

Gifted Students' Analogies towards Science and Arts Centres*

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Abstract

This study investigated the gifted students' analogical perceptions of science and arts centres (SACs). Qualitative research method has been adopted. The data were collected from 4th and 5th graders selected through the purposive sampling through an interview form developed by the researchers. The participant students' analogical expressions for SACs were analysed through the content analysis method. The students were required to make analogies between SACs and eight themes (e.g. cars, games, occupations, clothes, subjects, stories, scientists and relatives) by justifying them. The content analysis results of their responses indicated that the gifted students held quite positive perceptions of SACs and that these centres fulfil the goals and objectives identified by MoNE. SACs were mostly compared to speedy cars, challenging games that require use of mind and strategic thinking, warm clothes, occupations that require self-sacrifice, patience and dedication, numerical courses, close relatives, the most popular stories/ tales of the world literature and the scientists most of whom lived in 19th and 20th century. This study is important in terms of pointing out that there is a positive relationship between the attitudes of SAC students towards educational institutions and their academic success.

Keywords: Gifted Students, Analogy, Science and Arts Centre, Special Education

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Introduction

Sustainable development of the countries substantially depends on the quality of education provided to gifted students. Gifted children are those whose potential is distinctly above average in one or more of the following domains of human ability: intellectual, creative, social and physical (Gagné, 2003). They are also identified as those with a Full-Scale Intelligence Quotient (FSIQ) score higher than 130 and whose learning speed and levels differ from their peers and among the groups of students who need special training. Due to the complex and multifaceted nature of the subject, there is no consensus on the definition of “gifted students”. Those which were grounded only on one criterion such as high intelligence has been gradually replaced by the definitions based on multiple criteria (Davaslıgil,1991). They are defined as individuals who are qualified to carry out high-level work and superior than their peers in any academic field (Çağlar, 1986) and who exhibit higher-than-expected behaviours (Doğan & Çetin, 2018; Sak, 2010). In Turkey, they are described as ‘academically talented individuals with more competence in creativity, arts and leadership who learn faster than their peers, who are able to understand abstract ideas, who like to behave independently and who display high performance’ (Ministry of National Education, 2016, p. 2). These students have superior reasoning, critical thinking, problem solving and planning skills when compared to their peers (Sak, 2010; Gallagher, 2008; Renzulli, 1999). They are also able to develop different strategies to achieve a goal, to answer unexpected questions promptly and skilfully, to produce original ideas, to recall what they learned for a long time and to have a vivid imagination (Altıntaş, 2009; Davaslıgil, 1991). The aforementioned qualifications of the gifted students outlined in the definitions make it crucial for them to undergo a carefully designed educational process (Çapan, 2010; Sak, 2010; Davaslıgil, 1991). Science and Arts Centres (SACs, henceforth) are the institutions that are founded by MoNE in Turkey to serve this purpose. They primarily aim to ensure that special talented students of pre-school, primary, middle and high school age are aware of their individual abilities and to enable them to improve and use their capacities at the highest level by considering such factors as characteristics of the settlement and transportation facilities of the regions.

The relevant literature on students’ perceptions of school shows that they have positive perceptions about these institutions identifying them as ‘places of knowledge transfer’, ‘places where students are in safe’ and ‘places where development and growth take place’ along with some negative perceptions (Akkaya, 2012; Aydoğdu, 2008; Demir, 2007; Özdemir & Kalaycı, 2013; Yüner & Özdemir, 2017). The other studies have been conducted mostly with a focus on the gifted students’ perceptions of courses, learning environment (Aydın et al., 2011; Adediwura, 2011; Erdoğan & Yemenli, 2019; Gentry, Rizza & Gable, 2001; Opstad & Årethun, 2019; Potts, 2018; Rita & Martin-Dunlop, 2011; Tortop, 2013), curriculum (Atlı & Balay, 2016; Kitsantas, Bland, & Chirinos, 2017; Mullet, Kettler & Sabatini, 2017; Sak, 2016; Wu, 2018), teacher (Tischler & Vialle, 2009; Yılmaz et al., 2017; Zedan & Bitar, 2017) and family (Chan, 2005; Rudasill et al., 2012). In addition, it was

found that students have more positive perceptions of primary school while they have more negative perceptions of middle and high schools (Akkaya, 2012; Aydođdu, 2008; Cerit, 2006). In that regard, students' perceptions of the institutions where they are trained gain significance in terms of their effective participation to training and education activities as well as attainment of learning outcomes. As SAC students get additional training at these centres based on their talents and interests out of their school time, their negative attitudes towards the centres in concern will adversely affect the development of their talents.

As a matter of fact, the relevant literature indicates a positive correlation between SAC students' attitudes towards these institutions and their academic achievement. Analysing the metaphoric perceptions of gifted students about school and teacher, Ogurlu, Öpengin and Hızlı (2015) reported that students described them as "a peaceful and protective place". In a similar study conducted on SAC students' metaphoric perceptions of SAC and school, Su, Sağlam and Mutlu concluded that they hold more positive perceptions of the former than the latter and that the most frequently produced metaphors about SACs were "brain", "our home" and "family". The metaphors mentioned in these studies are used as a mental tool to reveal individuals' views about the desired situations and to explain theoretical/ abstract phenomena (Saban, 2008). They are regarded as meaning transfer between objects with perceptual or logical similarities (Gök & Erdoğan, 2010) and tools that are used to embody abstract concepts (Duit, 1991; Thiele & Treagust, 1994a). Ortony (1975) argues that metaphors are expected to explain complex phenomena in one or two words in a compact manner and to allow envisioning easily. Analogy, on the other hand, is another concept that draws attention with its similar meaning to metaphor in the related literature. It refers to making inferences about two concepts proposing that what is expressed for the first concept is also valid for the second taking into consideration the sameness or similarities between the concepts in concern (Uğur, 2009). A familiar situation similar to the unfamiliar phenomenon to be explained is used to provide the explanation, whereby a correspondence is assumed to exist between aspects of the analogical situation and those of the actual phenomenon (Dagher & Cossman, 1992, p. 364).

