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# Investigation of the Science Individualized Education Programs' Learning Outcomes According to the Revised Bloom Taxonomy


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## Abstract

This study aims to determine whether the LO in individualized education programs (IEP) have any learning outcome value, whether they are included in the science education curriculum, and how the LO are distributed according to the RBT knowledge and cognitive process dimension levels. The IEPs from 49 science teachers working in 7 different regions of Turkey, which they prepared at the secondary school levels, were requested, and IEPs were analyzed using the document analysis method. It was concluded from the analysis that 6% of the LO in the IEPs did not have any learning outcome value and that 55% of the 2883 LO that had a learning outcome value consisted of those included in the science education curriculum. It was determined that the LO in the IEPs were at the level of conceptual at the most and at the level of meta-cognitive at the least from the knowledge dimension levels of RBT additionally, they were at the understanding at the most and at the creating and evaluating at the least from cognitive process dimension levels of RBT.


***Keywords:*** Individualized education program, learning outcomes, revised Bloom taxonomy, science course.

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# Bireyselleştirilmiş Fen Bilimleri Eğitim Programları Öğrenme Çıktılarının Yenilenmiş Bloom Taksonomisine Göre İncelenmesi


| Makale Türü | Başvuru Tarihi | Kabul Tarihi |
|---|---|---|
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## Öz

Bu çalışmanın amacı, bireyselleştirilmiş eğitim programlarındaki (BEP) kazanımların herhangi bir kazanım değerine sahip olup olmadığını, fen bilgisi öğretim programında yer alıp almadığını ve yenilenmiş Bloom taksonomisinin (RBT) bilgi ve bilişsel süreç boyutlarına göre nasıl dağıldığını belirlemektir. Türkiye'nin 7 farklı bölgesinde görev yapan 49 fen bilgisi öğretmeninden ortaokul düzeyinde hazırladıkları BEP'ler istenmiş ve BEP'ler doküman analizi yöntemi kullanılarak analiz edilmiştir. Yapılan analizler sonucunda BEP'lerdeki kazanımların %6'sının herhangi bir kazanım değerine sahip olmadığı, kazanım değeri olan 2883 kazanımın %55'inin fen bilimleri öğretim programında yer alan kazanımlardan oluştuğu sonucuna varılmıştır. BEP'lerdeki kazanımların RBT'nin bilgi boyutu düzeylerinden en fazla kavramsal bilgi, en az ise üstbilişsel bilgi olduğu, ayrıca bilişsel süreç boyutunda en fazla anlama en az yaratma ve değerlendirme düzeyinde olduğu belirlenmiştir.

***Anahtar Sözcükler:*** Bireyselleştirilmiş eğitim programı, kazanım, yenilenmiş Bloom taksonomisi, fen bilimleri dersi.

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## Introduction

While special education aims to minimize the learning deficits between students with disabilities and their typical peers, it also aims to maximize the knowledge and talents of gifted students (Yell, 1998). Carrying out the special education in the least restrictive environment, instead of keeping students with special needs apart from those with typical development, enables these students to interact better with their peers and helps to integrate them into society (Stubbs, 2008).

Special education is carried out in special education schools and regular schools in Turkey. Such education carried out in regular schools is included within the scope of inclusive education (Tomlinson, 2017). Inclusive education, one of the special education practices, is being shaped according to the requirements of students with special needs. In order for the students included within the scope of inclusive education to learn more effectively and to participate actively in the education, an individualized education program (IEP) should be prepared by taking into account the insufficiencies or sufficiencies of the students (Christle & Yell, 2010). Because the preparation of IEPs for students with special needs and the implementation of these IEPs appear as one of the basic principles of special education (Tekin Ersan & Ata, 2018). Additionally, IEP provides opportunities for students with disabilities to continue their educational activities (Jung, Gomez, Baird, & Keramidas, 2008). Therefore, the current educational performance of the students, short term instructional objectives, annual measurable goals, student assessment methods, and additional services should be established at first for the students who will be included in the IEP (Strickland & Turnbull, 1990). Among these elements, short-term instructional objectives are LO (LO), and education for individuals with special needs is provided by taking these LO into account (Kargın, 2007).

The LO in the IEPs is very important in terms of addressing the needs of the students and achieving (as life skills) the targeted goals. The performance level of individuals indicates which of the LO in the curriculum can be achieved (Anderson & Krathwohl, 2001; MoNE, 2008). Therefore, the LO within the IEP should be prepared considering the individual's development level and insufficiencies (Bhroin, King, & Prunty, 2016).

