sciendo

Acta Educationis Generalis
Volume 13, 2023, Issue 3

DOI: 10.2478/atd-2023-0019

Revised Bloom's Taxonomy in a Principles of Economics Textbook

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Received: May 8, 2023; received in revised form: July 7, 2023;
accepted: July 10, 2023

Abstract:
Introduction: Among the contemporary models developed, the updated Bloom's taxonomy has become the most widely used cognitive process model for gauging learning questions. This model emphasizes the cognitive levels starting from remembering information and progresses to advanced levels such as producing knowledge. Even though students use a variety of strategies to synthesize information and learn, there is an urgent need for teachers to adopt better pedagogies to facilitate meaningful learning. Adams (2015) established that Bloom's taxonomy places emphasis on student's ability to acquire prior knowledge before interpreting or applying it into a real-world scenario. It is of interest then to determine the Bloom's levels in principles of economics textbooks.
Methods: This study utilized qualitative research to determine whether the aspects of Bloom's revised taxonomy were utilized in end of chapter questions. The questions at the end of the chapters of the "Principles of Economics" by Gregory Mankiw (2021) were classified based on Bloom's revised taxonomy.
Results: The study revealed that most of the questions utilized the apply level of Bloom's cognitive domain. There were few questions regarding evaluation or creating.
Discussion: Faculty need to be aware of the different Bloom's levels available to them and potentially focus more on the higher levels of Bloom's revised taxonomy.
Limitations: One limitation is that only the leading Principles of Economics textbook was surveyed. Other textbooks may produce different results.
Conclusions: The leading Principles of Economics textbook had many end-of-chapter questions at the apply level of the revised Bloom's taxonomy. There may

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be opportunities to develop more questions at the higher levels of the revised Bloom's taxonomy.
Key words: Bloom's taxonomy, principles of economics, undergraduate education.

Introduction

The classification of information into a precise sequence which is durable in an individual's memory allows learners to effectively store, retrieve and apply facts. It is essential for students to acquire fundamental knowledge before applying it in the real-world scenario. Measuring the updated Bloom's taxonomy cognitive levels utilized by learners in textbook questions allows curriculum developers and authors to formulate information that facilitate meaningful learning. Storing knowledge in long-term memory requires the involvement of higher cognitive processes (Forehand, 2005). Köksal, Ulum, and Yürük (2023) established that teachers, researchers, and textbook writers should use Bloom's innovative cognitive abilities to enable the learners to enrich texts based on vocabulary, structure, and context. They should also consider using strategies that enable learners to develop their low cognitive skills, standard memory tests, including ability to express themselves in appropriate language and content.

The principles of economics course is often the only economics course that business or general students take. Often the course is broken into two different semesters, one for microeconomics and one for macroeconomics. Other options include a compressed one-semester course in the essentials of economics. Whatever the approach, the principles course is the most important opportunity to reach general students and expose them to economic thinking. Therefore, the effectiveness of the textbook selected is of vital importance.

The leading textbook for introductory economics is "Principles of Economics" by Gregory Mankiw (2021). For the purposes of this paper, the 9th edition is used for analysis. This textbook has been used for decades and continues to dominate the market. As such, it is of interest to check the effectiveness of the end-of-chapter questions in terms of their learning potential. One approach is to classify the questions in terms of Bloom's taxonomy (Bloom et al., 1956). The original Bloom's taxonomy had six levels of ascending difficulty which were knowledge, comprehension, application, analysis, synthesis, and evaluation. Over time, Bloom's taxonomy has been revised by several authors (Darwazeh, 2017; Krathwohl, 2002).

1 Literature review

The value of Bloom's taxonomy generally lies in creating the learning objectives and goals which address the student's abilities. Forehand (2005) established that the theory is based on the ideology that there are several levels of observable actions which indicate the presence or absence of cognitive abilities and the amount of cognitive ability utilized. Teachers can indicate explicitly what the students must engage in to demonstrate meaningful learning by achieving the learning goals established through the measurable verbs (Wilson, 2016). Learning, teaching, and identifying educational goals are interwoven complicated concepts which must be done correctly to improve the quality of the education systems around the world.

Bloom spearheaded a group of educators who classified the educational objectives to demystify these concepts. The primary intent was to establish and formulate a model of classification of thinking behaviours which they believed were key processes of learning. The framework evolved to become a taxonomy which encompassed three major domains, such as cognitive, affective, and psychomotor. Forehand (2005) established that in 1956, Bloom's taxonomy was first published with its major focus on the cognitive domain. While there have been several hierarchical systems developed, Bloom's taxonomy remained as the de facto standard for more than fifty years.

