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Comparative Examination of the Primary School Science Curricula in Turkey (Curricula of 1992, 2001, 2005, 2013 and 2017)

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Abstract

In the present study, the science course curricula of 1992, 2001, 2005, 2013 and 2017 taught at the primary school level in Turkey have been examined comparatively in terms of four main elements (Target, Content, Educational Status, and Measurement and Evaluation). The reason for investigating the science curriculum at five key years was to identify and examine main changes in the system. To this end, the main elements of the curricula were presented in a table. The similarities and differences between the curricula in question were determined and interpreted as a result of the evaluations. The study was carried out using the document review technique, among qualitative research methods. The science curricula published by the Ministry of National Education were analysed in the study. The curricula of the afore-mentioned years were first analysed separately in the process, and then the results were re-investigated by being gathered together. Therefore, it was attempted to ensure the consistency of the data. The results achieved show that the curricula cannot be realized as expected due to certain problems encountered in the process of implementation despite overall positive developments (the fact that teachers are not informed sufficiently, infrastructure problems, crowded classes, the lack of technological equipment, etc.)

Keywords: primary school, primary school science course curricula, main elements of the curriculum, learning theories

1. Introduction

When the phased classification of programs is examined, the terms Education program, Curriculum and Syllabus are generally confused. While an Education program is shortly defined as "a set-up of learning experiences" (Varış, 1994), a Curriculum is the planned preparation of what is meant to be learned by students (knowledge, skills, attitudes, gains, etc.) in the form of lesson clusters in line with the aims of the education program. The syllabus incorporates the aim, content, teaching and learning processes and evaluation features of a subject. In educational processes, the term "course curriculum" is generally used together, and it is assumed that it incorporates all these activities of that subject. The term curriculum will be used in the present study, by sticking to the term that is also used by the MNE (Ministry of National Education/MEB). According to Taba (1962), there are 4 main elements that a curriculum must have. These are as follows: 1) Aim and specific objectives, 2) Content, 3) Teaching and learning process, and 4) Evaluation (quoted by Saylan, 1995, pp. 36-37). Countries change and renew their education programs and curricula from time to time according to the requirements of the time. In Turkey, either the education programs of an educational level are fully renewed, or the curricula of specific subjects are revised. The curricula of the Science course at the primary school level, which is the subject of this study, were renewed on different dates throughout the years, and researchers conducted different studies on these changes (Hamurcu, 1998; Çepni, Küçük, & Ayvacı, 2003; Ünal, Çoştu, & Karataş, 2004; Bahar, 2006; Buluş Kırıkkaya & Tanrıverdi, 2006; Bağcı Kılıç, Haymana, & Bozyılmaz, 2008; Eş & Sarıkaya, 2010; Dindar & Taneri; 2011). Furthermore, similar studies were carried out in terms of different variables on the process of implementation of science curricula. Among these studies, it is observed that the studies on the process of implementation and content of the new Science and technology curriculum that was started to be implemented in 2004 are especially high in number (Bümen, 2005; Akpınar, Günay, & Hamurcu, 2005; Akamca Özyılmaz, Hamurcu, & Günay, 2006; Akamca Özyılmaz, Hamurcu, & Günay, 2008; Gömleksiz & Bulut, 2007; Yangın & Dindar, 2007; Tekbıyık & Akdeniz, 2008; Buluş Kırıkkaya, 2009; Tüysüz & Aydın, 2009; Aktaş & Hamurcu, 2010; Güçlü, Kartal, & Mete, 2010; Aktaş & Unayağyol, 2010; Hamurcu & Günay, 2011). It is also observed that new studies have been carried out on the curricula in recent years (Karatay, Timur, & Timur, 2013; Toraman & Alcı, 2013; Özdemir & Arık, 2017).

This study examines the Science curricula implemented in 1992, 2001, 2005, 2013 and 2017, in terms of the main elements of the curriculum. The aim of carrying out the research starting from the 1992 curriculum is to evaluate the main changes in the system, teaching approaches, practices, etc. As of 2001, the main learning approach on which the curriculum is based has been regulated based on Cognitive learning theories. In the recent period (2013), primary education has been regulated as 4 years of primary school and 4 years of secondary school in line with the change made in the education system (the 4+4+4 model). With this change, the 5th grades that were previously taught by primary school teachers have been included in the scope of secondary school. Furthermore, it was planned to teach the subject named Science in this new system 3 hours a week in the 3rd and 4th grades. Therefore, the term primary school used in the title of the study was used to cover the change that occurred in the Science course curricula taught by primary school teachers in the system from past to present. The 1992 Science 4th and 5th grade, 2001 Science 4th and 5th grade, 2005 Science and technology 4th and 5th grade, 2013 Science 3rd and 4th grade Curricula, and the recently published 2017 Science 3rd and 4th grade curricula will be addressed and examined in the present study in terms of 1) Aim and gains, 2) Content, 3) Teaching and learning process (educational status) and 4) Evaluation dimensions.

2. Method

The study was conducted using the Document review technique among the Qualitative research methods. Curricula, etc. can be used as a source of data in this method (Yıldırım & Şimşek, 2000, pp. 140-141). The Science curricula published by the MNE (MEB) were analysed in the study. The curricula of the afore-mentioned years were first analysed by the researcher, and then re-investigated by another expert. Therefore, it was attempted to ensure the consistency of the data. The help of an academician, expert in the field of Education Programs and Teaching, was sought for deciding on the content of which program element the sub-dimensions belong to in the process of analysis. The analysis results are presented below in tables of the four main elements of the curriculum.

3. Findings and Interpretation

The differences of the main elements of the curriculum with the analysis of the qualitative data of the study are presented in the tables. Furthermore, there is interpretation of the data under each table.

3.1 Aim and Gains (targets) Element of the Curriculum

Features such as the knowledge, skills, attitudes, behaviours, etc. that are desired to be introduced to the student by a curriculum make up the first element of the curriculum. While each curriculum covers the aims of a subject at the beginning, these are followed by the specific targets or gains at varying numbers for each unit/subject in line with the learning approach on which the curriculum is based. The following Table 1 includes information on this distinction.

