Finding Acceptance of Bloom's Revised Cognitive Taxonomy on the International Stage and in Turkey

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Abstract

The aim of this study is to define academic staff's attitude about Bloom's Revised Cognitive Taxonomy working in the Department of Curriculum and Instruction. In accordance with this aim a scale developed by the researcher was applied to the academic staff in August and September 2010. The internal consistency reliability coefficient was calculated for the reliability analysis of scale and Cronbach's Alpha was found .84. The universe of research consisted of academic staff of the Department of Curriculum and Instruction. It was tried to contact with 420 academic staff without sampling by sending the developed scale via e-mail. However, 174 academic staff from 28 countries were willing to participate in the research, so the sample of the research consisted of 174 units. 28 countries consisting of the research group were categorized as countries of Europe, Africa, America and Asia. Five groups with Turkey group were formed and statistics were applied to these groups. Finally, in the research it was defined that Bloom's Revised Cognitive Taxonomy was useful and applicable according to academic staff.

Key Words

Bloom's Taxonomy, Goals, Revised Taxonomy, Curriculum Development.

Educational objectives are desirable characteristics acquired by education (Ertürk, 1997; Varış, 1996). The desirable characteristics are acquirements, skills, capabilities, interests, habits, attitudes, etc. While objectives are the main component and determining factor of the programme, content, educational circumstances and evaluation factors are designed according to the goals (Demirel, 2003; Erden, 1995; Kısakürek, 1983; Sönmez, 2007). Educational objectives have been classified and interpreted in a variety of ways (O'Neil & Murphy, 2010).

Bloom's Original Taxonomy of the Cognitive Domain

Being completed in 1956 and published in a book, Bloom's Taxonomy of the Cognitive Domain consists of six levels. Each level is subsumed by the higher levels in that it is hierarchical from simple to more complex. As the lowest level of cognitive domain is knowledge, it succesively follows comprehension, application, analysis, synthesis and evaluation. Mastery of each "lower" category was a prerequisite for achieving mastery of the next "higher" category. While knowledge, comprehension and application are accepted as lower levels, analyze, synthesis and evaluation are accepted as higher cognitive levels (Bloom, 1956; Krathwohl, 2009; Küçükahmet, 2005; Oliva, 1988; Wulf & Schave, 1984).

Bloom's Original classification is cumulative and hierarchical. It is cumulative as each level consists of behaviours of previous level and hierarchical as the levels are designed from simple to more complex. It is seen some limitations and deficiencies in applying the Bloom's taxonomy of cognitive domain. The very structure of the Taxonomy, moving from the simplest level of knowledge to the most difficult level of evaluation is seen as an important deficiency. For example, some objectives of knowledge level are more complex than some objectives of analyze and evaluation in some situations. In addition to this, it is stated evaluation level isn't more complex than synthesis and synthesis level contains evaluation level (Amer, 2006).

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Another criticism about progressive classification is hierarchical classification in that mastery of each "lower" category was a prerequisite for achieving mastery of the next "higher" category. However, in some fields before mastering behaviours belonging to a level, other behaviours belonging to a higher level can be seen. Take a literary critic as an example. Although he can't write an original novel (synthesis level according to taxonomy) he can evaluate a written novel (evaluation level according to taxonomy). Further, according to some experts the hierarchical classification is not regarded proper for each subject field (Senemoğlu, 2007).

During the term original taxonomy was published, curriculum and instruction was highly influenced by behaviouralism. However, today's world is in more different position than reflection of taxonomy in 1956. Constructivism and student-centred education have come into prominence and learning has been accepted as a period when learners actively construct or build new ideas or concepts based upon current and past knowledge or experience. Besides, learners are responsible for their own learning. Today, it is stated that taxonomy should be revised and all of the student-centred approaches should be gathered under the same category (Amer, 2006).