Analogies refer to strong connections among similarities shared between concepts, principles and formulas; furthermore, they are strong bridges established between preliminary information and the target information (Keserciođlu, Yılmaz, Huyugüzel-Çavaş & Çavaş, 2004). In a similar vein, one can obtain new information from analogies or change those existing in their cognition; in this respect, it becomes a pre-requisite to understand analogical reasoning process (Mozzer & Justi, 2012). They are effective for learning and teaching of concepts (Harman & Çökelez, 2017). Many analogies facilitate a visualization of the abstract target domain and are employed to determine student misconceptions (Duit, 1991). Besides, they facilitate restructuring existing memory and preparing it for the new information (Gentner, 1983). In a recent study, Çetinkaya, Taşpinar and Özdemir (2019) investigated 7th graders' mathematical analogies and reported that most them are constituted by

functional, verbal-visual, abstract-concrete and enriched analogies that are all related to the topic of whole numbers.

The word analogy and its various uses were invented by the Greeks. The concept of analogy was originally developed in Mathematics, and it shows the rate or proportion that indicates general or mutual relations (Ata, 2008). Analogy, while retaining the meaning of the similarity between relationships, began to mean a direct comparison between some similar terms to some extent (Ferre, 1967: 94). As Newby, Ertmer and Stepich (1995) emphasized, analogy, logic, philosophy, social sciences, education, divinity, commerce, reading comprehension, composition, computer programming, problem solving have been used in many fields. In a similar fashion, Thiele and Treagust (1994b) identify analogies as connecting concepts, theories or formulas by using only shared aspects or a mapping process conducted among them. In this case, the known and unknown are called 'source' and 'target', respectively. Orgill and Bodner (2007) reported that biochemistry students use analogies in various ways to promote understanding, visualization, recall, and motivation during classes and concluded that 'analogies can be powerful teaching tools because they can make abstract material intelligible to students by comparing it to material with which the students are already familiar' (p. 244).

The perceptions of students towards the institutions they receive education are important in terms of obtaining effective participation and learning outcomes in education and training activities. Considering the fact that SAC students continue their formal education in another educational institution, when they are out of school hours and come to these institutions and receive education according to their interests and abilities, it is faced with the fact that their negative attitude towards the institution will negatively affect their development in their talent areas. In this respect, it is very important for students to have a positive attitude towards these institutions. This study is valuable in terms of revealing this situation. The feature that distinguishes this study from other metaphors and analogies is that the analogies created by the students are examined in detail and the analogy groups are given in the form of a reference list and analogy aspects are handled in this way.

Leana-Tascilar (2016) states that reasoning by establishing abstraction and analogy should be accepted as the main component of intelligence. According to Hakkoymaz and Uygun (2017), as one of the characteristics of gifted children, it can be understood that it has a fluent articulation with its use of analogy, the ability to sing poetry in an improvised way, a sophisticated sense of humour, improved vocabulary and grammar knowledge. Review of the literature demonstrates that previous research has been mostly conducted with a focus on students' academic success, teaching and visualization of concepts, misconceptions and linking pieces of information and reported positive influences of analogies in education. As, to the best of the researchers' knowledge, gifted students' analogical perceptions of SACs have not been previously investigated, this particular study was motivated to

bridge the research gap in question. More precisely, SACs and students' analogies for SACs are evaluated as 'source' and 'target', respectively with the purpose of exploring their perceptions of these centres through analogies. Hence, it exclusively differs from other studies previously conducted on students' perceptions of SACs. Based on the research objective, the current study sought an answer to the following research question: What are the analogical perceptions of the gifted students attending SACs towards these centres? Accordingly, they were expected to produce analogies in eight domains: Cars, games, occupations, clothes, subjects, stories, scientists and relatives. All in all, it is believed that knowing about their attitudes, perceptions and schemes for these centres will be beneficial to provide them education of a higher quality.

Method

This section includes information about research design, participants, data collection tool, data collection processes, and data analysis.

Research Design

This descriptive study was qualitatively designed with the aim of the revealing analogical perceptions of the gifted students attending 4th and 5th grades at SACs towards these institutions. Qualitative research encompasses a process that is carried out to reveal perceptions and events in a realistic and holistic way through such data collection methods as observation, interview and document analysis (Yıldırım & Şimşek, 2016). Descriptive survey research designs are used in preliminary and exploratory studies to allow researchers to gather information, summarize, present and interpret for the purpose of clarification (Orodho, 2003). Accordingly, this study adopted this particular research design as the data were collected and findings were reported without manipulating any variables. This research is limited to the gifted 4th and 5th grade students attending SACs. Different situations in the upper or lower classes should be considered as probable.

Participants

The participants were selected through the purposive sampling method, which accelerated the data collection process even though it does not allow collecting rich data (Büyüköztürk et al., 2011). Purposeful sampling methods allow for in-depth study of situations that are considered to have rich knowledge. All students participating in the study are ISDP (Individual Skills Development Program) students. This program is the next stage after the support program applied to gifted students. Table 1 provides demographic information about the participants in question.

