的として（Alcón, 1993）、15週間にわたり行われた。6種類の質問（記憶、理解、応用、分析、評価、創造）の指導内容とその課題について言及した後、参加者の質問例、及び指導前後の質問頻度の比較を通して、指導効果を検証する。本調査では、質問指導が学習者の批判的思考を高める潜在的可能性を秘め、それがグローバル社会には不可欠であることを示唆している。

Asking questions has social and cognitive aspects and is an important part of the classroom interaction. Teachers' questions (a) encourage students to be curious, raise questions, and have surprises; (b) motivate students to learn; and (c) deepen their understanding (Tatsuno, 2009). Kusumi, Koyasu, and Michita (2011) claimed that university students' ability to ask questions serves as the foundation for critical thinking. However, it has been documented that teachers ask over 90% of questions (Graesser & Person, 1994) and this pattern has also been observed in EFL classrooms (Tan, 2007). Furthermore, educators have had concerns about students' ability to ask self-generated questions as not much research has been done on students' questioning-asking processes. According to Graesser and Person (1994), the majority of students' questions consist of basic knowledge level or recall questions: those that require "minimal mental activity" (Vogler, 2005, p. 98). On the other hand, high cognitive questions (Alcón, 1993) require deep thinking and processing beyond basic knowledge or recall questions. Studies on L2 English question-asking (Alcón, 1993; Ayaduray & Jacobs, 1997) have indicated that instruction through the use of question starters (King, 1990) is effective; however, question-asking pedagogy remains underexplored as there is no established method for instruction.

This paper introduces an instructional program for Japanese university students that was focused on how to ask questions in English, especially high cognitive questions. The course was designed to promote students' ability to ask self-generated questions and understand the importance of question-asking in English. Based on the revised Bloom's taxonomy (Anderson & Krathwohl, 2001), six question types were introduced: remembering, understanding, applying, analyzing, evaluating, and creating.

In this paper, Bloom's taxonomy (1956) is first reviewed as it provides the pedagogical framework for teaching the six question types. Next, a description on the course design and participants are provided, followed by the students' questions in writing and the frequency of which they were generated. The paper concludes with the belief that students' ability to ask self-generated questions is a necessary skill in this global age and it is important that university students equip themselves with this skill.

Bloom's Taxonomy

The Original Bloom's Taxonomy (1956) and the Revised Bloom's Taxonomy (2001)

Bloom's taxonomy is known as a hierarchy of cognitive processes or "psychological processes" (p. 33). The taxonomy was created as a classification of educational objectives regarding what students were expected to learn after instruction. Although Bloom's taxonomy consists of descriptions of six learning levels or cognitive processes (i.e., knowledge, comprehension, application, analysis, synthesis, and evaluation), they do not appear to be related to how the "human mind thinks and learns" (Williams & Burden, 1997, p. 13) or the mental processes involved in learning. Rather, the conceptualization of Bloom's taxonomy is said to represent how cognitive processes progress by level of difficulty. In other words, students must master the cognitive process in the lower level to advance to the next cognitive process.

Efforts to revise Bloom's taxonomy started because of conceptual changes that have ocurred since the release of the original Bloom's taxonomy. In the revised Bloom's taxonomy (Anderson & Krathwohl, 2001), the cognitive processes were renamed from nouns to verbs to clarify the processes that the nouns from the original taxonomy correspond to (i.e., remember, understand, apply, analyze, evaluate, and create). In the revision, the last two cognitive processes were reversed, putting evaluate (evaluation) before create (synthesis).

English Seminar Course

Description of the Course and Participants

Question-asking in English was taught in the course titled English Seminar at a private university in Tokyo during the 2017 spring semester. For this course, news stories in English were used to teach question-asking in English and to promote critical thinking skills. Out of the 12 third-year students who were enrolled in the semester-long course, four male students and five female students agreed to participate in the study.

The treatment, which was the explicit instruction of Bloom's taxonomy questions in English, was adapted from Alcón (1993). In the first week, a preinstruction task was administered in order to find out what questions participants were able to generate in English without any question-asking instruction. As Figure 1 indicates, a total of 12 weeks were spent on question-asking instruction in English and reinforcement activities, such as quizzes and discussions. After a week of review, the course concluded on week 15 with the administration of a postinstruction task, which used the same reading material as the preinstruction task.

