SCIENCE EDUCATION FOR GIFTED STUDENTS: OPINIONS OF STUDENTS, PARENTS, AND TEACHERS

Nagihan Tanik Onal, (Assist. Prof. Dr.)

Nigde Omer Halisdemir University, Turkey

Ugur Buyuk, (Prof. Dr.)

Erciyes University, Turkey

Doi:10.19044/ejes.v8no1a15 URL:http://dx.doi.org/10.19044/ejes.v8no1a15

Submitted:14 December 2020
Accepted: 08 February 2021
Published: 31 March 2021

Abstract

This paper aims to examine the opinions of gifted children, their parents, and science teachers working at the Science and Art Centre (BILSEM) regarding science education for the gifted. The present study participants, which was conducted by utilizing the phenomenology design using one of the qualitative research methods, were ten talented students, seven parents, and two science teachers working at BILSEM. The study's data were collected using semi-structured interviews held with the participants. The collected data were analyzed by adopting the data analysis process proposed by Moustakas (1994) for phenomenological studies. The study revealed that gifted students possess a mental perception of sciences in the form of life, experience, and scientific knowledge. Talented learners want to learn science by employing experiments, projects, excursions, and observations. Based on these findings, it is recommended that gifted students should be provided with an enjoyable science learning environment to make them active, have fun while learning, perform experiments, and develop projects.

Keywords: Science, gifted children, teacher, parents, phenomenology

1. Introduction

Gifted children often try to understand and are curious about all that is happening in their environment. Based on this data, it would not be wrong to claim that gifted children are generally interested in sciences (Camcı Erdoğan, 2014; Gallagher, 2006; Smutny & Von Fremd, 2004). While Gallagher (2006) states that sciences naturally appeal to gifted children,

Smutny and Von Fremd (2004) claim that gifted students have an inborn interest in sciences as they satisfy their imagination. On the other hand, natural science is a branch of science that necessitates reason, and the gifted possess a high level of reasoning ability (Brody & Stanley, 2005). Accordingly, it can be concluded that the attributes possessed by gifted children are relatively consistent with the nature of sciences. The best way to develop gifted children's unique talents is to expose them to challenges. Since science challenges the gifted learners' minds and curiosity, it is the most effective subject in enhancing their potentials (Singh, 2008; VanTassel-Baska & Stambaugh, 2006). However, it is observed that gifted students' success or performance during science education is not at the expected level. Hence, it is essential that more effort should be put to develop new science standards and to support and enhance gifted children's science education capacities (Singh, 2008). VanTassel-Baska (1998) proposes a science education based on active learning, problem-solving in-depth understanding of the units, and independent learning groups. Compared to other methods, problem-based and hands-on student-centred science education instil in gifted children more excitement and motivation to interact and the willingness to participate in class activities (VanTassel-Baska et al., 1998). A study conducted to evaluate materials for gifted children revealed that textbooks used in science lessons failed to satisfy the talented ones. During the education of the gifted, modular materials, which require students to exercise their questioning skill, helps them to carry out research such as problem-based activities, which enable students to engage in higher-order thinking (Johnson et al., 2013).

Receiving science education in such a way is not a privilege but a right for gifted students. However, the teaching that the gifted are exposed to schools is generally far from including the enriched science activities they need (VanTassel-Baska, 2006). When educators provide the gifted with opportunities to do free research and make discoveries, they often believe that they have designed the learning environment conducive to them. Differentiated programs in line with the needs of gifted students increase the academic achievement, creativity, attitude, and self-confidence of these students (Ayverdi, 2018). However, even though these implementations accelerate gifted students' ability to ask and respond to questions, they are, indeed, insufficient (Meador, 2003). Thus, it can be concluded that certain insufficiencies and problems in science education for the gifted need urgent solutions. Considering the deficiencies and problems, efforts are continuously made to make science education for the gifted more effective.

Research on gifted Turkish education is slow-paced when compared to other countries (Gökdere & Çepni, 2005). Moreover, the exceptional educational opportunities for the gifted in Turkey are limited to BILSEM (Camcı Erdoğan, 2014). BILSEM was founded to help talented students get enrolled in schools bound to the Ministry of National Education (MoNE) with education in areas they are interested in and have a talent for after formal school hours. These institutions, which provide part-time education, prepare individualized education programs and lesson plans for each student.

In other words, BILSEM does not implement one common curriculum for all the students. BILSEM aims to raise gifted students who can think creatively, conduct scientific research, make discoveries, and actively participate in the educational process by engaging in hands-on experimental learning with the guidance of leader teachers (BILSEM Guidelines, 2007). Students who attended BILSEM are selected by utilizing an exam administered by MoNE. Also, students who achieve a sufficient level of performance in this test are subjected to an individualized assessment by MoNE experts. With the experts' approval, students start to receive education at BILSEM (BILSEM Guidelines, 2007).

