Overview of Science Education Applied in Science and Art Centers for Specially Talented Students

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Abstract: Today, when viewed from the perspective of equality of opportunity in education, the issue of gifted/specially talented education is among the issues discussed with the argument that every individual has the individual right to develop their talents to the maximum extent. Gifted individuals play a key role in human progress due to their extraordinary potential. The most important potentials in question are creativity and problem-solving skills. It is very important that gifted and talented children, who are seen as treasures above ground and given as gifts in the development of countries, receive the education they deserve. Today, specially gifted children and their educational needs are of great importance. Gifted children who are educated in the same classroom environment with other typically developing children are deprived of the practices that meet their educational and developmental needs in these classroom environments. Teachers are either uninformed or inadequate in differentiating classroom practices and lesson plans for these children. For these reasons, Science and Art Centers (BİLSEM) were established for the education of specially gifted children. This education is not a privilege granted to them; it is their right. This study examines the science education received by gifted students in Turkey at Science and Art Centers.

Key Words: Specially Gifted Students, Science and Art Centers, Science Education

1. INTRODUCTION

When the development of societies from past to present is examined, it is seen that those who direct them and even open and close eras are not the "passive majority" but the "active minority" (Watters and Diezmann, 2003). "Superior or specially talented people" with leadership and productivity characteristics constitute the mentioned active minority (Çitil and Ataman, 2018). In this context, gifted students are defined as the gem of the earth that has the potential to produce qualified products in the future (Ercan Yalman and Çepni, 2021; Orbay et al., 2010; Şenol, 2011).

Gifted/talented students, as a group, are different from their peers in terms of cognitive, affective and intuitive aspects (Karnes and Bean, 2014). For this reason, although their learning styles are different, they learn more comprehensively, more deeply and faster. A learning environment, pace and materials should be provided in line with the abilities of these students (Lin, 2008). These differences lead to different needs for these students in science classrooms (Davis and Colangelo, 1997). In addition, an appropriate science curriculum is needed to both increase students' interests and support their careers (Robinson et al., 2014).

The education of gifted/talented individuals is of great importance in our country and all over the world in this century (Hadabi, 2010; Ülger and Çepni, 2020). In fact, the education of gifted/talented children has become a state policy in some developed countries (Cevher Kılıç, 2015; Shaughnessy and Sak, 2013). In our country, in order to raise these children, the Science and Art Centers within the Ministry of National Education (MEB) aim to develop the potential of students on the axis of some key concepts such as creativity, problem solving and project work (MEB, 2013).

1.1. General Information about Science and Art Centers

Under this subheading, the definition of Science and Art Centers, student selection, purpose and educational issues are discussed.

1.1.1. What is a Science and Art Center?

Science and Art Centers are defined as institutions where gifted students in Turkey can receive education in addition to their schools, so that they can realize their talents and develop in line with their abilities. Science and Art Centers, which were built with the aim of being a supplementary, supportive educational process to formal education, are based on the principle of students receiving education in Science and Art Centers outside of school hours. In this context, Science and Art Centers enable students in our country to discover their talents and to accelerate their development professionally in their fields of

interest (BİLSEM Student Identification and Selection Guide, 2019).

Science and Art Centers were established to develop the talents of gifted students and to combine these talents with scientific and aesthetic values, and to ensure that they become productive individuals with problem-solving skills (Akkanat, 2004). Science and Art Centers are opened by the ministry upon the proposal of the governorships, taking into account the characteristics of the region, transportation possibilities and the expected number of students to receive services, in order to enable specially gifted students from preschool to university age to realize their individual talents and use their existing capacities at the highest level (Ministry of National Education, 2015). Students are subjected to a test prepared by the Ministry and if they pass this test, they are subjected to individual examination. Students who are determined to be particularly talented by experts at the Guidance and Research Center are eligible to receive education at the Science and Art Centers.

1.1.2. Student Selection for Science and Art Centers

The Science and Art Center carries out the procedures related to the student selection and identification phase in the following order, as specified in the guide published by the Ministry of National Education:

■ The Science and Art Center student identification and selection process is carried out for students who are designated as candidates by their classroom teachers at the 1st, 2nd and 3rd grade levels based on their general mental ability, art talent and music talent.

■ The observation forms of students selected as candidates by the classroom teachers are entered into e-school and a student can be selected as a candidate for a maximum of two talent areas by the classroom teacher.

■ Students whose forms are entered into e-school are subjected to group scanning via computer.

■ Students who successfully pass the computerized group screening process are subjected to individual evaluation based on their general mental, art and musical abilities. In individual evaluation, intelligence scales and criteria determined by the ministry are taken into account.

■ As a result of the individual evaluation process, students who exceed the score limit previously announced by the Ministry of National Education have the right to register to the Science and Art Center (BİLSEM Student Identification and Selection Guide, 2019).

1.1.3. Purpose of Science and Art Centers

Science and Art Centers do not have an educational model that directly supports school subjects. Their primary purpose is to help gifted children develop their talents. Science and Art Centers, which foster the development of talented individuals, focus on discovering the talents of the future today. In line with the basic principles and general objectives of the Turkish National Education System, the educational services provided in Science and Art Centers provide special talented students with;

● To be raised as individuals who are loyal to Atatürk's principles and reforms, who love their family, nation and country, who know their duties and responsibilities towards their country and who have transformed these into behavior, who embrace, protect and develop the national, spiritual, cultural, moral and human values of their country,

● To raise and develop individuals who have the power of scientific and free thinking, who can look at the world from a broad perspective, and who are creative, constructive, leaders and who contribute to the development of the country,

● To help them grow up as self-actualized individuals who combine scientific thought and behavior with aesthetic values, solve problems, and realize at an early age that they can use their talents and creativity at the highest level,

● It is aimed for them to acquire discovery, creative thinking, invention, success in social relations, innovation, communication, leadership, artistic skills and scientific study discipline, to solve problems, to think interdisciplinary, and to carry out projects to meet determined needs (Ministry of National Education, 2019).

1.1.4. Education in Science and Art Centers

When the Republic of Türkiye was founded, institutions such as Village Institutes and Science High Schools, designed for the education of gifted children, failed due to various sociological and economic reasons. In the following years, Science and Art Centers, a successful project for the education of gifted children in Türkiye, was established. Science and Art Centers began as a pilot project in five cities in 1995 and spread throughout the country by 2023. As of 2023, there are 355 Science and Art Centers across Turkey.

Despite criticism and challenges, Science and Art Centers have earned a place as the most successful

and sustainable model for the education of gifted individuals in Turkish history. Science and Art Centers cannot be considered as an alternative to education in formal educational institutions. While gifted students continue their formal education at their schools, they come to Science and Art Centers in their free time.

Materials, curriculum, and teacher efficiency are important in an effective science program (Johnson et al., 1995). A curriculum that emphasizes detailed research and interdisciplinary studies should be offered to gifted students. It should allow for the teaching of fundamental ideas at deeper levels so that students can do and understand science. In addition, laboratory teaching based on small groups and independent activities is an integral part of the science curriculum (Van-Tassel Baska, 1998b). In order for students to participate in problem-based and thematic research, interesting, motivating and continuous activities should be provided to students. In addition, these activities should be similar and compatible with the interests, abilities and needs of the students (Diezmann and Watters, 2000; Subaşı, 2020).

As of 1950, the curriculum prepared in Turkey adopted the requirements of contemporary education within the scope of the reforms and basic needs in the country. Especially the new curriculum that was changed and implemented in 2005 was designed outside the norm with a different educational philosophy (Özmantar et al., 2009). These new programs are based on raising individuals who are productive and able to meet today's needs. While raising students who are responsible for their own learning by actively participating in the learning process, teachers are also expected to provide guidance (Ministry of National Education, 2015).

