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Araştırma Makalesi/ Research Article

Programın Temel Ögeleri Açısından 2013 ve 2018 Kimya Öğretim Programlarının Karşılaştırılması[1]

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Özet:

Bu araştırmanın amacı, 2013 ve 2018 ortaöğretim kimya dersi öğretim programlarını programın temel ögeleri açısından incelemektir. Bu araştırmada nitel araştırma yöntemlerinden biri olan doküman analizi kullanılmıştır. Araştırmanın analizi "genel amaçlar", "üniteler", "önerilen konu başlıkları", "kazanım sayıları", "ders saatleri", "öğrenme-öğretme süreçleri", "ölçme ve değerlendirme" bölümlerinden oluşmaktadır. Araştırmanın sonucunda 2013 Kimya Dersi Öğretim Programı'nda 9 ve 10. sınıfların "temel düzey", 11 ve 12. sınıfların "ileri düzey" olarak belirlendiği ve her iki düzeye yönelik genel amaçların programda yer aldığı görülmüştür. 2018 öğretim programında ise 13 genel amacın programda yer aldığı belirlenmiştir. 2013 öğretim programında dört yıl boyunca toplam 155 kazanım ifadesi yer alırken, 2018 öğretim programında 127 kazanım ifadesi yer almaktadır. Dört yıl boyunca 2013 öğretim programında toplam 18 ünitede 90 konu başlığı önerilirken, 2018 öğretim programında 19 ünitede 77 konu başlığı önerilmiştir. Hem 2013 hem de 2018 kimya dersi öğretim programlarında programın uygulanmasına ilişkin genel bilgilere yer verilmiştir.

Anahtar kelimeler: Öğretim programı, kimya, programın temel ögeleri

Sorumlu yazar: Dilek YARALI

GENİŞ ÖZET

Giriş

Bilim ve teknolojide meydana gelen hızlı gelişmeler, bireylerden beklenen rol ve sorumlulukları da beraberinde değiştirmiştir. Bu değişim ile bireylerin bilgiyi üreten, araştıran, problem çözen, iletişim becerileri gelişmiş olan, eleştirel düşünen, girişimci vb. özelliklerine sahip olması beklenilmektedir (MEB, 2018). Yaşadığı çağa ayak uyduran, araştıran, sorgulayan, özgüven duygusu gelişmiş olan vb. özelliklere sahip bireyleri yetiştirmenin yolu da eğitimden geçmektedir (Demircioğlu vd., 2015). Nitekim eğitim öğretim etkinlikleri ile yaşadıkları dönemin ihtiyaçlarına göre belirlenen bilgi, beceri, değerlere sahip olan bireyler yetiştirmek amaçlanır ve bu özellikler bireylere eğitim kurumları ile eğitim öğretim programlarıyla kazandırılmaya çalışılır (Kalaycı & Baysal, 2020). Dolayısıyla bu programların zaman içerisinde gelişen değişimlere paralel olarak yeniden düzenlenmesi önemlidir (Demircioğlu vd., 2015).

Eğitim programı, Millî Eğitimin amaçlarını gerçekleştirmek üzere hazırlanan tüm eğitim faaliyetlerini kapsarken (Gökalp, 2020) öğretim programı öğrenen bireylere, okulda ya da okul dışında bir dersin öğretimiyle ilgili hazırlanan tüm faaliyetleri kapsamaktadır (Demirel, 2004). Eğitim programlarının dört temel ögesi bulunmaktadır. Programın ögelerinden olan amaçlar, programların niçin öğretilmesi ya da öğrenilmesi gerektiği; içerik, bu amaçlara ulaşmak için ne/nelerin öğretilmesi gerektiği; öğretim süreçleri, amaçlar doğrultusunda içeriğin nasıl öğretilmesi gerektiği; değerlendirme ise programın amacına ulaşıp ulaşmadığı hakkında bilgiler verir (Küçükahmet, 2009).

Kimya öğretim programları ile ilgili literatürde birçok çalışmaya (Ağlarcı Özdemir, 2021; Aydın, 2006; Aydın, 2008; Ayyıldız vd., 2019; Demir, 2021; Demir & Nakiboğlu, 2021; Demir vd., 2017; Demircioğlu & Kardeş, 2020; Demircioğlu vd., 2015; Er & Atıcı, 2016; İzci & Eroğlu, 2018; Keskin Alsan, 2020; Öztekin, 2013; Pekdağ & Erol, 2013; Seçken & Kunduz, 2013; Yıldırım, 2012; Zorluoğlu vd., 2017; Zorluoğlu vd., 2016) rastlanılmıştır. Bu çalışmalarda geçmişte uygulanmış veya uygulanmakta olan kimya dersi ortaöğretim programları birçok açıdan incelenmiştir. Ancak bu çalışmalarda yapılan incelemeler sonucunda, kimya dersi öğretim programları arasında programın temel ögelerine göre karşılaştırma yapılan araştırma sayısının sınırlı olduğu görülmüştür. Bu çalışmada ise programın temel ögeleri açısından 2013 ve 2018 kimya dersi öğretim programları karşılaştırılmalı olarak incelenmiştir. Bu bağlamda araştırmanın sonuçlarının, alanyazına katkı sağlayacağı ve daha sonra yapılacak olan hem kimya dersi öğretim programları hem de program değerlendirme ile ilgili çalışmalara ışık tutacağı düşünülmektedir.

Yöntem

Bu araştırmanın amacı 2013 ve 2018 kimya öğretim programlarını programın temel ögeleri açısından (amaç, içerik, öğrenme-öğretme süreçleri ve değerlendirme) karşılıklı olarak incelemektir. Araştırmada nitel araştırma yöntemlerinden biri olan doküman analizi kullanılmıştır. Bu araştırmada yer alan veriler ortaöğretim kimya dersi 2013 ve 2018 öğretim programlarından elde edilmiştir (MEB, 2013; MEB, 2018).

Araştırmanın verileri, araştırmanın amacı doğrultusunda oluşturulan alt problemlere göre analiz edilmiştir. Araştırmanın analizi "genel amaçlar", "kazanım sayıları", "üniteler", "önerilen konu başlıkları", "ders saatleri", "öğrenme-öğretme süreçleri", "ölçme ve değerlendirme" bölümlerinden oluşturmaktadır.

Sonuç ve Tartışma

2013 ve 2018 ortaöğretim kimya öğretim programları genel amaçlar boyutunda değerlendirildiğinde; 2013 öğretim programında kimyanın tanıtılması, kimya kavramlarına ve sembolik diline aşinalık, günlük hayatta kullanılan çeşitli kimyasalların özellikleri ve işlevleri arasındaki ilişkiyi, kimyasalların insan ve çevreye etkilerini fark etmeleri ve kimyasalları doğru kullanmalarına yönelik öğrencilere bilinç kazandırmaya ilişkin amaçlara yer verilmiştir (MEB, 2013). 2018 öğretim programında ise öğrencilerin, kimya bilimi hakkında bilgi sahibi olmaları, sahip oldukları bilgiyi etik değerlere uygun olarak kullanmaları, kimya biliminin gelişiminde etkili olan kişiler ve çalışmaları hakkında bilgi sahibi olmaları, kimya dersinde öğrendiği bilgi ve beceriyi hayatlarında kullanmaları, fikirler üretmeleri, özgün çalışmalar yapmaya isteklendirilmeleri, kimya alanında kariyer olanaklarını tanımaları, kimya bilimine ilgi duymaları, deney yapmaları ve yorumlamaları, bilişim teknolojilerini kimya biliminde kullanmalarına dönük amaçlara yer verilmiştir (MEB, 2018).