Therefore, the opinions of teachers working at BILSEM and those of parents, who closely follow what their children experience during their educational process, can provide clues as to how science education for the gifted should be designed. In this way, if gifted students receive education in these centers following attributes peculiar to themselves, this will contribute to the development of both the gifted individual, the society, and our country. If this education is implemented with special care in sciences, these children will become scientists. Consequently, it can be stated that gifted children are a minority group that is highly important for the future of our country, and they have the power to shape our future. Thus, the present study focused on two crucial areas, namely the gifted and science education. The study's primary aim is to examine and synthesize the opinions of gifted children, their parents, and the science teachers working at BILSEM with respect to science education for the gifted. It also aims to propose a framework regarding science education for the gifted. The research question that the study sought to answer is as follows: "What are the opinions of gifted children, their parents, and the science teachers working at BILSEM following science education for the gifted?"

2.Methods

2.1 Research Design

One of the qualitative research methodologies, namely the phenomenology design, was utilized in the present study. Phenomenology is a design by which individuals' experiences related to a phenomenon are described (van Manen, 1990; Moustakes, 1994). The phenomenon examined in the present research study is the participants' opinions regarding science education for gifted students.

2.2 Participants

The research study participants were the gifted students attending BILSEM, located in Central Anatolia in Turkey, their parents, and the science teachers working at the same BILSEM. Subsequently, the gifted children who are to participate in the study were selected using criterion sampling, a purposeful sampling. The criteria defined in the present study were as follows:

- ✓ Attending the BILSEM supportive education program,
- ✓ Being interested in sciences, and

✓ Volunteering to participate in the research study.

In conclusion, the participants of the present study were comprised of 10 gifted students (between 12-13 years of age, six males and four females, two from a private school and eight from a public school), seven parents (three males, four males), and two science teachers working at BILSEM (two males, one with a bachelor's degree and one with a master's degree). The initial aim was to interview all the students participating in the study, but three of the parents were reluctant to participate in the study. Therefore, an interview could not be held with the parents of three students.

2.3 Data Collection Tools

The data of the research were collected in the second semester of the 2015-2016 academic year. The data collection technique employed in the present research study was the semi-structured interviews held with the participants. Interview protocols were prepared before the interviews. The researcher formulated the questions in the protocols based on the research questions by reviewing the related literature. The protocols designed were submitted to three field experts to be evaluated from various aspects, such as the consistency of the protocol questions with the research questions and the participant groups. Two of these experts were associate professors in science education, while the other expert held a PhD degree in the Education of the Gifted. Before the interviews in the present study, a meeting was held with the students, teachers, and parents.

The interviews were held in the counsellor teachers' room in BILSEM with only the researcher and the participant being interviewed. The interviews were held in this environment to ensure the security and easy accessibility of the participant. The interviews were recorded via a voice recorder upon the approval of the participant during the interview. The recorded interviews were transcribed within the shortest possible time. During the transcription, the data were written verbatim, making no changes whatsoever. Moreover, the participants' hesitations (e.g., expressions indicating waiting, thinking), and indications such as joy (e.g., laughing) and distress were also incorporated into the transcription.

2.4 Data Analysis

The data collected were prepared for analysis prior to the beginning of the study's data analysis process. To this end, initially, the interviews held with 19 people were transcribed verbatim by the researcher. The transcription process was completed in approximately two months. After the interviews, which were voice recorded with the participants' approval, it was converted to a Microsoft Word document and a code was assigned to each participant. The gifted students were coded from GS1 to GS10, the parents were coded from P1 to P7, and the science teachers were coded as T1 and T2. Subsequently, data analysis was conducted.

In the present study, the data analysis process proposed by Moustakas (1994) for phenomenological studies was employed. Thus, prior to data analysis, the data were prepared for data analysis. By following the steps of

phenomenological reduction, imaginative variation and uncovering the essence of the experience, the data analysis process was completed. Thus, Figure 1 displays the stages of phenomenological data analysis.