Rethinking Bloom's Taxonomy

In 1995 Lorin W. Anderson, a former student of Bloom, created a group in order to enhance the original taxonomy with the hope of adapting 21st century students and teachers. In that group there were cognitive psychologists (Richard Mayer, Paul Pintrich ve Merle Wittrock), curriculum and instruction experts (Lorin W. Anderson, Kate Cruikshank and James Raths) and assessment and evaluation experts (Peter Airasian, David Krathwohl). During 5 years, from 1995 to 2000, the group consisting of 8 educationalist and researcher came together in order to enhance Bloom's original taxonomy twice in a year. Lorin W. Anderson and David Krathwohl co-chaired the group gathering in Syracuse (New York/USA) (Anderson, 1999, 2005; Forehand, 2005).

This study attracts attention as the most widely participated and comprehensive study among other studies classifying cognitive domain. No fundamental transformation can be seen at the end of the long-lasting study in order to enhance and revise Bloom's taxonomy, but it includes several quite significant changes. Subtitles of all the levels are

wider, more comprehensive and intelligible than the original taxonomy. Bloom's Revised Cognitive Domain Taxonomy is called as Anderson & Krathwohl's Taxonomy (Yüksel, 2007).

Forehand (2005) analyzed the differences of new taxonomy in three broad categories: 1) Terminology changes: Bloom's six major categories were changed from noun to verb forms. Furthermore, the lowest level of the original, knowledge was renamed and became remembering. Finally, comprehension and synthesis were retitled. 2) Structural Changes: Bloom's original cognitive taxonomy was a one-dimensional form on the other hand the Revised Bloom's Taxonomy takes the form of a two-dimensional table. 3) Changes in Emphasis: The revised taxonomy was intended for a much broader audience.

The Structure of Revised Bloom's Taxonomy

The most noteworthy change of new taxonomy is that it is two-dimensional instead of one-dimensional. Both verb and noun forms of knowledge level can be seen together in the original taxonomy. Students are to recall and recognize the information for the verb form. On the other hand, verb and noun forms are seperated from each other into two seperate dimension: Knowledge Dimension and Cognitive Process Dimension (Amer, 2006).

Knowledge dimension is formed with different types of knowledge. These are factual, conceptual, procedural , and metacognitive knowledge. Labeled factual knowledge, this may include terminology of the discipline or knowledge of specific details and it includes the discrete facts and basic elements that students are to know about a specific subject field. Conceptual knowledge is knowledge of classifications and categories, principles and generalizations, theories, models, and structure. It involves figuring the interrelationships out among the basic elements within a larger structure enabling them to function together. Procedural knowledge is about how to do something and it includes methods of inquiry, criteria for using skills, algorithms, techniques, and methods. Finally, metacognitive knowledge is knowledge of cognition in general as well as awareness and knowledge of one's own cognition. Knowledge about one's own thinking involves knowing tasks,conditions and circumstances (Anderson, 2005).

Including four categories of knowledge dimension let the revised taxonomy be used for all subject fields, all grades, and all school forms. Thus the

critique "it cannot be used for all learning fields" about the original taxonomy is tried to be removed (Bekdemir & Selim, 2008).

Moreover, metacognitive knowledge in knowledge dimension is indispensably significant. Researches show how important students' recalling about their own metacognitive activities are and their using this knowledge in adapting to their own learning thinking and strategies appropriately is.

Metacognitive knowledge of learning strategies enables students to perform better and learn more. Students knowing different strategies for learning, thinking, and problem solving can use their knowledge and students knowing their own strengths and weaknesses can adjust their own cognition and thinking to diverse tasks in order to be more adaptive (Amer, 2006; Krathwohl, 2009).

Like the orijinal one, the new taxonomy consists of six levels. However, three of them (knowledge, comprehension and synthesis) were renamed and the order of two upper categories was interchanged, and those category names changed from noun form to verb form in order to fit the way they are used in instructional objectives. All of the original subcategories were changed to gerunds and named "cognitive processes" (Anderson, 1999; Hanna, 2007; Näsström, 2009; Şeker, 2010; Wilson, 2006).