Week of instruction	Activity
1	Preinstruction task
2 & 3	Remembering question instruction (2) / Quiz & discussion (3)
4 & 5	Understanding question instruction (4) / Quiz & discussion (5)
6 & 7	Applying question instruction (6) / Quiz & discussion (7)
8 & 9	Analyzing question instruction (8) / Quiz & discussion (9)
10 & 11	Evaluating question instruction (10) / Quiz & discussion (11)
12 & 13	Creating question instruction (12) / Quiz & discussion (13)
14	Review
15	Postinstruction task & reflective writing

Figure 1. Course syllabus.

Teaching Procedures of Question-Asking in English

The instruction of the six question types was based on the descriptions and sample sentence stems from Figures 3 and 4 (adapted from King, 1990) and the revised Bloom's taxonomy (Anderson & Krathwohl, 2001; adapted from Morgan & Saxton, 2006).

For each question type, 2 weeks were spent on instruction and follow-up activities. In the 1st week, students received handouts with the description and sample sentence stems, which were followed by activities consisting of reading a short news story and writing English questions using the sentence stems students had just learned. English news stories were used as they were in line with the course objective, which was to expose students to a variety of English language media. This was followed by short small-group discussions to foster students' thinking and problem-solving skills (Gillies, 2011). In the 2nd week, the students first took a quiz to reinforce question-asking practice. Then they participated in small group discussions, which, unlike the short group discussions from the previous week, started with students' sharing summaries of the news story. The summaries were intended to prompt students to ask questions to each other, which would be answered in their groups.

In this paper, details of the teaching procedure focus on the instruction from the 1st week, which consisted of an introduction of the question type and practice in forming questions in English, for which grammatical accuracy was not a focus. Figure 2 shows an example of the breakdown of a 90-minute class when a new question type was first introduced.

Activity	Time to spend
• Introduction of question type	Approx. 15 to 20 minutes
• Reading and practice writing questions	Approx. 15 to 20 minutes
• (Extra activity) Students answer classmates' questions by rotating students' lists of questions OR students read their questions out loud to the whole class	Approx. 10 minutes
• Small group discussions (dyads or triads)	Total 30 minutes (depending on class size)

Figure 2. Sample teaching procedure (90-minute class).

Low Cognitive Questions (Remembering, Understanding, Applying)

The first group of question types introduced here are the low cognitive questions, those that relate to remembering, understanding, and applying. For each question type, students received a handout with the description and sample sentence stems (see Figure 3). Then they practiced making questions.

Description	Sample sentence stems
Remembering questions have you...	What is ...?
→ Retrieve knowledge from your memory	How is ...?
→ Remember and recall facts and information	Where is ...?
	Why did ...?
	Which one ...?
	Who ...?
Understanding questions ask one's understanding by...	What is a (an) ...?
→ Summarizing	What does___ mean?
→ Giving examples	What is an example of ... ?
→ Explaining	How did ____ happen?
→ Comparing	Can you compare A to B?
Applying questions have you...	How would you use ...?
→ Solve problems by applying knowledge	How would you solve ...?
→ Solve problems by applying facts	What can _____ be used for?
→ Solve problems by applying information	What would be the result if ...?
... all in a different way	What would happen if ...?

Figure 3. Low cognitive questions (Anderson & Krathwohl, 2001; adapted from Morgan & Saxton, 2006).

Remembering Questions

Remembering questions start with question words (i.e., 5W + 1H, or *what, who, why, when, where,* and *how*) and ask basic knowledge level questions (Graesser & Person, 1994). For further practice, students read a news story about a Korean national who trained Japanese university students to become sports interpreters for the 2018 PyeongChang Olympics (Sugino, 2017).

Before students started forming their remembering questions, they practiced writing statements based on information found in the reading. Therefore, students first identified keywords to form their questions. The following are some of the remembering questions they came up with:

- What does he work?
- When did his life change?
- How old was he when he came to Japan?
- How many people participated in the training program?

Understanding Questions

Although appearing similar to remembering questions, understanding questions require that students ask questions beyond basic knowledge level questions, such as asking for explanations or checking understanding of what certain words mean. A news story on Japanese figure skater Mao Asada's retirement (Nagatsuka, 2017) was selected and used for practicing question-asking in English.

Students employed the strategy of identifying keywords to form their understanding questions as they did for remembering questions.

- What is the national championships?
- What does rival mean?
- What is the mean of Olympics for Mao Asada?
- How was her contribution to the sport?

Students wrote in their reflections that they came to realize that understanding questions were more complex than remembering questions because they had to identify more information for which answers were not found in the reading. Furthermore, when asking a question about what a word meant (e.g., What does rival mean?), being able to form the question alone did not accomplish the task of question-asking; they realized that they also needed to be able to provide an answer to their own question.