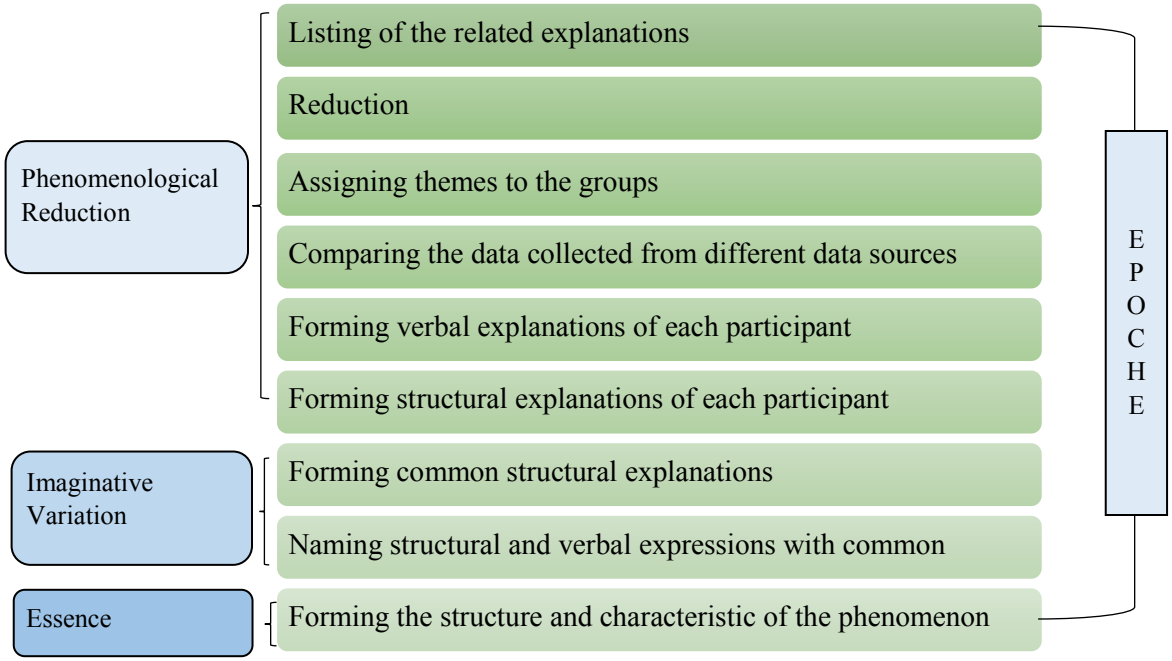

Figure 1. The Data Analysis Steps in a Phenomenological Study (Moustakes, 1994)

2.5 Validity and Reliability

To ensure the present study's internal validity, data source variability was obtained by interviewing gifted children, parents, and teachers. With the analysis of the data collected by two experts, the researcher variability was ensured. Another way the researcher can obtain internal validity is to collect data in the participants' natural environment. Hence, the data of the study were collected at BILSEM. In addition, the study was followed up by experts in the field throughout the process.

To guarantee external validity in the study, the research took the following measures: defined her role in the research process, straightforwardly defined the participants, described the environment where the research was conducted, and explained in detail the data collection and analysis processes (Yıldırım & Şimşek, 2013). Thus, another research wanting to replicate the study can arrive at similar results with similar implementations.

To assert that the study was internally reliable, the data were described and presented in the results section without adding any interpretations. Moreover, direct quotations of the participants' statements have been reported in the results section. Another measure was taken to ensure that the study's internal reliability was the data being analyzed by both the researcher and another expert in the field. The data obtained from the interviews held

with each participant in the research were transcribed. Subsequently, the researcher had the participants read these transcriptions and obtain their opinions regarding whether the data expressed them wholly and accurately (Member Check). Likewise, after the completion of the data analysis process, the participants were consulted, and feedback was received regarding the accuracy of the analysis. Besides, to increase the validity and reliability of the present research study and prevent loss of data, the interviews were voice recorded with the participants' approval, and notes were taken. The interviews were transcribed verbatim. Subsequently, by using a member check mechanism, the participants were asked whether the data reflected them and to make corrections if there were any that did not reflect them.

3. Findings

3.1 The Perceptions of the Gifted Regarding Sciences

Individuals' perceptions regarding any phenomenon can influence their life with respect to that phenomenon. Accordingly, before eliciting their opinions regarding science education, the gifted students were asked the following questions: "What does science mean to you? What does science mean? Could you please explain?" The findings obtained reveal that the gifted envisage sciences as experiments, as something fun, the whole of scientific knowledge, life, natural science, and a multi-disciplinary field. However, the most frequent statements used by the gifted students to describe their perceptions of sciences were 'Science is life' and 'Science is an experiment' (4/10). Furthermore, some participants described sciences as the whole of scientific knowledge (3/10), while others described it as being fun (3/10). Below are some direct quotations from some most clearly expressed participant statements of opinion:

"[Natural] Sciences is a branch of science which is fun and comprises our life and for this reason very useful and also it includes many topics." (GS6)

"Science, uhmmm (thinking)… I think science means experiment and life." (GS8)

3.2 The Educational Methods and Techniques Preferred by the Gifted in Science Education

The Opinions of the Gifted Students

In the interviews held with the gifted students, they were asked how they would like to learn the sciences, that is, what teaching method or techniques they wanted to use in the lessons. It was revealed that gifted students want to learn science by utilizing a student-centered approach using practice and research-based strategies. The participants were found to prefer to learn science operating practice, not memorization. Moreover, gifted students reported that they wanted to learn sciences through a method by which students did research and analysis, had fun, and how students' attributes were taken into consideration.

