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Maarif Model Middle School 5th Grade Science Course Curriculum Learning Outcomes and Content Relationship

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ABSTRACT

This study aims to examine the alignment between the learning outcomes in the renewed 5th grade science curriculum, developed within the framework of the 2024 Turkey Century Maarif Model (TYMM), and the content of the corresponding science textbook. The content of the Ministry of National Education (MEB) 5th grade science textbook, implemented in the 2024–2025 academic year, was evaluated for its consistency with the curriculum's learning outcomes. A rubric was developed to assess learning outcome–content alignment. The validity of the rubric was evaluated in terms of content, structure, and criteria, with input from five experts. Analysis confirmed the rubric's validity and reliability. Inter-rater consistency was high, with a Miles and Huberman coefficient of 0.930 and a Weighted Kappa coefficient of 0.746. Two independent experts scored the alignment between the curriculum's learning outcomes and textbook content using the rubric. Results indicated a high level of alignment between the learning outcomes in the Maarif Model 5th grade science curriculum and the textbook content. The study also found changes in the number, order, and naming of themes compared to earlier curricula, along with a reduction in the number of outcomes and a shift from the term "achievement" to "learning outcome." Based on these findings, it is recommended that learning outcomes be explicitly stated at the beginning of each theme, that textbook content be structured accordingly, and that similar alignment studies be conducted in other subject areas to ensure consistency between curriculum goals and educational materials.

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MAARİF MODELİ ORTAOKUL 5. SINIF FEN BİLİMLERİ DERSİ ÖĞRETİM PROGRAMI ÖĞRENME ÇIKTILARI VE İÇERİK İLİŞKİSİ

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ÖZET

MAKALE BİLGİSİ

Bu çalışmanın amacı, 2024 Türkiye Yüzyılı Maarif Modeli (TYMM) çerçevesinde yenilenen ortaokul 5. sınıf fen bilimleri öğretim programındaki öğrenme çıktıları ile ders kitabı içeriği arasındaki uyumu incelemektir. 2024-2025 eğitim-öğretim yılında uygulanmaya konulan MEB ortaokul 5. sınıf fen bilimleri ders kitabındaki içerik ile güncellenen ortaokul fen bilimleri öğretim programındaki 5. sınıf öğrenme çıktıları uyumluluk açısından değerlendirilmiştir. Çalışmanın verilerini toplamak için öğrenme çıktıları içerik uyumu değerlendirme rubriği oluşturulmuştur. Rubriğin geçerliği, içerik, yapı ve ölçüt açılarından değerlendirilmiş, bu süreçte 5 farklı uzmanın görüşleri alınmıştır. Oluşturulan rubriğin analizleri gerçekleştirilmiş olup çalışmada kullanılan rubriğin geçerli ve güvenilir olduğu ortaya konulmuştur. Analizler birbiri ile tutarlılık göstererek; Miles ve Huberman Katsayısı 0.930 olarak, Ağırlıklı Kappa Katsayısı ise 0.746 olarak bulunmuştur. İki bağımsız uzman araştırmacı tarafından, 5. sınıf fen bilimleri öğretim programındaki öğrenme çıktıları ve ders kitabındaki içerik uyumu, araştırmacılar tarafından geliştirilen öğrenme çıktıları içerik uyumu değerlendirme rubriği kullanılarak puanlanmıştır. Elde edilen puan ortalamalarının incelenmesi sonucunda, Maarif Modeli ortaokul 5. sınıf fen bilimleri öğretim programındaki öğrenme çıktıları ile ders kitabı içeriği arasında yüksek düzeyde bir uyum olduğu belirlenmiştir. Bununla birlikte yapılan incelemelerde Maarif Modeli ortaokul 5. sınıf fen bilimleri dersi öğretim programında tema sayısı, sıralaması ve adlandırmalarında önceki programlara göre değişikler yapıldığı, kazanım sayısının azaltıldığı ve “kazanım” yerine “öğrenme çıktıları” ifadesinin kullanıldığı belirlenmiştir. Çalışma kapsamında, öğrenme çıktılarının her temanın başında açıkça belirtilmesi, ders kitabı içeriğinin bu çıktılarla uyumlu şekilde yapılandırılması ve benzer analizlerin diğer dersler için de yapılması önerilmektedir.