When we look at the updated curriculum in 2018, it is stated that the rapid changes in technology and science, the changing and increasing needs of individuals and society, and the developments in learning and teaching approaches also affect the roles expected from individuals. These roles define individuals who can produce knowledge, transfer it to daily life and use it functionally, have problem-solving skills, think critically, are determined, entrepreneurial, have empathy and communication skills, etc. Curriculums that will serve to raise individuals with these characteristics have been prepared in a simple, understandable structure that takes into account individual differences and aims to provide values and skills rather than simply transferring knowledge (Ministry of National Education, 2018).

The generally accepted approach in the education of gifted students is that programs for these students should not be disconnected from general education programs, but rather should be built upon general education programs. In parallel with this approach, general education programs were differentiated using narrowing, enrichment and acceleration strategies and new special education programs were developed. To make room for enrichment and acceleration in general education programs, programs were narrowed in two ways:

1. The time allocated to some achievements in general education programs has been reduced, taking into account the learning speed of specially gifted students (Table 1).

Table 1: Comparison of the Ministry of National Education science program for general (2018) and special (2019) talented students

Ministry of National Education Science Program, 2018	Science Program for the Specially Gifted, 2019
Number of 5th grade outcomes: 36	Number of 5th grade outcomes: 78
Number of 6th grade outcomes: 59	Number of 6th grade outcomes: 71
Number of 7th grade outcomes: 67	Number of 7th grade outcomes: 91
Number of 8th grade outcomes: 61	Number of 8th grade outcomes: 88
Total number of outcomes: 223	Total number of outcomes: 328

Source: Ministry of National Education 2018 and 2019

When the programs in Table 1 are examined, it is seen that the total (recommended) time allocated to the outcomes at each grade level is 144 lesson hours. However, it has been observed that there is a significant difference between the total number of gains.

2. The achievements that were deemed inadequate in the education of gifted students and whose absence would not harm the structure of the programs were removed from the programs.

Students at the Science and Art Centers are enrolled in five different programs: an orientation education

program, a support education program, a program to recognize individual talents, a program to develop special talents, and a project production and supervision program. According to the Science and Art Centers Directive (2019), the educational programs and their contents are as follows:

✔Adaptation Program (AP):

The mission, vision and core values of Science and Art Centers are explained to students through activities planned to ensure the formation of the Science and Art Centers culture. Activities are organized that aim to get to know students better, contribute positively to their individual, social and spiritual development, and develop scientific thinking and artistic feelings. The Science and Art Centers' facilities, workshops, and staff are introduced to students.

✔Support Education Program (SEP):

It is a training program that aims to relate the basic abilities that individuals who have received adaptation training and are diagnosed in the field of general mental ability need to develop with other areas. This program aims to provide students with the skills of establishing dialogue, working together, belonging to a group, learning by doing, finding solutions to problems, engaging in science, being enterprising, approaching ideas critically, being productive, making the right decisions, using technology appropriately and correctly, fulfilling social duties, and using resources efficiently.

✔Individual Talent Recognition Program (ITRP):

It is an educational program that aims to help students who have successfully completed the support education program and have been diagnosed in the field of general mental ability become aware of their individual abilities.

In light of the data obtained from the support education program, students in the program can be divided into groups to obtain more efficient results. Activities related to the fields that aim to reveal creative thoughts in order to make students realize their individual talents are planned and implemented. Activities that attract the student's attention and interest, in which he/she has skills and can work more intensively on in the future, are organized by the field teachers to raise awareness of the student's attitudes and abilities in each field.

Project production studies continue, taking into account the interrelationships of different disciplines, but the project production studies in this program are more comprehensive than the project production studies in support education.

✔Special Abilities Development Program (SADP):

It is an educational program that aims to help students who have successfully completed the "adaptation training program in the field of music and art talent and the individual talent recognition training program in the field of general mental ability" realize their special talents and develop these talents.

During this program, science-based activities are carried out with students regarding their special talents. In this program, the student is at the center of the program and the program is implemented with the understanding that different disciplines are interrelated. For students identified in the "art and music talent area", in-depth artistic activities are carried out after the relevant field is introduced.

✔ Project Production and Management Program (PPMP):

It is a program in which training activities are carried out individually or in groups on a subject according to the abilities of individuals who have successfully completed the special talent development program.

Each individual participating in this training program is responsible for preparing a project, at least one in an academic year. The selection of topics for the projects to be prepared is made by the students under the guidance of teachers. When choosing a subject, choices can also be made from fields in other educational programs. In all activities carried out in line with this program, the basic principle is that students will work freely on projects related to the subject they have chosen and learn by doing and experiencing, rather than teachers directly presenting information.

1.2. Science Education in Science and Art Centers

The main purpose of the Science Course Curriculum is to enable gifted students to develop their potential to the highest level by equipping them with basic and advanced knowledge, skills, attitudes, values and behaviors in cognitive, affective and psychomotor areas. Raising gifted individuals who can produce knowledge, use it functionally in life, solve problems, think abstractly, creatively, flexibly, strategically and critically, are entrepreneurial, determined, have communication skills, empathy, and contribute to society and culture will add significant value to our country. The Science Course Curriculum for gifted students, which will serve to raise individuals with these qualities, adopts a teaching approach that allows students to recognize individual or social problems they may encounter in real life, to produce solutions using scientific methods appropriate to the nature

of science, to try out the solutions they produce, to develop new solutions or products when necessary, and to share the products they have developed, rather than a structure that merely conveys information. With this approach, it is aimed to provide scientific literacy skills to specially gifted individuals (Ministry of National Education, 2019).

The development of the Science Curriculum for Gifted Students was based on an eclectic philosophical approach based on humans, nature, and the interaction between them. In this approach, there is a need to synthesize the information obtained from observation or experiment with rationality, and to test the information revealed with rationality with observation or experiment. Therefore, research, observation, experimentation, measurement and rationality should be valued in the process of acquiring knowledge rather than the acquisition of knowledge itself in the education process. This curriculum, developed for gifted students from this perspective, adopts the nature of science and the use of the scientific method it envisages in the learning process as its main purpose. In this context, knowledge was considered as a human-made structure and the processes of creating knowledge were seen as the main element of education. In other words, this program adopted an approach based on applied rationalism, combining empiricism and rationalism.

In the program, the scientific method is considered as an understanding that integrates the nature of science, science – technology - environment relationships, and the experience and practices gained through interactions. Therefore, while students acquire knowledge and skills while studying science subjects, they are also expected to understand and use the method of science and acquire evaluation skills, attitudes and values befitting scientists in this process (MEB, 2019).

In their study, Aktepe and Aktepe (2009) determined that the teaching methods that gifted students want to use most in science classes are laboratory experiments, demonstrations by teachers in the classroom, observations of natural events, and field trips outside the classroom or school. Watters and Diezmann (1998) and Ülger (2019) stated that activity-based activities are at the center of science teaching. They also stated that a more productive learning environment can be created when students actively participate in activities where they participate in an event with their own mental, social and psychological development and are involved in the event with their own perspective or the scientific principles they adopt (Ülger and Çepni, 2018). It is important at this point that especially talented individuals who are promising for the future and development of countries have appropriate learning environments, activities and materials in the field of science.