The teaching process for the courses in Turkey is carried out in line with the LO in the curricula (Zorluoğlu, Kızılaslan, & Sözbilir, 2016). LO is a series of processes that indicate what students will learn and guide the teaching process (Arslan & Eker, 2018). In order to improve this process in terms of quality, it is necessary to evaluate the LO and use taxonomies in the evaluation process (Çerçi, 2018). This is because when taxonomies are used, it ensures that students gain knowledge at the targeted level (Anderson & Krathwohl, 2001). The revised Bloom's taxonomy (RBT) is frequently used in the implementation of science education curricula and in the evaluation of the processes and the results (Arı & İnci, 2015). RBT has knowledge dimensions and cognitive process dimensions. The knowledge dimension provides information about what teachers will teach students. The knowledge dimension consists of factual knowledge, conceptual knowledge, procedural knowledge, and metacognitive knowledge. The cognitive process dimension supports the active participation of the student and increases the transfer of learned knowledge. The cognitive process dimension consists of remembering, understanding, applying, analyzing, evaluating, and creating. Detailed information about RBT can be found in Anderson and Krathwohl (2010). RBT is extremely essential in terms of determining the knowledge and cognitive process dimension of the LO, how they are distributed, and directing the curriculum development studies regarding the results (Zorluoğlu, Şahintürk, & Bağrıyanık, 2017).

When the studies on taxonomy carried out on the basis of the science curriculum between 2010-2021 are examined, it is seen that the studies on RBT are in the majority. When the content of the studies in which the concepts of RBT and science are together are examined, it is observed that studies related to the analysis of the LO of the science education curriculum (Sağlamöz & Soysal, 2021; Zorluoğlu et al., 2017); analysis of exam questions in science courses (Ataş & Güneş, 2020; Gökulu, 2015); analysis of common exam questions (Akyürek, 2019; Kala & Çakır, 2016; Karaer, 2020); comparison of the original Bloom taxonomy and the RBT (Darwazeh & Branch, 2015; Forehand, 2010; Tutkun, Demirtaş, Erdoğan, & Aslan, 2010) were the ones that have been generally carried out. When the studies on IEP are examined, it is observed that there are studies including subjects such as

the opinions of teachers about IEP (Ateş, 2017; Evyapan, 2020; Yılmaz & Batu, 2016); opinions on the preparation/implementation of IEP (Burunsuz & İnce, 2020; Hedeen, Peter, Moses, & Engiles, 2013; Tekin Ersan & Ata, 2018); examination and evaluation of IEPs (Goodwin et al. 2020; İlik, 2017; Spiel, Evans, & Langberg, 2014); Difficulties experienced in the preparation process of IEPs (Özan & Sarıca, 2021; Söğüt & Deniz 2018).

When these studies were examined as a whole, it was known that the curricula were being analyzed with taxonomies. However, studies have not been found in the literature in which the concepts of RBT and IEP are used together. This study aims to determine whether the LO in IEPs have any learning outcome value, whether they are included in the science education curriculum, and how the LO are distributed according to the RBT knowledge and cognitive process dimension levels. In accordance with this aim, it is believed that the taxonomic analysis of the LO in the IEPs prepared for inclusive students will provide a more effective science education to the inclusive students and will reveal the current situation regarding the LO within the IEP. In addition, this study is important in terms of 'analysis of IEPs according to RBT reveals what type of knowledge and cognitive process the achievements contribute to; provides solid data for those who will analyze IEP from now on; and ensures that science teachers can teach and evaluate more effectively.'

In this study, "How do the LO in science individualized education programs show a trend compared to RBT?" problem and answers were sought to the following sub-problems.

1. What is the status of whether the LO has any learning outcome value?

2. What are whether the learning outcomes are included in the curriculum or not?

3. What is the distribution of the LO in Turkey and the regions according to the knowledge dimension of RBT?

4. What is the distribution of the LO in Turkey and the regions according to the cognitive process dimension of RBT?

5. What is the knowledge dimension distribution of the LO according to the grade levels in Turkey?

6. What is the cognitive process dimension distribution of the LO according to the grade levels in Turkey?

## Method

### Research Design

In this study, the document analysis method was used. Document analysis can be used as a complement to any qualitative research method or as an independent method (Bowen, 2009). Document analysis is a method that is based on an in-depth examination of written documents containing facts, events, and information related to the research topic and interpretation of the results (Bowen, 2009; Corbin & Strauss, 2008). In the study, the IEPs prepared by science teachers with inclusive students were carried out using the document analysis method, since they were considered documents.

