

## Investigating the Cognitive Levels of English Final Exams Based on Bloom's Taxonomy

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**Abstract** – The use of tests in educational system can result in different changes in teaching and learning practices. Due to the important effects of high-stake tests on teaching and learning practices, this study attempts to explore: 1) what are the cognitive levels of the nation-wide English final exams which were administered to third grade high school students in Iran on June 5, 2012 and to second grade high school students in Iran on May 29, 2012?, 2) Which cognitive level of Bloom's taxonomy is more dominant in the tests in these two series of questions?, and 3) What is the difference between the cognitive level of third grade questions and that of the second grade questions based on Bloom's taxonomy of educational objectives? For this purpose, the items of two nation-wide English final exams which were administered to third grade high school students second grade high school students were analyzed and codified based on the cognitive levels of Bloom's taxonomy of educational objectives. In this study, the data were analyzed through calculating frequencies, percentage and the use of chi-square tests. The results of this study showed that these tests consisted of different questions which were related to knowledge, comprehension and application levels of Bloom's taxonomy of educational objectives. Moreover, in the third grade high school English final exam, comprehension level of Bloom's taxonomy was more dominant, while in the second grade high school English final exam, knowledge and comprehension levels of Bloom's taxonomy were more dominant.

**Keywords:** Educational objectives, Bloom's taxonomy, Test, High-stake, High school

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### 1. INTRODUCTION

One of educational goals of the 21st century is to improve the students' problem-solving, critical thinking, and higher order thinking skills in order to help them adapt to the rapidly changing "Information Age" (Greenspan, 2001; Kerka, 1992). Although developing higher level cognitive abilities has been considered as one of the educational goals in the past decade, the results of different studies show that learners have limited abilities to think at higher levels of cognition (Gardiner, 1998; Kuhn, 1989; Tsui, 1998). One of the reasons for this issue can be related to the effect of high-stake tests on teaching and learning practices. According to Alderson and Wall (1993), high-stake tests have significant effects on teaching and learning activities. In other words, most of the teachers prefer to modify their teaching methodology to prepare their learners for the test and they do not focus on the activities that do not have significant impact on the test takers' success (Hughes, 2003). For example, when lower lever cognitive skills are emphasized in high- stake tests,

teachers tend to focus on lower order thinking activities in their classroom. Moreover, tests can have effects on learners' learning because learners prefer to focus on those parts of the materials that are expected to appear on the tests. Consequently, as Alderson and Wall (1993) assert, testing reflects what really goes on within the classroom. The effect of testing on teaching and learning is known as ‘the washback effect’ (Alderson & Wall, 1993; Bailey, 1996; Gates, 1995; Hughes, 1989; Pan, 2009). Messick (1996, p. 241) describes washback effect as "the extent to which the introduction and use of a test influences language teachers and learners to do things that they would not otherwise do which promote or inhibit language learning".

Nation-wide final exams in Iran are administered to third and second grade high school students at the end of each academic term to explore whether or not they have learned the material taught in the classroom; these tests can be considered as high-stakes tests because the decisions which are made based on the test scores can affect the students' achievement in the future. Due to the important effects of high-stake tests on teaching and learning practices, it is required to analyze the content of these tests in detail to identify which levels of educational objectives are focused in these tests. To achieve this aim, this study attempts to explore the cognitive levels of nation-wide English final exams which were administered to third and second grade high school students based on Bloom's taxonomy of educational objectives. The research questions are:

- 1) What are the cognitive levels of the nation-wide English final exams which were administered to third grade high school students on June 5, 2012 and to second grade high school students on May 29, 2012 in Iran?
- 2) Which cognitive level of Bloom's taxonomy is more dominant in these two series of questions?
- 3) What is the difference between the cognitive level of third grade questions and that of the second grade questions based on Bloom's taxonomy of educational objectives?