Materials, teaching methods and activities should be aimed at developing curiosity, objectivity and skepticism. Active learning, problem solving, in-depth study, small groups and independent work are very important (Van-Tassel Baska, 1998b). Traditional science education is based on basic textbooks and has little impact on students' ability to think like scientists and solve problems (Van-Tassel Baska, 1998a). These students cannot be successful in science by just reading or writing (Cooper et al., 2004). Johnson et al. (1995) stated that existing basic textbooks are inadequate to meet science standards, especially for gifted students. In their study, they evaluated 27 science education materials. The least preferred material among students was basic science textbooks.. Because these books do not provide in-depth research and do not give gifted students the chance to solve problems (Subaşı, 2020).

Gifted students who come to Science and Art Centers receive training in areas such as adaptation, support education, realizing individual talents, developing special talents and producing projects. A module-based approach was taken as basis in the preparation of the Science Course Individual Abilities Recognition Program, which is one of these areas. The Awareness of Talents program was prepared as a continuation of the Support Education Program and as the basis for the Development of Special Talents Program. The program includes a total of nine modules. Each module is covered within the subject area of The World and the Universe, Living Things and Life, Physical Phenomena, and Matter and Nature. The Science Course has been prepared to form a spiral structure with the Individual Abilities Recognition Program, and the Physics, Chemistry and Biology courses with the Special Abilities Development Program. The program is planned as 9 weeks, taking into account the work schedule.

The processing order of the modules in the program has the flexibility to be changed. Due to the holistic nature of nature, no single discipline is sufficient to understand nature. Therefore, a multidisciplinary understanding is needed when trying to understand and explain nature. With this understanding, the basic concepts, principles, laws and models included in the program were selected from the field of science; the achievements in question or their explanations were given together with real life, technological applications and interdisciplinary

connections. In this context, the following points should be taken into consideration in the preparation of Science Course activities:

♦ Students should be engaged in the learning process. Students should be guided towards a process of discovery rather than memorization.

♦ Active participation of each student in the learning process is essential. Teaching content should be delivered with real-life-based and interdisciplinary approaches.
♦ The problems addressed in the teaching process should be selected from real-life examples.
♦ Teaching should be skill-centered.
♦ The learning process should lead the student to produce concrete products.
♦ A collaborative approach, not a competitive one, should be at the center of learning environments (Ministry of National Education, 2020).
Below are the tables for the 5th, 6th, 7th and 8th grade levels from the 2019 Specially Gifted Science Program (Tables 2, 3, 4, 5).

Table 2: 5th grade science curriculum for gifted students, 2019

5th Grade					
				Recommended Duration	
Number	**Unit Name**	**Subject Domain Name**	**Number of Outcomes**	**Lesson Time**	**Percentage %**
1	Sun, Earth, and Moon	Earth and Universe	17	31	21,5
2	Cell	Creatures and Life	9	17	11,8
3	Face	Physical Events	3	5	3,5
4	Matter and Change	Matter and its Nature	20	37	25,7
5	Diffusion of Light	Physical Events	9	17	11,8
6	Metabolism and Energy Transformations	Creatures and Life	13	24	16,7
7	Electrical Circuit Elements	Physical Events	7	13	9,0
	Total		78	144	100

Source: BİLSEM Student Identification and Selection Guide (2019)

Table 3: 6th grade science curriculum for gifted students, 2019

6th Grade					
				Recommended Duration	
Number	**Unit Name**	**Subject Domain Name**	**Number of Outcomes**	**Lesson Time**	**Percentage %**
1	The Solar System and Eclipses	Earth and Universe	12	24	16,7
2	Cell Division and Reproduction	Creatures and Life	14	29	20,1
3	Force and Motion	Physical Events	7	14	9,7
4	Structure of Matter and Heat	Matter and its Nature	15	31	21,5
5	Sound and Features	Physical Events	13	26	18,1
6	World of Living Things	Creatures and Life	7	14	9,7

7	Transmission of Electricity	Physical Events	3	6	4,2
	Total		71	144	100

Source: BİLSEM Student Identification and Selection Guide (2019)

Table 4: 7th grade science curriculum for gifted students, 2019

7th grade					
				Recommended Duration	
Number	**Unit Name**	**Subject Domain Name**	**Number of Outcomes**	**Lesson Time**	**Percentage %**
1	The Solar System and Beyond	Earth and Universe	12	19	13,2
2	Genetic	Creatures and Life	19	30	20,8
3	Force and Energy	Physical Events	8	13	9,0
4	Matter and Its Transformation	Matter and its Nature	20	32	22,2
5	Interaction of Light with Matter	Physical Events	18	28	19,5
6	Ecology	Creatures and Life	11	17	11,8
7	Electrical Circuits	Physical Events	3	5	3,5
	Total		91	144	100

Source: BİLSEM Student Identification and Selection Guide (2019)

Table 5: 8th grade science curriculum for gifted students, 2019

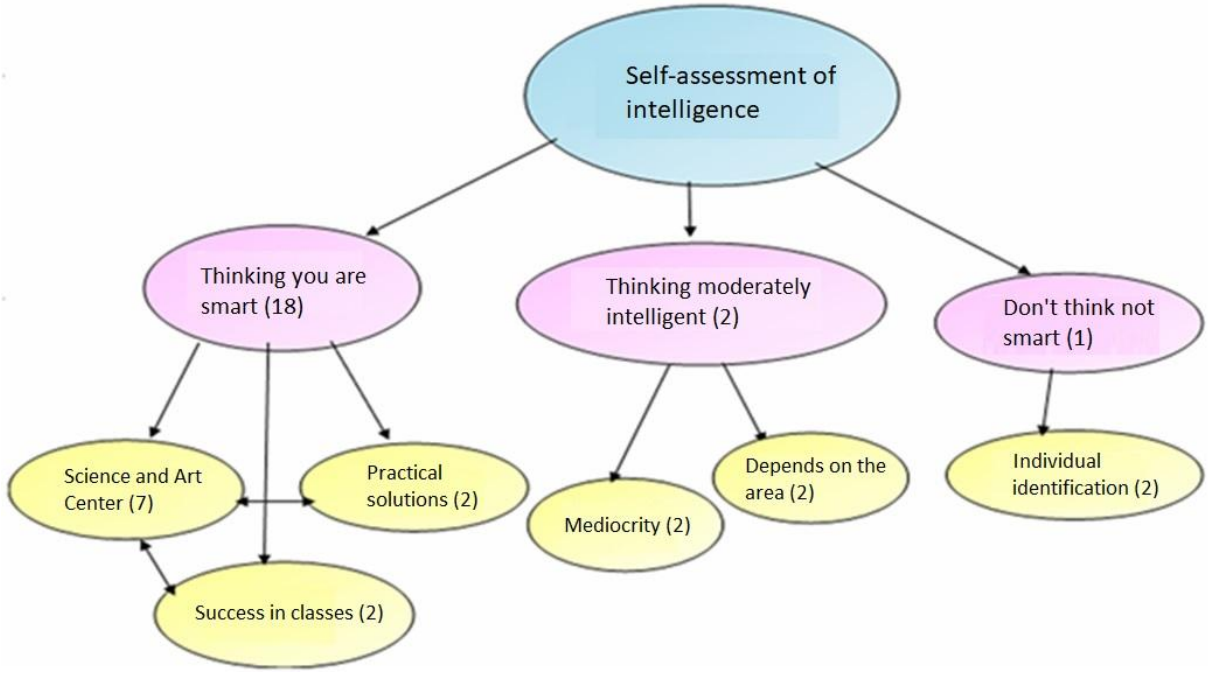
8th Grade					
				Recommended Duration	
Number	**Unit Name**	**Subject Domain Name**	**Number of Outcomes**	**Lesson Time**	**Percentage %**
1	Seasons, Climate and Destructive Natural Events	Earth and Universe	11	18	12,5
2	Systems in Our Body	Creatures and Life	20	33	22,9
3	Pressure	Physical Events	6	10	7,0
4	Properties and Change of Matte	Matter and its Nature	19	31	21,5
5	Simple Machines	Physical Events	4	6	4,2
6	Our Body Systems and Health	Creatures and Life	17	28	19,4
7	Electric Charges and Electrical Energy	Physical Events	11	18	12,5
	Total		88	144	100