That "induction" is a more complex process than "deduction" was the reason of the order of synthesis and evaluation was interchanged. While deduction includes breaking the whole into subparts, evaluating them, and determining whether criteria are met, induction includes finding things that could fit together, judging their appropriateness, and assembling them to best met criteria.

Like the original one, the cognitive domain of revised taxonomy consists of six categories hierarchically designed from simple to more complex. *Remember* is less complex than *understand, understand* is less complex than *apply, apply* is less complex than *analyze, analyze* is less complex than *evaluate,* and *evaluate* is less complex than create (Amer, 2006). However, in revised taxonomy the hierarchical principle of the original taxonomy is removed. For example, *understand* isn't prerequisite for *apply* anymore. Consequently, critiques about being hierarchical of original taxonomy is removed (Bekdemir & Selim, 2008).

In revised two-dimensional taxonomy has led to form two-dimensional taxonomy table. Knowledge dimension forms the vertical axis while the cognitive process dimension forms the horizontal axis.

The intersections of the knowledge dimension and cognitive process dimension form the cells. Finally, each objective can be classified in one cell or more than one cell. Columns are used to represent the verbs in the objective and rows are used to represent the nouns in the objective (Amer, 2006; Anderson, 2005; Krathwohl, 2009).

Besides showing what was included, the taxonomy table also shows what might have been included. The extensive perspective presented by the taxonomy table let teachers and students see blanks and reflect their opinions about lost educational opportunities. Moreover, taxonomy table can be used for both evaluating how well students master the objectives and classifying learning and instructional activities used to achieve the objectives (Krathwohl, 2009). In addition, taxonomy table can be used to serve four different purposes (Amer, 2006).

As explained above, Bloom's original cognitive taxonomy was revised and modified in order to remove critiques and adapt it for today's world. Whether the revised taxomy has been accepted or not and how well it has been used on the international stage are ambigious. In such a case, defining Department of Curriculum and Instruction academic staff's opinions is a great need. The aim of this study is to define academic staff's opinions about Bloom's Revised Cognitive Taxonomy working in the Department of Curriculum and Instruction.

Method

The method of the research is cross sectional method of survey. Cross-sectional researches aims at collecting data in order to determine some specific characters of a group (Büyüköztürk, Çakmak, Akgün, Karadeniz, & Demirel, 2009).

Research Group

The universe of research consisted of academic staff of Department of Curriculum and Instruction. The research was carried out with academic staff from various countries. Academic staff studying at this field were reached in via an electronic form. The number of academic staff reached via the electronic form was 420. After being examined the websites of randomly chosen 35 universities, e-mail addresses of academic staff were obtained and the scale developed by the researcher was sent to these academic staff in August and September 2010. However, 174 academic staff from 28 countries were willing to

participate in the study, hence the sample of the research consisted of 174 units. In the study, easily accessible sampling method was used. As the sample was formed with the willing academic staff, it represented the universe to a limited extent. No feedback was posted from Denmark, Germany, New Zeland, Norway, Spain, Brasil, and India. 28 countries consisting the research group were categorized as countries of Europe, Africa, America, and Asia. Five groups including Turkey group were formed and statistics were applied to these groups. As only one feedback was posted from Australia, this country was not included in categories.

Data Collection Device

The scale was developed with 26 items thinking that would be in the scale in accordance with studies examined with source scanning concerning with Bloom's Cognitive Domain Taxonomy. Being taken opinions of three experts, two of whose opinions were taken were associate professor and one of whose opinions was taken was a professor in the Department of Curriculum and Instruction, an appropriate items for the scale were chosen and necessary corrections for the necessary items were done in accordance with the opinions. In addition to this, the developed scale was examined by the assessment and evaluation experts and some misdescriptions were corrected according to expert opinions. The preliminary scale was applied to ten academic staff from ten different countries and the final form of the scale consisting of 22 items was developed. The internal consistency reliability coefficient was calculated for the reliability analysis of scale and Cronbach's Alpha was found .84. Furthermore, it wasn't seen any rise in this value after some items were removed. Consequently, it can be said that the scale has internal consistency and high reliability coefficiency.