## **2. LITERATURE REVIEW**

In 1956, Benjamin Bloom and his colleagues proposed their taxonomy of educational objectives which can help curriculum designers, materials developers, test developers and teachers define more precisely the outcomes expected from the learners. Generally, Bloom's taxonomy of educational objectives is one of the most widely used taxonomies in educational setting. Different scholars such as Hoeppel (1980), Granello (2000), Cross and Wills (2001), Granello (2001), Sultana (2001), Bastick (2002), Chan, Tsui, and Chan (2002), Chyung and Stepich (2003), Amin (2004), Gegen (2006), Anthony (2007), Plack et al. (2007), Larkin and Burton (2008), Gordani (2008), Mosallanejad (2008), Valcke, De Wever, Zhu, and Deed (2009), Crews (2010), Riazi and Mosalanejad (2010), and Hawks (2010) have used Bloom's Taxonomy in different fields. Moreover, other scholars such as Usova (1997), Aviles (2000), Lipscomb (2001), and Garekwe (2010) have used Bloom's Taxonomy in testing field. Among different studies which have been conducted based on Bloom's Taxonomy, few studies such as (Khorsand, 2009; Ebadi & Shahbazian, 2015) assessed the cognitive levels of tests in Iran

setting. Therefore, due to the important effects of the cognitive levels of the tests on teaching and learning practices, this study attempts to explore the cognitive levels of nation-wide English final exams which were administered to third and second grade high school students based on Bloom's taxonomy of educational objectives.

### **2.1. Bloom's Taxonomy of Educational Objectives**

Bloom et al. (1956) considered six cognitive levels for educational objectives. The six cognitive levels of Bloom's taxonomy include knowledge, comprehension, application, analysis, synthesis, and evaluation. The first two levels of Bloom's Taxonomy have generally been regarded as lower order thinking, while the remaining four levels have been considered as higher order thinking (Miller, 1990). Knowledge is the lowest cognitive level Bloom's taxonomy. It deals with recalling the previously learned information. At this level, students are expected to define facts and principles, recognize common terms or procedures and so on. Moreover, comprehension is related to understanding the meaning and interpreting the facts. At this level, students are expected to interpret the charts and graphs, translate numbers to words and so on. Additionally, application deals with using what learner has previously learned in new situations in order to solve the problems. At this level, students are expected to apply the theories and rules which they have learned in new situations. Furthermore, analysis is the fourth level of bloom's taxonomy. It is related to taking apart a structure into its constituent pieces in order to explore the relationships among the separated parts. Differentiating between facts and hypothesis can be considered as an instance of analysis. Besides, synthesis deals with putting the parts together in order to create something new. Making a story can be regarded as an example of synthesis. Moreover, evaluation is the highest cognitive level of Bloom's taxonomy. It deals with criticizing, making judgment and making decisions based on specific criteria.

## **3. METHOD**

### **3.1. Research Design**

This study attempts to conduct a content analysis study on the nation-wide English final exams which were administered to third grade high school students in Iran on June 5, 2012 and to second grade high school students in Iran on May 29, 2012 based on the Bloom's taxonomy of educational objectives. In this research, Bloom's taxonomy of educational objectives is used in order to codify the data. It is the qualitative part of this research. However, some quantitative analysis was done for computing the frequency of each level of learning objectives. Therefore, this research has a mixed design.

### **3.2. Materials**

The materials of this study consist of two nation-wide English final exams which were administered to third grade high school students in Iran on June 5, 2012 at 8:0 and to second

grade high school students in Iran on May 29, 2012 at 8:0. In this study, the third grade high school exam had 60 items and second grade high school exam had 43 items.

### **3.3. Procedure**

In this study, the items of nation-wide English final exams which were administered to third and second grade high school students were analyzed and codified based on the cognitive levels of Bloom's taxonomy of educational objectives. This taxonomy is hierarchical, arranged in six levels (e.g. knowledge, comprehension, application, analysis, synthesis, and evaluation) from simple/concrete to complex/abstract. In this study, the coding categories are labeled: 1) knowledge 2) comprehension 3) application 4) analysis 5) synthesis 6) evaluation.