Source: BİLSEM Student Identification and Selection Guide (2019)

1.3. Students' Self-Assessment Findings in Science

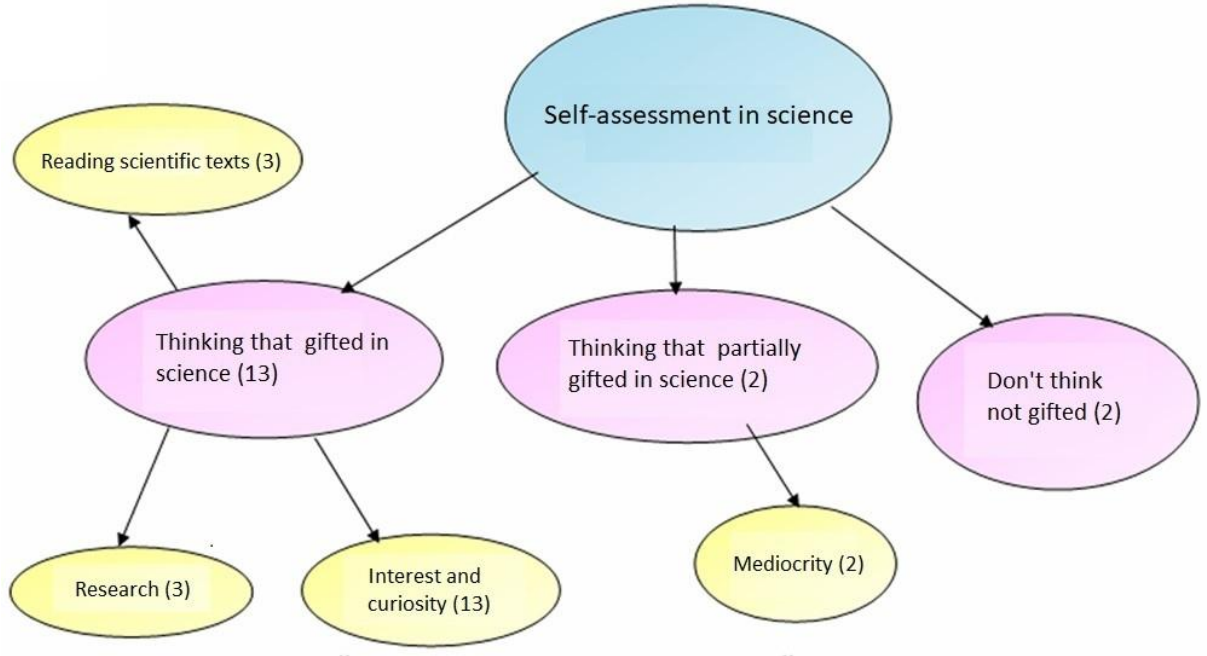
Students' general assessments of intelligence are presented in Figure 1.

Figure 1: Students' Self-Assessments of Intelligence (Ercan Yalman and Çepni, 2021)



When Figure 1 is examined, it is seen that the majority of students consider they intelligent. Seven of the eighteen students who consider themselves intelligent cite passing the science and art center exams as the biggest proof. In addition to coming to the science and art center, there are also students who feel smart because they are successful in their classes or can offer practical solutions. There are two students who do not consider themselves superior in terms of intelligence. These students stated that they saw themselves as average (not above or below standard) and not extraordinary, just like other people. In interviews with twenty-one people, one student stated that he did not find himself intelligent (Ercan Yalman and Çepni, 2021). When students were asked whether they saw themselves as gifted in science, the results in Figure 2 emerged.

Figure 2: Students' Self-Assessments in Science (Ercan Yalman and Çepni, 2021)



In interviews with twenty-one students, fifteen students consider themselves gifted in science. Two students in the study group think that they are partially talented in science. In other words, these students stated that they were not extraordinary in science and that they demonstrated the same skills as a normal individual in science. Two students in the study think that they are not talented in science (Ercan Yalman and Çepni, 2021).

A few of the students interviewed expressed only their feelings and opinions about science without mentioning whether they were gifted or not in science. For example, thirteen students made sentences that expressed interest and curiosity and declared that they loved science. While explaining their interest in science, three students emphasized that they were able to conduct research on a topic outside of school, that is, without being given any homework. Another three students stated that they liked reading and watching scientific things outside of science class (Ercan Yalman and Çepni, 2021).

As a result of the students' self-evaluation of science, it can be said that the students mostly see themselves as gifted in science and have a positive view of science. It can also be stated that students are aware of their current potential in the field of science (Ercan Yalman and Çepni, 2021).

1.4. Studies on the Education of the Specially Gifted in the World

The countries of the American continent, which attract attention with their innovative approaches and follow the reforms of the world countries, are included in this section, as are the countries of the European and Asian continents that they influenced politically, socially and economically, in short, in every sense. The countries included here are America, Canada, England, Sweden, Finland, Poland, Germany, France, Spain, Hungary, Israel, Singapore, South Korea, Russia and New Zealand.

America; The United States began its first systematic efforts in 1868, recognizing that some children learn more quickly and effectively than others. These initiatives progressed to the opening of the first school for gifted children, and then studies were initiated to develop tests to measure intelligence. In 1916, Lewis Terman developed the test, which was used in 1890 to diagnose mentally disabled street children, to distinguish between normal and gifted children. IQ measurements were first made with the Terman test (Akarsu, 2004).

In 1918, an opportunity room for gifted students was established at the University of California. Thus, special opportunity classes became widespread in other institutions and the view that gifted students deserve differentiated instruction was adopted (Bazler et al., 2015).

In the United States, separate education and acceleration practices in co-education were among the first solutions introduced for the education of gifted students. As part of separate education, schools focusing on mathematics and science were opened on university campuses for the gifted. Students who were selected and accepted to these schools had the opportunity to participate in artistic, sporting and cultural activities as well as mathematics and science education (Ministry of National Education, 2012).

After the 1930s, the idea of equality came to the fore and the opening of separate education classes was suspended due to economic reasons (Genç, 2016). The competitive environment felt during and after the Second World War made the importance of the education of the gifted felt again, and current policies were developed in this regard. The disagreements about the separate and combined education of gifted students, and the idea that separate education is not equal, which emerged with the Supreme Court decision, brought the importance of differentiated education back to the agenda (Bazler et al., 2015).

The Marland report, published in 1972, introduced many definitions of giftedness. The report mentions six different talent areas: general mental, special academic, creativity, leadership, art and psycho-motor (Ministry of National Education, 2012).

It also offers suggestions for special and individual programs and teacher training. It is stated that current services do not reach the disadvantaged segments of society, differentiated education is among the low priorities, and the practices implemented remain inadequate and theoretical due to limitations such as financing concerns and staff shortages (Marland, 1972). American scientists adopted child development as the study of abilities and thus conducted studies that revealed different areas of intelligence (Akarsu, 2004).