Participant GS5 expressed his/her opinions regarding science education as follows: *"I would like to learn science hands-on; I mean by*

doing experiments and research. Also, the teacher should be one that is closely concerned about his or her students. In this way, we can learn science easily; that's how I would want it to be." On the other hand, to summarize, it can be concluded that gifted students underscore the importance of the use of teaching strategies based on research and analysis in science, just as it is done in current science programs. In addition, the participants desire a science learning environment where their interests and attributes are prioritized.

The Opinions of the Parents

The parents participating in the study were asked what their opinions were regarding how they would like their gifted children to learn sciences. The parents' responses revealed that they wanted their talented children to learn sciences hands-on by doing experiments that are their responses, which were entirely consistent with those of the students. Moreover, some parents stated that they wanted their children to learn sciences by researching, reading books, and watching videos on the Internet.

Of the parents who stated that they wanted their children to learn science by doing experiments (P1, P3, P4, P5, P7), P4 explained his/her opinions as follows: *"He/she wants to do many, many experiments. He/She says s/he wants to learn everything new related to sciences by doing experiments, by practice."*

The Opinions of the Science Teachers at BILSEM

T1 and T2, who were asked to express their opinions on how gifted students wanted to learn sciences, stated that gifted students wanted to learn science through a hands-on and experiential method, and they believed that this was the best way. T2 expressed his/her opinion as follows:

"Upon starting to work at BILSEM, I realized that most gifted children have learning styles peculiar to themselves. Though not all, most gifted children state that they get bored during theoretical lectures. They are more participative during hands-on educational activities, and I have observed that permanent learning takes place with experiments and science activities implemented by using robotic devices."

During the interviews held with the teachers, both teachers emphasized that gifted children displayed significant differences from each other. Thus, providing these students with an individualized learning environment rather than a familiar learning environment for all was necessary. In this respect, ST expressed his/her opinions as follows:

"Hocam, the essence of the matter is this: gifted students are students who have different individualized intelligence. Whether one is gifted, every individual is unique, but common attributes can be present among the nongifted. But the gifted show a wide variation from a thing, uhm, from each other. For this reason, with gifted children, a different teaching method should be used following each student's area of interest and abilities."

As a result of the analysis of the data collected from the gifted children, parents and teachers, it was revealed that the participants believed that

experiments, research and analysis, projects, and hands-on teaching methods and techniques should particularly be preferred in the education of gifted students.

3.3 Science Education Activities at BILSEM

The Opinions of the Gifted Students

It can be stated that the positive views of the students attending BILSEM regarding science education were based on cognitive and affective justifications. The participants reporting views under the affective justifications theme believe that science activities based on experiments and practice at BILSEM are more educational. Furthermore, the participants stated that these activities were delightful and delighted to attend BILSEM as they loved their teachers. To illustrate, GS6, a participant holding this opinion, expressed him/herself as follows:

"The science activities here are quite good and sufficient. S/he do projects, so we find the opportunity for practice, and we do plenty of experiments. We have so much fun here that we learn science topics by having fun, but this is not the case at schools; there is always uniform instruction."

In addition, GS8, who were among the participants (GS6, GS8, GS9, GS10) stating that the science activities carried out at BİLSEM increased their accumulation of knowledge to a very great extent, expressed his/her opinions in the following way:

"We all like our teacher at BILSEM very much; I do so too, and this makes us come here very enthusiastically. We do many experiments, and when we learn through experiments, I learn more things at BILSEM than I do at school. I learn what I cannot learn in 40 lessons at school in four lessons at BILSEM."

The Opinions of the Parents

The gifted students' parents were asked to express their opinions regarding the science education activities implemented at BILSEM. Just like the gifted students, parents also stated that they believed such activities were performed quite effectively and productively and that their children were pleased about these activities. The parents, who thought that their children did not like education based on memorization and that lessons based on highly theoretical lectures and memorization did not appeal to the gifted, claimed that the experiments, projects, and research implemented at BILSEM were appropriate for their children's productivity and level of intelligence. Moreover, the parents added that since their children engaged in education at BILSEM the way they wanted to, they attended BILSEM enthusiastically, despite being after school hours.

Thus, it can conclude that both the gifted children and their parents considered science education practices at BILSEM to be effective and

productive. For example, P1 expressed his/her opinion as follows:

"Hocam, my child does experiment even at home. S/he creates new moving things from toy car pieces, electric supplies, and Lego pieces, and does these types of projects. Would you think that such a child would be happy from the regular lecturing at school or learn something by solving questions? My child finds what s/he expects from BILSEM. S/he enjoys the experiments, the project implementations, and the analysis they do there very much, and when this is the case, s/he always wants to go to BİLSEM, not to school. Naturally, I think like my child; God created this child with a different intelligence, [so] s/he deserves to be a scientist and as the name BILSEM suggests, [it is] a science centre."

