An Evaluation of Questions in Two ESP Coursebooks Based on Bloom's New Taxonomy of Cognitive Learning Domain

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Abstract

This study aims at exploring the types and levels of questions inherent in two English for Specific Purposes (ESP) textbooks, namely, *English for the Students of Sciences* (ESS) and *English for the Students of Engineering* (ESE) taught in Iranian universities for several academic years. The objective of the analysis was to evaluate the questions in the light of the revised version of Bloom's (1956) Taxonomy of learning objectives (i.e., remembering, understanding, applying, analyzing, evaluating, and creating). To this end, a coding scheme was developed and the data was codified based on Bloom's Taxonomy. Results from the codification of a total of 218 questions(100 questions in ESS and 118 questions in ESE) showed that most of the questions were aligned with remembering, understanding and applying as the three lower-level categories, while analyzing, evaluating, and creating as the three higher-level categories constituted the lowest frequency in the two textbooks. However, the chi-square test did not show a significant difference between the textbooks in terms of the six levels of cognitive domain. The results indicate that the above-mentioned textbooks fail to engage learners in the questions requiring higher levels of cognitive learning objectives. By implication, textbooks developers, educational decision-makers, and syllabus designers need to incorporate more higher-order questions and modify their materials in such a way as to achieve higher levels of learning objectives. Moreover, this study has opened new avenues for further research in the field of textbook evaluation.
Keywords: Bloom's New Taxonomy, Learning objectives, ESP textbooks, *English for the Students of Sciences, English for the Students of Engineering.*

1. Introduction

Of the various elements of any language program, teaching materials are one of the most significant ones. Tomlinson (2001, p.66) defines materials as "anything which can be used to facilitate the learning of a language." They provide L2 learners with enough input to practice and are mostly interpreted as reliable sources of information for novice teachers to plan and teach lessons in their classrooms (McDonough & Shaw, 2003; Richards, 2001).

According to Çakit (2006),coursebooks may even play the role of a syllabus or a self-study source for learners. They can also be considered, in Roberts' (1996) term, as progress indicators for both learners and teachers. Furthermore, the fact that the choice of coursebooks can strongly influence learners' attitudes towards learning L2 makes coursebook evaluation indispensable (Sheldon, 1988). Among the different existing taxonomies and models for textbook evaluation such as Vygotskian, Piagetian, and situated learning theories (Anderson & Krathwohl, 2001), Bloom's New Taxonomy can be an effective criterion to assess learning activities and aligning teaching materials with the cognitive learning domain such as remembering, understanding, applying, analyzing, evaluating, and creating. The rationale behind such a specific focus on Bloom's Taxonomy originates from the ongoing development of learners' thinking from the late 1950s to the early 1970s. During this period, there were attempts to classify different domains of human learning, namely cognitive, affective, and psychomotor (Anderson & Krathwohl, 2001). The results of these trials yield a number of taxonomies in each domain. The most common and earliest of them is Bloom's Taxonomy (1956) which has been employed in various fields. However, in the field of coursebook evaluation, such studies are quite small in number. To the best of researchers' knowledge, the only studies done in this area are the ones conducted by Hoeppel (1980), Amin (2004), Mosallanejad (2008) and Gordani (2008).

The development of Bloom's (1956) taxonomy of learning objectives dates back to conversations at the 1948 American Psychological Association. Educators suggested that more than surface learning is expected from their students. They expressed the view that they demanded their students to be able to really understand, to internalize knowledge, to comprehend, and to grasp the core essence of the topics covered. In 1956, the taxonomy of educational objectives was proposed by Benjamin Bloom, an educational psychologist at the University of Chicago. It is a classification of the different domain that educators set for students' learning objectives. Within the cognitive domain, Bloom (1956) identified six levels from the simple recall or recognition of facts, as the lowest level, through increasingly more complex and abstract mental levels, to the highest order which is classified as evaluation. The order of cognitive processes from simple remembering to higher-order critical and creative thinking process are depicted in Table 1 below:

Table 1

Bloom's Revised Taxonomy of Learning Objectives described by Anderson et al. (2001)

Learning objective	Definition
Create (level 6)	Put elements together to form a coherent or functional whole; we organize elements into a new pattern or structure
Evaluate (level 5)	Make judgments based on criteria and standards
Analyze (level 4)	Break materials into parts and determine how the parts relate
Apply (level 3)	Carry out or use a procedure in a given situation
Understand (level 2)	Construct meaning from instructional messages, including oral, written, and graphic communication long-term memory
Remember (level 1)	Retrieve relevant knowledge from long-term memory.