2013 ve 2018 ortaöğretim kimya öğretim programları ünitelerdeki kazanımlar-ders saatleri boyutunda değerlendirildiğinde; 2013 ve 2018 öğretim programlarında 9 ve 10. sınıflarda kimya dersi 72, 11 ve 12. sınıflarda ise kimya dersinin 144 saat olarak okutulduğu görülmüştür. Bu durumda her iki öğretim programında dört yıl sonunda öğrencilere toplamda 432 saat kimya dersi verilmektedir (MEB, 2013; MEB, 2018). Bu konuda Demir vd. (2017) tarafından yapılan çalışmada, öğretmenler 2013 öğretim programında ders saati süresinin temel düzey için kısmen, ileri düzey için ise büyük oranda yeterli olmadığını belirtmişlerdir. Bu bulguyu, Demircioğlu vd. (2015) ve İzci & Eroğlu (2018) tarafından yapılan çalışmalardaki bulguları da destekleyici niteliktedir çünkü bu çalışmalarda öğretmenler ders saati süresini yetersiz olarak belirtmişlerdir.

Dokuzuncu sınıflarda 2013 öğretim programında dört ünite (33 kazanım) yer alırken, 2018 öğretim programında beş ünite (38 kazanım) yer almaktadır. 10. sınıflarda 2013

(39 kazanım) ve 2018 öğretim programlarında (23 kazanım) dört ünite yer almaktadır. 11. sınıflarda ise 2013 (46 kazanım) ve 2018 öğretim programlarında (35 kazanım) altı ünite bulunmaktadır. 12. sınıflarda 2013 (37 kazanım) ve 2018 öğretim programlarında (31 kazanım) dört ünite yer almaktadır. Bu konuda Demir vd. (2017) tarafından yapılan çalışmada öğretmenler, 2013 öğretim programında genel olarak tüm sınıf düzeylerinde konu sıralamasında sorunlar olduğunu, bazı ünitelerin öğrencilerin hazırbulunuşluklarını sağlayacak şekilde doğru yerlerde verilmediğini belirtmişlerdir. Aynı çalışmada, 2013 öğretim programında öğretmenler bazı ünitelerde içeriğin çok yoğun olduğundan dolayısıyla kavram sayısının da fazla olmasından ve bu durumun ünitelerin öğrenciler tarafından anlaşılmasını zorlaştırdığından bahsetmişlerdir. Ayrıca bu çalışmada öğretmenler, temel düzeyin daha çok sözel ağırlıklı ve uygulamadan uzak olduğu, ileri düzeyin ise yoğun olarak hesaplamalar bulundurduğundan bahsetmişlerdir (Demir vd., 2017). İzci & Eroğlu (2018) ise 9. sınıf kimya dersine yönelik öğretmen görüşlerinin incelendiği çalışmada öğretmenler, çoğu içeriğin öğrenci seviyesine uygun ve güncel olduğunu belirtmişlerdir.

2013 ve 2018 ortaöğretim kimya öğretim programları öğrenme-öğretme süreçleri boyutunda değerlendirildiğinde 2013 öğretim programında, öğrenme-öğretme etkinliklerinin öğretmen tarafından organize edildiği ve yönetildiği, öğrencilerin somut materyallerle doğrudan etkileşime girmesini sağlayacak, zenginleştirilmiş bir öğrenme ortamından bahsedilmiştir (MEB, 2013). 2018 öğretim programında ise derslerin laboratuvarlarda ve etkinlik temelli işlenmesinden, öğrencilerin performans çalışmaları, deney tasarımları, etkinlikler ve projelerin sınıf içinde ve öğretmen gözetiminde yapılmasından bahsedilmiştir. Demircioğlu vd. (2015) tarafından yapılan 2013 kimya dersi öğretim programının öğretmen görüşlerine göre değerlendirildiği çalışmada, öğretmenler öğretim programında derslerini işlemelerine yönelik açıklamalara yeterli düzeyde yer verilmediğinden bahsetmişlerdir. Demir vd. (2017) tarafından yapılan çalışmada öğretmenler, 2013 öğretim programının uygulanmasında zorluklar yaşanıldığını belirtmişlerdir.

2013 ve 2018 ortaöğretim kimya öğretim programları ölçme ve değerlendirme boyutunda değerlendirildiğinde; 2013 kimya öğretim programında değerlendirme etkinlikleri ile öğrencilerin öğrenme süreçlerini izlemeyi ve bunun sonucunda bir değerlendirme yaparak eğer ihtiyaç duyulursa uygulanan öğrenme etkinliklerinin değiştirilmesi ve değerlendirmenin öğretim etkinlikleri ile mümkün olduğu kadar eş zamanlı olmasından bahsedilmektedir (MEB, 2013). 2018 öğretim programında ölçme ve değerlendirme uygulamalarına yön veren ilkelerde, ölçme ve değerlendirmenin programın ögeleri ile uyumlu olmasını, ölçme ve değerlendirmenin süreç boyunca yapılması, süreçle birlikte değerlendirilmesi, bilişsel, duyuşsal ve psikomotor alana yönelik olması, bireysel

farklılıkların esas alınması ve aktif katılımın sağlanıldığı çok odaklı bir şekilde düzenlenmesi önerilmektedir (MEB, 2018).

Öneriler

1. Kimya öğretim programlarının uygulayıcılarına yol göstermesi için ölçme ve değerlendirme etkinlik ve örnekleri programlarda daha detaylı yer almalıdır.

2. Kimya öğretim programlarının uygulayıcılarına yol göstermesi için programlarda öğrenme-öğretme süreçlerinin düzenlenmesine ilişkin örnek etkinlik ve açıklamalar daha detaylı yer almalıdır.

3. Teknolojinin çok hızlı ilerlediği ve eğitim sistemlerini etkilediği göz önünde bulundurulursa, kimya biliminin bilgi ve iletişim teknolojileri ile öğretilmesi konusunda öncelikli olarak uygulayıcılara bilgiler verilmelidir.

4. Kimya öğretim programlarının, öğretmenlere uygulama öncesinde hizmet içi eğitim programları ile daha detaylı tanıtılması önemlidir.

Comparison of 2013 and 2018 Chemistry Course Curricula in Terms of the Basic Elements of the Program [2]

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The purpose of this research was to examine the 2013 and 2018 secondary education chemistry course curricula in terms of the basic elements of the program. This research used document analysis which is one of the qualitative research methods. The analysis of the research consists of "general objectives", "units", "recommended topic titles", "numbers of learning outcomes", "course hours", "learning-teaching processes", and "measurement and evaluation" sections. As a result of the research, it was observed that in the 2013 chemistry course curriculum, 9th and 10th grades were determined as "basic level", 11th and 12th grades were determined as "advanced level," and it has been seen that the general objectives of both levels are included in the curriculum. During the four years, 90 topics in 18 units were proposed in the 2013 curriculum, while 77 topics in 19 units were proposed in the 2018 curriculum. It has been observed that general information about the implementation of the program is included in both the 2013 and 2018 chemistry curricula.