The Opinions of the Science Teachers at BILSEM

When the teachers were also asked what gifted students thought about the activities implemented at BILSEM, just like the talented children and their parents, the teachers stated that children generally attended BILSEM enthusiastically, that they tried to refrain from being absent from BILSEM, and that they were positively eager to do experiments and to take part in project work. However, the teachers added that the 8th students preparing for the high school entrance exam could disrupt their BILSEM activities at times. Moreover, T2's claim that by attending BILSEM, gifted students are labelled. For this reason, one of the significant finding is that they are sometimes reluctant to go to BILSEM. P2, who expressed this opinion, made the following claims:

"Students want to participate in the experiments, projects, and research we do at BILSEM, and they come enthusiastically. The only problem here is the 8th-grade students who are preparing for the TEOG [exam]. Because these students are more focused on the exam, their scientific work is disrupted at times. Moreover, the mission of being the most successful that the society imposes upon gifted children makes them tense and, that's why they can be unenthusiastic about BILSEM sometimes."

When the opinions of the gifted students, their parents, and teachers are evaluated in combination, it can be observed that they are all consistent with each other. The participants believe that the science education activities at BILSEM are useful and productive since they are based on such practices as experiments and projects and are research-based and that there is a science learning environment conducive to the attributes of the gifted children at BILSEM.

3.4 Opinions Regarding the Comparison of BILSEM and Schools

The Opinions of the Gifted Students

The gifted students were asked to compare and express their opinions regarding whether the BILSEM activities or the education offered at their schools contributed more to their development. They were also asked to explain the reasons underlying their views. The data obtained revealed that all the participants thought that the activities they engaged in at BILSEM were more effective and productive than their schools' education. As

mentioned earlier, all the participants reported that they were highly pleased to be attending BILSEM. Moreover, the gifted generally held a negative opinion about being subjected to mixed education at schools. For this reason, an expected finding shows that talented children find BILSEM more useful for their development.

When the participants were asked about the reasons underlying their opinions, most of the students stated that as BILSEM provided them with hands-on education, they learned more effectively and in an enjoyable way (GS1, GS2, GS3, GS4, GS6). Besides, some participants reported that education at BILSEM was useful because there were only gifted children at BILSEM and that experiments were done frequently (GS1, GS2), the teachers were more understanding and answered every question asked (GS8), the small number of students enabled the teacher to pay more attention (GS9), students found the opportunity to receive an education that was more appropriate to the students, and that the aim was not successful in an exam (GS10). Some participants' opinions regarding this issue are as follows:

GS8*: "What do you think? (laughs) BILSEM, of course. At BILSEM, our science teacher and all the teachers are more understanding and responsive to all our questions. But at our schools, not to go beyond the level of nongifted students or could be because the teacher does not know the answer, I cannot get responses to my questions."*

GS9: *"Come on, the answer to this question is clear, the answer is BILSEM because there are few people at BILSEM, but schools are very crowded, so here we are given more attention."*

The Opinions of the Parents

The gifted students' parents were asked to compare the science education activities implemented at their children's school and BILSEM. As a result of the data obtained, it was revealed that the parents believed that the science education activities performed at BILSEM were more appropriate to their gifted children's nature and that the implementations at BILSEM were effective and productive. When the participants were asked to explain the reasons underlying their opinions, the point on which there was unanimous agreement was that projects and experiments, which students participated in actively, were carried out at BILSEM. Parent P3 explained his/her opinions as follows:

P3: *"I think I had told you, hadn't I? My children are twins. One is gifted; the other isn't. Of these two kids, the gifted one loves BILSEM as much as s/he hates school. Of course, the other does not go to BILSEM, but s/he likes school because s/he has a remarkable ability to memorize.*

On the other hand, the gifted one wants to do experiments and is hasty. S/he gets bored when the teacher at school explains a topic. But s/he likes to participate, be active in the implementations at BILSEM. I also think more effective implementations are done at BILSEM."

The Opinions of the Science Teachers at BILSEM

BILSEM science teachers also reported that gifted children spent

more effective and productive hours at BILSEM than they did at their schools. According to the teachers, the possible reason of this situation is that at BILSEM, gifted children are paid attention on a one-on-one basis, theoretical lectures are not delivered, and emphasis is laid upon experiments and project practices. In addition, teachers emphasized that since special education needed by gifted children is offered at BILSEM, it has a place of particular importance. T1 explains his/her opinions as follows:

"Our students say this as well; I think so too. The students enjoy more and learn more quickly thanks to the activities we do at BILSEM, such as doing experiments and watching videos. But of course, we are at an advantage; the children learn and solve school questions [before coming to BILSEM]. We do not prepare students for an exam by working as a tutoring centre, like some BILSEM centres in Turkey. Carefully selected gifted students are admitted here, and we implement activities intending to develop them and enable them to discover their interests, abilities, and themselves. We are providing the special education they deserve. Ultimately, this place is a special education institution. Here, as teaching materials, I use experiment materials, robots, software specific to the field of sciences, and web designs. I never do lessons like 'Come friends, listen to me. Force is this. Its unit is this.' Anyways, if I did, I know they wouldn't listen. And our mission is not this anyway. We are not training students for an exam; we do not assign grades to students. But our students learn; they apply what they learn. That's why we cannot be compared to schools."