One of the main components of the coursebook, among others, is the questions upon which most of the instructional material revolves around. These questions usually appear in different sections of lessons and units. Due to the powerful influence of coursebooks on classroom instruction, it seems to be important for educators to be aware of the questioning practices in the coursebooks and their effects on learners' learning. As Edward and Bowman (1996) put it, questions are vital components of the coursebooks as they aim at creating an interest in the subject.

To researchers' knowledge, most of the studies on textbook evaluation have focused on analyzing the content of textbooks to see how much they represent and transfer special knowledge such as language functions, grammar, skills, and speech acts. However, in light of the mentioned ideas, there are only few studies (e.g., Amin, 2004; Mosallanejad, 2008) in the literature which have investigated the learning objectives of Bloom's influential Taxonomy in questioning practices in EFL contexts. It is believed that Bloom's Taxonomy is a practical instrument for course evaluation (Marzano& Kendall, 2007) and helps teachers match assessment and course learning objectives (Krathwohl, 2002).

Given the fact that in EFL contexts textbooks are the principal medium of instruction, the present study aims at exploring the quality of questions presented in *English for the Students of Sciences* (ESS) and *English for the Students of Engineering* (ESE) with a view to Bloom's Taxonomy.

2. Literature Review

The cognitive skills embedded in ESP textbooks may have a significant impact on the learning process during the course when teachers rely heavily on activities from the text. In other words, if mostly low-order learning objectives are incorporated into these activities, there is a potential risk

that mostly low-level learning will be achieved. Most of the related literature has revealed that teachers tend to pay more heed on lower order cognitive skills. It means there is a lack of higher-level learning objectives and concomitant lower-level cognitive activities in most coursebooks (Houghton, 2004; cited in Forehand, 2005).

In a study conducted by Hoeppel (1980),the questions found in reading skills development books were analyzed on the basis of Bloom's original Taxonomy. The results of the study indicated that about ninety nine percent of the questions were categorized within the two lowest levels of thinking (knowledge and comprehension), whereas very little stimulation of higher levels of thinking was provided through reading comprehension questions.

In another study, Amin (2004) applied Bloom's Taxonomy to scrutinize the learning domains of General Persian and General English language courses by examining the textbooks, exams, and college teachers' views. The findings of this study demonstrated that in general the Persian coursebooks focused more on higher levels of cognitive complexity in contrast to the general English ones which focused on lower levels of cognitive domain.

Moreover, Davidson and Baldwin (2005) examined the ESP textbooks used in accounting courses based on Bloom's Taxonomy of learning objectives. Results showed that Bloom's levels of learning objectives were not represented in accounting textbooks equally. They also found a lack of attention to the two highest levels of cognitive ability ,namely evaluating and creating, in all accounting textbooks.

In a more recent study, Nurisma (2010) studied the types of reading questions and the frequency of each question type in an English e-book based on levels in Bloom's original Taxonomy. The sample of the study consisted of four hundred questions contained in *Developing English Competencies for senior high school grade XI* (Nurisma, 2010). The criteria in Bloom's Taxonomy were chosen for analyzing the data. Each reading question in the textbook was analyzed in order to find out if it was based on any level of Bloom's cognitive processing. The results of the data analysis revealed that the reading questions covered five levels of reading comprehension based on Bloom's Taxonomy. The knowledge questions were the dominant reading questions followed by application, analysis, and evaluation which were presented in a few questions.

Furthermore, Riazi and Mosalanejad (2010) carried out a content analysis of Iranian senior high school and pre-university English language textbooks to investigate the types of learning objectives represented in these textbooks using Bloom's New Taxonomy of learning objectives. The findings revealed that in all grades lower-order cognitive skills were more common than higher-order ones. In addition, the difference between the senior-high schools at the pre-university textbooks in terms of the levels of the Taxonomy was significant since the pre-university textbook used some degrees of high-order learning objectives.