### Data Collection

The study group was determined by the purposeful sampling method. Purposeful sampling is the selection of a certain type and number of cases that will serve the purpose of the study and provide rich information to illuminate the research problems (Patton, 2018). Teachers working in every region of Turkey were preferred to ensure the generalizability of the study results (Popper, 2005). Science teachers who prepare IEPs and are inclusive students were included in the study in Turkey. In the study, a total of 2883 LO in IEPs ($5^{th}$, $6^{th}$, $7^{th}$, and $8^{th}$ grades) prepared by 49 science teachers in 7 different regions of Turkey were analyzed.

**Data Analysis**

The analysis of the LO in the IEPs according to the RBT and whether they have any learning outcome value or not were determined based on the consensus of the researchers. In cases where there was no consensus or the differences of opinion continued, the knowledge and cognitive process dimension of these LO was decided according to the majority of opinions. While calculating the reliability coefficient of the study, 10% of the analyzed LO (288 LO) were randomly selected by the researchers due to the large number of LO in IEPs. The selected LOs were submitted to the opinion of and analyzed by an expert experienced in the RBT. Upon comparing the analysis made by the expert with the analysis made by the researchers, similarities and differences were determined, and the reliability co-efficient (Miles and Huberman, 1994) of the analysis was .87. In addition, the researchers determined how much of the LO in the IEPs were included in the Science Education Curriculum (MoNE, 2018) and how many were written originally by the teachers. The noun expression of the LO was identified by the researchers in order to determine the knowledge dimension of the LO in IEPs, and verb expressions were identified to determine the cognitive process dimensions thereof, and then the RBT level of the LO was determined (Anderson & Krathwohl, 2001).

The noun expressions of the learning outcomes were identified by the researchers in order to determine the knowledge dimension of the learning outcomes in IEPs, and verb expressions were identified to determine the cognitive process dimensions thereof and then the RBT level of the learning outcomes was determined (Anderson & Krathwohl, 2001). Examples of how the learning outcomes in the IEPs examined in the study are analyzed according to the RBT and how their place in the taxonomy is determined are presented below. Additionally, an example of a learning outcome that is included in the IEPs but does not have the characteristics of an outcome, an example of an original learning outcome, and an example of an outcome taken from the science education curriculum are presented below.

Since the name expression of the learning outcome of "Explain the effect of friction force on kinetic energy with examples," which is "the effect of frictional force on kinetic energy," is a knowledge that is explained by mutual relations between basic concepts, it is at the conceptual knowledge level among the knowledge dimension levels, and the verb phrase "explain with examples" is at the understanding level among the cognitive process dimension levels, since the concepts are asked to be explained with examples. Since the verb expression of the sentence "The concepts of gene, phenotype, genotype, pure progeny and hybrid progeny are mentioned" does not indicate the knowledge, skills, and attitudes that the student will acquire, it does not have any learning outcome value. This outcome is not within cognitive process dimension levels and, therefore, was not included in the study. While the learning outcome "F.8.1.1.1. Make predictions about the formation of the seasons" is included in the science education curriculum, "Tell that there are four seasons in a year" learning outcome is not included in the science curriculum and was originally written by the teacher.

**Ethical Procedures**

Ethical committee consent for current research was obtained from the Ethics Committee of Süleyman Demirel University (Num: 108/25; Date: 28/06/2021).

## Results

It was presented with figures on whether the LOs in IEPs have any learning outcome value, whether they were included in the science education curriculum, and how the LOs in Turkey and within the regions were distributed according to the RBT knowledge and cognitive process dimension levels and the grade levels across Turkey.