Anahtar Kelimeler: program değerlendirme, öğrenme çıktıları, içerik, fen bilimleri öğretim programı, Maarif Modeli

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Introduction

Education is one of the processes that ensure both the personal development of individuals who make up societies and the harmonization of societies with each other. In the education process, curricula constitute the most basic building block of the education system. Curricula present learning objectives, methods and contents to the society as a whole. Curricula are not only a curriculum but also a process that provides students with the necessary knowledge, skills and values (Demirel, 2019). Curricula benefit from different disciplines such as developmental psychology, educational technologies and current pedagogical approaches. In this way, it aims to bring learning into a form that is useful both individually and socially. An effective curriculum is not limited to the transfer of academic knowledge. It also aims to develop the skills required by our age such as creative thinking, critical thinking and problem solving skills (Özmanlar et al., 2009).

In order to develop the skills required by our age, the curricula implemented in our country are organized by addressing the 21st century skills. Curricula in Turkey are also shaped within the framework of a student-oriented approach (MEB, 2024). The science curriculum, which is one of the curricula implemented in our country, enables students to make sense of nature and the environment from a scientific perspective and aims to provide students with basic skills and attitudes for this purpose. In science education, rather than transferring academic knowledge, it is aimed to develop students' scientific process skills and to produce solutions to social and environmental problems by adopting a critical approach (Batdı et al., 2021). In line with the stated goals, the science curriculum is constantly updated in consistency with contemporary scientific developments.

With the 2005 science curriculum, a constructivist approach was adopted and science education progressed in a student-centered manner, in accordance with the activities that students can apply and their daily lives (Bakırıcı & Çepni, 2014). In the 2018 science curriculum, it is seen that the STEM approach has been strengthened unlike the previous programs (Bahar et al., 2018). Updated in 2024, Turkey's Century of Education Model (TYMM) and the Science curriculum aim to provide a contemporary understanding of education from a broader perspective. With the new curriculum, current themes such as sustainability and digital technologies are made basic elements in science education. At the same time, it is also aimed to develop students' thinking skills. The new curriculum supports the use of learning environments enriched with today's technologies. Students who do not have the opportunity to conduct scientific experiments and observations will be able to access learning environments such as augmented reality (AR) and virtual laboratories. Technology-supported learning, enriched digital environments, experiential learning, and accessibility are emphasized in the new STEM curriculum (MEB, 2024).

In the revised 5th grade science curriculum, the term "learning outcomes" was renamed as "learning outcomes" instead of "outcomes" (MEB, 2024). Content is an important factor in achieving the learning outcomes specified in the curriculum (Demirel, 2019). The harmony between learning outcomes and content is necessary for the educational process to achieve the intended goals. For this reason, it is important to make the necessary evaluations about the compatibility of curriculum outcomes and content. When the studies conducted in this field in our country are examined; Kubat (2015) evaluated the content and outcomes of the 5th grade science curriculum with teacher opinions, Ocak and Kalender (2017) evaluated the relationship between the content and outcomes of the fifth and sixth grade science curriculum, Ocak and Kocaman (2018) evaluated the relationship between the content and outcomes in the primary school science curriculum, Yilmaz et al. (2021) evaluated the sixth grade science textbooks in terms of scientific content and outcomes. When the literature was examined, no study on content-learning outcome within the scope of the 2024 science 5th grade curriculum was found. With this study, the compatibility between the learning outcomes of the 2024 TYMM science 5th grade curriculum and the content of the textbook will be examined to fill the gap in the existing literature where there are limited studies on the level of compatibility after the updating of the programs. In addition, this study will contribute to the development of educational practices by providing concrete data to the literature on curriculum and material alignment.