The developed scale has two parts. The first part consisted of personal information like gender, academic qualification, job seniority, country etc, and the next part consisted of question items determining opinions about criticism on Bloom's original taxonomy and revised taxonomy. A 5 point likert-type items consisting "strongly disagree", "disagree", "agree somewhat", "agree", "strongly agree" has been used in order to determine academic staff's opinions about problems on scale items in the Department of Curriculum and Instruction. Finally, a section was placed for the participants who wanted to write further about original and revised taxonomies.

Data Analysis

Collected data were analyzed with SPSS software. A 5 point likert-type scale being an assessment scale from 1 to 5 was divided 5 equal sections and point intervals for each section were determined.

Frequency distribution (f) and percentage distribution of scale items were summarized in terms of academic staff's opinions. As countries were variables consisting three or more subcategories One Way Variant Analysis (ANOVA) was used to decide if there was any meaningful discrepancy. In addition, Tukey's multiple comparison test was used in order to decide in which groups there were meaningful discrepancies according to ANOVA results. While analyzing the data $p<.05$ level of significance was selected. The results were illustrated in tables.

Answers on the "write further" section at the end of the questionnaire were transferred to computer media. Similar opinions were gathered, made-up the best descriptions of the opinions, and finally opinion differences were noted.

Results and Discussion

Several weaknesses and practical limitations revealed by the critics on the original taxonomy has been tried to be overcome with the Revised Taxonomy. In the revised taxonomy, it is moved from one dimension to two dimension. In addition, it is separated as Knowledge Dimension and Cognitive Dimension. These categories and their subcategories have been revised and rearranged. It is regarded as knowledge categories in the Knowledge Dimension. These are Factual, Conceptual, Procedural and Metacognitive Knowledge. On the other hand, it is investigated how to use information in the Cognitive Dimension and its categories are Remember, Understand, Apply, Analyze, Evaluate, and Create.

Participants' opinions about Bloom's taxonomy which were arranged in order of increasing complexity on one-dimensional table is seen as an important defect. According to Amer (2006) in the application of the Original Bloom's taxonomy several weaknesses and practical limitations have been revealed and the assumption that cognitive processes are ordered on a single dimension from simple to complex behaviour is an important weakness.

That taxonomy is hierarchical in that categories are presumed not to overlap was not acknowledged by the participants and Bloom's taxonomy was not

thought fit in each field. On the other hand, that the revised taxonomy is not hierarchical is accepted as a right approach. One of the criticisms in the literature about progressive classification is hierarchical classification in that mastery of each "lower" category was a prerequisite for achieving mastery of the next "higher" category. However, in some fields before mastering behaviours belonging to a level, other behaviours belonging to a higher level can be seen. Further, according to some experts the hierarchical classificiation is not regarded proper for each subject field (Senemoğlu, 2007).

As curriculum and instruction was mostly influenced by behaviouralism at the term original taxonomy was published, that taxonomy was needed renewing according to current student-centred learning approaches was found out in the research. It is seen curriculum and instruction was mostly influenced by behaviouralism at the term original taxonomy was published. However, today's world is in more different position than reflection of taxonomy in 1956. Constructivism and student-centred education have come into prominence, and learning has been accepted as a period when learners actively construct or build new ideas or concepts based upon current and past knowledge or experience. Moreover, learners are responsible for their own learning. Today it has been discussed that taxonomy should be revised and all of the student-centred approaches should be gathered under the same category (Amer, 2006).

That nouns and verbs were separated into six major categories were changed from noun to verb forms and taxonomy took two-dimensional form (Knowledge and Cognitive Process Dimension) Thus, the revised taxonomy was seen a correct approach. In addition, that knowledge dimension formed with four categories (factual, conceptual, procedural and metacognitive knowledge) let the revised taxonomy be useful for all subject fields, all grades, and all school forms according to the research. Bekdemir and Selim (2008) stated with the final change the critique "classification is not regarded proper for each subject field" was removed

Participants agreed with the decision that subcategories were renamed as "cognitive processes" in the revised taxonomy, and noun category forms of original taxonomy were changed to verb forms. Moreover, that knowledge, comprehension, and synthesis were renamed and the order of two upper categories was interchanged. The revised taxonomy was favorably accepted by the participants in the research. Amer (2006) emphasized that evaluation

level is not more complex than synthesis and synthesis level contains evaluation level.