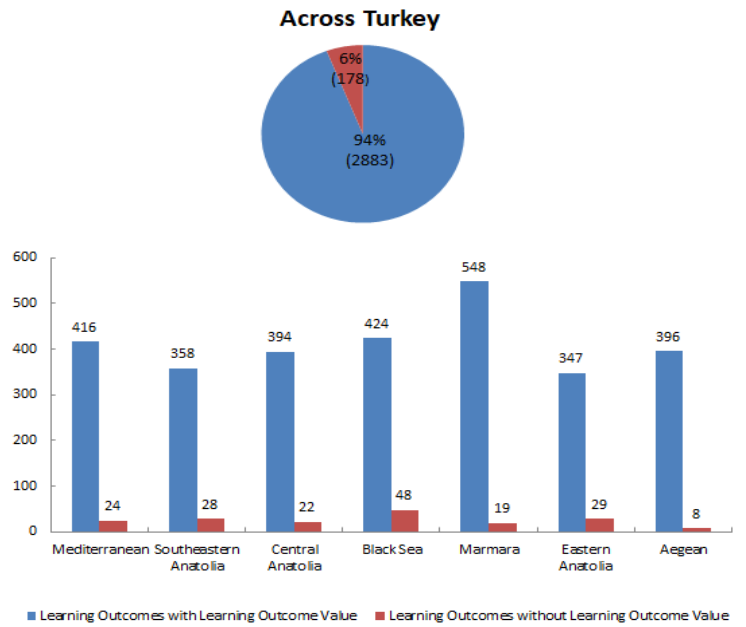


**Figure 1.** *Whether the LO has any learning outcome value*

In Figure 1, after examining a total of 3061 LO, it was determined that 94% of the LO (2883 LO) had a learning outcome value, while 6% (178 LO) did not have any learning outcome value. 24 LO in the Mediterranean Region; 28 LO in the Southeastern Anatolia Region (AR); 22 LO in the Central Aegean Region; 48 LO in the Black Sea Region; 19 LO in the Marmara Region; 29 LO in the Eastern Aegean Region and 8 LO in the Aegean Region have not been included in the analysis as they do not have any learning outcome value.

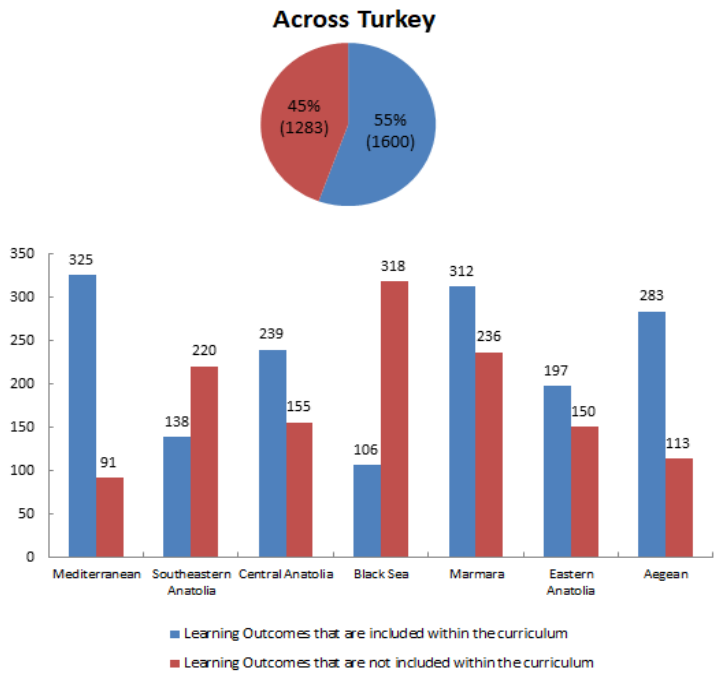


**Figure 2.** *Whether the LO is included in the curriculum or not*

In Figure 2, upon examining whether or not 2883 LO with learning outcome value are included in the science education curriculum (MoNe, 2018), it was determined that 45% of the LO (1283 outcomes) were not included in the curriculum and 55% (1600 outcomes) were included in the curriculum. When the LO were analyzed in terms of regions, it was seen that 91 LO were not included in the science education curriculum in the Mediterranean Region, 220 in the Southeastern Aegean Region, 155 in the Central Aegean Region; 318 in the Black Sea Region; 236 in the Marmara Region; 150 in the Eastern Aegean Region; and 113 in the Aegean Region.