In this study, it was aimed to reveal the alignment between the learning outcomes of the 2024 TYMM 5th grade science curriculum and the content of the textbook. In line with this purpose, answers to the following questions were sought:

- 1-How is the alignment between the learning outcomes in the 2024 TYMM middle school 5th grade science curriculum and the content of the textbook?
- 2-How are the descriptive analysis results of the learning outcome and content alignment scores in the TYMM middle school 5th grade science curriculum of 2024-2024?

Method

Research Model

The study was conducted using document analysis, one of the qualitative research methods. Document analysis is a method that enables the collection of information about an event or phenomenon through the examination of written sources (Sak et al., 2021). In the document analysis process, written materials related to the study are collected and analyzed according to their content. In this context, the written documents of the study consist of the learning outcomes in the 2024 TYMM 5th grade science curriculum and the 5th grade science textbook. The method of the study was determined as document analysis due to the evaluation of the harmony between the two written documents.

Data Collection Tools

In the study, there were two data collection tools: the 2024 TYMM 5th grade science curriculum and the 5th grade science textbook. The textbook examined was the textbook published by MEB in the 2024-2025 academic year (MEB, 2024), and the rubric created was used to collect the data of the study. Another name of rubrics is rating scales. With these scales, a performance or a product can be evaluated. There are criteria that define success and quality at different levels. With these criteria, evaluation can be done more systematically and objectively (Tuncel, 2011). Rubrics are divided into analytical and holistic rubrics. With holistic rubrics, a one-dimensional evaluation is made and a general judgment is made focusing on the product instead of detailed analysis (Sezer, 2005). In this study, the rubric for the assessment of learning outcome and content congruence, which was prepared for a one-dimensional product, is a holistic rubric. The criteria in the prepared rubric are as follows: 1- The information in the content does not match the learning outcome. 2- The information in the content is moderately compatible with the target learning outcome. Content and target learning outcome partially overlap. 3- The information in the content matches the target learning outcome to a good degree. The content and the target learning outcome overlap. However, there are parts of the content that need to be improved. 4- The information in the content is fully consistent with the learning outcome. The content and the target learning outcome are equivalent. The quality rating scores of these criteria were created between 1-4. Then the rubric was re-examined and the evaluation was started. It was determined by the evaluations that the rubric was applicable and useful. In the study, two expert researchers scored the specified learning outcomes and contents differently and independently from each other. Table 1 below shows the rubric for the assessment of learning outcome and textbook content alignment.

Table 1. Learning Outcome-Content Alignment Assessment Rubric

Score	
4	The knowledge in the content is highly relevant to the learning outcome. Content and target learning outcome are equivalent.
3	The information in the content is well aligned with the target learning outcome. The content and the target learning outcome overlap. However, there are parts of the content that need to be improved.
2	The information in the content is moderately aligned with the target learning outcome. Content and target learning outcome partially overlap.
1	The information in the content does not match the learning outcome.

Data Analysis

The data were analyzed in three stages. First, the rubric, which is a data collection tool, was prepared. Secondly, the learning outcomes and the content in the textbook were compared. In the last stage, independent expert researchers made separate scores with the rubric developed. In the next stage, statistical calculations appropriate to the study were made and the compatibility of the relationship between learning outcomes and content was found. One of the analyzed studies is given below as an example.

5th grade science textbook The World of Light theme is a sample application of learning outcome and content assessment

The learning outcome given as an example and the SLOUDR used in the content assessment study are given in Table 2. According to the criteria specified in the rubric, the evaluation of the theme was made as follows:

Theme 4 The World of Light

Learning outcome 1: Describes the qualities of light emanating from a source by observing its path (MEB, 2024).

This learning outcome is given in the activity carried out at the activity station in the theme as follows:

"Let's do the following activity about the propagation of light.