Table 1. Demographic features of the participants

Grade	Gender		Attended School	
	Female	Male	State	Private
4th	17	16	21	12
5th	18	21	24	15
Total	35	37	45	27

As seen in Table 1, approximately 49% of the participants were female while 51% of them were male. 63% and 37% of the students were attending state and private schools, respectively at the time of data collection. For the sake of confidentiality, the students in question were coded as S1, S2, S3,, S72.

Data Collection Processes and Analysis

The research data were collected through a form comprising of questions developed by the researchers to obtain the students' analogical perceptions of SACs. The first section of the form was intended to elicit demographic information about the participants while the second section was designed to obtain their analogical perceptions of SACs. Yıldırım and Şimşek (2016) advocate that the metaphors used in this context play a descriptive role. It is significant to note that a total of 17 domains were initially constructed in accord with the research objective. Subsequently, the expert opinion was elicited from a mathematics teacher working at a SAC, a scholar holding a doctoral degree in mathematics teaching and a language expert. Accordingly, 9 of the items were excluded from the form due to the fact they were considered to deviate from the research objective. The following are the expressions in the form were posed to students.

“SAC is like among cars because”

“SAC is like among games because”

“SAC is like among occupations because”

“SAC is like among clothes because”

“SAC is like among subjects because”

“SAC is like among stories because”

“SAC is like among scientists because”

“SAC is like among relatives because”

The forms were applied at SACs within a class hour subsequent to obtaining the relevant consent from the Directorates of SACs. It is noteworthy that the researchers were available in the classrooms to ensure that instructions were fully understood by the participants. The participant students' analogical expressions for SACs were analysed through the content analysis method and based on the following the steps proposed by Saban (2008).

1. Coding and extraction: Analogies produced by the students for each item along with their purposes are evaluated and listed separately. The incomplete responses were excluded from data analysis.

2. Category forming: The analogies were evaluated together with their purposes (justifications) and categorized based on the type of relationship between them.

3. Validity and reliability: Expert opinion on the suitability of the conceptual categories for analogies was elicited from two faculty members, one with 10-year teaching experience at SAC and one with doctoral degree in academic writing. Analogies and categories were matched within this framework. The inter-rater reliability was found quite high (.92) using the Miles and Huberman's Formula ($\text{Reliability} = \frac{\text{consensus}}{\text{Consensus} + \text{Disagreement}} \times 100$).

4. Presenting quantitative data of analogies and categories: Related analogies and categories were expressed in frequencies and presented in the following section.

Findings

This section of research is intended to outline the gifted students' analogical views on SACs considering the order of analogical items in the data collection form. The first item required them to complete the statement "SAC is like among cars because" by stating a car brand and the analogical purpose. Their responses were analysed and the related results are given in Table 2.

Table 2. The gifted students' car analogies for SACs

Car Brand	f	Car Brand	f	Car Brand	f
Tofaş (Local car brand in Turkey)	12	Porsche	3	Ford	1
Mercedes	10	Plane	3	Broadway	1
Lamborghini	6	Honda	2	Skoda	1
Ferrari	6	Pagani	2	Hyundai	1
BMW	5	Truck	2	Camaro	1
Hybrid	4	Jeep Compass	1	Caravelle	1
Bugatti	3	Audi	1	Range Rover	1
Renault	3	Trolley	1	Mini cooper	1

As seen in Table 2, SAC students compared these centres mostly to such cars as Tofaş (f=12), followed by Mercedes (f=10), Lamborghini (f=6) and Ferrari (f=6). Interestingly, it was also seen that they compared them to vehicles other than cars such as plane and truck. It might be attributed to semantic extension in their L1 as the concept of 'car' is occasionally used as an umbrella term for vehicles. Table 3 illustrates the ways they are compared to cars and the constructed analogies.

Table 3. The gifted students' ways of comparing SACs to cars

Function	f	Aesthetics / Appearance	f	Diversity	f	Comfort	f
Acceleration	27	Nice	5	Fun	2	Comfortable	4
Deceleration	6	Cool	4	Unaffordable	2	Uncomfortable	2
Teaching	4	Neglected	2	Customizable	1		
Continuity	3	Old	2	Precious	1		
Conveying info	2	Beautiful inside	3	Far	1		
Advancement	2	Ugly outside	1				
Development	1						
Total	45	Total	17	Total	8	Total	6

As shown in Table 3, analogies used by the gifted students to compare SACs to cars were evaluated in four categories: (i) function (59%), (ii) aesthetics/ appearance (22,7%), (iii) diversity (11,1%), and (iv) comfort (7,9%). More specifically, they compared SACs to cars based on their function of ‘acceleration’ mostly due to the fact that SACs allow students to cover a lot of ground within a short time in the way cars can move people or goods from one place to another in a very short time by saving time. For aesthetics/ appearance category, responses of some students indicated that it was not found aesthetically satisfying even though the qualifications of ‘nice’ and ‘cool’ were mostly used, their responses also show that SACs are considered more fun than schools. Finally, the students who evaluated these centres as comfortable places outnumbered those who did not. The following are the extracts taken from the students’ interview forms.

“SAC is like Lamborghini among cars because it enables us to learn everything very quickly.” (S44, Male, 4th Grader/ State School)

“SAC is like Tofaş among cars because it looks neglected. More modern buildings should be provided to these centres.” (S36, Male, 5th Grader/ State School)

“SAC is like a hybrid car among cars because it meets our needs, consumes less gasoline per mile, offer you high speed or comfort but it does not require much maintenance.” (S57, Male, 5th Grader/ Private School)

The gifted students’ responses to the statement of ‘SAC is like among games because’ were analysed and tabulated based on the analogies they used and the way they compared SACs to the games. The formers are presented in Table 4.