Similarly, Razmjoo and Kazempourfard (2012) applied Bloom's Revised Taxonomy of learning objectives to the *Interchange* series (Richards, Hull & Proctor, 2005) including *Interchange (Intro):Students' book* (3rd ed.), *Student's book 1* (3rd ed.). *Student's book 2* (3rd ed.). *Student's book 3*(3rd ed.). The results revealed the series favored lower-order thinking skills including remembering, understanding, and applying. Additionally, the findings revealed poor metacognitive knowledge on the part of the learners.

Given the previous literature review, the researchers found that there few studies (e.g., Razmjoo & Kazempourfard, 2012; Riazi & Mosallanejad, 2010) have checked the cognitive domain of Bloom's Revised Taxonomy which is, in Coleman's (2013) terms, one of the most influential educational models used for instruction, assessment, curriculum development, and materials evaluation. Hence, there seems a dire need to use Bloom's New Taxonomy.

The current study was an attempt to fill this gap in the literature by the evaluation of two ESP coursebooks: *English for the Students of Sciences* (ESS) (Akhavan, Behgam, Faghih, &Haghani, 2011) and *English for the Students of Engineering* (ESE) (Birjandi, Fallahi, Haghani, &Maftoon, 2013) by drawing on the cognitive domain of the new version of Bloom's Taxonomy including remembering, understanding, applying, analyzing, evaluating, and creating. In the light of the mentioned purposes, this study attempts to tackle the following research questions:

1. Which levels of cognitive processes in Bloom's New Taxonomy are represented in ESS and ESE?
2. Is there any significant difference between ESS and ESE in terms of various levels of cognitive domain according to Bloom's New Taxonomy?

3. Method

3.1. Materials
For the purpose of the current study, two ESP coursebooks were used as the materials of the study. The specifications of selected coursebooks are as follows:
1. *English for Students of Science* (Akhavan, Behgam, Faghih, &Haghani, 2011).
2. *English for the Students of Engineering* (Birjandi, Fallahi, Haghani, & Maftoon, 2013).

English for Students of Science contains 17 units with the pool of 100 comprehension questions, while *English for the Students of Engineering* contains 20 units with the total of 118 comprehension questions. Following the results of a survey conducted by Azizi (2012), these two ESP coursbooks enjoyed popularity as well as the highly-frequent use in most state universities in Iran. They are currently taught in General English courses to prepare collegiate students for reading academic texts.

3.2. Procedure and Data Analysis
In order to analyze the collected data, as the first step, all comprehension questions in both coursebooks were classified, analyzed and codified by two raters according to six levels of Bloom's Revised Taxonomy to examine the extent to which these learning objectives were represented. The coding categories are labeled as (1) remembering (2) understanding (3) applying (4) analyzing (5) evaluating and (6)creating. Each coding category consists of examples of action verbs for each level as well as key words that represent cognitive domain. Then, the frequency and proportion of the cognitive levels on the basis of the cognitive domain in Bloom's New Taxonomy were calculated. In order to foster the dependability of the data, the inter-rater index was estimated. The coefficient index for raters' agreement on codification scheme was 96% using Cohen's Kappa which is a reliable index of inter-rater consistency. To ensure intra-rater reliability, one third of the questions from each coursebook were randomly selected. After a two-week interval, the data was recorded by the raters and the degree of agreement was found to be 0.98.

In addition, to make the data more manageable, they were presented in the form of tables and graphs which would facilitate making judgments and comparing two coursebooks in terms of different educational objectives. In each table, raw frequencies as well as the percentage of the learning objectives are provided. Finally, as Hatch and Farhadi (1981) suggested "if you feel more comfortable with describing the data as frequencies (how many and how often) rather than amounts (how much), then the χ^2 is probably the best statistical procedure to use" (p. 172). Therefore, chi-

square test of significance was carried out to test the significance of the difference in the frequency of categories between the two ESP coursebooks.