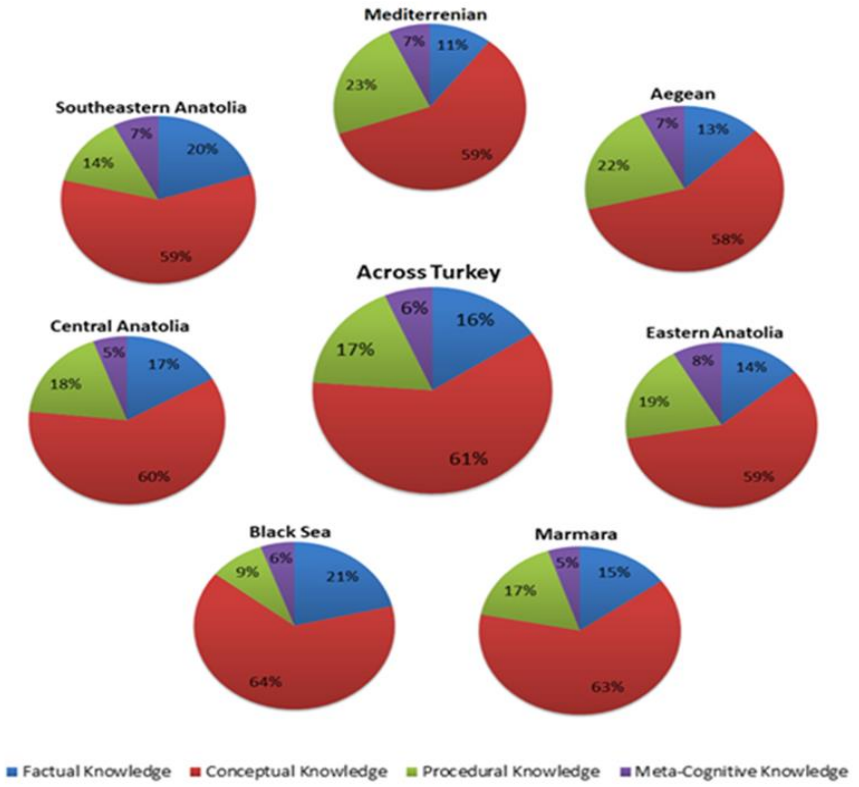


**Figure 3.** *Distribution of LO in Turkey and the regions by knowledge dimension*

In Figure 3, 16% of the LO across Turkey is factual knowledge, 61% is conceptual knowledge, 17% is procedural knowledge, and 6% is meta-cognitive knowledge. When the LO are analyzed regionally; it is shown that 11% of the Mediterranean Region's LO are the factual, 59% of them are the conceptual, 23% of them are the procedural and 7% of them are the meta-cognitive; 20% of the LO in the Southeastern Aegean Region are the factual, 59% of them are the conceptual, 14% of them are the procedural and 7% of them are the meta-cognitive; 17% of the LO in the Central Aegean Region are the factual, 60% of them are the conceptual, 18% of them are the procedural and 5% of them are the meta-cognitive; 21% of the LO in the Black Sea Region are the factual, 64% of them are the conceptual, 9% of them are the procedural and 6% of them are the meta-cognitive; 15% of the LO in the Marmara Region are the factual, 63% of them are the conceptual, 17% of them are the procedural and 5% of them are the meta-cognitive; 14% of the LO in the Eastern Aegean Region are the factual, 59% of them are the conceptual, 19% of them are the procedural and 8% of them are the meta-cognitive; 13% of the LO in the Aegean Region were the factual, 58% of them are the conceptual, 22% of them are the procedural and 7% of them are meta-cognitive knowledge level.