Table 4. The gifted students’ game analogies for SACs

Games	f	Games	f	Games	f
Playing tag	10	Mind games	2	Colour switch	1
Hide-and-peek	5	GTA	2	Airsoft	1
Football	4	Crossword Puzzle	2	Blue Whale	1
Fortnite (war game)	4	Sudoku	2	Malepoli	1
Chess	4	Mangala	1	Slither io	1
Hopscotch	3	Riddle	1	Know and Conquer	1
Word Challenge	3	Taboo	1	Puss-in-the-corner	1
Minecraft	3	Puzzle	1	Hangman	1
Reversi	2	Domino	1	Playstation	1
Pubg Mobile	2	Jacks	1	Party panic	1
Pacman	2	Stash	1	Blur	1
Cs-go	2				

It is understood that the gifted students tended to compare SACs to street games that require physical exertion such as playing tag, hide-and-peek and football. This indicates that they compared these centres mostly to concrete rather than virtual games. It was striking to see that one of the students compared them to the blue whale which is listed among the most dangerous games probably considering that SAC students are quite in risk since any negativity they are exposed to during their

education may arise unexpectedly dangerous results such as using their competences to the detriment of the society. Table 5 provides the constructed analogies and what features of games led the gifted students to compare SACs to the games.

Table 5. The gifted students' ways of comparing SACs to games

Situation / Emotion	f	Function	f	Education	f	Skill	f
Fun	6	Developing creativity	3	Progressivity	4	Using the mind	6
Tiring/ Busy	4	Developing intelligence	3	Complete learning	3	Requiring involvement	3
Loved	3	Exploiting info	2	Backwardnes	3	Teamwork	2
Nice	2	Race against time	2	Levelling-up	2	Brain battle	1
Inspiring	1	Forcing the mind	2	Associated learning	1	Strategic thinking	1
Exciting	1	Overcoming challenges	1				
Surprising	1						
Total	18	Total	13	Total	13	Total	13

It is seen that such themes as situation/ emotion (31,6%), function (22,8%), education (22,8%) and skill (22,8%) were constructed from the analogies established between SACs and games. Being fun was the most frequently reported emotion shared between SACs and games, followed by tiring/ busy, loved and nice. As is seen, the gifted students tended to express positive emotions except tiring/ busy in their analogies for SACs. Using mind revealed the most frequented code in the category of skills that were reported to be shared between SACs and games. The following were extracted from their responses to the relevant interview item.

“SAC is like Blur among games because we can never predict the way it proceeds –from the left or the right”. (S4, Male, 5th Grader/ Private School)

“SAC is like Minecraft among games because they improve our creativity.” (S5, Female, 5th Grader/ Private School)

“They are like Mangala among games because they require intelligence and strategic thinking and encourage us to think.” (S21, Male, 4th Grader/ State School)

Hence, the gifted students compared these centres to the challenging games that require use of mind and strategic thinking and that enable them to develop academically. The third statement in the form was designed to elicit the gifted students' analogies between SACs and clothes. Their responses to the item in question were analysed and demonstrated in Table 6.

Table 6. The gifted students' clothes analogies for SACs

Clothes	f	Clothes	f	Clothes	f
Coat	10	Pants	5	Gloves	1
T-shirt	8	Socks	4	Coveralls	1
Sweater	7	Jacket	3	Sportswear	1
Dress	6	Shirt	2	Team uniform	1
Hat/ Beret	6	Wedding dress	2	Leggings	1
Skirt	5	Scarf	2	Kimono	1
Suit	5	Shalwar	1		

As illustrated in Table 6, SACs were often compared to a coat noting that it keeps us warm within certain periods of time (f=10). It is followed by t-shirt, sweater and dress. The gifted students also compared SACs to unusual clothes such as wedding dress, kimono and coveralls. This might be attributed to the fact that these clothes are deemed to attract attention in the settings they are worn. Hence, the gifted students might have compared SACs to these clothes in order to underline their difference from the regular institutions of education. In addition, 20 different types of clothing analogies were made from 72 gifted students. And they made explanations that these clothes are used for different purposes. The table of these explanations is given below. Table 7 is intended to outline their ways of comparing SACs to the clothes.

Table 7. The gifted students' ways of comparing SACs to clothes

Function	F	Appearance	f	Emotion	f	Expediency	f
Keeping warm	8	Long	4	Loved	4	Expedient	2
Sheath	5	Large	4	Vital	3	Inexpedient	2
Challenging	3	Tight	3	Sincere	2	Can be tried	2
Relaxing	2	Smart	3	Necessary	2		
Embracing	1	Wrong size	1	Unnecessary	1		
Advancing	1	Revealing	1	Anyone's dream	1		
Facilitating	1	Detailed	1				
		Complicated	1				
		Comfortable	1				
		Thick	1				
		Short	1				
Total	21	Total	21	Total	13	Total	6

The most frequently established analogies between SACs and clothes were categorized under the themes of function and appearance (34,4%), followed by emotion (21,3%) and expediency (9,8%). The most common analogy formed under the theme of function was keeping warm (13,1%). Despite sounding negative, sheath revealed the second most frequently reported way of comparison between SACs and clothes. It was predicted that the gifted students established such connection between the phenomena in concern as the former is hard to enrol for the students. Namely, the candidate students are supposed to succeed in a set of challenging tests prepared and administered by the field experts. Under the theme of appearance, on the other hand, the respondents compared SACs and clothes using the adjectives "long" and "large" probably because training in SACs takes a long period that encompasses primary to high schooling. They also established analogies between them using "tight",

“wrong size” and “complicated” implying that these centres do not operate as regularly as their own schools. Namely, they spend only limited class hours a day at these centres out of their school time and they are exposed to a teaching programme designed in accordance with their individual development. Nonetheless, it is revealed that they tended to voice positive rather than negative expressions under the theme of emotions such as loved, vital and sincere. Lastly, they employed such expressions as expedient, inexpedient and can be tried. The following are the excerpts obtained from the interview forms of the participants.