Considering the views of the three participant groups regarding the issue in question, it can be claimed that all are in unanimous agreement. Also, there is a more effective and productive learning environment at BILSEM than in schools. The reasons expressed by the participants are that gifted children are more actively engaged in the educational process at BILSEM, they like experiments and project work more than they do theoretical lectures, and they find the opportunity to develop themselves. On the other hand, without denying the positive aspects, some of the participants expressed some negativities. One of the gifted students stated that s/he occasionally got bored at BILSEM, and both one gifted student and one parent commented that BILSEM sometimes took a lot of their time. One teacher also highlighted that after being labelled as talented, the pressure imposed upon the gifted to display full performance was too much.

4. Conclusions & Discussions

4.1 The Opinions of the Gifted towards Sciences

Based on the view that individuals' perceptions of any phenomenon can impact their experiences regarding that phenomenon, the present study aimed to identify gifted students' perceptions of sciences. The findings obtained indicate that the gifted envisage sciences as experiments, something fun, the whole of scientific knowledge, life, natural sciences, and a multi-disciplinary field. In a study by Afacan (2011), which was conducted to identify prospective science teachers' perceptions of science, it was found that the most frequent metaphor produced for sciences by the participants of

the study was "life". Considering the findings of this study, many science teacher candidates consider sciences as life itself. Moreover, Afacan (2011) reported that teacher candidates think that the science course is fun and includes different sciences disciplines. Therefore, these findings are consistent with those arrived at in the present study.

Consequently, the gifted children in the study perceived science as life and experiment. It should be highly emphasized in the present study because this enables one to think that talented students have a positive view of sciences. In support of this view, when the findings are examined, it can be observed that the talented did not report any negative image concerning the science course. Similarly, Smutny and Von Fremd (2004) stated that the gifted displayed a high interest in sciences. This interest originated from the fact that the gifted are individuals with a high level of curiosity and imagination. Moreover, it can be claimed that the findings that the present study revealed are consistent with those studies reporting that gifted students showed interest in the content of and the learning process in the science course (Tannenbaum, 2002).

4.2 Methods and Techniques Preferred by the Gifted in Science Education

Negative teacher attitudes and false beliefs about these students and myths may prevent gifted students from not receiving adequate support in normal classrooms (Kutlu Abu & Gökdere, 2020). For this reason, the methods and techniques teachers use in teaching science to gifted students are very important. As a result of the analysis of the data collected to identify the teaching methods and techniques that gifted children preferred in science education, it was revealed that the gifted wanted to learn science enjoyably using such methods as experiments, practice, and projects. Gifted students want to learn science through the projects they develop based on hands-on techniques, not by memorizing the overloaded theoretical information they are provided with. Furthermore, science education should be implemented by utilizing hands-on methods as a doctrine upon which there is an agreement in the entire world. Another study that supports the findings that the present study yielded was conducted by Aktepe and Aktepe (2009). This study revealed that while learning science, gifted students wanted methods such as experiments, excursions and observations, questions and answers, and role-plays to be utilized; they did not want their teachers to present theoretical lectures.

However, it is quite unfortunate that gifted children express complaints that teaching practices are signaling the traditional method in the schools they are attending. Thus, they stated that they found the opportunity to do projects and experiments only at BILSEM. Consistent with this view of the gifted students, in a research study conducted with primary school teachers at schools by Ekinci (2002), it was reported that even though the teachers believed that 85.1% of the participants consisted of gifted children, they could not establish an exceptional and supportive learning environment for these children.

The parents also stated that they wanted their gifted children to learn science by doing hands-on experiments, conducting research and analysis, reading books, and watching videos. Similarly, the science teachers of the talented children at BILSEM highlighted that their students like to learn through experience and participant in projects, while they do not like theoretical lectures. In a study conducted by Cross and Coleman (2014), it was reported that gifted students wanted to learn through experience and hands-on activities and research. Furthermore, Ngoi and Vondracek (2004) revealed that learning through research was a method that increased the motivation of gifted students. Colangelo et al. (2005) assert that gifted children should be kept active during their educational process, during which teachers play a catalyzer role. Accordingly, it can be claimed that the findings of these studies are consistent with those of the present study.

Another teaching method that has emerged in the teachers' statements is a teaching method designed per gifted children's characteristics. In support of this finding, it is highlighted in the literature that talented children should be subjected to an educational process in which individual differences and needs are considered (Van Tassel-Baska & Johnson, 2007). In other words, gifted children should go through an education which is appropriate to their areas of interest and that enables them to develop their potentials (Ataman, 2003; Davis & Rimm, 2004; Van Tassel-Baska, 2005) and in which their particular needs are taken into consideration (Chan, 2001; Davis & Rimm, 2004; Van Tassel-Baska & Stambaugh, 2005).