Due to its long-standing endurance among other systems, Bloom's taxonomy has been reinterpreted and reconstructed in a variety of ways. Forehand (2005) established that in 1990s, a new assembly to update the taxonomy to increase its preference for 21 century teachers and students occurred. This assembly involved representatives from the three domains, curriculum and instructional theorists, assessment specialists and cognitive psychologists. Krathwohl (2002) postulated that following the consensus, Bloom's lowest level of pyramid, which was originally knowledge, was changed to remembering.

The new terms formulated were remembering, understanding, applying, analyzing, evaluating and creating which metamorphosed from knowledge, comprehension, application, analysis, synthesis and evaluation (Gul, Kanwal, & Khan, 2020; Bertucio, 2017; Sarfraz, 2017). Psychomotor domains include body movement, coordination, and the use of motor abilities. The development of these skills must be done and measured by speed, accuracy and efficiency (Abidin et al., 2013). The Simpson's and Harrow's psychological areas are important for the development of children and adolescents and for adults to develop skills (Keeling & Major, 2018). Bloom's taxonomy holds critical importance in curriculum because it helps teachers and curriculum developers make effective decisions on helping students make meaningful learning. It also allowed teachers to develop lessons and learning objectives that allow students to achieve optimum learning.

1.1 Cognitive domain

Cognitive domain holds critical importance in Bloom's taxonomy as it establishes the basic cognitive processes that outline students' understanding. Huitt (2011) established that Lorraine Anderson also looked at the cognitive aspect of the classification of education and perhaps the two most prominent aspects being the renaming of six categories from nouns to verbs. This new classification represents a more powerful and potentially more accurate way of thinking. Students have varied levels of cognitive understanding and their process skills are diverse (Özgelen, 2012). The key aspects of the cognitive domains are elaborated below.

- Remembering: It is the ability of the individual to remember the information memorized before.
- Understanding: It is the ability to understand the meaning and interpret instructions and problems.
- Applying: It is the ability to use ideas in new ways (Abidin et al., 2013). In the learning environment, students are expected to apply what they learn in the classroom to new workplace situations.
- Analyzing: It is the process of breaking down material or ideas into parts to define an organizational structure.
- Evaluating: It involves expressing a judgment about the value of an idea or thing.
- Creating: A structure or model has several parts. Creating is the process of combining parts as a whole to create new behaviours or structures.

1.2 Affective domain

- Receiving phenomena: This indicates the active student's participation and the learning outcomes that are response-oriented.
- Valuing: The aspect denotes the values or morals that a person has about an object, situation or behaviour. Morality is based on a specific set of values, and evidence of these values can be seen in the general behaviour of students, which is often observed.
- Organization: It involves prioritizing values by comparing different values, resolving conflicts between them, and creating a unified value system. Emphasis is placed on comparison, cooperation, and convergence of values.
- Internalizing values: It is the value system that governs a person's behaviour. The behaviour is positive, stable and predictable, especially the personality of the student. Learning goals relate to students' general coping mechanisms characterized as personal, social, and emotional.

2 Method

The approach of this study involved analyzing the end of chapter questions in the identified textbook and classifying them based on the levels of revised Bloom's taxonomy. The textbook provides a variety of low and high reading cognitive level questions which students are ready to answer. Bloom's new rule was only used to ask reading questions in this study. There is an increased need to establish the theoretical basis for teachers to determine which strategies related to the use of textbooks can enhance student's reading comprehension skills. In the study, a qualitative research approach that uses descriptive analysis was utilized. The reading questions at the end of the selected chapters identified the cognitive levels in Bloom's taxonomy.

The key words and verbs that make up the assessment sections, sample questions, and targeted activities at each chapter were used to indicate the level of conceptual organization and how each aspect of Bloom's taxonomy was utilized. The data obtained were reviewed and analyzed. Frequencies have also been presented in research as a quantitative research design, but reading comprehension questions show similar examples in qualitative research. Low-level cognitive skills include memory, comprehension and practice while advanced cognitive skills include analysis, evaluation and reasoning. The frequency and proportion of each cognitive level were calculated. Bloom's taxonomy has been modified to examine assessment tools related to the cognitive fields of memory, cognition, and related psychology.

The textbook utilized for this study is the "Principles of Economics" by Gregory Mankiw (2021) which provides extensive information about economics. Mankiw uses a clear and engaging writing style to present information, useful facts and real-life scenarios. The economics concepts presented in the book have a significant role in the decisions made by practitioners in the field. Since the book is widely used in the field of economics and utilized in this course study, it was selected for review in this study. Each of the chapters was analyzed with each question at the end of the chapter being classified to determine cognitive levels utilized.