Propagation of Light

MATERIALS

- Two straws*
- Let's form groups of two.*
- Let's make one of the straws straight and the other bent.*
- Let's sit face to face with our friend.*
- Let's observe each other using the straight straw.*
- Let's observe each other using the bent straw.*
- Let's share the results of our observation and the information we have obtained about light with our friends.*

Evaluation

1- With which straw could we see our friend? Let's write it down.

2- Let's discuss the results of our observations with our friends. Based on this, let's define the qualities related to the propagation of light and write them down below." (Grade 5 Science Textbook, Book 2, 2024, pg. 17)

With the activity in the content, the learning outcome named "*Describes the qualities of light from a source by observing the path it follows*" can be achieved by observing the student. Content and target learning outcome are equivalent.

Learning outcome 2: Records the data obtained about the path of light as a result of observations (MEB, 2024)

This learning outcome is given in the activity carried out at the activity station in the theme as follows: *"Let's show the path followed by the light from the source in our activity in the area below with a drawing."* (Grade 5 Science Textbook, Book 2, 2024, p. 19) The information in the content exactly matches the given learning outcome. The content and the target learning outcome are equivalent.

Learning outcome 3: Explains that light follows a linear path in all directions (MEB, 2024).

This learning outcome is given in the activity carried out at the activity station in the theme and as information as follows: *"Did light propagate in one direction or in all directions? Let's write our observations below."* , *"Light propagates in all directions and linearly. Many examples can be given from daily life."* (Grade 5 Science Textbook, Book 2, 2024, pp. 20-21) The information in the content exactly matches the given learning outcome. The content and the target learning outcome are equivalent to each other.

Table 2 presents the results of the reliability found with the RCC and the ACR for the agreement between the scoring of the expert researchers related to the study.

Table 2. ACK and MHK Results of the Grade 5 themes related to the Expert Researchers' Cohesion of the SCLUDR

	Our Neighbors in the Sky and Us	Let's Recognize Force	Journey to the Structure of Living Things	Interaction of Light with Matter	Nature of Matter	Electricity in Our Lives	Sustainable Living and Recycling	Theme Total
Weighted								
Kappa Coefficient	0.710	0.860	0.628	1.00	0.738	1.00	0.629	0.746
Miles and Huberman								
Coefficient	0.911	0.965	0.949	1.00	0.898	1.00	0.911	0.930

When the data given in Table 2 are analyzed, it is seen that the 5th grade science course has a total of 7 themes. When the Weighted Kappa Coefficient and Miles and Huberman coefficients of concordance of the themes named The Structure of Light and Electricity in Our Lives were analyzed, it was seen that the coefficients showed full concordance with 1.00. In the concordance analysis of the other themes, it was determined that there was good similarity and very good similarity in terms of AKK, and very good agreement in terms of MHK. When the total agreement coefficients of the themes are examined in general, the values obtained with the ACK (0.74) analysis and MHK (0.93)

analysis support that there is consistency among the expert researchers and that the rubric created is reliable. In line with the results of the ACK and MHK analyses, consistency between the expert researchers and rubric reliability were strongly ensured.

Validity and Reliability Studies

When preparing rubrics, it is necessary to give importance to the validity and reliability study of the rubric prepared to be used in the study (Kan, 2007). Some methods are used in studies on validity. The content, constructiveness, external validity, indirectness and generalizability of the rubric are the most common ones (Jonsson & Svingby, 2007). Some validity studies were conducted for the holistic rubric prepared in this study. These are content, structure and criterion studies. Are the criteria in the rubric appropriate for the purpose of assessment? Are all important features included in the rubric? Are the criteria clear and understandable? Content validity was tried to be established by getting answers to the questions. Content validity was ensured by asking the experts to examine each criterion in the rubric in terms of covering all dimensions of the subject to be evaluated. Whether the criteria in the rubric are directly related to the targeted structure or skill was evaluated by the experts to ensure construct validity. The opinions of 3 experts with master's and doctoral degrees in science education and 2 experts from the department of curriculum and instruction were taken. In line with the opinions of the experts, the final version of the learning outcome and content alignment assessment rubric was determined. As the last step, a pilot application was conducted with the developed rubric. Independent expert researchers evaluated one theme and decided that the rubric was suitable for use.