4. Results

This section discusses the results the researchers obtained after analyzing the questions from the two ESP coursebooks taught in most Iranian universities as General English courses according to Bloom's New Taxonomy of learning objectives. Table 2 presents some of the descriptive features of two coursebooks.

Table 2

Overall Features of Coursebooks

Title of the ESP coursebook	No. of lessons	No. of questions included	publication year	Publisher
English for the Students of Sciences(ESS)	17	100	2011 (19th Ed.)	SAMT
English for the Students of Engineering(ESE)	20	118	2013 (28th Ed.)	SAMT
Total	37	218		

As Table 2 displays, ESS contains 17 units with a pool of 100 comprehension questions, whereas ESE contains 20 units with a total of 118 comprehension questions. The total number of questions evaluated in the study based on Bloom's New Taxonomy was 218 questions.

To answer the first research question, investigating the dominant cognitive categories in the two ESP coursebooks by drawing on Bloom's New Taxonomy, the frequencies and percentages of all six cognitive categories were calculated. In order to provide a better display of cognitive domain, the results are summarized in terms of lower- level and higher-level cognitive processes in Table 3.

Table 3

Frequencies and Percentages of Bloom's New Taxonomy of Cognitive Domain

Cognitive Domain	ESS		ESE		Total	
	Frequenc	Percentage	Frequency	Percentage	Frequency	
Percentage						
Lower-level						
Remembering	48	48%	53	44.9%	101	46.3%
Understanding	25	25%	31	26.2%	56	25.6%
Applying	16	16%	22	18.6%	38	17.4%
Higher-level						
Analyzing	6	6%	7	5.9%	13	5.9%
Evaluating	4	4%	3	2.5%	7	3.2%
Creating	1	1%	2	1.6%	3	1.3%
Total	100	100	118	100	218	100

As Table 3 demonstrates, the highest percentages of cognitive processes in both coursebooks is related to the remembering level (48% and 44.9%) which is followed by evaluating (3.2%) and creating (1.3%) processes which received the lowest percentages of cognitive processes in ESS and ESE, respectively. Furthermore, the frequencies of the lower-order categories, i.e. remembering, understanding, and applying in ESS were 48, 25, and 16respectively, which constitute a high percentage of the all levels. The frequencies of the same processes for ESE were 53, 31,and 22, which made up a large percentage (about 98%) of the cognitive processes. This highlights the fact that lower-order cognitive processes dominate the higher-order ones in both coursebooks. Figure 1 displays the bar graph of raw frequencies of all six cognitive processes in ESS and ESE.
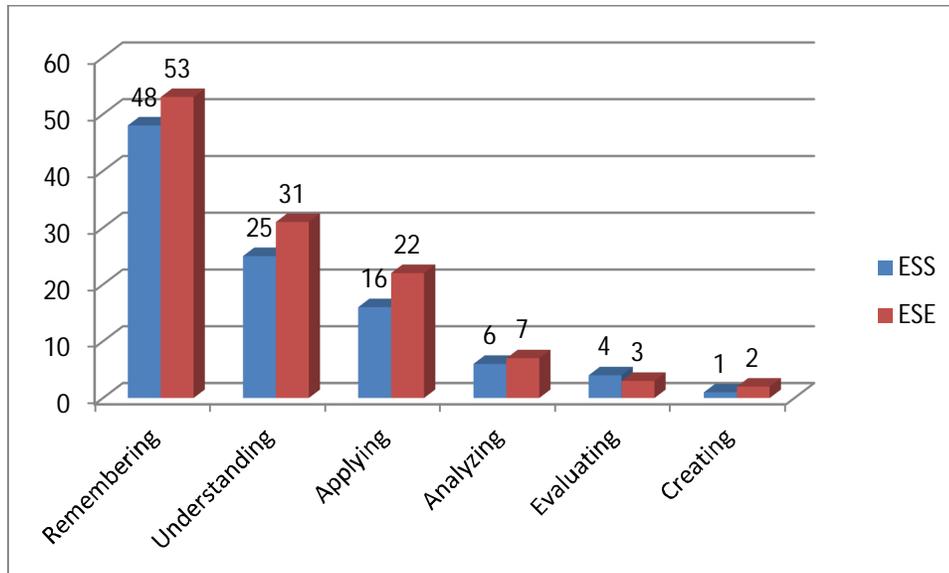
*Figure 1.*Adisplay of raw Frequencies for six cognitive levels in ESS and ESE coursebooks