Keywords: Curriculum, chemistry, basic elements of the program

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INTRODUCTION

Rapid developments in science and technology have changed the roles and responsibilities expected from individuals. With this change, individuals are expected to have the characteristics of producing information, researching, problem-solving, developing communication skills, thinking critically, being entrepreneurial, etc. (Ministry of National Education, 2018). The way to raise individuals who have adapted to the age they live in, who have developed a sense of self-confidence, investigating, questioning, etc., is through education (Demircioğlu et al., 2015). Because education-teaching activities aim to educate individuals who have knowledge, skills, and values determined according to the needs of the period they live in, and these features are tried to be gained by individuals through educational institutions, and education program/curricula (Kalaycı & Baysal, 2020). Therefore, it is important to reorganize and update the programs in parallel with these changes over time (Demircioğlu et al., 2015).

The qualification of education is related to the structure of educational programs (Demircioğlu & Kardeş, 2020). The education program is a program that covers all educational activities prepared to realize the objectives of the National Education (Gökalp, 2020). Also, the education programs cover all activities prepared for learners in school or outside school (Demirel, 2004). The educational program consists of a curriculum, and extracurricular activities (Küçükahmet, 2009). The curriculum covers all activities related to teaching a course at school or outside school for learners (Demirel, 2004). The Ministry of National Education Board of Education and Discipline deals with the preparation of the educational program (Gökalp, 2020). There are four basic elements of this program. Objectives are as follows: One of the basic elements of the program, why the curriculum should be taught or learned; the content, what needs to be taught to achieve these objectives; teaching processes, how the content should be taught in line with the objectives; and the evaluation gives information about whether the curriculum achieves its objectives (Küçükahmet, 2009).

In line with the emerging needs, the secondary education chemistry course curriculum is reviewed with the recommendations of chemistry teachers and different stakeholders and updated over time (Ministry of National Education, 2018). The first chemistry curriculum used in the Republican period was developed in 1930 (Yörük & Seçken, 2011), and the curriculum has changed for various reasons until today.

Chemistry course was aimed that within the scope of the curriculum of chemistry course, students, in general, are given content to get to know the science of chemistry, to transfer the knowledge they have learned in this course to their daily lives, to make them aware of the impact of chemistry/technology on the environment and human health and life (positive or negative), to recognize career thoughts and opportunities for chemistry science and to make them interested in chemistry (Ministry of National Education, 2013; Ministry of National Education, 2018).

In various research carried out to date, chemistry course secondary education programs that have been applied or applied in the past have been examined in many respects. In these examinations, studies found the following: The curricula of secondary education chemistry courses in various countries were compared and examined, and presented a new curriculum framework proposal for Turkey in the study conducted by Aydın (2006); chemistry curricula in Turkey and Turkmenistan were compared in the study conducted by Demircioğlu & Kardeş (2020); chemistry curricula of Finland and Turkey were comparatively examined in the study conducted by Er & Atıcı (2016); 2018 chemistry

curriculum and 2018 science high school chemistry curriculum in terms of basic elements were compared in the study conducted by Demir (2021). There are some studies in the literature that chemistry curricula are examined from various perspectives according to teachers' opinions. 2017 curriculum was evaluated in line with the teachers' opinions on the 2013 chemistry curriculum in the study conducted by Demir et al. (2017). The renewed chemistry curriculum was analyzed with the support of teachers' opinions in the study conducted by Demircioğlu et al. (2015). The renewed 9th-grade chemistry curriculum was evaluated according to the opinions of teachers in the study conducted by İzci & Eroğlu (2018); the opinions of secondary school teachers about the secondary school chemistry curricula applied since 1992 were examined in the study conducted by Aydın (2008); views of chemistry teachers about the applicability of the renewed chemistry curriculum were examined in the study conducted by Yıldırım (2012). Also, outcomes of the secondary education chemistry curriculum were examined from different perspectives in the literature. Some of these are provided here: Secondary school chemistry curriculum outcomes were analyzed and evaluated according to the structured Bloom taxonomy in the study conducted by Zorluoğlu et al. (2016); the chemistry curriculum outcomes and the activity and evaluation tools in the textbooks were examined in terms of cognitive, affective, and psychomotor dimensions in the study conducted by Keskin Alsan (2020); the 2017 draft secondary school chemistry curriculum was examined according to the revised Bloom taxonomy in the study conducted by Zorluoğlu et al. (2017); the achievements of the 2018 secondary school chemistry curriculum were examined according to the original and revised Bloom taxonomy in the study conducted by Ayyıldız et al. (2019). Also, the 2018 High School Chemistry Curriculum was investigated in terms of science high schools and other high school types in the study conducted by Ağlarcı Özdemir (2021); secondary education chemistry curricula were published between 1957-2007 in terms of the dimensions of rationale, goals, and subject-matter was exanimated in the study conducted by Pekdağ & Erol (2013); the chemistry subjects in the 2018 Science course curriculum were examined in the study conducted by Demir & Nakiboğlu (2021); secondary education school chemistry curricula belonged to the Republican Period was compiled in the study conducted by Yörük & Seçken (2011); the 9th grade in the study conducted by Seçken & Kunduz (2013), and 10th-grade chemistry curricula were evaluated in the study conducted by Öztekin (2013). As a result of the examinations in these studies, it was seen that the number of studies was limited that made comparisons between chemistry curricula published on different dates in terms of basic elements of the program. In this study, 2013 and 2018 chemistry course curricula were examined comparatively in terms of the basic elements of the program. It is thought that the results of the research will contribute to the literature and will shed light on both the studies to be done with the

chemistry curriculum and the program evaluation studies to be done later. In this respect, answers to the following question have been sought in the research: "How were the general objectives, numbers of learning outcomes and course hours, units and suggested topic titles, learning-teaching process, and measurement and evaluation process taken placed in the 2013 and 2018 secondary education chemistry curricula?"

The sub-problems of the research are as follows:

1. How were the general objectives included in the 2013 and 2018 secondary education chemistry curricula?

2. How were the numbers of learning outcomes and course hours in the units included in the 2013 and 2018 secondary chemistry curricula?

3. How were the units and suggested topic titles included in the 2013 and 2018 secondary education chemistry curricula?

4. How was the learning-teaching process included in the 2013 and 2018 secondary education chemistry curricula?

5. How was the measurement and evaluation process included in the 2013 and 2018 secondary education chemistry curricula?

METHOD

In this part of the research, information about the model of the research, data source, data collection tools, data gathering, and analysis of the data are explained, respectively.

Model of the Research

Document analysis from qualitative research methods was used in the research conducted for the mutual examination of the 2013 and 2018 secondary education chemistry course curricula in terms of the basic elements of the program. Document analysis is an analysis of written materials with information on the phenomenon or events planned to be investigated (Yıldırım & Şimşek, 2018). "Document analysis is a systematic procedure for reviewing or evaluating documents—both printed and electronic (computer-based and internet-transmitted) material" (Bowen, 2009: 27).