Many important sources for history were put forward, such as Howard Gardner's book conceptualizing many characteristics of gifted people in 1993 and the theory of multiple intelligences, Robert Sternberg's triple pillar theory of intelligence, and Renzulli's triple circle model (Akarsu, 2004; Reis and Renzulli, 2023). All these developments formed the basis of today's studies on the education of gifted individuals in the United States (Bazler et al., 2015).

Canada; it is a country that draws attention with its practices in the education of gifted individuals. Education for gifted individuals is integrated into formal education. The necessary financial support for activities related to the education of gifted individuals is provided by the state. Teachers and scientists who conduct research on giftedness at universities collaborate on the education of gifted individuals. Teachers are encouraged to pursue a master's degree in gifted education (Karabulut, 2010).

In Canada, practices regarding gifted students vary by region. While some provinces have no legislation for gifted students, areas such as Alberta and Ontario do have legislation for special education services. Five Canadian provinces have published a document stating that they support the education of gifted students. This support also includes acceleration training. Some provinces, such as Nova Scotia, New Brunswick, and British Columbia, have proposed similar information on gifted education, but this information is less comprehensive and less detailed (Kanevsky and Clelland, 2013: 254). Significant financial resources are allocated from the state budget to gifted education. However, transportation, school inspections, special programs, and other services are covered by local education departments (URL 1).

England; it is among the countries that attach importance to the education of gifted individuals. Studies on this subject began in 1944 (Kılıç, 2010). The report prepared by the National Association for Gifted Children has provided guidance for activities to be carried out for the education of gifted children. England has succeeded in achieving its goals in this regard by providing special opportunities, informing families, and having the economic power needed for teacher training (Levent, 2011; Uğurlu, 2022).

Practices such as starting school early, skipping a grade, taking classes from upper classes, mentoring, and supporting with extracurricular activities are encountered. Students' special talents are diagnosed through some tests. However, to benefit from some educational opportunities, tests alone are not sufficient. A portfolio presentation is also required (Levent, 2011).

EU Countries; in general, gifted education policies have not progressed as rapidly and experimentally as in the United States. The budgets allocated to education by member states have also influenced the policies they pursue. While some countries have policies to monitor the development of gifted students by providing one-on-one teacher support, in others, educational programs related to giftedness have only recently begun to emerge after the 1990s (Akarsu, 2001; Levent, 2011).

In 1994, at the 31st session of the Parliament of the Council of Europe, articles such as providing appropriate education for each individual, the potential of gifted individuals for the development of countries, the development of tests to diagnose gifted individuals, respect for individual differences and the provision of appropriate educational opportunities for gifted individuals, and informing teachers, parents, sociologists and doctors about giftedness were included (Levent, 2011).

Swedish; it is among the countries that started its studies on gifted individuals late. No separate program effort has been made for the gifted, who constitute a small portion of society (Mönks and Pflüger, 2005). The special education program includes applications only for individuals with disabilities and learning difficulties. The concept of special talent is not included in the law because it is thought that it may lead to separation in society (Uğurlu, 2022).

Instead, it is stated that there are individual differences in education and that educational program arrangements should be made accordingly. Therefore, students receive education in the same environment as their peers in formal education. However, in some special classes, students are given the opportunity to improve themselves according to their talent areas. It is also known that some schools allow students to take courses from a higher level.

In Sweden, where student identification is not done through IQ measurement, students can be identified as gifted by teachers with special certificates. These students study with their peers, but they can also do additional studies related to their talents and interests (Uğurlu, 2022).

Finland; it is seen in international PISA and TİMSS exam reports as a country with high academic success (Suna et al., 2019; Suna et al., 2020). This success stems from the importance it places on the education of the gifted. Since the education system includes policies for the development of talents, it offers opportunities for individualization and freedom of choice.

Within the framework of the general principles of the Ministry of National Education, schools can act flexibly regarding the education of gifted students. These situations were specified in the school legislation published in 1998, and it was also stated that children with advanced development could start school early. The legislation revised in 2004 is more comprehensive (Levent, 2011).

There is no specific section for gifted individuals in the Finnish education system and legislation. Because education policy is based on individualization and freedom of choice. Students attend schools close to their residence, but parents may choose to enroll their children in other schools. In this case, schools have the right to select students according to their own criteria. It would not be wrong to say that mostly gifted individuals attend schools that expect superior academic performance. In addition, to receive education in these schools, it is not enough to have superior academic performance; it is also necessary to get high scores from the exams (Mönks and Pflüger, 2005).

In addition, to receive education in these schools, it is not enough to have superior academic performance; it is also necessary to get high scores from the exams (Mönks and Pflüger, 2005). Additionally, opportunities such as skipping a grade or taking courses from higher classes are also provided (Ministry of National Education, 2012).

There are no special procedures for special abilities in Finland. When parents demand that their children start school early, they use some psychological and medical tests to diagnose their cognitive competence (Mönks and Pflüger, 2005).

When we look at teachers, another important step in this education system, it is known that they must have at least a master's degree. Teachers can voluntarily take courses on giftedness from universities (Levent, 2011).

Poland; there was no well-organized practice in Poland before 1991. The laws regarding the education of gifted individuals can be considered as the beginning of developments in this regard. Students who are talented in sports, arts or science can attend special courses in these fields, such as summer schools. Additionally, students have the opportunity to meet field experts through organized workshops. In this respect, Poland, which bases itself on enrichment, also bases itself on acceleration in education. In this context, it is possible for some students to skip one or two grades (Persson et al., 2000).

Germany; it made important studies on the education of gifted individuals before the Second World War. The first special class initiative in 1913 and the school for gifted students established in 1917 are important efforts regarding the education of the gifted. Although these studies had to be suspended for a while due to the war, the German Association for Gifted Children was established in 1978 (Akarsu, 2001; Levent, 2011).

In Germany, practices such as starting school early, skipping a grade, taking lessons from upper classes, and mentoring are included. In addition to common practices of grade skipping and enrichment, there are also magnet schools for gifted students. Magnet schools adopt the STEM curriculum and, unlike the science high schools known as Gymnasien, which have existed in Germany for a long time, do not only provide advanced mathematics and science education, but also engineering, technology and music education (Stoeger, 2019).

Originating in the USA, the school-wide learning model and the autonomous learning model are learning models that are increasingly being used in gifted education in Germany (Fischer and Müller, 2014).

There are both inclusive and special classroom practices for gifted students in the country. In Germany, the preferred approach to gifted and talented children is individualization. The Thuringia Constitution stipulates that gifted children should receive individual support. The most important document regulating the education of gifted and talented children in Thuringia is the Thuringia school law (URL 1).

France; it does not appear as a country with specific procedures in the education of gifted individuals. Within the concept of special education, it addresses individuals with learning difficulties, disabilities or school failure. In 2001, after the Ministry of National Education wanted to examine this situation, gifted children became a part of special education (Levent, 2011; Mönks and Pflüger, 2005).

However, studies on special talents did not begin at such a late date. For example, it is known that the first private classroom was opened in Paris in 1990. B Before this date, there were schools that selectively accepted students based on academic success, and these schools charged tuition fees, appealing only to those at a certain socio-economic level (Persson et al., 2000).

In France, there are private schools for students with high academic performance, along with special classes. It is possible to see that there are schools for social sciences and natural sciences as well as schools for economics throughout the country. There are also music, painting and sports schools for students with artistic talent. Opportunities provided for gifted students include skipping grades and starting school early. Intelligence tests are used in the diagnosis process of students (Levent, 2011).

Spain; in the distant history of Spain (1575), Prof. Huarte de San talked about the differences in

people's abilities in his book titled "Examen de ingenios para las ciencias". After a century of progress, it is known that in the 1900s, during the years of civil war in Spain, there were schools for gifted children and scientific studies were carried out on giftedness (Riba et al., 2018).