Table 1. Differences in relation to the aim and gains (targets) element of the science curricula

NAME OF THE LESSON Curriculum Features	SCIENCE 1992	SCIENCE 2001	SCIENCE and TECHNOLOGY 2005	SCIENCE 2013	SCIENCE 2017
AIMS and THEIR FEATURES	There are 22 general aims. While the first 14 of them have expressions that are close to the general aims, the subsequent ones (between 15-22) aim to introduce the targets of the subject area more (1992, p. 81).	There are 10 general aims. The aims consist of general expressions. (2000, p. 1013)	There are 11 general aims. The aims consist of general expressions (2008, p. 1028).	There are 12 general aims in the curriculum. The aims consist of general expressions (2013, p. II)	There are 10 general aims in the curriculum. The aims consist of general expressions. (2017, p. 5)
NUMBER OF GAİNS IN UNITS	Each unit covers the Aims and Behaviours. The number of aims varies by units, and a varying number of behaviours is shown under each aim.	The numbers of specific aims and gains in the curriculum vary by units.	There is no specific aim in the units. The number of gains varies by units	There is no specific aim in the units. The number of gains varies by units.	There is no specific aim in the units. The number of gains varies by units.
SPS (Scientific Process Skills)	Despite not being fully expressed as SPS in the general aims, it was mentioned as content (in aim 4-5-6). Furthermore, the building of the same content and problem-solving skill was mentioned in the Introduction part (1992, pp. 8-9).	SPS were mentioned in the general aims. The observation, research and experiment making skills were especially emphasised (2000, p. 1013).	SPS were included as the 4th dimension among 7 dimensions for science and technology literacy specified in the vision of the science and technology course. SPS were mentioned in the 8th item of the Aims of the Curriculum of the Science and Technology Course Furthermore, SPS are included under a separate title in the curriculum (2008, pp. 1113-1114).	SPS were explicitly referred to in the general aims (Aim 2 and 6; 2013, p. II).	SPS were referred to in the general aims (Aims 2, 4 and 9; 2017, p. 5).
VISION	There was no such expression in the introduction part. However, it was emphasised that Science subjects should be addressed within 4-8th grades since basic education was increased to 8 years, and in integrity with the high school science course (1992, pp. 7-10).	The introduction part of the curriculum includes the general definitions in relation to vision, and what the vision of the curriculum was mentioned as a section of 7 items (2000, p. 1005).	The vision of the Science and Technology Course Curriculum is said to be "Raising all students as science and technology literate regardless of their individual differences" (2008, p. 1111).	The vision of the Science Course Curriculum was defined as "Raising all students as science literate individuals" (2013, p. I).	Such an expression was not included in the introduction. However, it was specified that this curriculum aims to "Raise all individuals as science literate" right before the general aims (2017, p. 5).

ATATÜRK'S PRINCIPLES	There is no association with Atatürk's Principles and Reforms in the Curriculum.	The "Subjects Related to Atatürkism" in the curriculum were fully addressed in the units of the 4th and 5th grades.	There is no association with Atatürk's Principles and Reforms in the introduction part of the curriculum. However, it includes tables on the subjects related to Atatürkism that match the gains of the 4th and 5th-grade science and technology course curriculum (2008, pp. 1076-1110).	There is no association with Atatürk's Principles and Reforms in the curriculum.	There is no association with Atatürk's Principles and Reforms in the curriculum. The curriculum mentions Atatürk's name only under the title of Science and engineering practices, and it was said that "The importance attributed by Atatürk to science and technology is emphasised in the units of science and engineering practices at all grade levels" (2017, p. 11).

When the table is examined, it is observed that while the number of the general aims in the Science curriculum was first 22 in 1992, it was similar in other years (10, 11, 12 and 10). The change in the content of the aims can also be observed clearly. While the 1992 curriculum includes aims related to teaching, the aims also decreased in number as the learning approach on which the curriculum is based changed (The process of transition to the Cognitive learning approach from the Behavioural learning approach). While the 1992 curriculum included target behaviours, it is observed that the term gains started to be used as of the 2001 curriculum. Therefore, the change in the learning approach that has just been defined is also emphasised. In general, it is also observed that the number of gains decreases. Accordingly, it can be considered that "the less information is more" approach is adopted rather than loading students with too many information. This was already emphasised in the 2005 curriculum.

Upon examining the aims and gains in relation to introducing SPS in the curriculum, it is observed that it is briefly mentioned in the 1992 curriculum, while specifically emphasised, and even given as separate aims in the 2001, 2005, 2013 and 2017 curricula.

Upon examining the vision of the curricula, no clear definition was made on this subject in 1992, but the target of fulfilling the 8-year basic education was emphasised. As of 2001, the general definitions of the vision and 7-item objectives to be reached were included. The definition of vision with one sentence expressions is also encountered in the science curricula of 2005 and 2013. Since the importance attributed to technology teaching in the age of technology that developed with the inclusion of the term science literacy in the curriculum in 2005 was emphasised, the name of the subject was changed in addition to defining its vision as "Raising all students as science and technology literate regardless of their individual differences". In 2013, both the word technology was removed from the name of the subject, and the definition was given as "Raising all students as science literate individuals" by removing it from the vision. This was also emphasised in the study conducted by Karatay et al. (2013, p. 255). In this sense, it can be said that science literacy is emphasised more in the recent 2 curricula. No determination was made regarding the vision in the latest curriculum that started to be implemented in 2017, but the expression "The Science Course Curriculum that aims to raise all individuals as science literate" before defining the general aims was included (MNE, 2017, p. 5). As can be seen, no emphasis was made on technology in this curriculum, as well.

In the last sub-dimension related to the aims of the curriculum, whether the curriculum includes "Atatürk's Reforms and Atatürk Nationalism", which is the 7th of 14 main principles that make up Article 1 of the General aims of Turkish National Education and are listed among the Main principles of Turkish National Education No. 1739 (published in the official gazette of 1973 No. 14574) was also investigated. As it is known, the curricula of the subjects should be in full compliance with the General aims of Turkish National Education. Therefore, it was found out that no association was made with Atatürk's principles that are supposed to be included among the general aims of the curricula of all educational levels in the curricula of 1992 and 2013. Nevertheless, it is observed that they are included in the curricula of 2001 and 2005, and even associations are made with the subjects. There is also not much association in the curriculum of 2017. However, reference was made in only one unit as it is also emphasised in the table above.

Consequently, it can be said that there are differences between the five curricula in terms of the first element of the curriculum.

3.2 Content Element of the Curriculum

The information on the Content (scope, approach, and the subject areas included), which is the second element of the curriculum, is presented in Table 2.

Table 2. Differences in relation to the content element of the science curricula

	Curriculum of 1992	**Curriculum of 2001**	**Curriculum of 2005**	**Curriculum of 2013**	**Curriculum of 2017**
THE LEARNING APPROACH ON WHICH THE CURRICULUM IS BASED	Upon examining the Aim and Behaviour expressions in the curriculum, it is observed that the curriculum was prepared based on "The Behavioural learning theory".	When the Aim and Achievement expressions in the curriculum are examined, it is observed that the curriculum was prepared based on the "Cognitive learning theory". However, problems were encountered in implementation.	It was endeavoured to reflect the Constructivist learning approach as much as possible.	The expression "Research-inquiry based learning approach is based on" is used in the curriculum (2013, p. III). No other approach was included.	The expression "Research-inquiry based learning approach with an interdisciplinary approach is based on" is used in the curriculum (2017, p. 11). No other approach was included.
SCOPE AND CONTENT	Each grade covers 8 units in the curriculum, and the scope of the units is quite wide, and it was estimated to give much information.	Each grade has 4 units. The units were structured based on experiments.	Each grade has 7 units in the curriculum. It was tried to cover more activities within unit subjects.	Each grade has 7 units in the curriculum. The scope of the units is not broad, and the notion less information is better was adopted.	There are 7 units in 3rd grade and 8 units in 4th grade in the curriculum. This new unit added to the 4th grade is the "Applied science" unit that will also continue in the 5th, 6th, 7th and 8th grades. The scope of the units is not broad, and the notion less information is better was adopted.