After the codification process, the frequencies and percentages of the occurrence of different learning objectives were calculated in order to explore which cognitive level of learning objectives was more dominant in the tests. Additionally, chi-square tests were used in order to examine whether the observed differences were statistically significant. Moreover, in this study, in order to achieve reliability, the researcher codified all of the data once more and the degree of agreement between the two codifications was calculated based on Spearman Rank correlation Coefficient. The degree of consistency in the two coding attempts was found to be .96, being used as the intra coder reliability. Besides, the researchers asked another person who had PhD in TEFL to code 40 percent of the data based on the cognitive levels of Bloom's taxonomy of educational objectives; Spearman Rank Correlation Coefficients was used in order to calculate the inter rater reliability. In this study, the degree of agreement between her coding attempt and that of the researcher was found to be .87 and was used as the inter coder reliability.

### **3.4. Data Analysis**

In this study, the data was analyzed and codified based on Bloom's taxonomy of educational objectives. Additionally, the frequencies and percentages of the codified items were calculated in order to explore which cognitive level of learning objectives was more dominant in the tests. Besides, Spearman Rank Correlation Coefficients was used in order to calculate the intera rater and inter-rater reliability. In this study, the intera rater reliability was found to be .96 and the inter-rater reliability was found to be .87. Furthermore, chi-square tests were run in order to examine whether the differences between the frequencies of occurrence of different levels of Bloom's taxonomy of educational objectives were statistically significant.

## **4. RESULTS**

As table 1 showed, 50% of the third grade high school questions belonged to comprehension level of Bloom's taxonomy of educational objectives. Besides, 43.33% of the questions belonged to knowledge level and only 6.66% of the questions belonged to application level.

**Table 1: The Frequency and Percentage of third grade high school Questions**

	Frequency	Percentage
Knowledge	26	43.33%
Comprehension	30	50%
Application	4	6.66%
Analysis	0	0%
Synthesis	0	0%
Evaluation	0	0%

**Table 2: The Frequency and Percentage of second grade high school Questions**

	Frequency	Percentage
Knowledge	20	46.51%
Comprehension	20	46.51%
Application	3	6.97%
Analysis	0	0%
Synthesis	0	0%
Evaluation	0	0%

As table 2 indicated, 46.51% of the second grade high school Questions belonged to comprehension level of Bloom’s taxonomy of educational objectives. Moreover, 46.51% of the questions belonged to knowledge level and 6.97% of the questions belonged to application level.

As the results of this study showed third and second grade high school English final exams mostly assessed lower level learning. These tests included different questions which were mostly related to knowledge and comprehension levels. Moreover, no item of these tests was related to the three highest levels of learning objectives of Bloom's Taxonomy.

**Table 3: Chi-square tests for third and second grade high school Questions in terms of learning objectives**

	Third grade	Second grade
Chi-Square	19.600	13.442
df	2	2
Asymp.Sig	.000	.001

As indicated in Table 3, the result of Chi-square test for third grade high school questions showed that the differences between the frequencies of occurrence of different levels of Bloom's taxonomy of educational objectives were significant ( $\text{sig}=.000$ ). Additionally, for second grade high school questions, Chi-square test gave us a significant result ( $\text{sig}=.001$ ).

## **5. DISCUSSION AND CONCLUSION**

Tests are measurement instruments that can be used for different purposes. However, the use of tests in educational system results in various intentional or unintentional changes in the curriculum, particularly in teaching and learning practices. Due to the important effects of high-stake tests on teaching and learning practices, it is required to analyze the content of these tests in detail to identify which levels of educational objectives are focused in these tests. To achieve this aim, this study attempts to explore 1) what are the cognitive levels of the nation-wide English final exams which were administered to third grade high school students in Iran on June 5, 2012 and to second grade high school students in Iran on May 29, 2012? , 2) Which cognitive level of Bloom's taxonomy is more dominant in these two series of questions? , and 3) What is the difference between the cognitive level of third grade questions and that of the second grade questions based on Bloom's taxonomy of educational objectives?

The results of this study showed that the third and second grade high school English final exams mostly assessed lower level learning. These tests consisted of different questions which were related to knowledge, comprehension and application levels of Bloom's taxonomy of educational objectives. Moreover, in this study, no item of these tests was related to the three highest levels of learning objectives of Bloom's Taxonomy. Moreover, in the third grade high school English final exam comprehension level of Bloom's taxonomy was more dominant, while in the second grade high school English final exam knowledge and comprehension levels of Bloom's taxonomy were more dominant. Additionally, the result of Chi-square test for third grade high school questions showed that the differences between the frequencies of occurrence of different levels of Bloom's taxonomy of educational objectives were significant. Additionally, for second grade high school questions, Chi-square test gave us a significant result.