Applying Questions

In applying questions, students were asked to apply the concepts they learned to new situations. According to Takeda (2017), Japanese university students found applying questions in English to be confusing and difficult. This can be attributed to students' having to identify problems in the reading in order to ask applying questions and find solutions; this requires students to have some background knowledge on a given topic. The news story students read to practice their applying questions dealt with a United Airlines flight from which a passenger was dragged off ("United incident," 2017).

Prior to forming applying questions, students made remembering and understanding questions about the same news story. Then, to form applying questions, students had to be able to identify problems in the reading and then come up with potential solutions:

- How would you solve overbooking seats?
- What would be the result if the man was injured in the incident?
- What would happen if they were to stop overbooking?
- How can SNS be used to spread the news?

Reading the United Airlines news story revealed that although the students had been passengers on flights, they were not familiar with airline operations such as overbooking, which made it difficult to produce applying questions based on this particular story. Depending on the content of the news story selected, more time may be necessary for scaffolding information to familiarize students with the topic and ensure that they can come up with applying questions. That said, the final student question was noteworthy for two reasons: (a) it captured the phenomenon of this news story going viral on the Internet and (b) it went beyond simply substituting words from the news story into the sentence stems.

High Cognitive Questions (Analyzing, Evaluating, Creating)

High cognitive questions include analyzing, evaluating, and creating questions. The handouts for students included the description and sample sentence stems (see Figure 4).

Description	Sample sentence stems
Analyzing questions have you ask details by... → Breaking information into parts → Breaking information to find connections	How would you categorize ...? (*putting things in groups*) What is the relationship between A and B? (*asking relationships*) What is the purpose of ... ? (*asking the purpose of something*) How are A and B different/similar? (*asking differences or similarities*) What is/are the problem(s) with ...? (*asking to identify a problem*) What can happen with ...? (*asking about possible consequences*)
Evaluating questions ask you to... → Present opinions → Present opinions by making judgments about information	Do you agree with the actions of ...? Do you agree with the results ...? What is your opinion on ...? What choice would you have made, _____ or ____? Which would have been better, _____ or ____? What is the importance of ...?
Creating questions ask you to... → Put information together to create new patterns and suggest solutions → Design a procedure to accomplish a task → Construct or invent a product	How many ways can you create ...? How can ____ be used to create ...? How could _____ be improved? Can you think of an original way to ...? Can you make a model that would change ...? What could be combined to change ...?

Figure 4. High cognitive questions (Anderson & Krathwohl, 2001; adapted from Morgan & Saxton, 2006).

Analyzing Questions

Besides applying questions, analyzing questions were the other question type that was challenging for students (Takeda, 2017). As analyzing questions have many functions, it was necessary to scaffold and walk the students through several steps before they were able to form analyzing questions independently. After reading a story about local municipalities in Japan that capitalize on *ninja* in order to attract foreign tourists (Iizuka, 2017), the students used the sentence stems to make their questions.

Because analyzing is an ambiguous concept, it was necessary to provide additional information (see italics in Figure 4) so students could better understand the sample sentence stems. The following are some of the analyzing questions students made:

- What is the purpose of Japan Ninja Council?
- What is the relationship between *ninja* and local economies?
- What is the purpose of spreading *ninja* culture?
- What is the difference between Tokyo and local city like Mie?

Although this story on Ninja was selected at the students' request, they experienced difficulty when making analyzing questions. Therefore, more time was necessary to review the other three question types that students had already practiced.

Evaluating Questions

Evaluating questions ask about one's opinions or position about an issue, such as agreement or disagreement. In Takeda's (2017) study on question-asking in English involving advanced level participants, evaluating questions were the second most frequently asked questions after understanding questions. As this suggests that Japanese university students are familiar with asking opinions of others' in English to some degree without being taught how to do so, it may seem more valuable to teach evaluating questions earlier in the course. However, as found in Takeda (2017) and documented in the participants' reflective writing, in general students are not able to express their opinions in the form of providing answers to evaluating questions, unless they have basic information on a given topic. Therefore, it is important to teach basic recall type questions (i.e., remembering and understanding) before the evaluating questions. To practice this question type, students read the story on a fire that had broken out in London flats (Reuters, 2017a).

Although readers of this story would have benefitted from knowledge on the topics of construction and architecture to better understand the details, the students' evaluating questions pertained to general risk management in the event of an emergency, which did not require expert information:

- What is the importance of investigating the cause of the fire?
- What is your opinion about lacking fire barriers?
- Which would be better, stay or move when building is fire?
- If you will live new house, do you check the type of wall?