ABSTRACT CONCEPTS	It was tried to classify them, but no precise orientation was made in this respect. However, the subject of heat was first given in 5th grade, and then it was provided for to teach in a more detailed way in 7th grade since it has abstract concepts (1992, pp. 71-72). The subject of heat was not addressed in any other grade.	The curriculum includes subjects related to the Earth, space and the environment in addition to the subjects of physics, chemistry and biology. The subjects were distributed in a balanced way to science fields and classes, and the level of the subjects was defined in accordance with the age of students (2000, p. 1004).	It was shown that the abstract concepts would be explained by being concretized in given activity examples. However, if we address them in terms of time, it can be thought that it can be hard to provide sufficient time for these activities.	Abstract concepts were not covered much by the curriculum. The subject of light is covered in 3rd and 4th grades.	Abstract concepts are not included in the curriculum. It is observed that the contents of physical events are tried to be given once in two years briefly and to the point.
SUCCESSIVENESS OF THE SUBJECT CONTENT	While certain subjects are taught only in 4th and 5th grades (Our Earth and sky-4th grade, Heat-5th grade, Sound-5th grade), it is observed that other subjects are taught at both grade levels. And they are organized in a way that they complement one another.	No information is given on this subject in the introduction part of the curriculum. However, it is observed that certain units complement one another (2000, p. 1014).	When their content is examined in general, it can be said that the subjects are organized in a way that they complement one another. It can be said that the spiral structure suggested in the curriculum is implemented.	When we look at the subjects of the 3rd and 4th grades, a spiral structure in which the content in the 3rd grade is taught by being expanded in the 4th grade draws attention. The subjects are arranged in a way that they complement one another.	In general, subject contents complement one another. However, disconnection is observed in the subject field of the Living beings and life. While the 3rd grade covers the unit “Our five senses”, the unit “Our food” is included in the 4th grade, the subject content is skipped in the 5th grade, and the Systems are covered in the 6th grade.
INCLUSION OF UP-TO-DATE INFORMATION	Although subjects include explanations on the association with daily life, it is observed that contemporary and new information is not covered much (lower grades do not include it, 7th and 8th grades include it partially).	Subjects include explanations on making associations with daily life. For example; the subject of earthquakes is covered by the 4th-grade’s 4th unit, while no information is given on the earthquake of 1997. (2000, p. 1027)	In the *overview* part of the units, it was stated that it was necessary to make an association with the daily life when presenting subjects to students. The subjects are given by making an association with the daily life in the activity examples prepared.	Both importance was attributed to making associations between the subjects and the daily life (Aim 6), and the contemporary subjects were included in the curriculum.	The association of the subjects with the daily life was included in the curriculum (Aim 4). Moreover, defining and seeking a solution to a daily life problem are emphasised in the “Applied science” unit that is recently added to the 4th grade.
NUMBER OF UNITS	4th grade: 8 units 5th grade: 8 units	4th grade: 4 units 5th grade: 4 units	4th grade: 7 units 5th grade: 7 units	3rd grade: 7 units 4th grade: 7 units	3rd grade: 7 units 4th grade: 8 units

KNOWLEDGE OF TECHNOLOGY	Technology is referred to and is said to be important in the Introduction part of the curriculum (1992, pp. 8-9). However, information on technology and contemporary developments is generally addressed in 6th, 7th and 8th grades.	Technology is referred to and is said to be important in the Introduction part of the curriculum (2000, p. 1001). Regarding technology and contemporary developments (in 4th grade), it was explained that it is now possible to split the atom.	In the curriculum, it was tried to be shown how important technology learning is in Science-Technology-Society-Environment Relations that are among the dimensions of science and technology literacy (2008, pp. 1033-1034, 1037). Moreover, it is shown that science and technology are concentric in STSE gains and activity examples.	Technology is attributed importance in the curriculum. There is a learning area called Science-Technology-Society-Environment. Moreover, there are subjects such as Lighting Technology, Sound Technologies in the curriculum.	It is observed that technology is not mentioned much in the curriculum. It is not mentioned in the general aims. It is observed that innovative inventions and technology are addressed only within Science and engineering practices. The curriculum covers the subject of “Lightning and Sound Technologies” in the 4th grade.
PRESENTATION OF THE SUBJECTS RELATED TO THE ENVIRONMENT	A general explanation is made about the Environment and environmental consciousness in the introduction part of the curriculum (1992, p. 8). Moreover, as can be seen in the attached table, the “Human and environment” unit is included at all grade levels.	The unit “Let’s Get to Know Our Environment” is included at the 4th grade level. The investigation of air-water-soil pollution and their solutions was mentioned in the unit “Nature of the Matter” of 4th Grade’s Unit 2. And the Unit “Living Beings and Their Interaction with the Nature” is in the 5th grade (2000, p. 1031).	In the curriculum, the gains for “Science-Technology-Society-Environment” for the 4th and 5th grades are presented in a table (2004, p. 1037). Furthermore, gains related to the environment are given in 5 units (2,4,5,6,7) in the 4th grade and 3 units (2, 6, 7) in the 5th grade	Items regarding the environment and environmental consciousness are included in the general aims of the curriculum (aim 2 and aim 4). Moreover, the 3rd grade includes the subject “Natural and Artificial Environment” (2013, p. 4). The subject “Human and Environment Relationship” is also mentioned in the 4th grade (2013, p. 13).	-Subjects related to the environment are included in the general aims of the curriculum (aims 1, 2, 3 and 7). The 3rd grade includes the subject “A journey into the world of living beings”, and the 4th grade includes the subject “Human and Environment”. (2017, p. 13)