To clearly present the data in this study, the ratio and frequency of individual information levels are presented in a table. In summary, Bloom's taxonomy was developed as the theoretical basis for this study. Based on this, points were calculated for the relevant examples to reflect each level of Bloom's new perspective. The chapters analyzed for this research study are Chapters 1 through 12. This represents the first four major sections of the textbook: Introduction, How Markets Work, Markets and Welfare, and The Economics of the Public Sector. The specific chapters analyzed are listed below for each major section:

Introduction
- Chapter 1 – Ten Principles of Economics
- Chapter 2 – Thinking Like an Economist
- Chapter 3 – Interdependence and the Gains from Trade

How Markets Work
- Chapter 4 – The Market Forces of Supply and Demand
- Chapter 5 – Elasticity and Its Application
- Chapter 6 – Supply, Demand, and Government Policies

Markets and Welfare
- Chapter 7 – Consumers, Producers, and the Efficiency of Markets
- Chapter 8 – Application: The Costs of Taxation
- Chapter 9 – Application: International Trade

The Economics of the Public Sector
- Chapter 10 – Externalities
- Chapter 11 – Public Goods and Common Resources
- Chapter 12 – The Design of the Tax System

3 Data analysis and results

Referring to Bloom's new taxonomy, this study attempts to determine whether reading questions have low or high comprehension and classify these questions based on Bloom's revised taxonomy. The findings will help teachers improve end-of-chapter problems at the appropriate cognitive level. The results of this seminal study will help teachers and curriculum developers to choose the appropriate books. It will also provide a better understanding of the level of information that should be included in the textbook. The results of the research will be of great value to participants with national and international interests in achieving the objectives of the course.

The tables below show the frequency of how the textbook questions studied reflected on remembering, understanding, applying, analyzing, evaluating, and creating aspects of revised Bloom's taxonomy. The questions at the end of the chapters identified were classified based on Bloom's revised taxonomy. The questions selected were the open-ended "Problems and Applications" questions, not multiple-choice questions.

The tables which are used to represent the data contain all the aspects of revised Bloom's taxonomy and their frequency. Several similar works using the old version of Bloom's taxonomy have been used by different researchers, but this study employs the use the new version of Bloom's taxonomy. This number of questions and percentages for each area and skill level were calculated for the questions in the textbook used. The data obtained indicate that while remembering aspect was not utilized in all the chapter questions selected, the

majority of the questions reflected the applying aspect followed by the analyzing aspects.

Questions are an important part of effective learning. Nappi (2017) established that every day, experts use questions to stimulate students' thinking and imagination which also tests students' memorization and application of knowledge. Effective questions reflect the educational goals to be achieved which makes it an effective instrument used in the classroom environment. Effective questions include narrative or problem-solving questions, as well as more complex questions that stimulate students' intellectual activity. The questions selected in this case were not vague or ambiguous and did not contain complex vocabulary, complex grammar or unclear punctuation.

Table 1

Classification of textbook questions for Section 1 Introduction (Chapters 1 - 3)

Level	#	%
Remembering	0	0.00%
Understanding	1	0.00%
Applying	16	62.96%
Analyzing	7	25.93%
Evaluating	3	11.11%
Creating	0	0.00%
Total	27	100.00%

The data in Table 1 reveal that number of text book questions which utilized the remembering aspect of revised Bloom's Taxonomy were none, those that utilized understanding was 1, those that utilized applying were 16 (62.96%) while which utilized analyzing were 7 (25.93%), those that utilized evaluating were 3 (11.11%) while those that utilized creating were none.

Sample questions from the text illustrating these levels are listed below:

"Describe some of the trade-offs faced by each of the following:" (Understanding level, p. 14)

"Draw a circular-flow diagram." (Apply level, p. 34)

"How can you compare the benefits to the costs?" (Analyze level, p. 14)

"Are the following statements true or false? Explain in each case." (Evaluate level, p. 59)

Table 2

Classification of textbook questions for Section 1 Introduction (Chapters 4 - 6)

Level	#	%
Remembering	0	0.00%
Understanding	4	12.12%
Applying	21	63.64%
Analyzing	6	18.18%
Evaluating	2	6.06%
Creating	0	0.00%
Total	33	100.00%

The data in Table 2 reveal that number of textbook questions which utilized the remembering aspect of revised Bloom's Taxonomy were none, those that utilized understanding were 4 (12.12%), those that utilized applying were 21 (63.64%) while which utilized analyzing were 6 (18.18%), those that utilized evaluating were 2 (6.06%) while those that utilized creating were none. It is evident that the majority of the questions reflected the applying aspect followed by the analyzing aspects.