Data Source

The population of the research consisted of all secondary education chemistry curricula published in Turkey. The sample of the research consisted of 2013 and 2018 secondary education chemistry curricula published in Turkey. The research used criterion sampling which is one of the purposive sampling methods. Criteria sampling consisted of units that bear the specified criteria (Büyüköztürk et al., 2008). The criterion here can be created

by the researcher (Yıldırım & Şimşek, 2018). 2013 and 2018 secondary education chemistry course curricula were selected as the subject of research because these programs are currently implemented (2018) and have been implemented in the recent past (year 2013). 2013 and 2018 secondary education chemistry course curricula were examined comparatively according to the sub-problem of the research. The data were analyzed for general objectives, units, suggested topic titles, number of learning outcomes, course hours, educational status, measurement, and evaluation dimensions.

2013 and 2018 secondary education chemistry course curricula are the data source of the research (Ministry of National Education, 2013; Ministry of National Education, 2018).

Data Collection Tools

The data in this study were obtained from 2013 and 2018 secondary education chemistry course curricula (9th, 10th, 11th, and 12th grades).

Data Gathering

The steps to be followed while performing document analysis should be a very general guide (Sak et al., 2021). Document analysis was carried out in accordance with the following stages: "1) accessing the document, 2) checking the authenticity, 3) understanding the documents, 4) analyzing the data, 5) using the data" (from Foster 1995 as cited in Yıldırım & Şimşek, 2018: 194).

Analysis of the Data

The main data sources of this research were the 2013 and 2018 chemistry course curricula. The document analysis method was used in the examination of these curricula. A relevant literature review was carried out about the subject of research. After the relevant studies were examined, the problems of the research were determined. The research data were analyzed according to the sub-problems created for the research. During the analysis of the research, four basic elements of the program were examined. These were as follows: 1-Objectives, 2-content, 3-learning-teaching process, and 4-measurement and evaluation. In this direction, "general objectives" were examined for the objective element of the curricula in the research. "Units, recommended topic titles" were examined for the content element of the curricula in the research. 2013 and 2018 chemistry course curricula were examined one by one and comparatively according to the sub-problems determined. These documents were scanned several times and it was checked whether the analysis results exist in the documents. The data collected by the researcher in this research were reported in detail. The research was presented in the opinion of an expert working in the field of Education Curriculum and Instruction. Moreover, the research was presented twice to the opinion of the expert, at the beginning and the end of the research. At the beginning of the research, while collecting

data about the curricula, expert's opinion was received on what dimensions should be examined in the curricula, and a consensus was reached with the expert. Also, the research was presented with expert opinions on issues such as the findings obtained during the analysis process and the presentation of the findings. The findings were finalized in line with the examinations made by the expert and the opinions received from the expert.

FINDINGS

In this part of the research, findings for comparative analysis of the 2013 and 2018 secondary education chemistry course curricula are included in terms of the basic elements of the program.

1)The general objectives in the 2013 and 2018 Chemistry Course Curricula

The 2013 and 2018 chemistry curricula were examined in terms of their general objectives, and the findings are presented in Table 1 (Ministry of National Education, 2013: 1; Ministry of National Education, 2013: 23; Ministry of National Education, 2018: 11-12).

Table 1

2013 and 2018 Chemistry Course Curricula (General) Objectives

Quotations from objective statements	2013	2018
"The basic level chemistry course aims to raise awareness in terms of career awareness and entrepreneurship in students by introducing chemistry science based on the historical development and cause and effect relationships;	✓	
To enable them to discover the relationship between the properties and functions of various chemicals that have entered daily life by gaining familiarity with the concepts and symbolic language of chemistry, to recognize the effects of chemicals on human and environmental health, and to gain awareness of their correct use"(Ministry of National Education, 2013: 1).	✓	
The general objectives of the basic level chemistry course are "to raise chemistry literate individuals who understand the place of chemistry in daily life and realize its value, who are interested in chemistry, who think analytically" (Ministry of National Education, 2013: 1).	✓	
The general objectives of the advanced chemistry course are to" educate chemistry literate individuals who understand and recognize the place of chemistry in everyday life, who are interested in chemistry, who think analytically, and to provide a good chemistry infrastructure to students who will continue their education in the fields of science, health, and engineering in the future" (Ministry of National Education, 2013: 23).	✓	
It is aimed that they know the basic concepts, principles,		✓

models, theories, and laws of chemical science,	
It is aimed that they understand the development process and nature of scientific knowledge, which is the common heritage of chemistry science and humanity, and the importance of using scientific knowledge per ethical values,	✓
It is aimed that they know the scientists and their studies that have contributed to the development of chemical science in the world and understand the social, cultural, economic, and environmental conditions affecting these studies,	✓
It is aimed that they use the knowledge and skills gained in chemistry class to explain the events related to daily life, health, industry, and environment,	✓
It is aimed that they can distinguish the positives and negatives of chemical technologies reflected in life,	✓
It is aimed that they realize the contributions of chemistry to society, social life, economy, and technology,	✓
It is aimed that they recognize how social, economic, and environmental factors interact to support and protect human life and understand the role of chemistry in this interaction,	✓
It is aimed that they organize, present, report, and share the information acquired using information technologies per the symbolic language and scientific content of chemistry,	✓
It is aimed that they obtain data by experimenting, making inferences using these data, interpreting, and reaching generalizations,	✓
It is aimed that they recognize and are interested in the career opportunities related to chemical science,	✓
It is aimed that they understand the necessity and importance of having ethical values in scientific studies and social life and acting per these values,	✓
It is aimed that they understand the role of chemistry in understanding life and continuing life,	✓
It is aimed that they are willing to develop new ideas and make original studies that will benefit humanity by using the knowledge, or skills and competencies they have acquired in chemistry (Ministry of National Education, 2018: 11-12).	✓

In the 2013 chemistry course curriculum, 9th and 10th grades were determined as "basic level", 11th and 12th grades were determined as "advanced level," and the general objectives were included in the curriculum (Ministry of National Education, 2013). 13 general objectives were included in the 2018 curriculum (Ministry of National Education, 2018). A table of the general objectives in the 2013 and 2018 chemistry curricula was arranged and presented in Table 1.

The objectives of the basic level chemistry course in the 2013 chemistry courses curriculum can be summarized as introducing the science of chemistry and its historical development, raising awareness in terms of career and entrepreneurship in students, familiarizing them with chemistry concepts and its symbolic language, the relationship between the properties and functions of various chemicals used in daily life, the effects of chemicals on human and environmental health, to make students aware of them and to

raise awareness of students for using them correctly (Ministry of National Education, 2013). In addition, among general objectives of the 2013 chemistry courses curriculum there are the expressions such as raising individuals who know and understand the place of chemistry in daily life, who are interested in chemistry, think analytically, and are chemistry literate. Also, it aims to provide a chemistry background to students who plan to continue their education in science, health, and engineering in advanced-level chemistry courses (Ministry of National Education, 2013). The characteristics of the chemistry literacy students in this curriculum are stated as follows:

A. "Acquires the basic concepts, principles, models, theories, laws, and skills of chemical science and uses this knowledge and skills to explain events related to everyday life, human health, industry, and environmental problems.