PRESENTATION OF THE INFORMATION RELATED TO HEALTH	It is observed that information about human health is given in different units at all grade levels. These are as follows: In 4th grade; Unit 2- Living beings and life. Unit 4- Human and environment (1992, pp. 88-92). In 5th Grade; Unit 1- Let's get to know our body, Unit 3- Human and environment, Unit 5- Sound, Unit 6- Light, Unit 7- Heat, (1992, pp. 100-117).	In 5th grade; "Living Beings and Their Interaction with Nature"; viruses that cause diseases by affecting human health negatively, and the effects of bacteria on human health (2000, pp. 1030-1031).	Information on health is given in the Inter-Discipline Area Gains Table matching with the 4th and 5th grade Science and Technology Course Curriculum Gains (2008, pp. 1076-1109). The Health culture gains in the table are correlated with the units 1, 4, 5, 6 and 7 in the 4th grade. For example; 4th-grade Unit 1 Living Beings and Life, In the 5th grade, it is correlated with the units 1, 4 and 6.	It is mentioned that basic information on health will be given in the general aims part of the curriculum (aim 1). Also, information on human health is included among the subjects. These are as follows: 1- 3rd grades; Unit 5- Living Beings and Life, (2013, p. 5). 2- 4th grades; Unit 1- Let's Get to Know our Body, (2013, p. 8). Unit 4- Lightning and Sound Technologies from Past to Present, (2013, p. 12). Unit 5-Microscopic Creatures and Environment, (2013, p. 13).	No reference is made to health in the general aims part of the curriculum. Information on human health is included under certain subjects. "Our five senses" unit in the 3rd grade addresses the health of our sensory organs (2017, p. 16), while the unit "Our Food" in the 4th grade talks about the effects of nutrition, and the use of alcohol, cigarette, etc. on human health (2017, p. 21). Moreover, the effects of noise pollution on health are included in the "Lightning technologies" unit in the 4th grade (2017, p. 23).

If we look at the learning approaches on which the curricula are based first, a transition from the behavioural approach to the research-inquiry approach is observed. We can observe that the student is regarded as a person that takes information as it is and reflects it into his/her behaviour in the 1992 curriculum, but an effort is shown to ensure a transition to a cognitive (constructivist) approach that defends that an individual structures information in his/her mind. However, as it is also emphasised by the MNE in the 2004 draft science curriculum, it is determined that this transition, unfortunately, cannot be fully ensured (MNE, 2004, p. 39). While no approach is directly referred to in the curricula of 2013 and 2017, it is stated that activities are planned according to the learning approach that is based on the student-centred research and inquiry (the constructivist approach). Karatay et al. (2013, p. 255) specifically emphasised this change in the curriculum of 2013.

Again, upon evaluating in terms of scope and content, a change is observed from the curriculum of 1992 to the curriculum of 2017, the scope becomes narrower and becomes more activity-based. When we examine the succession of the subject content, it can be said that the subjects are generally arranged in a way that they complement one another in all curricula. However, it can be said that the succession in all subjects cannot be ensured by decreasing the number of the units in the curriculum of 2001 (see Table 3 for additional information). The differences between the curricula also attract attention in terms of the time allocated to the units. A new learning domain was added to the lesson starting from the 4th grades in the curriculum of 2017. It is observed that the "Applied Science" unit is added to the sub-domain of "Science and engineering practices" as a skill learning domain to each grade (4th, 5th, 6th, 7th and 8th grades). This addition can be considered as a beginning of the STEM (Science, Technology, Engineering and Mathematics) approach. Therefore, it can be said that creativity and innovation are added to science lessons. Consequently, while there are 7 units in the 3rd grade, this number increases to 8 in the 4th grade. This subject was introduced as the last unit in all grades, and it was stated that students are expected to use their innovative process skills such as getting to know a problem, looking for a solution and creating a product "in cooperation with their friends" under the supervision of their teacher.

Upon addressing the learning domains, while the curriculum of 1992 includes only the information areas, no explanation was made on this subject in 2001. As of 2005, it is observed that SPS and affective and skill areas are also added. Differences are also observed in the associations made with other lessons in the curricula. While associations with other fields were not included in the curricula of 1992, 2001 and 2013, they were included in the curriculum of 2005. The Turkey Qualifications Framework (TQF) was referred to in the curriculum of 2017, and it was provided for that gains cover these skills.

> *"The TQF is the national qualifications framework that is designed in line with the European Qualifications Framework (EQF) and shows all qualification principles gained through vocational, general and academic curricula and syllabi and other ways of learning, including the primary, secondary and higher education. The main aim of the TQF is to provide an integrated structure in which all the qualifications in our country are defined, classified, and consequently, relations such as the transfer and advancement between the qualifications are defined. The TQF includes eight key competencies that all individuals are expected to gain within the scope of lifelong learning.*
>
> *These are listed as the communication in the mother tongue, communication in foreign languages, mathematical competence and basic competencies in science/technology, digital competence, learning how to learn, social competence and competencies related to citizenship, taking initiatives and the sense of entrepreneurship, cultural awareness and expression.*
>
> *All the key competencies are of the same importance because each of them may contribute to a successful life in an information society. Most of these competencies are in accord with one another, comprise each other, and are based on the principle of supporting one another." (MNE, 2017, p. 6)"*

It was also emphasised that these competencies are related to the gains prepared in a way that they cover the Scientific Process Skills (SPS), Life skills and Engineering and design skills included in the curriculum.

Although technology was mentioned in the introduction parts of the 1992 and 2001 curricula, it was given significant importance as a requirement of the modern society as of the curriculum of 2005, and as can also be realized from the change in the name of this course-it was said that science and technology are concentric. While there is also a similar case in the curriculum of 2013 (the STSE area is also included in the content, although technology is removed from its name), it is not included much in the curriculum of 2017.

The fact that subjects related to the environment and health are attached importance in all curricula draws attention. However, it is observed that information on health is given only in one grade and one unit as a result of the decrease in the number of units in the 2001 curriculum. As for the 2017 curriculum, it is observed that information on healthy and balanced diet, obesity, storage and freshness of food, frozen foods, etc. is addressed in the unit Our Foods in 4th grade. It can be said that this is positive in that it ensures drawing attention to the nutrition problems in our age.

Consequently, it can be said that there are differences between the five curricula in terms of "content", which is the second element of the curriculum. More detailed explanation on the number of units of the curricula is presented in Table 3.

Table 3. Unit names in the science curricula

1992 Science Curriculum		**2001 Science Curriculum**		**2005 Science Curriculum**		**2013 Science Curriculum**		**2017 Science Curriculum**	
4th Grade	5th Grade	4th Grade	5th Grade	4th Grade	5th Grade	3rd Grade	4th Grade	3rd Grade	4th Grade
Our Earth and the sky	Let's get to know our body	Let's get to know our environ-ment	Interaction between Living Beings and Nature	Let's Solve the Puzzle of Our Body	Let's Solve the Puzzle of Our Body	Our Five Senses	Let's Solve the Puzzle of Our Body	Let's Get to Know Our Planet	Earth crust and the Movements of Our Earth
Living beings and life	Diversity of living beings	Nature of the Matter	Sound and Light	Let's Get to Know the Matter	Change and Recognit-ion of the Matter	Let's Get to Know the Force	Effects of the Force	Our Five Senses	Our Food
Diversity of Living Beings	Human and environ-ment	Living Beings are Diverse	Heat and the Journey of Heat in the Matter	Force and Movement	Force and Moveme-nt	Let's Get to Know the Matter	Let's Get to Know the Matter	Let's Get to Know the Force	Effects of Force
Human and environment	Matter and energy	Our planet	Movement and Force	Light and Sound	Electricity in Our Life	Light and Sounds in our Environme-nt	Lightning and Sound Technologies from Past to Present	Let's Get to Know the Matter	Properties of the Matter