In general, the results of this study were in line with the results of Ebadi and Shahbazian's (2015) study as well as Khorsand's (2009) study. The results of Ebadi and Shahbazian's (2015) study on the cognitive level of first and second grade of Iranian high-school final exam questions revealed that the focus of first and second grade Iranian high school exams was on lower order cognitive skills. Moreover, the results of Khorsand's (2009) study on the cognitive levels of questions used by Iranian EFL teachers in advanced reading comprehension tests indicated that Iranian EFL teachers mostly tended to use low cognitive level questions rather than high level ones in their tests.

Therefore, the results of the above studies showed the preponderance of low cognitive level questions in the above tests which were administered to Iranian students. Generally, the

use of the low cognitive level questions in nation-wide final exams can affect teaching and learning practices. When lower level cognitive skills are emphasized in high-stake tests, teachers tend to focus on lower order thinking activities. In other words, teachers may follow the “teach to test approach” (Chan, 2001, p. 39). Learners also prefer to focus on those parts of the material that are expected to appear on the tests or to practice specific items which are similar to those of the test (Alderson & Wall, 1993); Weili (2010); Nikoopour and Farsani (2012); and Bailey (1996). Additionally, learners tend to acquire knowledge through rote learning and memorization because their exams contain low cognitive level questions. In this regard, Riazi and Mosalanejad (2010) believe that in the educational system of Iran, the main focus is on acquiring knowledge through rote learning and memorization rather than acquiring knowledge through higher order thinking skills such as analysis and synthesis. However, one of the educational goals of the 21st century is to improve the students' problem-solving, critical thinking, and higher order thinking skills in order to help them adapt to the rapidly changing "Information Age" (Greenspan, 2001; Kerka, 1992). Consequently, due to the important effects of tests on learners, teachers, educational systems, and the society in general (Hughes, 2003), it is required to focus on higher order thinking skills in high-stake tests in order to prepare students for challenging real-life situations which require critical thinking skills.

## REFERENCES

- Alderson, J. C., & Wall, D. (1993). Does washback exist? *Applied Linguistics*, 14, 115–129.
- Bailey, K. M. (1996). Working for washback: A review of the washback concept in language testing. *Language Testing*, 13, 257–279.
- Amin, A. (2004). *Learning objectives in university Persian & English general language courses in terms of Bloom's taxonomy*. Unpublished master's thesis, Shiraz University, Iran
- Anthony, B.A. (2007). *Making students' writing bloom: The effect of scaffolding oral inquiry using Bloom's taxonomy on writing in response to reading and reading comprehension of fifth graders*. Doctoral dissertation, Auburn University. Available online at ProQuest database.
- Aviles, C. B. (2000). Teaching and testing for critical thinking with Bloom's taxonomy of educational objectives. Retrieved 1/2016 from: <http://eric.ed.gov>.
- Bastick, T. (2002). *Gender differences for 6-12th grade students over Bloom's cognitive domain*. Paper presented at the Annual Meeting of the Western Psychological Association. Retrieved 2/2010 from: <http://eric.ed.gov>.
- Bloom, B., Englehart, M., Furst, E., Hill, W., & Krathwohl, D. (1956). *Taxonomy of educational objectives: The classification of educational goals*. Handbook I: Cognitive domain. New York, Toronto: Longmans, Green.
- Chan, Y. C. (2001). Elementary school EFL teachers' beliefs and practices of multiple assessments. *Reflections on English Language Teaching*, 7(1), 37–62.