Sample questions from the text illustrating these levels are listed below:

"Is the demand curve elastic or inelastic?" (Understanding level, p. 107)

"What is each driver's price elasticity of demand?" (Apply level, p. 108)

"What happens to the price of donuts?" (Analyze level, p. 108)

"Should you increase or decrease the price of admission?" (Evaluate level, p. 108)

Table 3

Classification of textbook questions for Section 1 Introduction (Chapters 7 - 9)

Level	#	%
Remembering	0	0.00%
Understanding	3	10.00%
Applying	14	46.67%
Analyzing	6	20.00%
Evaluating	6	20.00%
Creating	1	3.33%
Total	30	100.00%

The data in Table 3 revealed that number of textbook questions which utilized the remembering aspect of revised Bloom's Taxonomy were none, those that utilized understanding were 3 (10.00%), those that utilized applying were 14 (46.67%) while which utilized analyzing were 6 (20.00%), those that utilized evaluating were 6 (20.00%) while those that utilized creating were 1(3.33%). It is evident that most of the questions reflected the applying aspect followed by the evaluating and analyzing aspects.
Sample questions from the text illustrating these levels are listed below:
"Would the deadweight loss from this tax likely be greater in the first year after it is imposed or in the fifth year? Explain." (Understanding level, p. 164)
"Calculate the amount of revenue this tax raises for Smalltown and the deadweight loss of the tax." (Apply level, p. 165)
"Does a subsidy lead to a deadweight loss?" (Analyze level, p. 165)
"Evaluate the following two statements." (Evaluate level, p. 164)
"Can you propose a better policy?" (Create level, p. 165)

Table 4

Classification of textbook questions for Section 1 Introduction (Chapters 10 - 12)

Level	*#*	*%*
Remembering	0	0.00%
Understanding	4	15.38%
Applying	8	30.77%
Analyzing	8	30.77%
Evaluating	5	19.23%
Creating	1	3.85%
Total	26	100.00%

The data in Table 4 reveal that number of textbook questions which utilized the remembering aspect of revised Bloom's Taxonomy were none, those that utilized understanding were 4 (15.38%), those that utilized applying were 8 (30.77%) while which utilized analyzing were also 8 (30.77%), those that utilized evaluating were 5 (19.23%) while those that utilized creating were 1 (3.85%). It is evident that most of the questions reflected the applying and analyzing aspects both at 30.77% followed by the evaluating aspect at 19.23%.
Sample questions from the text illustrating these levels are listed below:
"On your graph, shade the area corresponding to the deadweight loss of the market equilibrium." (Understanding level, p. 206)
"Who sells permits and how many do they sell?" (Apply level, p. 207)
"What does this example teach you about the optimal provision of public goods?" (Analyze level, p. 223)

"Based on your calculations, would you support the mayor's policy?" (Evaluate level, p. 207)
"Can you think of ways the private market can solve this problem?" (Create level, p. 223)

4 Discussion

The purpose of this study was to investigate the low and high levels of reading comprehension in textbook questions and characterize it based on Bloom's revised taxonomy. The data revealed that the text questions examined did not focus on the remembering aspect of Bloom's taxonomy. It is also evident that most of the questions reflected the applying aspect followed by the analyzing aspects. In general, the reading questions measured a moderate level of cognitive ability rather than a high level. Memorization, comprehension, and application are the most assessed processes in this case; advanced skills have not been carefully evaluated. The data showed that the essay questions did not show a high level of reading proficiency. The results of the study also revealed that the level of cognition and the cognitive processes that are undertaken when the different types of questions are presented vary significantly. This is because some of the questions require deeper understanding, memory, and comprehension before it can be stored which means that the level of cognition required for such tasks is higher. The textbook questions presented in this study required varying cognitive levels.

While some of the questions required the students to use a small portion of their cognitive abilities, others required the student to utilize a large proportion of their cognitive ability. Most of the questions presented, however, did not target the students to exhibit higher cognitive levels. Köksal, Ulum and Yürük (2023) established that it was ubiquitous that learners rarely reinforced their lexical, contextual, and syntactical knowledge unless the information provided in the reading text required so. Due to limited time and heavy workload, some teachers cannot prepare adequate teaching materials for the class. Therefore, most of them use textbooks in their classes and mention these books as their main teaching tools (Ulum, 2016).