“SAC is like a coat among clothes because I like it most (it keeps my body warm).” (S5, Female, 5th Grader/ Private School)

“SAC is like a (mini) skirt among clothes because it lasts very short.” (S6, Female, 5th Grader/ Private School)

“SAC is like a jacket among clothes because you decide (not) to wear but if you wear it on, you will not get cold. I mean, it is necessary no matter how it sounds not.” (S55, Female, 5th Grader/ State School)

“SAC is like a suit among clothes because it teaches all main courses.” (S17, Male, 4th Grader/ State School)

4th statement in the interview form was intended to elicit the gifted students’ analogies between SACs and occupations. The analysis results of their responses are given in Table 8.

Table 8. The gifted students’ occupation analogies for SACs

Occupations	f	Occupations	f	Occupations	f
Teacher	19	Astronaut	2	Dentist	1
Scientist	14	Basketball player	1	Judge	1
Doctor	10	Lawyer	1	Police officer	1
Architect	5	Academician	1	Mechanic	1
Garbage man	3	Shepherd	1	Accountant	1
Surgeon	3	Military officer	1	Soldier	1
Student	3	Tailor	1	City police	1

The gifted students’ responses revealed that SACs were mostly compared to teachers (f=19), followed by scientists (f=14) and doctors (f=10). They justified their analogical choices noting that these occupations are constantly intertwined with science and that they contribute to the development of science. That these three professions were mostly reported by the students could be attributed to the fact that they require self-sacrifice, patience and dedication. The findings also indicated that these centres were compared to cognitively less challenging and demanding occupations such as mechanics, shepherd and garbage man. Table 9 displays their purposes of comparing SACs to the occupations listed.

Table 9. The gifted students’ ways of comparing SACs to occupations

Function	f	Quality	f	Originality	f
Educates	14	Scientific	6	Exclusiveness	4
Offers new info	4	Challenging	2	Selectiveness	1
Makes transactions	2	Neglected	2		
Closes the gap in education	2	Designer/ Innovative	2		
Allows discovery of genius	2	Nice	1		
Defends/ Protects	2	Skilful	1		
Heals the mind	1	Busy	1		
Binds up wounds	1	Races against time	1		
Repairs	1	Planned	1		
Teaches science	1	Careful/ Cautious	1		
Alleviate pains (Pain-killer)	1	Delicate	1		
Advances	1	Talented	1		
Facilitates our works	1	Shortcomings	1		
Total	33	Total	21	Total	5

The gifted students’ analogies were assessed under the themes of function (55,9%), quality (35,6%) and originality (8,5%) when considering their purposes of comparison between SACs and occupations. The frequency of the function of education might be attributed to the finding that these centres were mostly compared to teachers among occupational groups provided in Table 8. The most frequently used analogy under the theme of quality was scientific that was considered a shared feature between SACs and occupations by the participant students some of whom compared these centres to scientists. The theme of originality, on the other hand, comprised of the analogies of exclusiveness and selectiveness that were mostly attributed to such occupations as doctors, astronauts and professors. The following are the excerpts extracted from the gifted students’ responses to the related interview item.

“SAC is like an astronaut among occupations because we feel in a different world when we come to it.” (S5, Female, 5th Grader/ Private School)

“SAC is like a garbage man among occupations because we collect and learn from what is left from scientific research. I hope what we have learned here will be beneficial to us in the future.” (S31, Female, 5th Grader/ State School)

“SAC is like a tailor among occupations because tailors always patch the clothes and sew the ripped off.” (S57, Male, 5th grader/ State School)

“SAC is like a teacher among occupations because it teaches us so many things we do not know.” (S60, Male, 5th Grader/ State School)

“SAC is like a surgeon among occupations because it is expected to know everything in detail –like the way surgeons know about the body.” (S61, Male, 5th Grader/ State School)

The fifth statement in the review form was designed to cover the gifted students’ analogies between SACs and course/course contents.

Table 10. The gifted students' course/course content analogies for SACs

Course (content)	f	Course (content)	f	Course (content)	f
Mathematics	26	Social Sciences	2	Chemistry	1
Science	11	Religious Studies	2	Mind Games	1
Turkish	6	Pi	1	Famous Scientists	1
Fractions	5	Philosophy	1	Etude	1
P.E.	3	Reflections	1	Doing a Test	1
Foreign Language	3	Informatics	1	Physics	1
All content	2	Addition	1	Grasping the Main Idea	1

As indicated in Table 10, the participant students tended to compare SACs to the courses rather than course contents (79%). Namely, Mathematics revealed the course mostly compared to these centres (f=26), followed by Science (f=11) and Turkish (f=6). Considering that the most and second most frequently reported responses are numerical courses; this finding might be attributed to the relatively more challenging nature of the courses in concern. It might also stem from the fact that these centres are more related to science and mathematics as their name originates from science (Science and Art Centre) and that these two courses constitute the ground of science. Table 11 exhibits their purposes of comparing SACs to the course/ course contents provided in Table 10.