- Chan, C.C, Tsui, C.M., & Chan, M.Y.C. (2002). Applying the structure of the observed learning outcomes (SOLO) taxonomy on students' learning outcomes: An empirical study. *Assessment & Evaluation in Higher Education*, 27(6), 511-527
- Crews, C.F. (2010). *The effects of using Bloom's Taxonomy to align reading instruction with the Virginia Standards of learning framework for English*. Doctoral thesis, Liberty University |
- Cross, G., & Wills, K. (2001). *Using Bloom to bridge the WAC/WID divide*. Retrieved from: <http://eric.ed.gov>.
- Chyung, S.Y., & Stepich, D. (2003). Applying the “congruence” principle of Bloom’s taxonomy to designing online instruction. *The Quarterly Review of Distance Education*, 4(1), 317-330
- Ebadi , S. & Shahbazian,F. (2015). Exploring the cognitive level of final exams in Iranian high schools: Focusing on Bloom’s taxonomy. *Journal of Applied Linguistics and Language Research*. 2( 4), 1-11.
- Gardiner, L. F. (1998). Why we must change: The research evidence. *Thought and Action*, 14(1), 71-88.
- Garekwe,M. (2010). *Analysis of cognitive levels of examinations questions set in the Bachelor of Nursing Programme at University of KwaZulu-Natal*. Master’s thesis, University of KwaZulu-Natal
- Gates, S. (1995). Exploiting washback from standardized tests. In J. D. Brown & S. O. Yamashita (Eds.), *Language testing in Japan* (pp. 101–106). Tokyo: Japanese Association for Language Teaching.
- Gegen, S.E. (2006). *The effects of higher-level questioning in a high school mathematics classroom*. Master's thesis, Wichita University
- Granello, D.H. (2000). Encouraging the cognitive development of supervisees: Using Bloom's taxonomy in supervision. *Counselor Education & Supervision*, 40(1), 31-46.
- Granello, D.H. (2001). Promoting cognitive complexity in graduate written work: Using Bloom’s taxonomy as a pedagogical tool to improve literature reviews. *Counselor Education & Supervision*, 40(4), 292-307
- Greenspan, A. (2001, June 20). *The growing need for skills in the 21st century*. Federal Reserve Board Speech, Washington D.C.: U.S., Department of Labor.
- Gordani, Y. (2008). *A content analysis of guidance school English textbooks with regard to Bloom's levels of learning*. Unpublished master’s thesis, Shiraz University, Iran
- Hawks, K.W. (2010). *The effects of implementing Bloom's Taxonomy and utilizing the Virginia Standards of Learning Curriculum Framework to develop mathematics lessons for elementary students*. Doctoral thesis, Liberty University

- Hoepfel, F. (1981). *A taxonomy analysis of questions found in aiding skills developmental books used in Maryland Community College*. Dissertation Abstracts International, 41(12).
- Hughes, A. (1989). *Testing for language teachers*. Cambridge, England: Cambridge University Press.
- Hughes, A. (2003). *Testing for language teachers (2nd ed.)*. Cambridge: Cambridge University Press.
- Kerka, S. (1992). *Higher order thinking skills in vocational education* (Report No. EDO-CE-92-127). Columbus, OH; ERIC Clearinghouse on Adult, Career, and Vocational Education. (ERIC Document Reproduction Service No. ED350487)
- Khorsand, N. (2009). Cognitive levels of questions used by Iranian EFL teachers in advanced reading comprehension tests. Retrieved 2016 from <http://eric.ed.gov/?id=ED507869>.
- Kuhn, D. (1989). Making cognitive development research relevant to education. In Damon, W. (Ed.) *Child Development Today and Tomorrow* (pp. 261-287). San Francisco, CA: Jossey-Bass Publishers.
- Larkin, B.G., & Burton, K.J. (2008). Evaluating a case study using Bloom's taxonomy of education. *AORN Journal*, 88(3), 390-402
- Lipscomb, J.W. (2001). Is Bloom's taxonomy better than intuitive judgment for classifying test question? *Education*, 106(1), 102-107
- Messick, S. (1996). Validity and washback in language testing. *Language Testing*, 13, 241–256.
- Miller, C. (1989). Cognitive levels of instruction and student performance in college of agriculture courses. (Doctoral dissertation, The Ohio State University, 1989). *Dissertation Abstracts International*, 51-02, Section A, 0386.
- Mosallanejad, N. (2008). *Evaluation of high school English textbooks on the basis of Bloom's taxonomy*. Unpublished master's thesis, Shiraz University, Iran
- Nikoopour, J., & Farsani, M. A. (2012). Depicting washback in Iranian high school classrooms: A descriptive study of EFL teachers' instructional behaviors as they relate to university entrance exam. *The Iranian EFL Journal*, 8(February), 9–34.
- Pan, Y.-C. (2009). A review of washback and its pedagogical implications. *VNU Journal of Science, Foreign Languages*, 25, 257–263.
- Plack, M.M., Driscoll, M., Marquez, M., Cuppernull, L., Maring, J., & Greenberg, L. (2007). Assessing reflective writing on a pediatric clerkship by using a modified Bloom's taxonomy. *Ambulatory Pediatrics*, 7(4), 285-291. Available online at: [www.sciencedirect.com](http://www.sciencedirect.com)
- Riazi & Mosalanejad (2010). Evaluation of Learning Objectives in Iranian High-School and Pre-University English Textbooks Using Bloom's Taxonomy. *The Electronic Journal for English as a Second Language*. 13(4), 1-16.