It is also evident in Table 3 that for higher-level processes, ESS received the frequencies of 6,4, and 1 for analyzing, evaluating, and creating levels respectively, with analyzing receiving the highest percentage (6%) and creating the lowest percentage (1%). Similarly, the frequencies obtained in ESE for the three above-mentioned categories were 7,3,and 2, respectively, with analyzing receiving the highest percentage (5.9%)and creating the lowest percentage (1.6%).Figures 2 and3 clearly depict the percentages of six cognitive levels two ESP coursebooks.
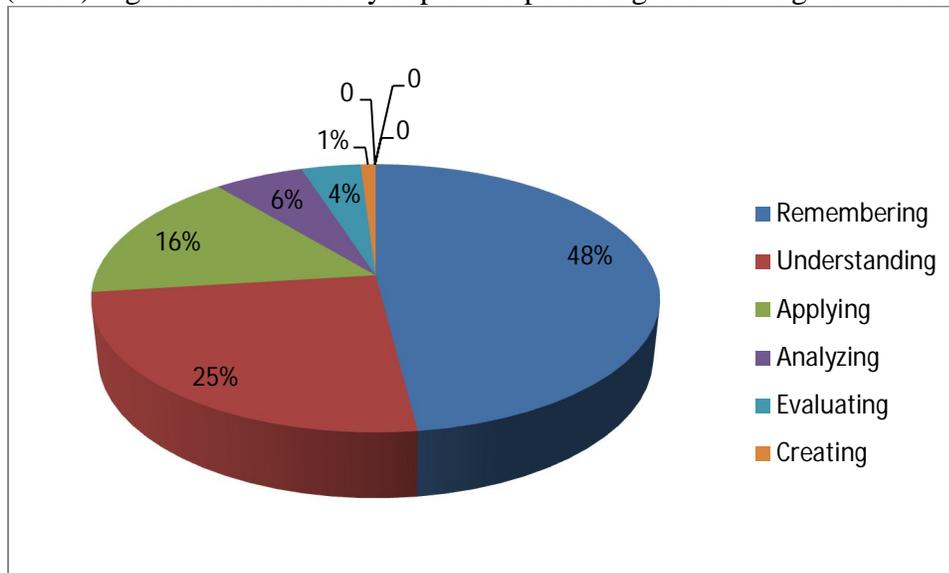

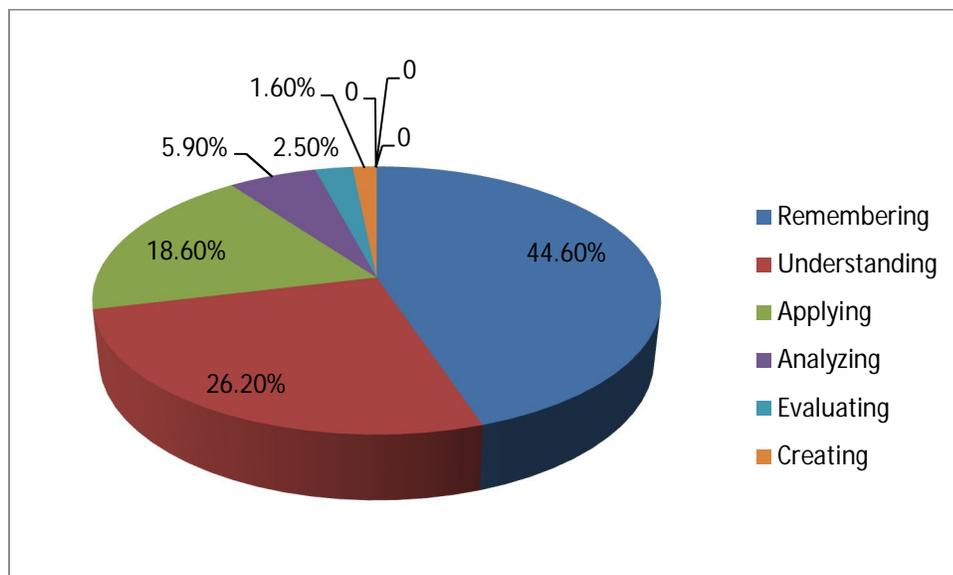*Figure2*. The pie chart for six cognitive levels in ESS coursebook