Table 11. The gifted students' ways of comparing SACs to course/ course contents

Quality	f	Originality	f	Function	f
Fun	10	Extraordinary	5	Experimental	4
Boring	5	Best	2	Teaches new things	3
Scientific	5	With Strict Rules	2	Solves problems	1
Hard	4	Hard to obtain	2	Contributes to test achievement	1
Loved	4	Multi-faceted	1		
Complicated	3	Talent-driven	1		
Comprehensive	3	Intelligence-driven	1		
Problematic	1				
Demanding	1				
Time flows like water	1				
Fast	1				
Requiring hard work	1				
Lasting	1				
Detailed	1				
Treasury	1				
Total	42	Total	14	Total	9

As shown in Table 11, the analogies constructed by the gifted students between SACs and course/ course contents were categorized into three themes: (i) quality (64,6%), (ii) originality (21,5%) and (iii) function (13,9%). The mostly reported analogies were fun (f=10), extraordinary (f=5) and experimental (4) under the themes of quality, originality and function, respectively. The following are the extracts taken from the gifted students' responses to illustrate their purposes for the analogies they constructed between SACs and course topics.

“SAC is like fractions among the course contents because it is demanding and challenging. It is everywhere.” (S2, Female, 4th Grader/ State School)

“SAC is like ‘The most famous scientists’ among the course contents because we have a lot of fun there and we travel through time while learning.” (S5, Female, 5th Grader/ Private School)

“SAC is like grasping the main idea among the course contents because it is extremely hard. We must have an in-depth knowledge about the given subject/ context in order to get that idea.” (S14, Female, 4th Grade/ Private School)

“SAC is like physics subjects among course contents because we are learning things that require intelligence and hard work.” (S20, Male, 4th Grader/ State School)

“SAC is like the foreign language (course) among courses because you can easily comprehend it while it is very hard to understand for others.” (S55, Female, 5th Grader/ State School)

Overall, the gifted students had a tendency to report courses/ course contents that are typically learned with fun. Nonetheless, they compared these centres to the course contents that are typically perceived challenging, demanding, complicated and hard. This might be attributed to that these centres offer in-depth and enriched education to the gifted students and that the learning activities are designed in compliance with high level cognition.

The sixth item in the interview form was to elicit the analogies the gifted students formed between relatives and SACs. The analysis of their responses are presented in Table 12.

Table 12. The gifted students’ relative analogies for SACs

Relatives	f	Relatives	f	Relatives	f
Uncle	15	Father	7	Brother-in-law	2
Cousin	13	Grandfather	7	Sister-in-law	1
Mother	9	Grandmother	5	Distant relative	1
Aunt	9	Sibling	3		

As illustrated in Table 12, the gifted students compared SACs mostly to uncle (f=15), followed by cousin (f=13), mother and aunt (f=9) and father and grandfather (f=7). This allows us to conclude that they tended to establish analogies between SACs and close rather than distant relatives probably because they spend most of the time together. In a similar vein, they attend courses in these centres three days a week. Among these findings, the association of SACs to uncle and cousins rather than parents is an interesting finding. In these institutions, training with students of their age and intelligence level can be effective in this. In the table below, it is categorized for its positive or negative attitudes towards these relatives. Their justifications for the comparison of SACs to relatives are displayed in Table 13.

Table 13. The gifted students' ways of comparing SACs to relatives

Positive feature	f	Negative feature	f
Wise	11	Stubborn	4
Loved	10	Boring	3
Hardworking	5	Lazy	1
Fun	4	Indifferent	1
Helpful	3		
Informative	3		
Warm-hearted	2		
Tender-hearted	2		
Smart	2		
Intelligent	2		
Tolerant	2		
Sensitive	2		
Colourful	1		
Open-minded	1		
Participative	1		
Well-behaved	1		
Likes me	1		
Sincere	1		
Disciplined	1		
Total		Total	9

As suggested in Table 13, the students' responses related to their analogies between SACs and relatives were gathered mostly into two themes. More precisely, the majority of them fell into the theme of positive features (85,9%) while the minority was listed among the negative features (14,1%). It might be concluded that they feel safe and comfortable while studying in these centres because the teachers and the other staff were selected through a high-stake nationwide test that was annually administered by MoNE. They reported "wise" under the theme of positive features with the highest frequency (f=9), followed by loved (f=10), hardworking (f=5). It is also seen that they reported such negative features as stubborn (f=4), boring (f=3), lazy (f=1) and indifferent (f=1). The following are the statements taken from their responses.

"SAC is like my grandmother among my relatives because it is very wise, so is SAC." (S6, Female, 5th Grader/ Private School)

"SAC is like my sister-in-law among my relatives because it is very colorful." (S14, Female, 4th Grader/ Private School)

"SAC is like my father among my relatives because it is very disciplined." (S26, Male, 5th Grader/ Private School)

"SAC is like my uncle among my relatives because it is very busy. It always works and it allocates most of their time to work." (S40, Male, 4th Grader/ State School)

"SAC is like my cousin among my relatives because it is not just for class. We both study our lessons and have fun there by playing games." (S72, Male, 4th Grader/ Private School)

The seventh item in the form required the gifted students to make analogies between SACs and stories. Their responses were analysed and the related results are provided in Table 14.