The last one is another noteworthy question as (a) it is based on a reaction that fireproof walls could prevent fires and (b) it is a participant's original question that was not made by substituting words from the story into any of the sample sentence stems.

Creating Questions

Creating questions ask about new or alternatives to existing ways. If students experience difficulty in formulating creating questions, one way to present them is by preceding them with evaluating questions. For example, the teacher can tell the students that after evaluating, something could be created for improvement. In this way, the evaluating–creating continuum would be logical, provided that students read the same news story to form questions of both question types. For this course, students read the story on AI robots (Reuters, 2017b) to form their creating questions.

While the intent of selecting the news story on AI was to have students stretch their imagination, the concept of AI itself seemed to be beyond their reality. As a result, students' questions were mainly formed by putting key words from the story into the sample sentence stems:

- How can AI be used to be better our health?
- How can AI be used to create a rich life for human?
- Can you make a model that would change the style of our work by AI?
- Can you think of an original way to prevent demerits of AI?

Pre- and Postinstruction Tasks

As outlined in the Course Syllabus (see Figure 1) a preinstruction task was administered in the first week of the course. The purpose of this task was to investigate what kind of questions the nine participants produced prior to question-asking instruction. The students read a short news story in English on a Japanese student majoring in politics at Harvard University and wrote six questions in English. The postinstruction task, which

consisted of the same task, was conducted after the instruction of all six question types were completed. The participants' questions were coded based on the sentence stems of each question types. Table 1 shows the frequency of questions in both tasks.

Table 1. Results of Pre- and Postinstruction Tasks

Question type	Task	#	Participants' sample questions
Remembering	Pre	13	How old is he?
	Post	12	Where did he go to university in the U.S.?
Understanding	Pre	26	Why did he decide to go to Harvard University?
	Post	16	What does *matured* mean?
Applying	Pre	0	--
	Post	2	What is the result if he didn't live in Britain?
Analyzing	Pre	12	Why did he think interacting with many people is important?
	Post	17	How would you solve about weaking English skills?
Evaluating	Pre	1	I wasn't grow up in foreign countries, Can I'm going to speak English well?
	Post	14	Do you want to study abroad with enough time and money?
Creating	Pre	2	In the future what will he want to be?
	Post	9	How can our life be improved by English?

Compared to the preinstruction task, more questions were produced during the postinstruction task (54 vs. 70), as some of the students had more time to make additional questions. The results indicate that after instruction, the frequency of high cognitive questions (analyzing, evaluating, and creating questions) rose and low cognitive questions (remembering and understanding) dropped slightly. The exception was applying questions. The higher numbers of high cognitive questions after instruction was consistent with the results of Alcón (1993) and Ayaduray and Jacobs (1997).

Conclusion

This paper introduced an instructional program designed for Japanese university English learners on how to ask questions in English. After reviewing Bloom's taxonomy, which provided the pedagogical framework, descriptions and sentence stems employed for the instruction of the six question types were introduced. There were only nine participants in this small-scale research: The results are not generalizable but are useful in providing points for reflection on the way the course was taught and the students' performance. The results of the postinstruction task show that the number of high cognitive questions asked by the participants was higher after the instruction.

This study suggests that Japanese university students' ability to ask high cognitive questions is connected to the potential for the development of their critical thinking (Barnett & Francis, 2002; Nentl & Zietlow, 2003). This can be seen in some of their sample questions, such as the last ones in the sections about applying and evaluating questions. The contents of such questions showed that what students asked went beyond substituting words into the sentence stems. Although participants' written reflections and interviews were not part of the data for this particular paper, in them the students made positive comments about Bloom's taxonomy: that it was a graded, step-by-step way for them to learn how to ask questions in English from least to most difficult and allowed them to stretch their depth of thinking (Takeda, 2017).

Although beyond the scope of this paper, there are some issues regarding assessment, which need to be addressed in future research. After piloting this instructional program for 2 years, it was concluded that it would be difficult to give a numerical score to the questions students ask as their performance and competence in question-asking could differ depending on their level of familiarity with a topic. While students' qualitative data (e.g., students' questions, written reflections, interviews including their efforts and self-perceived progress) can better depict what they are capable of doing as far as question-asking in English is concerned, how this can be part of their assessment needs to be further explored.

Question-asking is a skill which cannot be mastered in one semester, but rather is a lifelong endeavor that helps develop the critical thinking necessary in this global age. For that reason, exposure to new topics that call for critical thinking challenge the students to raise their level of cognitive thinking and, thus, expand their repertoire of questions so that they can deepen their understanding.

Bio Data

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