Disciplines, such as teaching and learning methods, research studies and psychology, show that the brain uses various cognitive processes to process, interpret, store, and retrieve information. These cognitive processes include memory, perception, sensation, and analysis. According to Smith and Kelly (2015) cognition involves complex operations, such as learning, problem solving, reasoning, critical thinking, and intelligence. All of these processes have sub-tasks which can occur simultaneously or sequentially depending on the activities of the person. The complexity of these thought processes also varies, with some having low, medium, or high complexity. To correctly obtain the

intellectual scores for the learners and measure these cognitive processes, complexity is considered part of the psychological rating system.

Unlike the first taxonomy developed in 1956, the new Bloom's taxonomy allows the combination of different levels defined as a function. Both original and revised taxonomy refers to a hierarchical structure that identifies cognitive levels from simple memory to more complex operations (Adams, 2015). Forehand (2010) established that Bloom's Taxonomy of Learning Objectives plays an important role in the development of higher and lower knowledge learning activities, assessment tools, and learning materials because of the importance of assessing whether students have engaged in meaningful learning.

Bloom's assessment of educational goals was first proposed by educational psychologist Benjamin Bloom and later by Anderson et al. (2001) and Krathwohl (2002). The basic classification measures the difficulty of thinking in 6 classification levels, classified into subgroups of cognitive skills (Rahman & Manaf, 2017). In the first edition, three objectives were clearly defined: types of learning objectives, curriculum development models and facilitating communication between teachers when administering learning assessment. Hierarchy states that the ability to succeed at one level of Bloom's hierarchy is the result of success at the previous level (Rahayu, 2018). Therefore, it is ubiquitous that the level of knowledge and understanding is important. Verenna et al. (2018) established that if students are not sufficiently successful at basic levels of general understanding, they are less likely to succeed at higher levels, including application, analysis, synthesis and evaluation which require more explanation and complex understanding.

Design, instruction, and assessment are among the most important steps in determining whether students' conceptual development is consistent with learning objectives. Jones et al. (2009) established that assessment is used to identify and determine student and teacher effectiveness. It also determines the curriculum content and is an important way to assess students' knowledge. Bloom's taxonomy is a system for ranking educational goals according to the level of knowledge students need to succeed (Poluakan et al., 2019). There are six levels and the rule is that the strength at the highest level is an accurate indication of meaningful understanding.

At the lowest level, which is remembering, students can repeat facts when asked without understanding their meaning. The next level is "understanding" which is higher because the student has reached the level of knowledge to understand the meaning of the truth (Akib & Muhsin, 2020). When students are challenged to deviate from prior learning, students demonstrate that understanding through knowledge transfer. At the advanced level of collaboration and evaluation, students are expected to demonstrate exceptional ability to set and achieve goals, some academic support, and exceptional ability to evaluate material.

5 Future research and recommendations

Future research should incorporate Bloom's new taxonomy. While hierarchical thinking increases students' flexibility, integrating reading materials and activities is a major concern for writers. Limiting students below proficiency levels is a major challenge for language teaching and learning. Therefore, many economics textbook questions are limited to low levels of recognition and characteristics that need to be developed to improve the level of recognition. Köksal, Ulum, and Yürük (2023) also maintained that Bloom's taxonomy can include the integration of many methods and approaches, such as to language learning. Textbook questions are a good way for learners to reflect as they read and study the material. Furthermore, by incorporating high levels of information, the cognition performance of the student can increase. This research has shown that students can be more motivated when they believe they can acquire certain skills.

Curriculum developers and educators are strongly encouraged to use the revised version of Bloom's Taxonomy for reading comprehension questions. However, textbook assessment questions need to be adapted to higher cognitive levels. There is also a clear need that learners should be encouraged to engage in reading comprehension activities that transcend lower cognitive levels and develop higher cognitive levels. This optimistic view can be achieved through collaboration between teachers, curriculum developers, writers, and students.

Conclusion

Updated Bloom's taxonomy provides useful and effective features that allow learners to be creative when studying. It is a creative approach to writing questions and learning which requires synthesis, creation, planning and application. The increased need to use advanced reasoning skills for textbook questions indicates that aspects of Bloom revised taxonomy are key for learning. To improve the effectiveness of principles of economics courses, the primary textbook used holds critical importance. The questions formulated at the end of each reading or chapter also have a significant effect on whether the students gain meaningful learning. End-of-chapter textbook questions can be potentially improved to reach higher levels of Bloom's revised taxonomy.

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