Table 14. The gifted students' story analogies for SACs

Story	f	Story	f	Story	f
Little Red Riding Hood	12	White Fang	2	Fatih	1
Keloglan	9	7-day Adventures	2	Heart Master	1
Nasiruddin Hodja	5	Alice in Wonderland	2	On the Trail of Evidence	1
Snow White and the Seven Dwarfs	5	Around the World in 80 Days	2	La Fontaine's Tales	1
Hansel and Gretel	3	Mouse and Lion	2	Pinocchio	1
Harry Potter	3	The Dragon with a Chocolate Heart	1	Pollyanna	1
Curry-comb	3	Stickman's Life	1	Bumpkin	1
Cinderella	3	Dada Gorgud	1	Les Miserables	1
Chess	2	Crazy Wolf	1	Fox and Crow	1
The Three Musketeers	2	Dreams Club	1	7 Good Men	1

Table 14 suggests that SACs were compared to a wide range of stories including Little Red Riding Hood, Nasiruddin Hodja, Around the World in Eighty Days and Les Miserable. The gifted students compared SACs mostly to Little Red Riding Hood (f=12), followed by Keloglan (f=9), Nasiruddin Hodja (f=5) and Snow White (f=5). It is interesting to see that the first three stories listed in Table 14 are anonymous and among the most popular stories/ tales in the world literature (Tearle, 2020). The purposes they expressed for comparing SACs to stories are presented in Table 15.

Table 15. The gifted students' ways of comparing SACs to stories

Quality	f	Doctrine	f	Function	f
Nice	4	Determination	7	Advice	7
Fun	4	Team Spirit	4	Learning a lesson	3
Exciting	4	Logic	2	Teaching	2
Interesting	4	Honesty	2		
Familiar	3	Patience	1		
Adventurous	3	Inquiry	1		
Mysterious	2				
Funny	2				
Fiction	2				
Long	1				
Not appreciated	1				
Total	30	Total	17	Total	12

The gifted students' ways of comparing SACs to stories were evaluated under three themes: (i) quality (38%), (ii) doctrine (21,5%) and (iii) function (15,2%). The analysis of the gifted students' responses under the theme of quality shows that SACs were mostly compared to stories that were evaluated nice, fun, exciting and interesting by the gifted students. The analysis of their responses under the theme of doctrine, on the other hand, indicates that they compared these centres to the stories that exclusively inspire such values as determination, team spirit, logic and honesty. Quite similarly, analysis of their responses under the theme of function reveals that they compared these

centres to the stories that offer advices and teach lessons to them. The following are to illustrate their views.

“SAC is like Fox and Crow among stories because its advices us to use our mind to do better things –just like the narrated fox that uses its mind to get the food.” (S39, Male, 5th Grader/ State School)

“SAC is like Snow White and the Seven Dwarfs among stories because our country (Turkey) is like a princess and SACs are like a prince; so, it is in strong need of SACs to awake!” (S55, Female, 5th Grader/ State School)

“SAC is like Curry-comb among stories because it is like the step child of MoNE that falls victim to slander.” (S57, Female, 5th Grader/ State School)

“SAC is like Little Red Riding Hood among stories because it allows us to learn lessons from every line.” (S68, Female, 5th Grader/ Private School)

The last item of the interview form required the gifted students make analogies between SACs and scientists. The analysis results of their responses were provided in Table 16.

Table 16. The gifted students’ scientist analogies for SACs

Scientists	f	Scientists	f	Scientists	f
Albert Einstein	29	Aziz Sancar	4	Thales	2
Thomas Edison	7	Leonardo da Vinci	3	Ali Kuşçu	2
Nicolas Tesla	6	Graham Bell	2	Biruni	1
Pythagoras	6	Marie Curie	2	İbn-i Sina (Avicenna)	1
Galileo	4	Robert Koch	2	Stephen Hawking	1

The gifted students compared SACs mostly to Albert Einstein (40,3%), followed by Thomas Edison (9,7%), Nicolas Tesla (8,3%) and Pythagoras (8,3%). Their choice of these scientists for the analogies in concern might be attributed to the fact that they lived in the recent past when compared to others with some exceptions. Namely, they lived in 18th and 19th centuries while most of the others lived in earlier periods. Overall, it is seen that they were compared to 11 foreign and 4 Turkish scientists by the gifted students. Interestingly, those who were reported by the students are among the most influential scientists in the world (Barna, Tarlach, & Scharping, 2017). Table 17 illustrates the gifted students’ ways of comparing SACs to the afore-cited scientists.

Table17. The gifted students’ ways of comparing SACs to scientists

Quality	f	Function	f
Clever	14	Conveying knowledge	8
Determined	7	Making experiments	6
Smart	5	Science production	5
Wise	5	Make inventions	4
Leader	5		
Extraordinary	4		
Weird	4		

Shy	2		
Successful	2		
Looking complicated	2		
Talented	1		
Brave	1		
Observer	1		
Prolific	1		
Logical	1		
In need of support	1		
	Total	56	Total
			23

As seen in Table 17, the gifted students justified their comparisons of SACs to scientists under two broad themes: (i) quality (70,9%) and (ii) function (29,1%). They mostly underlined such qualities as being clever, determined, smart, wise and leader while comparing these centres to the scientists under the theme of quality. Some of their responses are presented to illustrate them.

“SAC is like Marie Curie among scientists because it tells us that we achieve anything we want enough.” (S5, Female, 5th Grader/ Private School)

“SAC is like Albert Einstein among scientists because it is very wise/ knowledgeable. It is like genius. Only clever students can get training here –just like the centre.” (S13, Male, 4th Grader/ State School)

“SAC is like Thomas Edison among scientists because it is the bright child of science. If he had not discovered the electricity, further inventions could not have been made.” (S28, Female, 4th Grader/ State School)

“SAC is like Aziz Sancar among scientists because it is a success story. He comes from a small village and wins the Nobel prize.” (S40, Male, 4th Grader/ State School)

They mostly attributed such functions of conveying knowledge, making experiments, science production and making inventions to the scientists in their comparison to the centres in concern. It is significant to note that they tended to report positive qualities about the centres while making analogies between them and the scientists. The following section is intended to summarize the overall findings of the present research and to offer practical implications in the light of the findings as well as relevant literature.