The first large-scale experimental study in Spain was conducted in the 1980s. The Gifted Children Research Team (EINNS), founded by the Autonomous University of Barcelona, held the first symposium on the psychopedagogy of exceptionalism. In this symposium, studies were conducted on a new model for special talents, the identification of special talents, and teacher education (Riba et al., 2018).

Throughout history, the education of gifted individuals has been addressed by various laws. Although the need for special education for gifted individuals is stated, in Spain, gifted individuals continue to attend regular schools. Although practices such as skipping a grade, enriching the curriculum, and taking courses from upper classes are allowed in these schools, these practices are quite rare (Levent, 2011; Mönks and Pflüger, 2005).

Hungary; it is one of the countries that attach importance to the education of gifted students (Yılmaz, 2011). The education of gifted students is included in special education under the guarantee of the law (Mönks and Pflüger, 2005). In this way, schools and teachers are responsible for identifying gifted students. Education in homogeneous classes is adopted rather than acceleration and enrichment education models. Unlike other countries, in Hungary, it is important for students to receive education in the field of folk arts and to reveal their interests and talents in this direction (Mönks and Pflüger, 2005; Yılmaz, 2011).

Although intelligence tests are used to diagnose students, it is very important for the teacher to diagnose the candidate student. In this regard, in teacher education, courses related to gifted individuals are given in undergraduate education and professional in-service training.

Israel; it is one of the countries that has made the education of gifted individuals a national priority. In the country where talent is seen as a national asset, many scientific studies are being conducted on special talents (Akarsu, 2001). On the other hand, it is also among the countries that started their studies on gifted individuals late. However, due to her special interest in this issue, it has enacted various laws regarding the education of gifted students and has protected the rights of students in this regard (Genç, 2016).

In the 1970s, the Directorate for Gifted and Talented Children was established within the Ministry of National Education and the organization of educational activities was carried out by examining the programs of the leading countries in this regard (Akarsu, 2001). With the law enacted in 1988, the state is held responsible for the education of gifted individuals.

Unlike other countries, Israel continues to identify gifted individuals after high school graduation. In countries where military service is mandatory, male and female high school graduates are diagnosed with an intelligence test. In this way, students who have been overlooked in the education system are provided with special education, while students who receive special education support have the opportunity to develop their talents more specifically. This program provides a second, additional opportunity. Unlike school education, students participating in the program are expected to work with extra dedication, patience, and perseverance (Akarsu, 2001).

Singapore;

Being a country that ranks high in PISA and TİMSS exams, it attracts attention as to how it achieved this success in education (Suna et al., 2019; Suna et al., 2020; Uğurlu, 2022). Singapore is not a country that can capture the contribution of natural resources to economic growth because it has limited resources. For this reason, education is highly valued. For Singapore, education is seen as the most important factor driving advances in science and technology, as well as economic growth. Hard work and self-discipline are also crucial in a performance-based education system. Education impacts a nation's well-being. This makes the education of the gifted extremely important.

Because the specially talented people are a source of human power with the high performance they show in their talent areas. Singapore implemented its first special education program in 1984. Although this practice focused on academic success by focusing primarily on mathematics and natural sciences in schools, when we look at the ongoing practices, we see that art and sports schools have also been opened.

Teachers who will work in the field of education of gifted students improve themselves in this field through in-service training that they are required to attend. Additionally, teachers are encouraged to take part in various scientific activities (Uğurlu, 2022).

South Korea; it is among the leading countries with the policies it follows in the education of gifted

individuals. A large part of the work done for the education of gifted individuals consists of in-service training programs. After 1995, gifted students were given the right to skip grades and start school early. Thus, the acceleration model has begun to be implemented. Furthermore, as part of enrichment efforts, courses based on talent areas have been added to school curriculums. After this date, special laws were enacted for those with special abilities and many conceptual definitions were made. It is known that in South Korea, different types of opportunities are offered as gifted classes, gifted education centers and gifted schools (Uğurlu, 2022).

In the education of gifted students, emphasis is placed on mathematics, science and natural sciences. Apart from this, activities such as creativity, self-regulated research, discussion and writing programs are included within the scope of skills training. South Korea is also notable for not using IQ tests in student identification. Based on the results of teachers' observation reports up to the 3rd grade of primary school, gifted students are included in the education of gifted students starting from the 4th grade.

Teachers who will provide education for gifted students must either have special talents themselves or have a doctorate degree (Uğurlu, 2022).

Russia; considering that many of Russia's citizens are internationally renowned for their talent, excellence in sports, arts, and science, it has become easier to connect Russia's pride in talent and superior achievements with its potential in these areas. It is well known that Russia has historically prioritized the education of gifted and talented individuals. Gifted education has become a policy.

It is known that talented students are directed to relevant schools. There are boarding schools established for rural areas and sometimes experts are assigned to work with students on a common subject within a school (Persson et al., 2000).

It is known that these practices are based on schools established under the leadership of Nobel Prize-winning scientists in the 1950s (Akarsu, 2001). There are private schools that offer enriched instruction in areas such as mathematics, natural sciences, technology, music, art, leadership, and sports. These schools, where leaders in science and art are trained, offer a wide range of opportunities for gifted individuals (Akarsu, 2001).

In addition, the fact that the schools are located on the university campus allows students to benefit from the opportunities available there, and it also contributes to their encounter with the world of science at an early age by taking lessons from academics who are experts in their fields. In Russia, it is also considered very important for gifted children to be trained in artistic and sports branches such as music, ballet and sports after the age of 6 and to reveal their talents in these fields (Genç, 2016).

New Zealand; in 2003, the law regarding the provision of support and services to children with special needs came into force. In 2004, the Ministry of Education published the findings of a study on how gifted and talented students should be identified and supported.

According to the results of this report, conclusions were drawn regarding increasing awareness about the need for education allocated to gifted and talented children in line with their needs and taking the necessary steps to develop gifted and talented students (Ministry of National Education, 2012). In order to meet the needs of gifted and talented students, schools use practices such as differentiation, enrichment, acceleration, special programs or class programs within the school, cluster grouping, different applications where resources are evaluated, and curriculum models (URL 1).

2. CONCLUSIONS AND DISCUSSION

In recent years, studies on the education of specially gifted individuals have been increasing in our country and around the world. Educating these individuals, who constitute approximately 2-3% of societies, making them productive and giving them the opportunity to use their potential and creativity for social progress makes the education of specially talented individuals even more important.

It is noteworthy that teachers agree more with the view that the education provided in Science and Art Centers helps students become aware of their individual abilities. So much so that, while gifted children experience the process of integration with society in their schools, they have the opportunity to work and produce in line with their own interests and abilities in Science and Art Centers, with the awareness of their abilities (Baykoç Dönmez, 2004; Kazu and Şenol, 2012).

Students generally enjoy science classes and do them without difficulty. When asked to evaluate this on a subject-by-subject basis, it was seen that the subjects that students understood most easily in science class were the subjects in biology class, while the subjects they had the most difficulty with were the subjects in physics. Students stated that

the subjects of physics, especially forces and vectors, are complex. Students can still do the subjects they have difficulty with, but they work a little harder on these subjects compared to other subjects (Subaşı, 2020). This may be related to the interest of gifted students in science courses (Köksal and Sormunen, 2009). Students attribute their ease of understanding biology lessons to their ability to relate the lesson to daily life and to watching documentaries frequently. Students who have difficulty with physics subjects attribute this to the fact that the subject is not used much in daily life, the concepts related to this subject are not heard much before starting school, and it is more abstract compared to other subjects. The results of the present study are similar to the study conducted by Hacker and Rowe (1993).