B. Develops an attitude that can distinguish between the positive and negative aspects of chemical technologies reflected in human life; evaluates them in terms of human health, society, environment, and quality of life.

C. Understands the process and nature of chemical science and scientific knowledge; examines the factors affecting this process.

D. Analyzes the data obtained/ready through their experience; organizes, presents, reports/shares them following the symbolic language and scientific content of chemistry using information technologies when necessary" (Ministry of National Education, 2013: 1; Ministry of National Education, 2013: 23).

The 2018 chemistry course curriculum, which is prepared based on individual differences, general objectives are located under the main basic philosophy and general objectives of the curriculum. In this curriculum, the general objectives have been determined in more detail and can be summarized as students' knowledge of chemistry, understanding the importance of using scientific knowledge in accordance with ethical values, having information about scientists who are effective in the development of chemistry and their studies, using the knowledge they learned in chemistry course, using the knowledge, skills and competencies learned in this course to produce ideas that can be beneficial to humanity and being willing to do original studies on this subject, knowing the effects of chemistry technologies on life, being aware of the contributions of chemistry to various areas of life, using information technologies to both the symbolic language of chemistry and organizing, experimenting, interpreting and generalizing in accordance with the scientific content, introducing career opportunities in chemical science and being interested in the field of chemistry, having ethical values in scientific and social life, comprehending the importance of having values and understanding life and the role of chemistry in the continuity of life (Ministry of National Education, 2018).

While the 2013 curriculum includes concepts such as analytical thinking and chemistry literacy, the 2018 curriculum includes ethical values, experimentation and inferences, and information technologies. While the 2013 curriculum has objectives for the history of chemistry, the 2018 curriculum includes purposes for knowledge about scientists and their studies who contribute to the science of chemistry. In both programs, there are purposes related to both career and interest in chemistry science (Ministry of National Education, 2013; Ministry of National Education, 2018).

2) The numbers of learning outcomes and course hours in the units included in the 2013 and 2018 Chemistry course curricula: 2013 and 2018 chemistry course curricula were examined in terms of the numbers of learning outcomes and course hours in the units, and the findings were presented in Table 2 (Ministry of National Education, 2013: 15-47; Ministry of National Education, 2018: 13).

Table 2

The numbers of learning outcomes /course hours in the units included in the 2013 and 2018 curricula by class

		2013 Curriculum		**2018 Curriculum**	
Class	Units	Recommended time (Course time)	Numbers of learning outcomes	Recommended time (Course time)	Numbers of learning outcomes
9th grade	Chemical Science	14	6	6	7
	Atomic and Periodic System	20	7	16	5
	Interactions Between Chemical Species	18	9	22	11
	States of Matter	20	11	20	10
	Nature and Chemistry	--	--	8	5
	Total	**72**	**33**	**72**	**38**
10th grade	Mixtures	16	5	18	5
	Acids, Bases and Salts	18	8	14	7
	Energy in Industry and Living Things	20	13	--	--
	Chemistry Everywhere	18	13	12	7
	Basic Laws of Chemistry and	--	--	28	4

	Chemical Calculations				
	Total	**72**	**39**	**72**	**23**
11th grade	Modern Atomic Theory	28	8	26	5
	Chemical Calculations	12	4	--	--
	Gases	20	5	30	6
	Liquid Solutions	24	7	--	--
	Chemistry and Energy	28	8	--	--
	Speed and Balance in Reactions	32	14	--	--
	Liquid Solutions and Resolution	--	--	26	6
	Energy in Chemical Reactions	--	--	16	4
	Speed in Chemical Reactions	--	--	14	3
	Balance in Chemical Reactions	--	--	32	11
	Total	**144**	**46**	**144**	**35**
12th grade	Chemistry and Electricity	32	9	42	9
	Introduction to Carbon Chemistry	32	7	36	6
	Organic Compounds	44	14	40	11
	Chemistry in Our Lives	36	7	--	--
	Energy resources and scientific developments	--	--	26	5
	Total	**144**	**37**	**144**	**31**

The basic level chemistry course curriculum for 2013 was included a content aimed at gaining a chemistry culture related to the daily life of the individual, while the advanced chemistry course curriculum was included the content for principles, concepts, laws, and mathematics-based applications based on the assumption that the individual should choose some professions based on chemical infrastructure (Ministry of National Education, 2013).

In the 9th and 10th grades, the chemistry course was taught for 72 hours in all curricula, and in the 11th and 12th grades, the chemistry course was taught for 144 hours. At the end of four years in both curricula, students are given a total of 432 hours of chemistry (Ministry of National Education, 2013; Ministry of National Education, 2018).

There are 33 learning outcomes in the 2013 curriculum and 38 in the 2018 curriculum in the ninth grade. There are 39 learning outcomes in the 2013 curriculum and 23 in the 2018 curriculum in the 10th grade. There are 46 learning outcomes in the 2013 curriculum and 35 in the 2018 curriculum in the 11th grade. There are 37 learning outcomes in the 2013 curriculum and 31 in the 2018 curriculum in the 12th grade. In the 2013 curriculum, 155 learning outcomes were tried to gain for students for four years, while 127 learning outcomes were tried to gain in the 2018 curriculum.

When the unit titles are examined, it is seen that there are four units in the ninth grade, four units in the 10th grade, six units in the 11th grade, and four units in the 12th grade in the 2013 curriculum. In the 2018 curriculum, there are five units in ninth grade, four units in 10th grade, six units in 11th grade, and four units in 12th grade. There are some differences between the two curriculum units. While these are the same units under four headings (chemistry science, atomic and periodic system, interactions between chemical species and states of matter) in the 2013 and 2018 curricula for the ninth grades, the 2018 curriculum included an additional "nature and chemistry" unit. The 2013 and 2018 curricula in the 10th grades include "acids, bases and salts, chemistry everywhere and mixtures". In addition to these, the 2013 curriculum included the "energy in industry and living things" unit, while the 2018 curriculum included the unit "basic laws of chemistry and chemical calculations". In the 11th grade, the 2013 and 2018 curricula included "modern atomic theory and gases" units with the same title. In addition, the 2013 curriculum included "chemical calculations, liquid solutions, chemistry and energy, speed and balance in reactions" units, while the 2018 curriculum included "liquid solutions and resolution, energy in chemical reactions, speed in chemical reactions, balance in chemical reactions". The 12th grade 2013 and 2018 curricula include "chemistry and electricity, introduction to carbon chemistry, organic compounds" units with the same title. In addition to these, the 2013 curriculum includes a "chemistry in our lives" unit, while the 2018 curriculum includes the "energy resources and scientific developments" unit (Ministry of National Education, 2013; Ministry of National Education, 2018).

3) The unit and suggested topic titles in the 2013 and 2018 Chemistry course curricula: *C*hemistry course curricula were examined in terms of units and suggested topics. The findings are presented in Table 3 (Ministry of National Education, 2013: 15-47; Ministry of National Education, 2018: 13-39).