- Tsui, L. (1998, November). A review of research on critical thinking. *Paper presented at the 23rd Annual Meeting of the Association for the Study of Higher Education*, Miami, FL
- Sultana, Q. (2001). *Scholarly teaching--Application of Bloom's taxonomy in Kentucky's classrooms*. Paper presented at the third annual conference on scholarship and teaching. Available online at: <http://eric.ed.gov>.
- Usova, G. M. (1997). Effective test item discrimination using Bloom's taxonomy. *Education*, 118 (1), 100-118
- Valcke, M., De Wever, B., Zhu.C., & Deed,C. (2009). Supporting active cognitive processing in collaborative groups: The potential of Bloom's taxonomy as a labeling tool. *Internet and Higher Education*, 12,165-172
- Weili, W. (2010). Investigating the washback effect of the New CET 4 Listening Comprehension Subtest on language learners, Northwest Agriculture & Forestry University. *Chinese Journal of Applied Linguistics (Bimonthly)*, 33(9), 28–39.

**Appendix 1: Coding scheme based on Bloom's Taxonomy of cognitive domain**

Level	Definition	Key Words and Examples	Sample Task Rubrics
<b>Knowledge</b>	Recalling data or information	<b>Key Words:</b> define, describe, identify, label, list, match, name, outline, reproduce, select, state. <b>Examples:</b> The student recalls and/or quotes information from memory to the teacher.	Fill in the blanks with appropriate words
<b>Comprehension</b>	Understanding the meaning, translation, and interpretation of instructions and problems; Stating a problem in one's own words	<b>Key Words:</b> describe, estimate, explain, extend, generalize, infer, interpret, paraphrase, predict, rewrite, summarize, translate. <b>Examples:</b> The student translates, comprehends, or interprets information s/he has received.	Answer the questions according to the reading
<b>Application</b>	Using a concept in a new situation or unprompted use of an abstraction; Applying what was learned in the classroom into novel situations.	<b>Key Words:</b> apply, change, compute, demonstrate, discover, manipulate, modify, predict, prepare, produce, relate, show, solve, use. <b>Examples:</b> The student applies the new information in his/her future assignments or classroom activities.	Make sentences using the given pattern and words.
<b>Analysis</b>	Separating material or concepts into component parts so that its organizational structure may be understood	<b>Key Words:</b> analyze, breaks down, compare, contrast, discriminate, distinguish, identify, illustrate, infer, outline, relate, select, separate. <b>Examples:</b> The student compares and contrasts a new structure to the ones previously learned.	Compare the following words to see how they sound differently.

Level	Definition	Key Words and Examples	Sample Task Rubrics
<b>Synthesis</b>	Putting parts together to form a whole, with emphasis on creating a new meaning or structure	<b>Key Words:</b> categorize, create, devise, design, explain, organize, plan, arrange, reconstruct, relate, revise, rewrite, summarize, tell, write. <b>Examples:</b> The student integrates information from several sources to solve a specific problem or to answer a question.	Make sentences using the scrambled words.
<b>Evaluation</b>	Making judgments about the value of ideas or materials	<b>Key Words:</b> appraise, conclude, critiques, evaluate, judge, justifies, relate, support. <b>Examples:</b> The student selects the most effective solution to a problem and is able to justify it.	On the scale, show how you evaluate the words. Which of the followings is the best answer to the question? Why?