According to Subaşı (2020), students want to use models that prioritize visuality or auxiliary resources where they can directly apply what they have learned and gain practice when it comes to material use. Basic science books are not among the students' preferences. The fact that basic textbooks that do not provide in-depth information are the least preferred materials (Johnson et al., 1995) and the desire to use supplementary resources is related to the fact that basic textbooks do not give students the opportunity to solve problems (Johnson et al., 1995; Van-Tassel Baska, 1998a). The most desired material to be used is the models. The preference for models is consistent with the study of Van-Tassel Baska (1998), who emphasized the use of materials that enable students to apply and relate to the real world.

Students generally want practical activities to be carried out in the process of learning science courses (Subaşı, 2020). The reason why students attach so much importance to practice is that, as stated by Cooper et al. (2004), these students cannot be successful by just reading or writing. In addition, Aktepe and Aktepe (2009) stated in their study that gifted students mostly wanted experiments to be conducted in the laboratory.

Considering that teachers are an important factor in the education of gifted students, the dissemination of studies that include their views and attitudes is important for the quality of education that will be given to students. Teachers of gifted students must have the characteristics of all good teachers, be experts in their field, have expertise in the characteristics of gifted students and the models and programs applied in their education, and have internalized the phenomenon of giftedness (Sak, 2017). For this reason, the opinions of science teachers who teach in Science and Art Centers regarding the evaluation of science practices gain importance in the use of different models and strategies in the science education of gifted students.

Teachers should be given periodic in-service training on the education of gifted students. The contents of in-service training seminars should be prepared by taking into account the needs of teachers in pre-service training centers. Support should be obtained from universities in the implementation and evaluation of in-service programs.

The education of gifted children, which is seen as a national value in many countries from Germany to the United States, from Canada to New Zealand, has been studied for nearly a century, and these studies have gained momentum in the last 20-25 years.

Our country, with its experience of Enderun, the longest-standing and most effective training center for gifted individuals in history, knows well how important a talented and trained human cadre is for the future of a country. The Ministry of National Education, together with all segments of society, should take care of approximately 500 thousand gifted children of preschool, primary and secondary school age. The different methods and techniques these children need, which are implemented in many countries, should be implemented as soon as possible, taking into account regional differences and challenges, also benefiting from the Enderun experience.

REFERENCES

Akarsu, F. (2001). Üstün yetenekli çocuklar aileleri ve sorunları. Ankara: Eduser.

Akarsu, F. (2004). Üstün yetenekliler. Yer Aldığı Eser R. Şirin, A. Kulaksızoğlu ve AE Bilgili (Ed.), Üstün Yetenekli Çocuklar: Seçilmiş Makaleler Kitabı, (127-154). İstanbul: Çocuk Vakfı Yayınları, 63.

Akkanat, H. (2004). Üstün veya özel yetenekliler. Yer Aldığı Eser R. Şirin, A. Kulaksızoğlu ve AE Bilgili (Ed.), Üstün Yetenekli Çocuklar: Seçilmiş Makaleler Kitabı, (169-193). İstanbul: Çocuk Vakfı Yayınları, 63.

Aktepe, V., & Aktepe, L. (2009). Fen ve teknoloji öğretiminde kullanılan öğretim yöntemlerine ilişkin öğrenci görüşleri: Kırşehir BİLSEM örneği. Ahi Evran Üniversitesi Kırşehir Eğitim Fakültesi Dergisi, 10(1), 69-80.

Baykoç Dönmez, N. (2004). Bilim sanat merkezlerinin kuruluşu ve isleyişinde yapılması gereken düzenlemeler. I. Türkiye Üstün Yetenekli Çocuklar Kongresi Bildiriler Kitabı. İstanbul: Çocuk Vakfı Yayınları.

Bazler, J., Graybill, L., & Sickle, M. V. (2015). Historical overview of adult gifted education in the United States. In Book: Special and Gifted Education, doi: 10.4018/978-1-5225-0034-6.ch001

BİLSEM Student identification and selection guide. (2019). https://orgm.meb.gov.tr/www/bilim-ve-sanat-

merkezleri-ogrenci-tanilama-ve-yerlestirme-kilavuzu-yayimlandi/icerik/1231

Cevher Kılıç, V. (2015). Türkiye'de üstün ve özel yetenekli çocuklara yönelik bir eğitim politikası oluşturulamaması sorunu üzerine bir değerlendirme. 21. Yüzyılda Eğitim ve Toplum, 4(12), 145-154.

Çitil, M., & Ataman, A. (2018). İlköğretim çağındaki üstün yetenekli öğrencilerin davranışsal özelliklerinin eğitim ortamlarına yansıması ve ortaya çıkabilecek sorunlar. Gazi Üniversitesi Eğitim Fakültesi Dergisi, 38(1), 185-231.

Cooper, C. R., Baum, S. M., & Neu, T. W. (2004). Developing scientific talent in students with special needs: An alternative model for identification, curriculum, and assessment. Prufrock Journal, 15(4), 162-169.

Davis, G. A., & Colangelo, N. (1997). Handbook of gifted education. Allyn and Bacon.

Diezmann, C. M., & Watters, J. J. (2000). Challenging the young gifted child in science and mathematics: An enrichment strategy. Talent Ed: Teaching and Learning in Entrepreneurial Education, 18(1), 2-8.

Ercan Yalman, F., & Çepni, S. (2021). Üstün yetenekli öğrencilerin bilimsel yaratıcılık ve bilimsel problem çözme ile ilgili öz değerlendirmeleri. YYÜ Eğitim Fakültesi Dergisi (YYU Journal of Education Faculty), 18(1), 852-881, doi:10.33711/ yyuefd.938725

Fischer, C., & Müller, K. (2014). Gifted education and talent support in Germany. Center for Educational Policy Studies Journal, 4(3), 31-54, doi: 10.26529/cepsj.194

Genç, M. A. (2016). Üstün yetenekli bireylere yönelik eğitim uygulamaları 1. Journal of Gifted Education and Creativity, 3(3), 49-66.

Hacker, R. G., & Rowe, M. J. (1993). A study of the effects of an organization change from streamlined to mixed-ability classes upon science classroom ınstruction. Journal of Research in Science Teaching, 30(3), 223-231.

Hadabi, A. S. D. (2010, October). Yemeni basic education teachers' perception of gifted students' characteristics and the methods used for ıdentifying these characteristics. International Conference on Learner Diversity, Bangi, Malaysia.

Johnson, D. T., Boyce, L. N., & VanTassel-Baska, J. (1995). Science curriculum review: Evaluating materials for high-ability learners. Gifted Child Quarterly, 39(1), 36 42.

Kanevsky, L. S., & Clelland, D. (2013). Accelerating gifted students in Canada: Policies and possibilities. Canadian Journal of Education, 36(3), 229-271.

Karabulut, R. (2010). Türkiye'de üstün yeteneklilerin eğitimi tarihi süreci. (Yayınlanmamış yüksek lisans tezi). Abant İzzet Baysal Üniversitesi. Sosyal Bilimler Enstitüsü. Eğitim Programları ve Öğretimi Anabilim Dalı, Bolu.

Karnes, F., & Bean, S. (2014). Methods and materials for teaching the gifted. Sourcebooks, Inc.

Kazu, İ, Y., & Şenol, C. (2012). Üstün yetenekliler eğitim programlarına ilişkin öğretmen görüşleri (BİLSEM örneği). e-International Journal of Educational Research, 3(2), 13-35.