Table 3

The units and suggested topic titles in the 2013 and 2018 Chemistry curriculum

		2013 Curriculum	2018 Curriculum
Class	**Units**	**Suggested topic titles**	**Suggested topic titles**
9th grade	Chemical Science	*-Symbolic language of chemistry* - What is chemistry? - What does chemistry do? - Our Safety and Chemistry	- Alchemy to Chemistry -Chemistry Disciplines and Chemists' Fields of Study, - Occupational Health, and Safety in Chemical Applications
	Atomic and Periodic System	*-Periodic System* - Development of the concept of atoms - Bohr atomic model	- Atomic Models - Structure of the Atom
	Interactions Between Chemical Species	*- What's the chemical type?* *- Classification of chemical interspecies interactions* *- Strong interactions* *- Poor interactions* *- Physical and chemical changes*	
	States of Matter	*- Physical states of matter* *- Gases* *- Liquids* *- Solids*	-Plasma
	Nature and Chemistry	------	-Water and Life -Environmental Chemistry
10th grade	Mixtures	- Homogeneous mixtures - Heterogeneous mixtures - Separation of mixtures	-Homogeneous and Heterogeneous Mixtures -Separation and Purification Techniques
	Acids, Bases and Salts	- Getting to know the acids and the bases *- Reactions of acids/bases* *- Acids and bases in our lives* *-Salts*	-Acids and Bases
	Energy in Industry and Living Things	- Fossil fuels - Clean energy sources - Energy in living things	-----
	Chemistry Everywhere	- Water and Life - Chemistry at home - Chemistry at school - Chemistry in industry - Environmental Chemistry	-Common Everyday Life Chemicals -Foods
	Basic Laws of Chemistry and Chemical Calculations	-----	-Basic laws of chemistry -Mole concept -Chemical reactions and equations -Calculations in chemical reactions
11th grade	Modern Atomic Theory	-Thoughts on the atom - Symbolic language of chemistry and naming *- Quantum model of the atom*	-----

	- Periodic system and electron arrays *- Periodic features* *- Getting to know the elements* *- Oxidation steps*	
Chemical Calculations	- Mole concept - The simplest formula, and molecular formula, - Chemical reactions and equations - Chemical calculations	-----
Gases	*-Properties of gases* *-Kinetic theory in gases* *-Real gases* *-Gas mixtures* *-Ideal gas law*	
		and Gas Laws
Liquid Solutions	- Solvent-soluble interactions - Concentration units - Colligative properties - Resolution - Factors affecting resolution - Separation and purification techniques	-----
Chemistry and Energy	- System and environment - Heat, mechanical work, and internal energy - First law of thermodynamics - Entropy - Third law of thermodynamics	-----
Speed and Balance in Reactions	- How do substances react? - Reaction speeds - Factors affecting the speed of reaction - Chemical balance - Factors affecting balance - Aqueous solution balances	-----
Liquid Solutions and Resolution	-----	-Solvent-Soluble Interactions -Concentration Units -Colligative Properties -Resolution -Factors Affecting Resolution
Energy in Chemical Reactions	-----	-Heat Change in Reactions -Enthalpy of Formation -Bond Energies -Addictiveness of Reaction Heats
Speed in Chemical Reactions	-----	-Reaction Speeds -Factors Affecting Reaction Speed
Balance in Chemical	-----	-Chemical Balance -Factors Affecting Balance

	Reactions		-Aqueous Solution Balances
	Chemistry and Electricity	*-Electrodes and electrochemical cells* *-Electricity generation from chemicals* *-Electrolysis* *-Corrosion*	
		-Spontaneity and electric current in reduction-oxidation reactions -What oxidates/reduces what?	-Electric Current in Reduction-Oxidation Reactions -Electrode Potentials
	Introduction to Carbon Chemistry	-Functional groups -Isomerism	-Simple formula and molecular formula
		-Inorganic and organic compounds *-Carbon in nature* *-Lewis's formulas* *-Hybridization-Molecular geometries*	
	Organic Compounds	-Amine -Carboxylic acid derivatives -Multifunctional compounds	-Functional Groups -Esters
		-Hydrocarbons *-Alcohols* *-Ethers* *-Carbonyl Compounds* *-Carboxylic Acids*	
	Chemistry in Our Lives	- Oil refining - Oil production - Margarine - Surfactants - Polymers - Biomolecules	-----
12th grade	Energy resources and scientific developments	-----	-Fossil fuels -Alternative Energy Sources -Sustainability -Nanotechnology

Italics are topic titles that are commonly included in both programs.

When Table 3 is examined, it is seen that in the 2013 curriculum, 16 topic titles in four units in 9th grade, 15 topic titles in four units in 10th grade, 33 topic titles in six units in 11th grade, and 26 topic titles in four units in 12th grade are suggested. In the 2018 curriculum, 19 topic titles were suggested in five units in 9th grade, 12 topic titles in four units in 10th grade, 24 topic titles in six units in 11th grade, and 22 topic titles in four units in 12th grade. At the end of four years, 90 topic titles were proposed in 18 units in the 2013 curriculum, while 77 topic titles were proposed in 19 units in the 2018 curriculum (Ministry of National Education, 2013; Ministry of National Education, 2018).

When the curricula are examined, the units "nature and chemistry, chemistry everywhere" in the 2018 curriculum and "chemistry in our lives and chemistry everywhere" units in the 2013 curriculum draw attention to the effect of chemistry on daily life (Ministry of National Education, 2013; Ministry of National Education, 2018).

It is seen, that when the subject headings under the unit titles are examined, only the symbolic language of the chemistry title is the same in the ninth grade "chemistry science" unit in both the 2013 and 2018 chemistry curricula. Apart from these subjects, while the titles "what is chemistry? what does chemistry do? and our safety and chemistry?" topics are included in the 2013 curriculum, there are " alchemy to chemistry, chemistry disciplines, and chemists' fields of study, occupational health, and safety in chemical applications" topics in the 2018 curriculum. Only the periodic system title is the same in the "atomic and periodic system" unit. The 2013 curriculum is included "the development of the concept of atoms and the Bohr atomic model" topics, while the 2018 curriculum is included "atomic models and the structure of the atom" topics. In both programs, the topics in the units "Interactions Between Chemical Species" (what is the chemical type?, classification of chemical interspecies interactions, strong interactions, poor interactions, and physical and chemical changes) and "states of matter" (physical states of matter, gases, liquids, and solids) are the same and only in addition to the topics in the states of matter unit in the 2018 curriculum, plasma topic is included. The "Nature and Chemistry" unit is only available in the 2018 curriculum and includes "water and life, environmental chemistry" (Ministry of National Education, 2013; Ministry of National Education, 2018).

The 10th-grade "mixtures" unit is included under two different headings in the 2013 curriculum in the form of homogeneous and heterogeneous mixtures. In the 2018 curriculum, homogeneous and heterogeneous mixtures are under one heading. The separation of mixtures topic in the 2013 curriculum is included, as separation and purification techniques topics in the 2018 curriculum. The topics in the "Acids, bases and salts" unit are the same as "reactions of acids/bases, acids and bases in our lives, salts", and while the 2013 curriculum includes the topic "getting to know acids and bases", the 2018 curriculum includes the topic "acids and bases". The "energy in industry and living things" unit is only included in the 2013 curriculum with "fossil fuels, clean energy sources, energy in living things" heading. In the "Chemistry everywhere" unit, the 2013 curriculum includes "water and life, chemistry at home-school-industry and environmental chemistry" headings, while the 2018 curriculum includes "common everyday life chemicals and foods" heading. The "basic laws of chemical and chemistry calculations" unit is only included in the 2018 curriculum with the topics "basic laws of chemistry, mole concept, chemical reactions and equations, calculations in chemical reactions" (Ministry of National Education, 2013; Ministry of National Education, 2018).