Getting to Know the Matter	Sound		Our Planet Earth	Earth, Sun and Moon	Journey into the Life of Living Beings	Microscopic Creatures and Our Environment	Light and Sounds in Our Environ-ment	Lightning and Sound Technologi-es
Light	Light		Let's Travel around, Get to Know the World of Living Beings	Let's Travel around, Get to Know the World of Living Beings	Electrical Tools in Our Life	Simple Electrical Circuits	Journey into the Life of Living Beings	Human and Environment
Electricity	Heat		Electricity in Our Life	Light and Sound	Let's Get to Know Our Planet	Movements of Our Earth	Electrical Tools	Simple Electrical Circuits
Energy	Electrici-ty							Applied Science

3.3 Educational Status Element (Learning-Teaching Process) of the Curriculum

Information on the Educational Status (Learning-teaching process) element, which is the third element of the curriculum, is presented in Table 4 below.

Table 4. Differences in relation to the educational status element (learning-teaching process) of the science curricula

	Curriculum of 1992	Curriculum of 2001	Curriculum of 2005	Curriculum of 2013	Curriculum of 2017
WEEKLY COURSE HOURS	It was planned as 4 hours a week. However, the course hours were reduced to 3 with the transition to the 8-year Basic education in 1997/1998.	It was planned as 3 hours a week.	It was planned as 4 hours a week.	It was planned as 3 hours a week.	It was planned as 3 hours a week.
LEARNING-TEACHING STRATEGIES	There is no general explanation for the learning and teaching strategies to be used in the curriculum.	There is a title called learning and teaching activities in the curriculum. Leading students to the research-discovery process is mentioned under this title (2000, p. 1002).	Teaching strategies were presented, and teachers were made free in choosing their strategies based on the constructivist approach to get the gains in the curriculum.	Under the title "Adopted Strategies and Methods" in the curriculum, it is mentioned that classroom and out-of-school learning environments will be designed according to the "Research-inquiry based learning strategy" (2013, p. III)	Under the title "Adopted Strategies and Methods" in the curriculum, it is mentioned that classroom/school and out-of-school learning environments will be designed according to the "Research-inquiry based learning strategy" (2017, pp. 11-12).
LEARNING-TEACHING PROCESS	Upon examining the expressions in the curriculum, it is observed that a "Teacher-centred" learning process is defined in general.	Upon examining the expressions in the curriculum, it is observed that a "Student-centred" learning process is defined in general. *	A "student-centred" learning process was defined since the curriculum was created based on the Constructivist approach.	In the curriculum, a "student-centred" learning process, in which the student is responsible for his/her own learning, that allows for structuring the information in one's own mind by ensuring active participation in the learning process, is mentioned (2013, p. III)	In the curriculum, "the learning process was defined as covering the discovery, inquiry, argument creation and product design" (2017, p. 12). The student is responsible for his/her own learning; accordingly, the process can be named as student-centred.

ROLE OF THE TEACHER	The expressions in the curriculum show that a “Teacher-centred” learning process is adopted.	In the curriculum, “Expectations from the Teacher” are those; “Teachers should create a suitable environment for students to learn by exploring. They should be involved in the process in a more active way with students in accordance with the student-centred approach. Students should be motivated by teachers.” (2000, p. 1011).	The teacher was defined as the person who pays attention to using various teaching strategies in accordance with the constructivist approach, takes individual differences into consideration, guides the process rather than manages it.	In the curriculum, the teacher was defined as the person who encourages students to develop the soul and sense for researching and scientific way of thinking by adopting a facilitating and guiding role, and who ensures that scientific ethical principles are adopted in applications (2013, p. III).	The “encouraging, guiding roles” of the teacher are referred to in the curriculum (2017, p. 11), and creating a democratic environment in the classroom, and helping students to achieve higher level thinking, product development, discovery and innovation making levels are addressed (2017, p. 11).
ROLE OF THE STUDENT	Although the expression that students should perform their own learning was used in the introduction part of the curriculum (1992, pp. 8-9), it is observed that an overall teacher-centred process is defined when the Aim, behaviours and handling parts of the whole curriculum are examined.	The role of the student in the curriculum is given under the title “Expectations from Students”. Each student should be individually aware of his/her responsibilities in science learning. They should be interested in the science lesson, participate in the process actively, do research, discover, and participate in group works. They should learn the rules in the science course at first, and act accordingly (2000, p. 1012).	The student should be active in the learning process, questioning, investigator, and have a character that actively participates in problem-solving and decision-making processes.	The role of the student in the curriculum was defined as researching, questioning, explaining and discussing the source of information. It was emphasised that the student is responsible for his/her own learning and participates in the process actively (2013, p. III).	In the curriculum, it was emphasised that “the student is responsible for his/her own learning, and the learning strategy that is based on research-inquiry and the transfer of information in which their active participation in the learning process is ensured was emphasised” (2017, p. 11) It is suggested that students participate in the process in formal and informal learning environments in interaction with their peers under the guidance of their teacher (2017, p. 12)
LEARNING ENVIRONMENTS (TEACHING METHODS-TECHNIQUES)	Teaching methods and techniques such as “Experiment, Observation, Assignment, Group work, Discussion, Case study, Teaching through examples, Lecturing, Teaching through models, Demonstration through diagrams, Examination of living beings, Experiment and model design” were used.	Teaching methods and techniques such as “Experiment, Trip-Observation, Researching, Examination, Group work, Discussion, Sample review, Teaching through examples, Lecturing, Teaching through models” were used.	Teaching strategies such as “Narration, Programmed one-to-one teaching, Video display, Simulation, exercising, Small group discussions (peer teaching), School trips, Cooperation-based learning, Drama, Playing Games, Library review, Questioning, Discovery, Problem-based learning, Learning centres, Programmed learning, Personalized learning systems” were used.	The classroom and out-of-school learning environments were mentioned in the curriculum. Methods and techniques such as problem, project, argumentation, cooperation based learning, etc. were emphasised (2013, p. III).	Classroom/school and out-of-school learning environments were mentioned in the curriculum. “Centring on the student (problem, project, argumentation, cooperation-based learning, etc.)” was referred to (2017, p. 11). Moreover, it was suggested to include activities such as designing new products in the process of learning and communicating and discussing ideas with friends (2017, p. 12).