Kılıç, C. (2010). Enderun mektebi örnekleminde günümüz üstün yetenekli çocukların eğitiminin değerlendirilmesi. (Yayınlanmamış yüksek lisans tezi). Gazi Üniversitesi Eğitim Bilimleri Enstitüsü, Ortaöğretim Anabilim Dalı, Ankara.

Köksal, M. S., & Sormunen, K. (2009). Advanced science students' understanding on nature of science in Turkey. Esera 2009 Conference, 31 August- 4 September, İstanbul, Turkey.

Levent, F. (2011). Üstün yeteneklilerin eğitimine yönelik görüş ve politikaların incelenmesi. (Yayınlanmamış yüksek lisans tezi). Marmara Üniversitesi Eğitim Bilimleri Bölümü, Psikolojik Danışma ve Rehberlik Ana Bilim Dalı, İstanbul.

Lin, H. G. (2008). Impact of gifted program from math and science talent students' perspectives. In: Paper presented at the 10th Asia-Pacific Conference on Giftedness in Singapore, July. 2008, 14-18.

Marland, S. P. (1972). Education of the gifted and talented: Report to the Congress of the United States by the U.S. commissioner of education. Washington: U.S. Government Printing Office.

Ministry of National Education. (2012). Destek Hizmetleri Genel Müdürlüğü. 2012 yılında yayınlanan tebliğler dergisi.

Ministry of National Education. (2013). Üstün yetenekli bireyler strateji ve uygulama planı 2013- 2017. Erişim 1_ustunyeteneklileri.

Ministry of National Education. (2015). 2015-2016 Bilim ve Sanat Merkezleri tanılama süreci.

Ministry of National Education. (2018). 2018-2019 BİLSEM Öğrenci tanılama ve yerleştirme kılavuzu ve tanıtım animasyonları yayımlandı. https://orgm.meb.gov.tr/www/2018-2019-bilsem-ogrenci-tanilama-ve-yerlestirme-kilavuzu-ve-tanitim-animasyonlari-yayimlandi/icerik/1125

Ministry of National Education. (2019). 2019-2020 Eğitim öğretim yılında BİLSEM' lere aday gösterilen öğrenciler ve aday gösterildikleri yetenek alanları.

Ministry of National Education. (2020). 2019-2020 Bilim ve sanat merkezleri öğrenci tanılama ve yerleştirme kılavuzu güncellendi. https://orgm.meb.gov.tr/www/2019-2020-bilim-ve-sanat-merkezleri-ogrenci-tanilama-ve-yerlestirme-kilavuzu-guncellendi/icerik/1384

Mönks, F. J., & Pflüger, R. (2005). Gifted education in 21 European Countries: Inventory and perspective. Radboud University Nıjmegen, Holland.

Orbay, M., Gökdere, M., Tereci, H., & Aydın, M. (2010). Attitudes of gifted students towards science depending on some variables: A Turkish sample. Scientific Research and Essays, 5(7), 693-699.

Özmantar, M. F., Bingölbali, E., Demir, S., Sağlam Y., & Keser, Z. (2009). Değişen öğretim programları ve sınıf içi normlar. Uluslararası İnsan Bilimleri Dergisi, 6(2), 1-21.

Persson, R. S., Joswig, H., & Balogh, L. (2000). Gifted education in Europe: Practices, and current research.

Reis, S. M., & Renzulli, J. S. (2023). The schoolwide enrichment model: A focus on student strengths & interests. In J.S. Renzulli, J. Gubbins, K.S. Mcmillen, R.D. Eckert & C.A. Little (Eds.), Systems & Models For Developing Programs For The Gifted & Talented (pp. 323-352). New York: Routledge.

Riba, S. S., Sánchez, L. F. P., & Villaverde, A. B. (2018). Programs and practices for identifying and nurturing high intellectual abilities in Spain. Sage Journals, 41, 63-74.

https://Journals.Sagepub.Com/Doi/Epub/10.1177/107621751 775 0703

Robinson, A., Shore, B. M, & Enersen, D. L. (2014). Üstün zekâlılar eğitiminde en iyi uygulamalar: Kanıt temelli bir kılavuz (Çeviri Editörleri: Ü. Ogurlu, F.Kaya) Nobel Akademik Yayıncılık.

Sak, U. (2017). Üstün zekâlılar özellikleri, tanılanmaları, eğitimleri. Ankara: Vize.

Shaughnessy, M. F., & Sak, U. (2013). A reflective conversation with Ugur Sak: Gifted education in Turkey. Gifted Education International, 30(2), 1-9.

Stoeger, H. (2019). Identifying and nurturing gifted and talented students in Germany. UNESCO, Regional Center for Educational https://doi.org/10.1177/001698620004400302 Planning (RCEP).

Subaşı, M. (2020). Üstün yetenekli öğrencilerin fen bilimleri dersine yönelik görüşleri: Hatay bilim ve sanat merkezi örneği. Atatürk Üniversitesi Kazım Karabekir Eğitim Fakültesi Dergisi, 41, 67-81.

Suna, H. E., Tanberkan, H., Taş, U. E., Eroğlu, E., & Altun, Ü. (2019). PISA 2018 Türkiye Ön Raporu. Milli Eğitim Bakanlığı, Ankara.

Suna, H. E., Şensoy, S., Parlak, B., & Özdemir, E. (2020). TIMSS 2019 Türkiye ön raporu. Milli Eğitim Bakanlığı, Ankara.

Şenol, C. (2011). Üstün yetenekliler eğitim programlarına ilişkin öğretmen görüşleri (BİLSEM örneği). (Yayımlanmamış yüksek lisans tezi). Fırat Üniversitesi, Elazığ.

Uğurlu, R. (2022). Bilsem öğretmenlerinin görüşlerine göre Türkiye'deki özel yetenekli öğrencilere yönelik eğitim politikalarının değerlendirilmesi. (Yayımlanmamış yüksek lisans tezi). Necmettin Erbakan Üniversitesi Eğitim Bilimleri Enstitüsü, Konya.

URL 1. Batuhan Nar eğitim uzmanı. Üstün zekalı ve yetenekliler eğitiminde 9 ülke, 9 eğitim politikası. (http://batuhannar.com/ustun-zekali-ve-yetenekliler-eğitiminde-9-ulke-9-egitim-politikasi/)

Ülger, B. B., & Çepni S. (2018). Kuramdan uygulamaya STEM+A+E eğitimi (4. Baskı, Ed.: S. Çepni). PEGEM Akademi.

Ülger, B. B. (2019). Üstün yetenekli öğrencilere yönelik farklılaştırılmış sorgulama temelli fen bilgisi ders modüllerinin geliştirilmesi, uygulanması ve etkililiğinin değerlendirilmesi. (Yayımlanmamış doktora tezi). Uludağ Üniversitesi, Bursa.

Ülger, B. B., & Çepni, S. (2020). Gifted education and STEM: A thematic Review, Journal of Turkish Science Education, 17(3), 443-466.

VanTassel-Baska, J. (1998a). Planning science programs for high ability learners. ERIC Digest E546.

VanTassel-Baska, J., Bass, G., Ries, R., Poland, D., & Avery, L. D. (1998b). A national study of science curriculum effectiveness with high ability students. Gifted Child Quarterly, 42(4), 200-211.

Watters, J. J., & Diezmann, C. M. (1998). "This is nothing like school": Discourse and the social environment as key components in learning science. Early Child Development and Care, 140(1), 73-84.

Yıldız, K., Sipahioğlu, Ş., & Yılmaz, M. (2011). Çevre bilimi. Ankara: Gündüz.