The topics of the "chemical calculations" unit (mole concept, the simplest formula, and molecular formula, chemical reactions and equations, chemical calculations) in the 11th grade 2013 curriculum are almost identical to the basic laws of chemistry and chemical calculations unit in the 10th grade 2018 curriculum (basic laws of chemistry, mole

concept, chemical reactions, and equations, calculations in chemical reactions). In the "modern atomic theory" unit, the topics "quantum model of the atom, periodic system, and electron sequences, periodic features, getting to know the elements, oxidation steps" are the same in both the 2013 and 2018 curricula. In addition to these, the 2013 curriculum includes topics about the "thoughts on the atom and symbolic language of chemistry and naming of chemistry" titles. While the "gases" unit contains gas laws are included in the 2018 curriculum, and other topics are the same in both curricula (the properties of gases, ideal gas law, kinetic theory in gases, real gases, and gas mixtures). The "liquid solutions" unit in the 2013 curriculum has the same subject headings as the "liquid solutions and resolution" unit in the 2018 curriculum, except for the separation and purification techniques in the 2018 curriculum (solvent-soluble interactions, concentration units, colligative properties, resolution, factors affecting resolution). The "chemistry and energy" unit is only included in the 2013 curriculum with the topics "system and environment, heat, mechanical work, and internal energy, the first law of thermodynamics, entropy, the third law of thermodynamics". In the 2013 curriculum, while the "speed and balance in reactions" unit is included, in the 2018 curriculum as "speed in chemical reactions" and "balance in chemical reactions" units are included. When the subject titles of these units are compared, the "speed and balance in reactions" unit in the 2013 curriculum and the "speed in chemical reactions" and "balance in chemical reactions" units in the 2018 curriculum have the same subject titles, only except for "how do substances react?" in the 2013 curriculum (reaction speeds, factors affecting the speed of reaction, chemical balance, factors affecting balance, aqueous solution balances). Namely, while the "speed in chemical reactions" unit in the 2018 curriculum is included in the topics of "factors affecting reaction speeds and reaction speed," the "balance in chemical reactions" unit is included with the topics "chemical balance, factors affecting balance, aqueous solution balances". The "energy in chemical reactions" unit is only included in the 2018 curriculum with the topics "heat change in reactions, enthalpy of formation, bond energies, the addictiveness of reaction heats" (Ministry of National Education, 2013; Ministry of National Education, 2018).

Although the topics in the 12th grade "chemistry and electricity" unit show similarities in both curricula (electrodes and electrochemical cells, electricity production from chemicals, electrolysis, corrosion), the 2013 curriculum includes the topics "what oxidates/reduces what?" and "spontaneity and electric current in reduction-oxidation reactions", while 2018 curriculum includes the topics "electrode potentials" and "electric current in reduction-oxidation reactions". In the "introduction to carbon chemistry" unit, while the topics of "inorganic and organic compounds, carbon in nature, Lewis's formulas, hybridization-molecule geometries" are under the same heading in both curricula, the topics of "functional groups" and "isomerism" are included in the 2013 curriculum, and

"simple formula and molecular formula" topic is included in the 2018 curriculum. In addition, the "functional groups" topic head in this unit in the 2013 curriculum, it is included in the 2018 curriculum in the organic compound's unit. The subjects of "hydrocarbons, alcohol, ethers, carbonyl compounds, carboxylic acids" in the "organic compounds" unit are the same in both curricula, and while "amines, carboxylic acid derivatives, multifunctional compounds" are included in the 2013 curriculum, "functional groups and esters" are included in the 2018 curriculum. "Chemistry in our lives" unit is only included in the 2013 curriculum with the titles "oil refining, oil production, margarine, surfactants, polymers, biomolecules". The "energy resources and scientific developments" unit is only included in the 2018 curriculum with the titles "fossil fuels, alternative energy sources, sustainability, nanotechnology" (Ministry of National Education, 2013; Ministry of National Education, 2018).

4) The learning-teaching process in 2013 and 2018 Chemistry course curricula: In the 2013 curriculum, the learning-teaching approach in both basic and advanced chemistry course curricula was mentioned with the statement, "It is essential that learning and teaching activities are organized and managed by the teacher in an environment enriched to ensure the direct relationship and interaction of the student with concrete materials" (Ministry of National Education, 2013: 4; Ministry of National Education, 2013: 26). In other words, the students' learning should be realized with the learning-teaching activities in which the teacher embodies the teaching with materials in the 2013 curriculum. In addition, it was mentioned that the individualized curriculum should be prepared per their characteristics for students who need special education in the basic level chemistry course curriculum (Ministry of National Education, 2013).

In the 2018 curriculum, the issues to be considered in implementing the 5-item curriculum were determined. "It is necessary to pay attention to the content limitations in especially unit titles and acquisitions in the implementation of the chemistry course curricula. The course must be taught in the laboratory and activity-based. Teachers should be sure that students have the knowledge and skills needed in scientific activities in the classroom and laboratory environment. Before the studies, safety rules should be reminded, and students should be encouraged and warned to take responsibility for their own and others' safety. Performance studies, experimental designs, activities, and projects should be structured and implemented in a classroom environment under the supervision of the teacher" (Ministry of National Education, 2018: 12).

5) The measurement and evaluation in 2013 and 2018 Chemistry course curricula: In the 2013 curriculum, the measurement and evaluation approaches were mentioned as a title. The measurement and evaluation in this curriculum include the statement "it envisages monitoring the students' learning processes and changing the

learning activities used, when necessary, by evaluating the knowledge and skills they have gained in this process" (Ministry of National Education, 2013: 4; Ministry of National Education, 2013: 26). In the 2013 curriculum, it is stated that the evaluation should be prepared according to the objectives and learning outcomes of the course, and it is emphasized that these measurement and evaluation activities are carried out simultaneously with the teaching activities. In addition, it is recommended to determine and improve students' analytical thinking abilities by measurement and evaluation, to use together with different tools and methods when evaluating success, and to use all kinds of tools and methods to evaluate the levels of knowledge, skills, and attitudes of students (Ministry of National Education, 2013). Also, it is stated that a measurement and evaluation tool suitable for the individual should be selected by using an individualized curriculum according to the characteristics of individuals who need special education during the measurement and evaluation phase in the basic level chemistry course (Ministry of National Education, 2013).

The 2018 chemistry course curriculum mentioned measurement and evaluation issues under the heading "measurement and evaluation approach in the curriculum". In the 2018 curriculum, which is based on individual differences, it is recommended to make as much diversity and flexibility as possible in the measurement and evaluation process. "It is the expected of teachers or educational practitioners to ensure the effectiveness of the measurement and evaluation practices in this curriculum. It is the basic expectation of originality and creativity from teachers in this regard" (Ministry of National Education, 2018: 8). The principles guiding measurement and evaluation practices have been determined in the 2018 curriculum. According to the Ministry of National Education (2018), these are important in measurement and evaluation: these are to be in harmony with the program elements of the measurement and evaluation studies, based on the limits of the acquisitions and explanations, to carry out the measurement and evaluation throughout the process, to evaluate the testing results together with the process. In addition, according to the Ministry of National Education (2018) measurements should be made for thought, emotion, and action. Since the individual's interest, attitude, and success may vary over time, it is necessary as measurement at different times should be done in the process and made applications of measurement and evaluation in a very focused manner with the active participation of teachers and students. (Ministry of National Education, 2018).