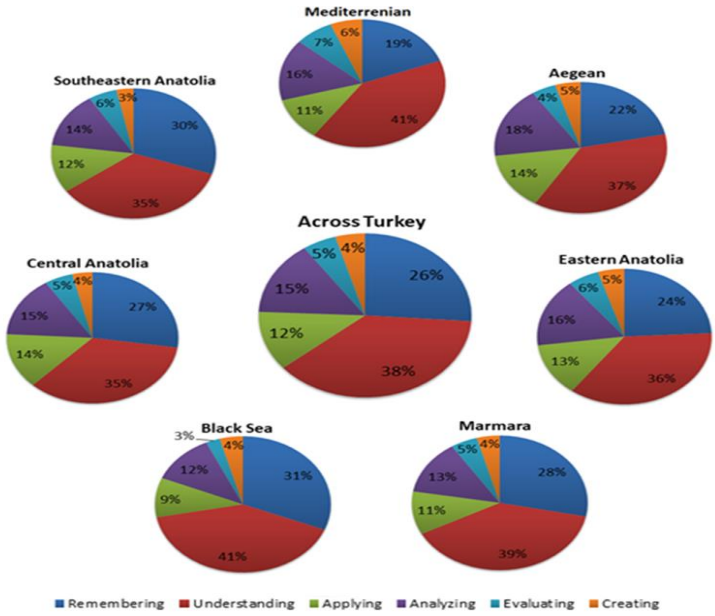


**Figure 4.** *Distribution of LO in Turkey and the regions by cognitive process dimension*

In Figure 4, 26% of the LO across Turkey are the remembering, 38%, are the understanding, 12% are the applying, 15% are the analyzing, 5% are the evaluating and 4% are the creating. When the LO are analyzed regionally; it is shown that 19% of Mediterranean Region's LO are the remembering, 41% of them are the understanding, 11% of them are the applying, 16% of them are the analyzing, 7% of them are the evaluating and 6% of them are the creating; %30 of the LO in the Southeastern AR are at the remembering, 35% of them are the understanding, 12% of them are the applying, 14% of them are the analyzing, 6% of them are the evaluating and 3% of them are the creating; 27% of the LO in the Central AR are the remembering, 35% of them are the understanding, 14% of them are the applying, 15% of them are the analyzing, 5% of them are the evaluating and 4% of them are the creating; 31% of the LO in the Black Sea Region are the remembering, 41% of them are the understanding, 9% of them are the applying, 12% of them are the analyzing, 3% of them are the evaluating and 4% of them are the creating; 28% of the LO in the Marmara Region are the remembering, 39% of them are the understanding, 11% are the applying, 13% are the analyzing, 5% of them are the evaluating and 4% are the creating; 24% of the LO in the Eastern AR are the remembering, 36% of them are the understanding, 13% are the applying, 16% are the analyzing, 6% of them are the evaluating and 5% of them are the creating; and 22% of the LO in the Aegean Region are the remembering, 37% of them are the understanding, 14% are the applying, 18% are the analyzing, 4% are the evaluating and 5% of them are the creating.

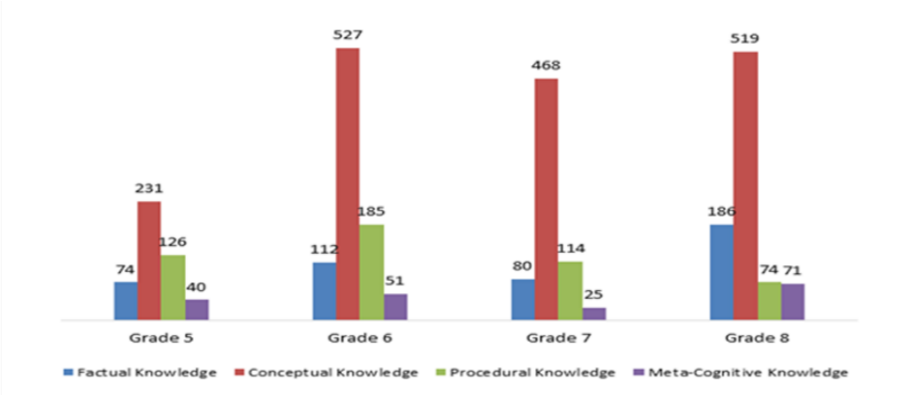


**Figure 5.** *Knowledge Dimension Distribution of LO by Grade Levels in Turkey*

In Figure 5, when we look at the distribution of LO at the the Grade 5 level across Turkey according to knowledge dimension, it is understood that 74 LO are factual knowledge, 231 LO are conceptual, 126 LO are procedural, and 40 LO are the meta-cognitive. When we look at the distribution of LO at the Grade 6 level in Turkey according to knowledge dimension, it is shown that 112 LO are the factual, 527 LO are the conceptual, 185 LO are the procedural, and 51 LO are the meta-cognitive, when we look at the distribution of LO at Grade 7 level in Turkey according to knowledge dimension, it is shown that 80 LO are the factual, 468 LO are the conceptual, 114 LO are the procedural, and 25 LO are the meta-cognitive; when we look at the distribution of LO at Grade 8 level in Turkey according to knowledge dimension, it is understood that 186 LO are the factual, 519 LO are the conceptual, 74 LO are procedural, and 71 LO are the meta-cognitive.