4.3 Science Education Activities at BILSEM

Opinions regarding science activities BILSEM of the gifted students who were not pleased about receiving education in mixed classes at school were also examined. Based on the data obtained, it was revealed that the gifted found the science education activities at BILSEM quite useful and productive. These activities at BILSEM are based on experiments and practice and are designed to teach science enjoyably to please the gifted. Like talented participants, the parents and teachers also reported that the gifted loved the science activities implemented at BILSEM. Likewise, Kunt and Tortop (2013) stated that gifted students used positive metaphors to describe BILSEM such as source of knowledge, information transmitter, an enjoyable and secure learning environment; that is, they held positive views of BILSEM.

In support of these opinions of gifted children, they found an enjoyable learning environment at BILSEM based on experiments and practice. Çaylak (2009) stated that the science activities at BILSEM were generally hands-on. According to Çaylak, in BILSEM science activities, experiments and laboratory techniques, experience sampling, and discussion methods are often preferred. Moreover, Van Tassel-Baska and Stambaugh (2006) indicated that project work was the most commonly used method in gifted students' education.

4.4 Opinions Regarding Comparison of BILSEM and Schools

The present study revealed that gifted children thought that BILSEM

was more beneficial for them than their schools. The low number of students at BILSEM, the non-existence of exam anxiety at BILSEM, teachers' particular attention, and the employment of student-centred hands-on teaching methods enable the gifted to engage in a more effective and productive learning experience at BILSEM than in their schools. However, the present study results also showed that the parents of the gifted and the science teachers held the same opinion in that gifted children benefitted from their education at BILSEM more than they did from their education at school. Similarly, it was reported in a study by Çelik Şahin (2014) and Yıldız (2010) that the participants of their study believed that BILSEM was beneficial for gifted students and it even supported students' lessons at school. This shows that the participants specified that the activities of BILSEM education are productive and the activities in question are considered positive from an overall perspective. In support of this finding, in a study by Özarslan (2015), it was revealed that gifted students believed that they would use the skills and knowledge they learned during their education at BILSEM and at the university as well. Furthermore, BILSEM was very beneficial for them.

Based on the present study's findings, it seems that the only problem for the gifted and their parents regarding gifted students attending BILSEM is the time constraint. Since gifted children attend BILSEM and their traditional schools simultaneously, the remaining time for the gifted themselves is limited. This finding is totally consistent with the results reported in a study by Ülger (2011).

5. Suggestions

1. Gifted students should hold positive views about sciences as they seem to have a high level of interest in it. This condition can be used to an end in the education of gifted children. This implies that science can be integrated into the other subjects of gifted children. In this way, students' interest or eagerness to learn in other subjects would increase.

2. It is recommended that the frequency of gifted students' attendance at BILSEM should be increased.

3. A guiding program for BILSEM centers, which can facilitate teachers' work, should be developed or such training can be offered to the teachers.

2.6 The Limitations of the Study

The study's first limitation was the reluctance of three of the parents of the gifted students to participate in the study. Another limitation of the study is related to the data collection tools. The initial aim was to employ observation and document analysis techniques and the interviews, to ensure data variety in the study; however, the fact that documents related to gifted children were kept confidential prevented the collection of rich data for document analysis. Similarly, owing to the lack of classrooms at BILSEM, each student could not be individually observed in a detailed manner. As the formal schools where the students were enrolled were many, the researcher

did not have the opportunity to conduct detailed observations at these schools.