When table 4 is examined, it is observed that learning and teaching strategies are addressed under a specific title in all curricula apart from the curriculum of 1992. The learning-teaching process that is teacher-centred in the curriculum of 1992 is student-centred in subsequent curricula, whereas as of 2001, the student-centred approach was adopted, and it was emphasised that the teacher was a guide rather than a director. However, as it was also previously stated (MNE, 2004, p. 39), this transition could not be realized. It is possible to observe the importance attributed especially to the student-centred learning process when the "role of the student" is explained in the curricula of 2005, 2013 and 2017. As can be seen from the table, the fact that the student is active in all these three curricula emphasises that he/she is responsible for his/her own learning.

When learning environments (methods and techniques) are examined, it draws attention that transition from teacher-centred methods to student-centred methods and techniques in which the student is active is realized. Here, it is observed that methods and techniques such as Project, Problem, Cooperation based learning are emphasised. It is observed that importance is attached to argumentation in the 2013 and 2017 curricula. However, the necessity for the competencies to be brought by pre-service teachers from the pre-service learning process, and introducing the process with in-service learning opportunities is revealed in this respect. While the classroom is mentioned more in previous curricula as a learning environment, out-of-school environments (museums, zoos, etc.) are mentioned in the curricula of 2013 and 2017.

3.4 Measurement-Evaluation Element of the Curriculum

The analysis results in relation to Measurement-evaluation, which is the last element of the curriculum, are presented in Table 5.

Table 5. Differences in relation to the measurement-evaluation element of the science curricula

	Curriculum of 1992	**Curriculum of 2001**	**Curriculum of 2005**	**Curriculum of 2013**	**Curriculum of 2017**
MEASUREMENT-EVALUATION	No general explanation was made in the curriculum for "Measurement-evaluation". However, directive expressions that end with "Saying, Writing, Having made, Having listed" were used in general. When the whole curriculum is examined, it is observed that the measurement-evaluaton expressions defined are generally based on "Traditional measurement-evaluation" approaches.	A general explanation was made in the curriculum on measurement-evaluation under the title "Evaluation Activities". It was mentioned that multiple-choice written exams fail to measure student success alone. To this end, it was emphasised that the results of measurement should be evaluated with the observation results obtained by observing the behaviours and attitudes of students in the classroom. To this end, the curriculum contains "the Student Observation Form". Guiding students to project, group working methods is also in question. The "Self-Evaluation Form and Group (Cluster) Evaluation Form" are included to evaluate this (2000, pp. 1008-1010).	In the curriculum, it was emphasised that it is necessary to apply multiple evaluation methods in which students can exhibit their knowledge, skills and attitudes, and traditional and alternative techniques were used for measurement and evaluation. Moreover, it was emphasised that more alternative measurement and evaluation techniques should be used as they measure not only the product but also the learning process.	Starting from the fact that the numerical data obtained with traditional measurement tools under the title "Measurement and Evaluation Understanding" in the curriculum do not make a sense alone, it is suggested to pay attention to such aspects as; -using complementary evaluation tools and techniques, -self and peer assessments, -multiple evaluation opportunities, and -using the technology (2013, p. IV).	A three-stage practice was mentioned in the curriculum with "the Approach of Measurement and Evaluation". These stages that are summarized in the form of a table were defined as "Getting to know, Monitoring-shaping and Result (product) oriented" (2017, pp. 8-9). The table also includes the aims and tools. It is also said in this part that "A measurement-evaluation understanding aimed at providing constant feedback to support meaningful and permanent learning in students by monitoring, guiding, and eliminating learning difficulties of students in the process was adopted" (2017, p. 8).

Upon examining the science curricula in terms of the Measurement and evaluation element, it is observed that while traditional measurement and evaluation tools were used in the curriculum of 1992, self-assessment tools enabling students to evaluate themselves were mentioned by realizing that the previous evaluations were insufficient. Nevertheless, the fact that this cannot be implemented sufficiently was also emphasised in the 2004 draft curriculum published by the MNE itself (MNE, 2004, p. 39). Consequently, it can be said that traditional measurement and evaluation methods-techniques are still used in the curricula of 1992 and 2001. In addition to traditional evaluation, alternative measurement and evaluation tools were also emphasised in the curriculum of 2005, and it was said that not only the product but also the process should be evaluated. An effort was shown to support teachers by giving various examples in the curriculum in this respect. Furthermore, in-service training works were carried out for teachers both in the provinces where the Pilot application took place and other provinces during the preparation of the curriculum (Akamca et al., 2006, pp. 347-360). The points of using the technology were emphasised in multiple evaluation and measurement evaluation in the curriculum of 2013. Accordingly, it can be said that there is a transition from centring only around the product to centring around the process and using the multiple evaluation opportunities. Indeed, the opinions of science teachers on the curriculum were examined in the study carried out with 9 science teachers by Toraman & Alcı (2013), and it was shown that they stated that the curriculum was positive in terms of target, content and process evaluation.

It is observed that a similar approach is also defended in the curriculum of 2017. In the curriculum, it was endeavoured to explain the measurement and evaluation techniques in a more detailed way with a table, and the importance of feedback was expressed. However, no detailed explanation was given on how to evaluate the project and product that students would prepare with their friends in the Applied science unit added at the end in all grade levels as of the 4th grade. It is believed that this may constitute a problem in terms of teachers who have started to implement the curriculum.

4. Discussion and Conclusion

In this study, in which the curricula of primary education (primary school) science lessons implemented in Turkey (1992, 2001, 2005, 2013 and 2017) were addressed comparatively, the curricula were examined in terms of 4 main elements. The comments on each element are given under the relevant tables. The results and discussions in relation to each element are presented below.

1) The change in the *aim and gains (targets) element of the curricula* can be observed clearly. The number of the aims decreased as a transition to the Cognitive learning approach from the Behavioural learning approach was realized in the curriculum of 1992. Consequently, it can be thought that the understanding of less information is better has been adopted rather than loading students with information, and the curricula have developed towards features that can also be supported by teachers in the system by transforming in many respects. It is observed that similar features are emphasised in the studies carried out. In the study they carried out on 203 teachers in Izmir province, Akpınar, Günay and Hamurcu determined that teachers had positive opinions on the curriculum of 2001 when compared to the curriculum of 1992. Akamca, Günay, & Hamurcu (2006 and 2008), who achieved similar results in the studies on the implementation of the pilot scheme of the curriculum of 2005, revealed that teachers generally had positive opinions on the new curriculum, while parents were indecisive, but both groups thought that they were not sufficiently informed about the subject. In a study conducted with 23 teachers, Bümen (2005) defined that teachers believed that the content of the new science curriculum decreased. In their study, Gömleksiz & Bulut (2007) also tried to determine the effectiveness of the new primary school Science and Technology Curriculum in practice based on teacher opinions. To this end, they developed the Likert-type Science and Technology Course Curriculum Scale consisting of 32 items and applied it to 383 primary school teachers in total, who worked at 64 pilot schools in Istanbul, Ankara, Izmir, Kocaeli, Van, Hatay, Samsun and Bolu provinces where the new Science and Technology Course Curriculum was implemented. The data were comparatively analysed by the variables of province and classroom size. According to the findings obtained, it was found out that the gains, scope, educational status and evaluation provided for in the curriculum were effective at a “high” level. Furthermore, while a difference was found between teacher opinions in terms of the variable of province, no difference was found in terms of the class size variable.