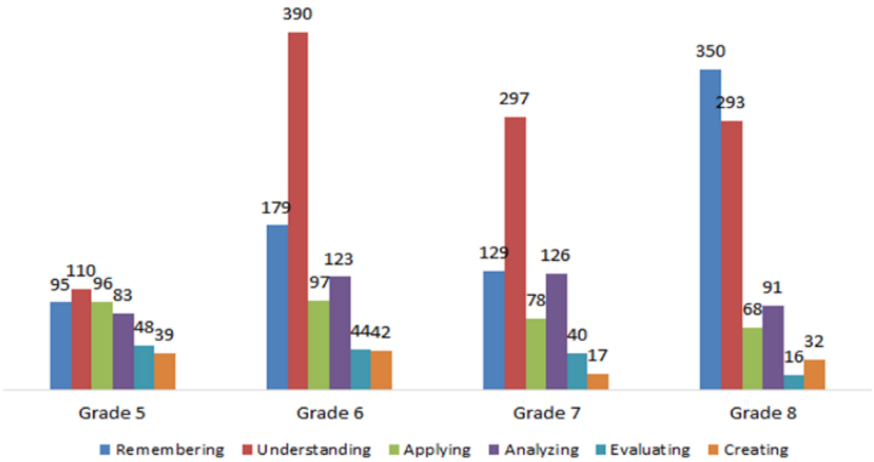


**Figure 6.** *Cognitive Process Dimension Distribution of LO by Grade Levels in Turkey*

In Figure 6, when we look at the distribution of LO at Grade 5 level across Turkey according to cognitive process dimension, it is understood that 95 LO are the remembering, 110 LO are the understanding, 96 LO are the applying, 83 LO are the analyzing, 48 LO are the evaluating, and 39 LO are the creating; when we look at the distribution of LO at Grade 6 level across Turkey according to cognitive process dimension, it is shown that 179 LO are the remembering, 390 LO are the understanding, 97 LO are the applying, 123 LO are the analyzing, 44 LO are the evaluating, and 42 LO are the creating; when we look at the distribution of LO at Grade 7 level across Turkey according to cognitive process dimension, it is shown that 129 LO are the remembering, 297 LO are the understanding, 78 LO are the applying, 126 LO are the analyzing, 40 LO are the evaluating, and 17 LO are the creating; when we look at the distribution of LO at Grade 8 level across Turkey according to cognitive process dimension, it is shown that 350 LO are the remembering, 293 LO are the understanding, 68 LO are the applying, 91 LO are the analyzing, 16 LO are the evaluating, and 32 LO are the creating.

## Discussion, Conclusion and Recommendations

In this study, 'the LO in IEPs have any learning outcome value, whether they are included in the science education curriculum, levels of RBT in which the LO across Turkey and the regions are included, and the distribution of knowledge and cognitive process dimensions according to grade levels throughout Turkey' were observed.

When it was examined whether LO in the IEPs had any learning outcome value or not, it was determined that 6% of them did not have any learning outcome value. Certain criteria have been taken into account while determining whether the LO has any learning outcome value or not. In his study, Saracaloğlu (2015) stated how the LO should be prepared and the characteristics that these LOs should have in order for them to be expressed as LOs. Considering the characteristics that must be

presented in the LO, the ones in the IEPs with no learning outcome value were not included in the analysis. Since it was known that teachers have a lack of knowledge about preparing IEPs (Burunsuz & İnce, 2020; Christle & Yell, 2010; İdin, 2016; Kosko & Wilkins, 2009; Pektaş, 2008; Şahin, 2017; Tekin Ersan & Ata, 2018; Yell & Drasgow, 2005); it was believed that 6% of them were caused by teachers' lack of knowledge about writing LO.

This study determined that the LO in IEPs mostly consisted of the LO included within the science education curriculum, and the teachers gave less place to the LO that they prepare themselves. Similarly, Burunsuz and İnce (2020) concluded that teachers tend to use ready-made LO without taking into account students' needs. However, the LO included in the science curriculum is prepared according to students with normal development (Mete, Çarpraz, & Yıldırım, 2017). For students with special needs, IEPs should be prepared, taking into account their developmental characteristics, educational needs, and performance in line with the curriculum (MoNE, 2000). Therefore, since science education cannot be carried out for students with special needs by adhering to the curriculum, it is necessary to revise and edit the LO in the science education curriculum or to write new LO in line with the curriculum (Cawley, Hayden, Cade, & Kroczynski, 2002). The fact that the majority of the LO in the examined IEPs consist of the LO included within the science education curriculum indicates that the LO was used as they are in the curriculum without any revision or change. Considering the learning deficits of the students, the LO should not be exactly the same as those within the science education curriculum, and the teachers should create original LO themselves. Therefore, it leads to the conclusion that the LO in the examined IEPs are prepared without considering the levels of the students. Upon examining the RBT analysis results of the LO in the IEPs, which are studied focusing across Turkey and on regions, it was observed that the LO were at the conceptual knowledge level at the most and at the meta-cognitive knowledge level at the least from knowledge dimension levels of RBT. The general distribution of the study according to knowledge dimension levels is similar to the studies in the literature (Ayyıldız, Aydın, & Nakiboğlu, 2019; Yaşar & Sadi Yılmaz, 2020; Zorluoğlu, Güven & Korkmaz, 2017). Furthermore, it was observed that the LOs were at the understanding level the most and at the creating and evaluating level at the least from the cognitive process dimension levels of RBT. The general distribution of the study according to cognitive process dimension levels is similar to the studies in the literature (Sağlamöz & Soysal, 2021; Yaşar & Sadi Yılmaz, 2020; Zorluoğlu et al., 2017). Sağlamöz and Soysal (2021) found that 22.27% of the total number of LO was for high-level cognitive skills in the 2018 Science Education Curriculum, which were analyzing, evaluating, and creating. In this study, however, it was determined that 24% of the total number of LO were for high-level cognitive skills which are analyzing, evaluating, and creating levels. When the results of the study are compared, it is seen that the rate of LO that requires high-level cognitive skills in IEPs is higher. Considering the learning deficits of students with special needs, it is believed that the cognitive level of the LO in the science education curriculum should be at lower levels, unlike their peers.