References

1.Abraham, A. (2010). *Teachers' perspectives on teaching mathematics to gifted/talented students*. Doctoral Thesis, University of Nevada.
2.Afacan, Ö. (2011). Metaphors used by elementary science teacher candidates to describe "science" and "elementary science and technology teacher". *NWSA, 6*(1), 1242-1254.
3.Aktepe, V., & Aktepe, L. (2009). Teaching method using science and technology education on students' aspects: The Example of Kırşehir BİLSEM. *Ahi Evran University Journal of Kırşehir Education Faculty, 10*(1), 69-80.
4.Ayverdi, L. (2018). *Usage of technology, engiineering and mathematics in Science education for gifted students: Stem approach.* Doctoral Thesis, Balıkesir University Institute of Science, Balıkesir.
5.Brody, L. E., & Stanley, J. C. (2005). Youths who reason exceptionally well mathematically and/or verbally: Using the MVT: D4 model to develop their talents. In R. J. Sternberg (Ed.), *Conceptions of giftedness* (2nd ed., pp. 20–37). Cambridge University Press.
6.Camcı Erdoğan, S. (2014). *The effect of differentiated science and technology instruction based on scientific creativity on gifted and talented students' achievement, attitude and creativity.* Doctoral Thesis, İstanbul University Eğitim Bilimleri Enstitüsü.
7.Çaylak, B. (2009). *The investigation of natural and applied sciences activities applied in science and art centers*. Master Thesis, İnönü University Institute of Education.
8.Çelik Şahin, Ç. (2014). Investigating science and arts center students' opinions on these organizations. *HAYEF: Journal of Education*, *11*(1), 101-117.
9.Chan, D.W. (2001). Learning styles of gifted and nongifted secondary students in Hong Kong. *Roeper Review*, *23*(4), 197 – 202.
10.Colangelo, N., Assouline, S. G., & Gross, M. U. M. (2005). *A Nation deceived: How schools hold back America's brightest students*. Iowa City, Blank Center for Talent Development.
11.Cross, T. L., & Coleman, L. J. (2014). School-based conception of giftedness. *Journal for the Education of the Gifted, 37*(1), 94-103.
12.Davis, G. A., & Rimm, S. B. (2004). *Education of gifted and talented* (5th Ed.). Allyn and Bacon.
13.Ekinci, A. (2002). *Evaluation of teachers' opinions on the eligibility level of primary schools for gifted children (Batman province example).* Master Thesis, Dicle University, Institute of Social Sciences.
14.Gallagher, J. (2006). *Models that guide teaching the gifted. Gifted children gifted education.* Great Potential Press.
15.Gökdere, M., & Çepni, S. (2005). Prepared for the science teachers of the highly talented into the learning environment of the work of an in-service training reflections. *The Turkish Online Journal of Educational Technology, 4*(4), 204-217.
16.Johnson, D. T., Boyce, L. N., & Van Tassel-Baska, J. (2013). Science curriculum review: Evaluating materials for high-ability learners. *Gifted*

Child Quarterly, 39(1), 36-42.
17.Kunt, K. & Tortop, H.S. (2013). The metaphoric perceptions of science and arts centers for gifted students in Turkey. *Journal of Gifted Education Research, 1*(2), 117-127.
18.Kutlu Abu, N., & Gökdere, M. (2020). Evaluations and conceptual perceptions of prospective classroom teachers related to differentiated science teaching module for gifted students. *Yüzüncü Yıl Üniversitesi Eğitim Fakültesi Dergisi, 17*(1), 768–798.
19.Meador, K. S. (2003). Thinking creatively about science: Suggestions for primary teachers. *Gifted Child Today, 26*(1), 25-29.
20.Moustakas, C. (1994). *Phenomenological research methods*. Sage.
Ngoi, M., & Vondracek, M. (2004). Working with gifted science students in a public high school environment. *Journal of Secondary Gifted Education, 15*(4), 141-147.
21.Özarslan, M. (2015). *The thoughts of project partners on Bilsem biology projects and the effect of these projects on the motivations of gifted and talented students towards learning biology and their scientific attitudes*. PhD Thesis, Balıkesir University Institute of Science.
22.Singh, A. (2008). *Professional development and perspectives of science teachers: An extracurricular science program for gifted middle school students.* Doctoral dissertation, The University of Lowa.
23.Smutny, J., & Von Fremd, S. E. (2004). *Differentiating for the young child*. Corwin Press.
24.Tannenbaum, J. A. (2002). A history of giftedness in school and society. In Heller, K. A. Monks, F. J., Sternberg, R. J., Subotnik R. F. (Eds), *International handbook of giftedness and talent* (2th Ed.) (p. 3-23). Elsevier Science.
25.Ülger, B. B. (2011). *The investigation of science education programs in science and art centers view of managers', teachers' and students*. Master Thesis, Çukurova University Institute of Social Sciences.
26.Van Manen, M. (1990). *Researching lived experience*. State University of New York Press.
27.Van Tassel-Baska, J. (1998). Characteristics and needs of talented learners. In Vantassel-Baska, J. (Eds) *Excellence in educating gifted and talented learners*, (3rd ed,173-191). Love Publishing.
28.Van Tassel-Baska, J. (2005). Domain-specific giftedness: Applications in school and life. In Sternberg, R. J. & Davidson, J. E. (Eds). *Conceptions of Giftedness* (2nd ed) (pp.358-376). Cambridge University Press.
29.Van Tassel-Baska, J., & Johnson, S. K. (2007). Teacher education standards for the field of gifted education: A vision of coherence for personnel preparation in the 21st century. *Gifted Child Quarterly*, *51*, 182-205.
30.Van Tassel-Baska, J., & Stambaugh, T. (2005). Challenges and possibilities for serving gifted learners in regular classroom. *Theory into Practice*, *44*(3), 211-217.
31.Van Tassel-Baska, J., & Stambaugh, T. (2006). *Comprehensive curriculum for gifted learners*. Pearson Education.

32.Yıldırım, A. & Şimşek, H. (2013). Qualitative research methods in the social sciences. Seçkin Publishing.
33.Yıldız, H. (2010). *A case study on the arts and science centers (BİLSEM) which are a model for the education of gifted and talented children.* Master's thesis, Gazi University, The Department of Social and Historical Foundations of Education.