In the reliability study of the rubric, two experts with postgraduate education in the field of curriculum and instruction examined and scored the rubric separately from each other. The most basic method for reliability in rubrics is the similarity between the scorers' scoring (Moskal & Leydens, 2000). Based on the scoring results, the Weighted Kappa Coefficient (WKC) was used to analyze the reliability. Miles and Huberman Coefficient (MHK) was performed to strengthen the reliability level reached as a result of the analysis. Reliability results of the rubric were obtained by identifying similar and different situations. The evaluation of the results obtained with the CCR was made as "Poor similarity =< ,20; Acceptable similarity= ,20-40; Moderate similarity= ,40-,60; Good similarity= ,60-,80; Very good similarity= ,80-1,00" (Şencan, 2005). The cases where the raters had different opinions were re-examined and a common decision was reached.

Results

2024 TYMM middle school 5th grade science curriculum learning outcomes and the results obtained by evaluating the alignment of the content of the book used are given in Table 3.

Table 3. Learning Outcome and Content Alignment Assessment Results

Unit	Expert 1 \bar{X}	Expert 1 SS	Expert 2 \bar{X}	Expert 2 SS	Specialist Total \bar{X}	Percentage (%)	Number of Acquisition
Our Neighbors in the Sky and Us	3.545	1.035	3.727	0.646	3.636	92.4	11
Let's Recognize Force	3.545	0.934	3.636	0.674	3.59	95.4	11
Journey to the Structure of Living Things	3.615	0.869	3.769	0.832	3.692	96.1	13
Interaction of Light with Matter	4	0	4	0	4	100	10
Nature of Matter	3.619	0.864	3.761	0.7	3.69	96.03	21
Electricity in Our Lives	4	0	4	0	4	100	11
Sustainable Living and Recycling	3.7	0.948	3.7	0.674	3.7	98.3	10
Total	3,7	0,794	3,7	0,612	3,74		87

When the results given in Table 3 are examined, it is observed that there is a high level of agreement between the expert researchers' ratings in general. It was found that the averages of the Interaction of Light with Matter and Electricity in Our Lives themes were 4.00 and the averages of these themes were the highest compared to the other themes. It was determined that these themes showed 100% compatibility in terms of the relationship between learning outcome and content.

Journey to the Structure of Living Things and Nature of Matter stand out with a higher number of learning outcomes (13 and 21, respectively) and an alignment rate above 90% compared to other themes. In the Journey to the Structure of Living Things theme, the standard deviation of Expert 1 was 0.869 and that of Expert 2 was 0.832. Similarly, in the Nature of Matter theme, the standard deviation was 0.864 for Expert 1 and 0.7 for Expert 2, and their mean scores (3.692 and 3.69) were close to each other.

The agreement rate of the theme named Let's Recognize Force was above 90%, similar to the Journey to the Structure of Living Things and Nature of Matter themes. In this theme, the mean scores of the experts were $\bar{X} = 3.545$ for Expert 1 and $\bar{X} = 3.636$ for Expert 2, and the total mean was calculated as $\bar{X} = 3.59$. The standard deviations were $SD = 0.934$ for Expert 1 and $SD = 0.674$ for Expert 2.

Regarding the theme named Our Neighbors in the Sky and Us, the standard deviation value of Expert 1 ($SD = 1.035$) was higher than that of Expert 2 ($SD = 0.646$). The overall mean ($\bar{X} = 3.636$) and percentage agreement (92.4%) of the experts were high. Similarly, in the theme named Sustainable Living and Recycling, Expert 1's standard deviation was calculated as 0.948 and Expert 2's as 0.674, and it was seen that Expert 2 made more variable scoring, but despite these differences, agreement rates above 90% were achieved in both themes (92.4% and 98.3%).