That taxonomy table shows the place of objectives in the content and provides to see what to be was positively perceived. Bekdemir and Selim (2008) classified functions of algebra learning field in mathematics curriculum (for 6-7-8th grades) according to revised taxonomy. Pertaining to the algebra learning field of Primary School Mathematics Curriculum, it was aimed to develop mathematical concepts and processes in the knowledge dimension and understand and apply thinking skills were predominantly in the cognitive process dimension, higher order of skills like analyze and evaluate were ignored in the research. Therefore, it can be said that the taxonomy not only let teachers see the objectives in the content but also provides a perspective about what should be.

Although participants from the other countries agreed with the idea that the revised taxonomy would find a place in application on the international stage and participants from countries of America somehow agreed. The most agreement on the idea was in Turkiye. Participants stated that revised taxonomy was somehow known by the other curriculum and instruction experts in their countries and the highest percentage belonged to European countries. Participants from Africa did not agree with the revised taxonomy. It was accepted by the other curriculum and instruction experts in their countries, on the other hand participants from other countries were somehow agreed with it. Furthermore, some participants added that Bloom's taxonomy was not immensely used, instead of Bloom's taxonomy, other taxonomies like SOLO and Detmer were used in their countries.

The changes made about revised taxonomy were considered acceptable in this research. Bümen (2007) stated the advantages of revised taxonomy in his research. When Näsström (2009) investigated whether revised taxonomy was useful in evaluating the functions of mathematics, finally it was regarded useful in his research in Sweden. However, he stated that new researches should be carried out in order to see whether the revised taxonomy is useful in other fields.

Noble (2004) integrated revised taxonomy with Multiple Intelligence. In his research he planned science unit on natural disasters according to integration of revised taxonomy and multiple intelligence and it applied to six teachers. At the end of the application, the developed matrix was found to be successful. Ayvacı and Türkdoğan (2010) got at

the truth that 55 % questions used in Science and Techonology lesson were mostly on remembering category in which they aimed to evaluate exam questions according to the revised taxonomy.

Consequently, it is seen that Revised Bloom Taxonomy has been perceived on the international stage. The least acceptance rate is seen in Africa. The revision has been positively perceived by the academic staff of Department of the Curriculum and Instruction, and its applicability in the field gained recognition. Nonetheless, it is understood that in addition to Bloom's taxonomy other taxonomies like SOLO and Detmer should be used and also it is ascertained that these taxonomies are known even better than Bloom's taxonomy in some countries. Even though Bloom Taxonomy is widely used, other taxonomies like SOLO, Fink, Detmer are not immensely known, used, or conducted researches in Turkiye. Researches on not only the revised taxonomy but also other taxonomies will contribute to the progress of the field.

References/Kaynakça

Amer, A. (2006). Reflections on Bloom's revised taxonumy. *Electronic Journal of Research in Educational Psychology*, 4/8, 213-230.

Anderson, L. W. (1999). *Rethinking Bloom's taxonomy: Implications for testing and assessment* (ERIC Document Reproduction Service No. ED435630, TM 030 228).

Anderson, L. W. (2005). Objectives, evaluation, and the improvement of education. *Studies in Educational Evaluation*, *32*, 102-113.

Ayvacı, Ş. A. ve Türkdoğan, A. (2010).Yeniden yapılandırılan Bloom taksonomisine göre fen ve teknoloji dersi yazılı sorularının incelenmesi. *Türk Fen Eğitimi Dergisi*, *7* (1), 13-25.

Bekdemir, M. ve Selim, Y. (2008). Revize edilmiş Bloom taksonomisi ve cebir öğrenme alanı örneğinde uygulaması. *Erzincan Eğitim Fakültesi Dergisi*, *10* (2), 185-196.