Figure 3. The pie chart for six cognitive levels in ESE coursebook

To answer the second research question and to examine the significance of the difference in the frequency of categories between the two coursebooks, chi-square test of significance was applied. The results are shown in Table 4.

Table 4

Chi-Square Test for the Significance of Difference in the Frequency of Categories

Test	Value	*df*	*Asymp. Sig.*(2-tailed)*
Pearson Chi-Square	4.762	9	.204
Likelihood Ratio	5.197	9	.195
Linear-by-Linear Association	0.968	1	.576
N of Valid Cases	218		

*p ≤.05

As shown in Table 4, the value for Pearson chi-square was 4.762, with $p \leq .05$. It means that the difference between ESS and ESE was not statistically significant in terms of the various levels of cognitive processes.

Regarding the third research question, further statistical formulae were applied in order to examine the distribution pattern of various levels in both coursebooks. Table 5 summarizes the results.

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Table 5

Chi-Square Test for Two ESP Coursebooks Based on Bloom's Levels of Learning Objectives

	ESS	ESE
Chi-Square	98.243	85.604
df	1	1
Asymp. Sig.*	.000	.000

*p ≤.05

As indicated in Table 5, the Chi-square test yields a significant result (Sig=.000, , *df=1,* p≤.05) in both ESP coursebooks. This suggests that the distribution of the codes or learning levels is not equal in the coursebooks. That is, the codes are not distributed equally among two books. Therefore, it can be concluded that the differences between the frequencies of occurrence of different levels of the taxonomy of learning objectives do not have a specific pattern in ESS and ESE. Furthermore, in order to evaluate the significance of the observed difference between the values of lower-order and higher-order levels in both ESP coursebooks, another chi-square test was carried out. The results of the chi-square analysis revealed that in both coursebooks, there was a significant difference between the frequencies of lower- and higher-order cognitive processes ($\chi^2 =570.68$, *df = 1,* p≤.05).

5. Discussion

The results of the present study demonstrate that the lower-level processes of cognitive domain within Bloom's Revised Taxonomy are more frequently represented than those higher-level ones in two aforementioned ESP cousebooks. The most prevalent cognitive process, based on the results, was *remembering* which is the lowest-order category in Bloom's New Taxonomy. The reason behind the dominance of lower-order processes in these coursebooks is likely to be Bloom's (1956) attention to the importance of knowledge and remembering. According to Krathwohl (2002), knowledge is frequently treated as a backbone to all the other education objectives. In the same vein, Gotcher (2012) argues that as an individual's knowledge increases, there will be a development of the individual's acquaintance with reality. Higher-order processes such as *evaluating* and *creating* must be based upon previous knowledge of our realities, which is, what we remember (Marzano& Kendall, 2007). This finding is also in agreement with the findings of the previous studies conducted by Riazi and Mosallanejad (2010) and Razmjoo and Kazempurfand (2012) who found that the lower-order cognitive processes are more frequent in ELT textbooks taught in Iran and that there is a dire need for incorporating activities for EFL students to practice and self-evaluate their own performance. Another plausible explanation for the fact that ESP coursebooks focused more on the three lower levels of cognitive domain may be attributed to the students' proficiency level in Iranian universities. It is assumed that students are admitted in universities with inadequate previous knowledge in learning English. As a result, the students' low proficiency level hinders obtaining higher levels of cognitive domain.

Moreover, Gordani's (2008) study supports our finding. He found that lower levels of cognitive skills were more dominant in Iranian guidance school English coursebooks.

Another finding worth mentioning is that lower-order processes such as understanding were predominantly distributed in two ESP coursebook under study. This finding is in line with Bloom's(cited in Forehand, 2005) idea that comprehension as a pre-requisite for in-depth understanding, probably is the most frequent intellectual ability to be focused in colleges.