When the distribution of LO across Turkey by grade level knowledge dimension was examined, it was observed that LO at the factual knowledge level is most seen in Grade 8 and least in Grade 5, LO at the conceptual knowledge level is most seen in Grade 6 and least in Grade 5, LO at the procedural knowledge level is most seen in Grade 6 and least in Grade 8, and LO at the meta-cognitive knowledge level is most seen in Grade 8 and least in Grade 7. When the cognitive process dimension distributions were examined, it was observed that LO at the remembering level are most seen in Grade 8 and least in Grade 5; LO at the understanding level are most seen in Grade 6 and least in Grade 5; LO at the applying level are most seen in Grade 6 and least in Grade 8; LO at the analyzing level are most seen in Grade 7 and least in Grade 5; LO at the evaluating level are most seen in Grade 5 and least in Grade 8; LO at the creating level are most seen in Grade 6 and least in Grade 7. While the number of LO at the factual, conceptual, and meta-cognitive knowledge levels among knowledge dimension levels tends to increase towards Grade 8, the number of LO at the procedural knowledge level tends to decrease. As for the cognitive process dimension, the number of LO at the remembering, understanding, and analyzing levels tends to increase, and the number of LO at the applying, evaluating, and creating levels tends to decrease. According to Anderson & Krathwohl (2001), in terms of an effective curriculum, the level of knowledge and cognitive process dimension of the LO is expected to increase as the grade level increases. It was determined that the distribution

of the LO across Turkey according to grade levels was not in line with Anderson & Krathwohl's (2001) opinion, and the knowledge and cognitive process dimension levels of the LO did not increase according to the grade level. In addition to the foregoing, the LO should be prepared by taking into consideration the development and grade levels of students with special needs (Pektaş, 2008). Preparing LO that the students can achieve in accordance with their development and grade level will both make IEPs effective and enable these students to acquire low-level and high-level LO according to RBT levels.

It was determined that the LO in IEPs mostly consisted of the LO included within the science education curriculum; the teachers gave less place to the LO that they prepare themselves; LO in the IEPs was determined that 6% of them did not have any learning outcome value. It leads to the conclusion that the LO in the examined IEPs are prepared without considering the levels of the students and teachers who lack knowledge about writing LO. The LO in the IEPs were at the conceptual knowledge and understanding levels at the most. When the study results were compared with science curriculum, it was concluded that the rate of LO that requires high-level cognitive skills in IEPs is higher. The LO's knowledge and cognitive process dimension levels did not increase as the grade level increased. It was concluded that the distribution of the LO of IEPs according to grade levels was not in line with RBT, and the knowledge and cognitive process dimension levels of the LO did not increase as the grade level increased. As a result, it has been determined that the LO in the IEPs have not been prepared by taking into consideration the development and grade levels of the students with special needs and RBT.

The LO in IEPs with no learning outcome value indicate that teachers have deficiencies in creating LO. Pre-service and in-service trainings can be provided to teachers to overcome this deficiency. In addition to the foregoing, the special education course given to teacher candidates during the undergraduate process can be expanded in terms of content, or courses for preparing IEP can be added. Consequently, when the knowledge deficiencies of teacher candidates and teachers are eliminated, students will be able to learn more effectively. While preparing IEPs, teachers should try to create the LO according to the learning deficits of the students and not to use the LO included in the science education curriculum directly. By paying attention to the knowledge and cognitive process dimensions of the LO, the LO that the student can accomplish should be included. In addition to the foregoing, as the grade level increases, students can accomplish LO that requires high-level thinking skills as well. Therefore, it is suggested that as the grade level increases, the RBT knowledge and cognitive process dimensions of the LO should be prepared from higher levels.

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