Tekbıyık & Akdeniz (2008), who performed a similar study with 5 primary school teachers working at various primary schools in Rize province Çayeli district using semi-structured interviews, determined that teachers adopted the new Science and Technology Course Curriculum that started to be implemented in the 2004-2005 academic year, believed in the success of the curriculum, showed an effort to implement the curriculum, but they encountered certain problems since they were not familiar with the curriculum sufficiently. In the study of Tüysüz & Aydın (2009), it was aimed to determine the opinions of science and technology teachers working at the primary schools in Izmir in the 2007-2008 academic year regarding the new curriculum. To this end, the

5-point Likert-type scale prepared regarding the new curriculum was applied to 312 Science and Technology teachers, and the data obtained were analysed. According to the results obtained, most of the teachers stated that the curriculum fitted the level of students, took into consideration the level of development of students, the curriculum was prepared in a student-centred way, allowed students to discover the information, and was quite suitable for group work. However, students said that it was quite hard to apply the curriculum in crowded classes.

It is observed that generally positive opinions have been determined for the changing, new curriculum in most of the above-mentioned studies. However, it is also observed that different results have been obtained in certain studies carried out. For example, Ünal, Çoştu, & Karataş (2004) examined the science curricula developed in our country so far with a critical point-of-view taking into consideration the stages of planning, application and evaluation. In the examinations carried out, they concluded that detailed requirement analyses were not performed adequately at the planning stages of the curricula, conditions that were required in the process of application were not provided to all schools, and effective evaluations could not be performed after the application. In a study carried out in 2006; Buluş, Kırıkkaya and Tanrıverdi also concluded that the gains were not realized sufficiently. In another study, Yangın & Dindar (2007) collected data by applying a survey to 75 primary school teachers teaching science and technology course at primary schools located in Ankara during the 2005-2006 academic year. According to the results obtained, they determined that the opinions of the 4th and 5th-grade teachers on the lesson in line with the 2004 science and technology curriculum changed negatively during the teaching process. The researchers think that this result is caused mostly by the problems that occur during the process of application. In this case, it is emphasised in the study that studies should be increased in number to review the aims in the science and technology curriculum and the education system, make structural changes, and incorporate the subjects of science-technology-society into the curriculum. Bağcı Kılıç et al. (2008) also emphasised similar deficits in the evaluation of the 2005 curriculum in terms of science literacy and SPS skills. The researchers observed that the researching nature and scientific information dimensions of science were emphasised more in the curriculum, the dimension of the interaction of science-technology-society was emphasised less, while the science leading to information dimension was emphasised very little. No balance was found between different dimensions of science literacy in gains and activities. Upon examining in terms of science process skills, it was found out that basic scientific process skills were emphasised more than combined scientific process skills.

In the study comparing especially the curricula of 2005 and 2013, it is observed that Karatay et al. (2013) achieved similar results. The researchers defined the changes made in relation to the gains, science literacy, and the arrangement of units.

While all these results obtained emphasise the positive aspect in the change of the curriculum, it shows that problems that are still encountered in the application, source supply, in-service teacher training and class size affect the implementation of the curriculum. The 2017 curriculum started to be implemented in the 3rd and 5th grades as of the 2017-2018 academic year. It is believed that the analysis of the situation will be more suitable by conducting studies again after the implementation of the curriculum.

2) Upon examining *in terms of the content, which is the second element of the curriculum*; it is observed that the learning approaches on which the curricula are based change from the behavioural approach to the research-inquiry based approach. This situation is considered important because it represents a fundamental change in learning approaches in Turkey. It is observed that the student is considered as a person who takes the information as it is and reflects it on his/her behaviours, while the transition to the cognitive (constructivist) approach is tried to be ensured in the curriculum of 2001, in which the student is centred around and information is structured in the mind of an individual. However, as it is also emphasised by the MNE, it is determined that this transition cannot be fully ensured in the 2004 science curriculum (MNE, 2004, p. 39). This is also specified by Arsal (2012) in the curriculum of 2005. Arsal, who accepted the 5 principles created by examining the relevant literature as criteria for constructivism, investigated all the gains of the 4th and 5th grade Science and Technology course curriculum and determined that it was not prepared in accordance with the principles of the constructivist understanding in general. In the comparison made in 2013, Karatay et al. stated that the curricula of 2005 and 2013 incorporated the constructivist and research inquiry-based learning strategies.

Differences are also observed in the associations made between the curricula and other lessons. While the associations with different areas are not included in the curricula of 1992, 2001 and 2013, they are included in the curriculum of 2005. This is among the aspects that are also emphasised in the study carried out by Bümen (2005). While the teachers that participated in the workshop found the horizontal association of the science and technology curriculum with Turkish and Social sciences lesson more adequate, they stated that sufficient integrity with Mathematics lesson could not be ensured. This interaction between different lessons is considered important in the education system in Turkey because the Life sciences course takes place in the first 3 years of the primary school and the Science and Social sciences courses start in the 4th grade. These courses continue in the 5th-8th grades of the secondary school. It is known that topics that constitute the basis of both science and social sciences courses are included within the scope of the Life sciences course. In this case, students get prepared for the science and social sciences courses in the first 3 years. It is known that it is recommended to teach science, Turkish, life sciences, social sciences, etc. by associating them with each other as a general approach. The teachers also stated that the content in the 4th and 5th grades supported one another vertically. Bahar (2006), who investigated the curriculum in terms of the principle of spirality, determined that this feature was not adequate in certain units. Aktaş & Hamurcu (2010), and Aktaş, Hamurcu, & Günay (2011) who carried out two different studies in the same subjects determined that the content of the units in the curriculum was generally prepared in accordance with the principle of "spirality", although this was not exactly the case in certain subjects. It can be said that this principle is also generally complied with in the curriculum of 2013. Nevertheless, it is observed that this structure is deteriorated in the 2017 curriculum. The successiveness of the units in the 3rd and 4th grades cannot be ensured in the subject area of "Living beings and life". The 3rd grade covers the unit "Our five senses". The unit "Our food" is given in the 4th grade. Nevertheless, children should first get the information about themselves in the process of education according to the proximodistal principle. The information about "Our body and systems" which can follow the sensory organs is given in the 6th grade (MNE, 2017, p. 13). However, in the previous curricula (2005 and 2013), information on the children's own body and systems continued in the 3rd, 4th, 5th… and other grades successively. It is not known why this successiveness has been broken (and even by skipping to the 6th grade from the 3rd grade). If it has been aimed to inform students about the balanced diet, obesity, etc. subjects by teaching them the subject of Food, it is estimated that this requirement can be fulfilled by replacing the new unit.