Discussion, Conclusion and Recommendations

This study scrutinized 4th and 5th grade gifted students’ analogical perceptions of SACs by considering SACs and their perceptions as source and target, respectively. The analysis of the analogies they established between SACs and cars, games, clothes, occupations, course/ course contents, relatives, stories and scientists under the theme of function indicated that they hold positive views about the fulfilment of these centres’ missions. Namely, they emphasized “speed”, “improvement of creativity”, “keeping warm” and “advice” while comparing SACs to cars, games,

clothes and stories, respectively. These findings are in congruence with previous research (Aslan & Doğan, 2016; Bildiren & Türkkani, 2013; Kunt & Tortop, 2013). The following are the goals and objectives of SAC published in the Journal of Notifications (MoNE, 2016): to raise productive and self-fulfilling individuals who can combine scientific thinking and behaviors with aesthetic values, who can solve problems, who can recognize and use their own talents and creativity at early ages and who are expected to think creatively, to make inventions and discoveries, to establish and sustain successful social interactions, and to gain competence in leadership, communication and art. The present findings revealed that the gifted students came up with analogies for SACs that imply these centres contribute to their academic and personal development at the expected level. Kunt and Tortop (2013) previously reported that the gifted students mostly produced such metaphors as “treasury” and “informative” for SACs. Our findings overlap with this specific finding as the researchers concluded that these centres make significant contributions to the gifted students’ mental and academic development.

In a comparative study, Aslan and Doğan (2016) documented that the gifted students produced different metaphors for their schools and these centres and that the former were found less-developed than SACs in terms of speed. Namely, the participant students compared their schools and SACs to black trains and high-speed trains, respectively. In addition, the relevant review of literature informs that the gifted students perceived their own schools as competitive, frightening and under-developed while they related SACs with such positive concepts as relaxation, excitement and development (Aslan & Doğan, 2016; Erisen et al., 2016; Saban, 2008; Talas, Talas & Sönmez, 2013). Considering our finding on the gifted students’ remarkably positive perceptions about SACs, it could be claimed that the present research approves the existing literature. In a recent research, Kurnaz (2018) informed that the gifted students frequently produced metaphors for such values as curiosity, leadership, honesty and courage. Quite similarly, our study yielded that the gifted students established such analogies as being multi-faceted, team spirit, sincerity, facilitation, honesty, discipline and learning lessons. It could be concluded that the desired level of significance is attached to the values education at these centres as the study reported more diverse values than those informed by the previous research.

Kunt and Tortop (2013), on the other hand, advocated that SACs try to undertake the responsibilities of the schools and that the gifted students evaluated these centres as the route to knowledge rather than their schools. Likewise, the present research indicated that the gifted students perceived SACs as distinct institutions that contribute to their personal and academic development. They mentioned implementations that are peculiar to SACs while making analogies between these centres and the given themes. More precisely, no curriculum is implemented at SACs where the teachers plan learning activities in accordance with the students’ cognition and learning needs at the time. So, the students mentioned the common course contents when they were asked to make

analogies between SACs and the given themes rather than those which were identified only in their own school curriculum.

Pollio (2018) contends that the gifted students are able to use humour and metaphors for the situations they are familiar with and to make analogies between them. They can use unfamiliarity in their mind to change others' ordinary perceptions. Similarly, the present study showed that these students could even establish analogies between the existing analogies and come up with a wide range of similarities when asked. In Vogelaar, Resing and Stad (2020) study investigated differences in the processes of solving analogies between gifted and average-ability children (aged 9–10 years old) in a dynamic testing setting utilizing a pre-test-training-post-test control group design. Irrespective of ability group, dynamic testing resulted in a larger number of accurately applied transformations, changes in the proportion of preparation time utilized, and more advanced usage of solution categories. Differences were found between and within the groups of gifted and average-ability children in relation to the different process variables examined. In another study (Vogelaar, Sweije & Resing, 2019) was examined whether a newly developed dynamic test of analogical reasoning would be sufficiently difficult for identifying between 7- and 8-years old potential for solving analogies children. In this study, it was observed that gifted children were more successful than their peers. It was also stated that they needed less instruction during the training process. Analogical reasoning is assumed to play a large role in learning and problem solving in everyday and school settings.

In this study, majority of the gifted students created positive analogies that indicate these centres fulfil the goals and objectives identified and regulated by MoNE. Besides, albeit small in number, some gifted students produced negative analogies especially for the buildings of SACs such as small, old-fashioned, neglected and step-child. Moving from these criticisms, it might be recommended that these centres should be provided teaching staff, adequate infrastructure, teaching materials, playgrounds and social facilities to attain the afore-mentioned education goals and objectives more easily. Besides, foundation of ateliers that allow these students to improve their talents more efficiently and to receive more effective training could increase the demand for these centres.

The gifted students' perceptions about SACs could be explored in more in-depth research to be conducted nationwide and in other countries. It should not be forgotten that human wealth is very significant for the societies and that gifted individuals play a crucial role in the growth and advancement of societies. Accordingly, this segment of society should be provided more privileges to contribute to their personal and academic development especially by improving the facilities of SACs. With this study, perceptions and attitudes of gifted students towards SACs have been revealed. In other studies, similar studies in gifted but different age and grade levels can be applied. In this study, apart from the topics chosen as the subject of analogy, different analogy studies can be conducted on more general and global concepts.

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