A further interesting, though quite probable, result of the current study is that no statistically significant difference was found between the two coursebooks in terms of the frequency of occurrence of cognitive skills. That is, in both coursebooks, the frequencies of the lower-order skills were found to be more significant. This finding is incongruent with one of the findings of Mosallanejad's (2008) study which found a significant difference between the senior high school and the pre-university coursebooks drawing on the levels of the Bloom's New Taxonomy.

By and large, the findings of this study revealed most questions appear under the lower-level cognitive processes of remembering and understanding in the aforementioned coursebooks.

6. Conclusion and Implications

The current study was an attempt to investigate the types and levels of questions available in two ESP course books, namely, *English for the Students of Sciences* and *English for the Students of Engineering* taught in Iranian universities based on Bloom's New Taxonomy of learning objectives. The overall findings of this study was that the most prevalent learning objectives pursued in the above-mentioned coursebooks in Iran were lower-order cognitive processes, that is, *remembering*, *understanding* and *applying*. In other words, the majority of the questions assessed the three lower-level cognitive domains and only few questions were found to address higher cognitive processes among the six levels of Bloom's New Taxonomy. Therefore, it can be concluded that, based on the results of this research, the main objectives of the two ESP coursebooks were the development of lower-order cognitive skills. Hence, it is suggested that in order to improve the content of the coursebooks and make a balance between lower-order questions and higher-order ones, multilevel questions should be devised and incorporated at the end of each passage.

In sum, the results of the current study imply that questions available at ESP corsebooks should be modifiedto engage students more in higher-order cognitive skills such as evaluating, analyzing and creating. As Gordon (2009) rightly points out, focus on the higher-order cognitive processes can help students contribute more effectively and intellectually in the topic at hand. The present study, while attempting to evaluate questions in two popular ESP coursebooks, did not include the remaining activities in the coursebooks. Therefore, further research is needed to track six cognitive levels of Blooms' New Taxonomy to examine if the results are consistent in all activities. Another good topic for investigation might be the evaluation of other ESP or EAP coursebooks taught in other top universities in Iran based on Bloom's Revised Taxonomy.

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Forehand writes: "Bloom's Taxonomy is a multi-tiered model of classifying thinking according to six cognitive levels of complexity"1. It is one of the most widely used and often cited works of education1. Bloom's taxonomy can serve many purposes: it. provides a common language among educators; helps determine the alignment of objectives, learning activities, and assessment; and. stretches the educational possibilities to give greater breadth and depth to courses and curricula2. Â Classify examples of objectives into cells of Bloom's Taxonomy (in the cognitive domain): Remember, Understand, Apply, Analyze, Evaluate, and Create. To what extent are you now able to meet the above objective? Please record your self-assessment. (0 is not at all and 5 is completely). Bloomâ€™s Taxonomy provides a valuable framework for teachers, trainers, and instructional designers to use to focus on higher order thinking. By providing a hierarchy of thinking, Bloomâ€™s Taxonomy can help in developing performance tasks, creating questions, or constructing problems. The following chart illustrates the expectation of the learner at each level of the hierarchy and gives some examples of how the learner can demonstrate his or her ability at each level.Â Bloomâ€™s taxonomy of learning domains: The three types of learning. Big Dog & Little Dogâ€™s Performance Juxtaposition. Search for @inproceedings{Coleman2013NationalME, title={National Music Education Standards and Adherence to Bloom's Revised Taxonomy}, author={Vada M. Coleman}, year={2013} }. Vada M. Coleman. Published 2013. Psychology. National Music Education Standards and Adherence to Bloomâ€™s Revised Taxonomy by Vada M. Coleman MS, Walden University, 2003 BMus, Georgia State University, 1994 Doctoral Study Submitted in Partial Fulfillment of the Requirements for the Degree of Doctor of Education Teacher Leadership. scholarworks.waldenu.edu.Â An Evaluation of Questions in Two ESP Coursebooks Based on Bloomâ€™s New Taxonomy of Cognitive Learning Domain. Gholamreza Zareian, Mohammad Davoudi. 2015.