When the content of the curriculum is addressed in terms of technology subjects, it is observed that while technology was mentioned in the introduction parts of the 1992 and 2001 curricula, it was attributed significant importance as of the curriculum of 2005 also as a requirement of the contemporary society, and the intertwinement of science and technology was emphasised. Nevertheless, we can see that technology is not included in the general aims in the curriculum of 2017, while technological development and innovation are emphasised with the field of science and engineering practices added. It is remarkable that subjects related to the environment and health are attributed importance in all curricula. However, it is observed that information on health is given in one grade and one unit since the units are reduced in number in the curriculum of 2001.

3) *When the data on the Educational Status (Learning-teaching process) element of the curricula* are examined, it is observed that learning and teaching strategies are included in all curricula apart from the curriculum of 1992. It is observed that the learning and teaching process that was teacher-centred in 1992 moved towards being student-centred in the curriculum changes in subsequent years. Especially after 2001, it was emphasised that the teacher is the person who guides and not manages, by taking the student in the centre. Although the extent to which this transition was fulfilled is a matter of discussion, this message is clear when explaining "the role of the student" in the curricula (2005, 2013 and 2017). In the study in which they compared the curricula of 1968, 1992, 2000 and 2004, Dindar & Taneri (2011, p. 376) also attracted attention to the student-centeredness especially in the curricula of 2000 and 2004.

Nevertheless, although the learning environment is mentioned as being student-centred, it is known that teachers encounter various problems in the process of application. Just as it is determined in the studies (Kan, 2005; İnce, 2005; Çınar, 2006) quoted by Gömleksiz & Bulut (2007), teachers with no sufficient experience on this subject tried to implement the new curriculum. Çepni et al. (2003) tried to determine the problems encountered by teachers when carrying out the science curriculum. In their studies, they collected the data with semi-structured interviews conducted with 25 primary school teachers, 27 science teachers and 7 science instructors. It was observed from the data that most of primary school teachers did not teach Science willingly, had difficulty in performing laboratory practices, and they thought that it would be more suitable if branch teachers taught these lessons.

Akamca, Hamurcu, & Günay (2006) also determined that teachers addressed problems especially such as the lack of tools, materials, reference materials, and crowded classes after the curriculum of 2005, and demanded in-service training. Similar results were achieved in the studies of Tekbıyık & Akdeniz (2008). The researchers determined that teachers encountered certain problems since they were not familiar with the curriculum sufficiently. In a similar way, Tüysüz & Aydın (2009) determined that teachers at research schools in Buca district of Izmir province emphasised the positive aspects, student-centeredness, etc. of the curriculum, but they encountered certain difficulties in the application of this curriculum with crowded classes. In the study conducted by Buluş Kırıkkaya (2009), the opinions of science teachers on the curriculum were investigated. It was determined that teachers had positive opinions on the curriculum after the in-service training course in which they participated, such as "student-centeredness, emphasising learning by doing, attributing importance to experiment and observation, leading students to researching, attenuation of subject levels, spiral units, and popularizing science lessons" (2009, p. 141).

Similar results were obtained in the study conducted by Unayağyol (2010) in the surroundings of Yozgat province. According to the results of the analysis carried out on 255 primary school teachers and 70 science teachers, teachers generally talked positively of the 2005 curriculum. However, they also mentioned problems they encountered during the implementation process of the curriculum. Teachers stated that problems such as the lack of tools-materials, not being informed sufficiently about the curriculum, crowded classes and inadequate books were effective in their failure to apply the curricula to the desired extent.

Özdemir & Arık (2017) investigated the opinions of Science (n = 99) and Primary School Teachers (n = 26) working in primary and secondary schools on the curricula of 2005 and 2013 using a survey. According to the data obtained by the researchers, there were significant differences between teacher opinions on the elements of the old and new curricula. It was observed that teachers found the curriculum positive in terms of the targets, content, process and evaluations in relation to the renewed science curriculum.

Consequently, it can be said that many positive contributions brought about by the changing curricula cannot be realized sufficiently because of the problems encountered in application environments.

4) Upon examining the results in relation to *measurement-evaluation, which is the last element of the curriculum,* it is observed that while traditional measurement and evaluation tools were used in the curriculum of 1992, they differed in the curricula of 2001, 2005, 2013 and 2017. Self-assessment forms for students were mentioned in 2001, alternative measurement-evaluation tools were emphasised in the curriculum of 2005, and multiple evaluation and using technology in measurement and evaluation were emphasised in 2013. A table is given in the curriculum of 2017 by focusing on this subject in a more detailed way. Identification, Monitoring and Result assessment aims and means are explained briefly in the table. Furthermore, explanations are made on self-assessment, group and peer evaluations (MNE, 2017, pp. 9-10).

Upon examining the studies conducted on this subject, according to the findings obtained from the study carried out by Gömleksiz & Bulut (2007) with a total of 383 primary school teachers, it was found out that the evaluation dimension of the 2005 curriculum was effective at a "high" level.

In the study carried out by Güçlü, Kartal, & Mete (2010) on the measurement and evaluation dimension of the 2005 curriculum with 79 primary school and science teachers in Kırşehir province, it was determined that the opinions of teachers on alternative measurement and evaluation were generally positive. In the study, Unayağyol (2010) concluded that teachers thought that problems were caused especially in the evaluation process of crowded classes. As for the studies conducted on the curriculum of 2013, it was determined that teachers generally thought positively of the process evaluation in the curriculum (Toraman & Alcı, 2013; Özdemir & Arık, 2017).

Consequently, it can be said that positive contributions made by changing curricula to the process of measurement and evaluation cannot be implemented sufficiently for various reasons (crowded classes, insufficiency of teachers' knowledge on the subject, etc.).

5. Suggestions

Results achieved in this study show that the curricula have changed positively by years. However, the fact that these developments are not realized due to certain problems encountered in the process of application (the fact that teachers are not informed sufficiently, the lack of tools-materials, infrastructure problems, crowded classes, etc.) is among the findings obtained in the studies carried out.

The following suggestions are made based on the findings obtained from this study.

1) In the preparation of the curricula, it is also suggested to conduct studies on taking the opinions of teachers who play a significant role in the application process and help the realization of learning by guiding.

2) Before implementing the changes made in the curricula, it is suggested to give teachers in-service training and therefore provide sufficient experience to implement the curricula effectively.

3) Evaluations should be performed at suitable intervals to show the problems encountered in the process of implementing the curricula and interfer on time. It should be ensured that the necessary corrections are made in line with the data obtained.

4) The importance of the learning environment in ensuring the aimed gains has been emphasised in many studies. Therefore, it is believed that it will be beneficial to provide the necessary physical conditions (laboratory, classroom layout, order, technological equipment, etc.) for the effective and efficient implementation of the curricula.

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Note

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