RESULTS AND DISCUSSION

The results of the research and the relevant discussion are presented below:

In this research, 2013 and 2018 secondary education chemistry course curricula were examined mutually in terms of the basic elements of the program. In the 2013 chemistry curriculum, grades 9 and 10 were divided into two levels "basic" and grades 11 and 12 as "advanced". In this regard, the study conducted by Demir et al. (2017), which examined teacher opinions on the 2013 chemistry course curriculum, found it useful that the majority of the teachers who participated in the study were divided into basic and advanced levels of the 2013 curriculum. However, in the same study, a small number of teachers mentioned that the basic level is very easy, the advanced level is very difficult, and as a result, they do not find it useful to divide the 2013 curriculum into basic and advanced levels (Demir et al., 2017).

When the 2013 and 2018 secondary education chemistry course curricula were evaluated in the general objectives dimension, it was observed that both the 2013 and 2018 curricula had general objectives. In the 2013 curriculum, it was aimed to raise awareness of the introduction of chemistry, familiarity with the concepts and symbolic language of chemistry, discovery the relationship between the properties and functions of various chemicals used in daily life, the effects of chemicals on humans and the environment, and their correct use of chemicals. In addition, chemistry literacy, analytical thinking, career and entrepreneurship, and the aims of providing a chemistry infrastructure for students who want to continue their education in chemistry in the future are included in the 2013 curriculum (Ministry of National Education, 2013). In the 2018 curriculum, students are asked to know chemical science, to use it following ethical values, to know the people who are influential in the development of chemistry science and their studies, and to use the knowledge and skills learned in chemistry class in their lives, to produce ideas, to be asked to do original studies, to recognize career opportunities in the field of chemistry, to be interested in chemistry, to experiment and interpret, the purposes for the use of technologies in chemical science (Ministry of National Education, 2018).

When the 2013 and 2018 secondary education chemistry course curricula were evaluated in the dimensions of units-learning outcomes-course hours, it was observed that the chemistry course was taught for 72 hours in 9th and 10th grades and 144 hours in 11th and 12th grades in the 2013 and 2018 curricula. In this case, a total of 432 hours of chemistry courses are given to students at the end of four years in both curricula. In the study conducted by Demir et al. (2017), teachers stated that the course hours in the 2013 curriculum were not sufficient in part for the basic level and largely for the advanced level. Also, the studies carried out by Demircioğlu et al. (2015) and İzci & Eroğlu (2018) were stated teachers that course hours have stated the duration of the course hours as insufficient.

There are 33 learning outcomes in the 2013 curriculum in the ninth grade and 38 in the 2018 curriculum. There are 39 learning outcomes in the 2013 curriculum in the 10th grade and 23 in the 2018 curriculum. There are 46 learning outcomes in the 2013 curriculum in the 11th grade and 35 in the 2018 curriculum. There are 37 learning outcomes in the 2013 curriculum in the 12th grade and 31 in the 2018 curriculum (Ministry of National Education, 2013; Ministry of National Education, 2018).

There are four units in the 2013 curriculum in the ninth grade, while five units are included in the 2018 curriculum. There are four units in the 2013 and 2018 curricula in the 10th and 12th grades. In the 11th grade, there are six units in the 2013 and 2018 curricula (Ministry of National Education, 2013; Ministry of National Education, 2018).

When the 2013 and 2018 secondary education chemistry course curricula were evaluated in terms of suggested topic titles, it was determined that although there were different units and topics in both programs, they showed some similarities. In the study conducted by Demir et al. (2017), teachers stated that there were problems in the subject ranking at all class levels in general in the 2013 curriculum and that the subjects in some units were not suitable for the students' readiness. In the same study, teachers in the 2013 curriculum mentioned that the content in some units is very dense, so the number of concepts is also high, making it difficult for the units to be understood by the students. In addition, in this study, the teachers mentioned that the basic level is mostly verbal and far from practice, while the advanced level includes intensive calculations (Demir et al., 2017). In the study of İzci & Eroğlu (2018), in which teachers' views on the 9th-grade chemistry lesson were examined, most of the teachers stated that the content was appropriate and up-to-date to the student's level.

When the 2013 and 2018 secondary education chemistry curricula were evaluated in terms of learning-teaching processes, the following results were reached: In the 2013 curriculum, an enriched learning environment was mentioned that would allow students to interact directly with concrete materials. In addition, these activities are expected to be planned by teachers (Ministry of National Education, 2013). In the 2018 curriculum, it was mentioned that the courses were processed in laboratories and on an activity basis. That performance studies, experimental designs, activities, and projects of the students were carried out in the classroom and under the supervision of teachers (Ministry of National Education, 2018). In the study, in which the 2013 chemistry course curriculum was evaluated according to teacher opinions, it was mentioned that the explanations for how teachers processed their courses were not adequately included in the curriculum (Demircioğlu et al., 2015). However, in the study conducted by İzci & Eroğlu (2018), in which the 2013 ninth grade curriculum was examined according to the teachers' opinions, the teachers stated that the teaching-learning approach of the curriculum was

generally appropriate and student-centered. In the study conducted by Demir et al. (2017), teachers stated that there were difficulties in implementing the 2013 curriculum.

When the 2013 and 2018 secondary education chemistry curricula were evaluated in terms of measurement and evaluation, the following results were obtained: In the 2013 chemistry curriculum, it points out monitoring the learning levels of students with evaluation activities and, as a result, making an evaluation and changing the applied learning activities if needed. At the same time, it is mentioned that the evaluation is simultaneous with the teaching activities. In addition, it was proposed to improve the students' analytical thinking abilities and use different tools and methods to evaluate success (Ministry of National Education, 2013). In the 2018 curriculum, the principles that guide the measurement and evaluation practices have been determined. These are recommended that the measurement and evaluation be compatible with the elements of the program, that the measurement and evaluation be carried out throughout the process, that it is evaluated together with the process, and that it is aimed at the cognitive, sensory, and psychomotor field, those individual differences are based, and that active participation is ensured in a multifaceted way (Ministry of National Education, 2018). In the study conducted by İzci & Eroğlu (2018), in which the 2013 9th grade curriculum was examined according to the teachers' opinions, the teachers generally expressed a positive opinion about the measurement and evaluation dimension of the curriculum.

SUGGESTIONS

1. To guide the chemistry curricula’s practitioners, measurement and evaluation activities and examples should be included in more detail in the curricula.

2. To guide the chemistry curricula's practitioners, sample activities and explanations related to the regulation of the learning-teaching process should be included in more detail in the curricula.

3. Considering that technology is advancing very fast and affecting education systems, first of all, practitioners should be informed about the teaching of chemistry with information and communication technologies.

4. It is important that the chemistry curricula be introduced to the teachers in more detail with in-service training programs before the application.

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