Conclusion and Discussion

The compatibility of the 28 learning outcomes in the 2024 TYMM middle school 5th grade science curriculum with the content of the 5th grade science textbook prepared by MEB in accordance with the curriculum was evaluated. As a result of the study, it was determined that the learning outcomes in the 2024 TYMM middle school 5th grade science curriculum and the content of the textbook used were highly compatible. In a similar study, Kubat (2015) evaluated the relationship between the content and outcomes of the 5th grade science curriculum with teachers' views. As a result of the study, he concluded that half of the teachers he interviewed thought that the achievement-content alignment was fully connected. Ocak and Kalender (2017) found the achievement-content alignment in science, 5th grade and 6th grade at a high level with an average of 3.72. Ocak and Kocaman (2018) concluded that the relationship between objectives and content was compatible as a result of the evaluation of the alignment of the objectives and content in the primary school science curriculum.

Considering the curriculum and content studies in the literature, it is seen that there is a high level of congruence between the learning outcomes of the 2024 TYMM 5th grade science curriculum and the content of the textbook.

Weighted Kappa Coefficient analysis was used for the reliability study of the SCLR created for the study. The results were evaluated according to the criteria of Şencan (2005) and it was concluded that the themes showed very good agreement. The Miles and Huberman Coefficient, which was used to increase reliability, was greater than 0.70. Thus, similar results were obtained with the results of the Weighted Kappa Analysis. The reliability of the rubric created with the analyzes was ensured. The final version of the rubric was created by taking the opinions of 5 different experts with master's and doctorate degrees in science education. With this rubric, the compatibility of the learning outcomes in the 2024 TYMM middle school 5th grade science curriculum and the content of the fifth grade science textbook was evaluated. It is thought that the 5th grade science SCLR can be revised and used in different learning outcome-content analyses in the future.

When the studies in the literature are examined; it is seen that the 2013, 2017 and 2018 science curricula have similar themes in the content, but the number, order and naming of the themes are different (Başar & Demiral, 2019). Similarly, in the 2024 TYMM middle school 5th grade curriculum, there are the same number of themes with similar content, but there are changes in their names and order. In the 2018 science curriculum, it is seen that the number of learning outcomes is lower than in the 2013 curriculum (Cengiz, 2019). Similarly, it is seen that the learning outcomes in the 2024 TYMM middle school 5th grade science curriculum are less than the learning outcomes in the 2018 middle school 5th grade science curriculum. In addition, with the updated curriculum, the word outcomes was removed from the curriculum and replaced with the word learning outcomes.

2024 TYMM shows that the learning outcomes targeted in the middle school 5th grade science curriculum and the content of the textbook prepared in accordance with this curriculum are largely compatible. This harmony reveals that it effectively reflects the learning outcomes targeted in the curriculum and that the textbook is a successful tool in achieving the learning outcomes.

The aim of this study is to determine the level of compatibility between the learning outcomes in the 2024 middle school 5th grade science curriculum, which was updated under the Turkish Century Education Model framework, and the content of the textbook prepared in accordance with the curriculum. This study makes an important contribution in terms of determining the level of compatibility and differences in the content of the textbook prepared according to the updated learning outcomes.

Recommendations

In this direction, some suggestions can be made to strengthen the alignment between the curriculum and textbook content. It is suggested that a strong relationship should be established between the content of the textbook and the learning outcomes specified in the curriculum. In particular, clearly stating the relevant learning outcomes at the beginning of each theme and structuring the content in a way that directly supports these outcomes will both improve the quality of the teaching process and contribute to students' more conscious acquisition of the targeted learning outcomes. In addition, it is recommended to determine the level of curriculum and content alignment in other courses and to conduct studies to eliminate possible deficiencies.

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