Bloom, B. S. (1956). Taxonomy of educational objectives, the classification of educational goals, handbook I: Cognitive Domain. New York: David McKay Company.

Bümen, N. T. (2007). Effects of the original versus revised Bloom's taxonomy on lesson planning skills: a Turkish study among pre-service teachers. *International Review of Education*, *53*, 439–455.

Büyüköztürk, Ş., Çakmak, E. K., Akgün, Ö. E., Karadeniz, Ş. ve Demirel, F. (2009). *Bilimsel araştırma yöntemleri*. Ankara: Pegem Yayıncılık.

Demirel, Ö. (2003). *Kuramdan uygulamaya eğitimde program geliştirme*. Ankara: PegemA Yayıncılık.

Erden, A. M. (1995). *Eğitimde program değerlendirme*. Ankara: Pegem Yayıncılık.

Ertürk, S. (1997). *Eğitimde program geliştirme*. Ankara: METEKSAN.

Forehand, M. (2005). Bloom's taxonomy: Orginal and revised. In *Emerging Persceptives on Learning, Teaching, and Technology (e-Book)*. Retrieved 29 March, 2010 from http://eit.tamu.edu/JJ/DE/BloomsTaxonomy.pdf

Hanna, W. (2007). The new Bloom's taxonomy: Implications for music education. *Arts Education Policy Review*, *108* (4), 7-16.

Kısakürek, M. A. (1983). Eğitim programlarının hazırlanması ve geliştirilmesi. *Ankara Üniversitesi Eğitim Bilimleri Fakültesi Dergisi*, *16* (1), 217-244.

Krathwohl, D. R. (2009). Bloom taksonomisinin revizyonu: Genel bir bakış (çev. D. Köğce, M. Aydın ve C. Yıldız). *İlköğretim Online*, *8* (3), 1-7.

Küçükahmet, L. (2005). *Öğretimde planlama ve değerlendirme*. Ankara: Nobel Yayın Dağıtım.

Näsström, G. (2009). Interpretation of standards with Bloom's revised taxonomy: A comparison of teachers and assessment experts. Gunilla *International Journal of Research & Method in Education*, *32* (1), 39-51.

Noble, T. (2004). Integrating the revised Bloom's taxonomy with multiple ıntelligences: A planning tool for curriculum differentiation. *Teachers College Record*, *106* (1), 193-211.

Oliva P. F. (1988). *Developing the curriculum*. Boston: Scott, Foresman and Company.

O'Neill, G., & Murphy, F. (2010) Guide to taxonomies of learning. *UCD Teaching and Learning/Resources*, Retrieved January 01, 2010 from http://www.ucd.ie/t4cms/ucdtla0034.pdf.

Sönmez, V. (2007). *Program geliştirmede öğretmen el kitabı*. Ankara: Anı Yayıncılık.

Senemoğlu, N. (2007). *Gelişim öğrenme ve öğretim, kuramdan uygulamaya*. Ankara: Gönül Yayıncılık.

Şeker, H. (2010). Bloom'un taksonomisinden, bilişsel süreç boyutlarının sınıflandırmasına doğru revize edilen taksonomi üzerine. *Çukurova Üniversitesi Eğitim Fakültesi Dergisi*, *3* (39), 01-09.

Varış, F. (1996). *Eğitimde program geliştirme*. Ankara: Alkım Kitapçılık Yayıncılık.

Wilson, L. O. (2006). *Beyond bloom - A new version of the cognitive taxonomy*. Retrieved 04 April, 2010 from http://www.uwsp.edu/education/lwilson/curric/newtaxonomy.htm

Wulf, K. M., & Schave, B. (1984). *Curriculum design, a handbook for educators*. USA: Foresman and Company.

Yüksel, S. (2007). Bilişsel alanın sınıflamasında (taksonomi) yeni gelişmeler ve sınıflamalar. *Türk Eğitim Bilimleri Dergisi*, *5* (3), 479-509.