Journal of Education and Learning (EduLearn)
Vol. 16, No. 1, February 2022, pp. 92~102
ISSN: 2089-9823DOI: 10.11591/edulearn.v16i1.20424

Gifted students' number sense skills in terms of number sense components

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Article Info

Article history:

Received Nov 21, 2021
Revised Dec 25, 2021
Accepted Feb 22, 2022

Keywords:

Gender
Gifted students
Grade level
Number sense
Number sense skill

ABSTRACT

As a descriptive survey research, this study aimed to investigate the number sense skills of gifted in terms of number sense components. Participant of this research consisted of 123 gifted secondary school students, who were selected according to the convenience sampling method in Turkey. The data of this research were collected in the 2021-2022 academic year. The number sense test was used as the data collection tool. This test is comprised of 20 items which were prepared in line with five basic number sense components. The data obtained from the data collection tool were analysed by quantitative analysis methods. As a result of the analysis, it was confirmed that the number senses of gifted secondary school students differed according to gender and this difference was in favour of the male students. The highest number sense performance according to grade levels belonged to eight grade level students. Furthermore, it was observed that the number sense performance increased in parallel with the grade levels of the students. In addition, when the mean of correct answers for the number sense components was considered, it was concluded that the highest mean was in the understanding of the effect of the operation and the lowest mean was in the understanding of the number concept, respectively.

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1. INTRODUCTION

Even in the early stages of development, human has a competence, which is calledas the number sense until a better name is found. This competence enables a person to realize that there is a change when a new object is added or removed without his knowledge to a small collection of objects [1]. It is essential to develop the ability to recognize the meaning of numbers and the relationship between numbers and operations through learning. The studies carried out support that number sense is the most important factor in recognizing the relationship between numbers, and it is emphasized that number sense has an important place in mathematics education and teaching [2]–[7]. Some studies [8], [9] expressed the number sense as the general understanding of numbers and numbers on operations, the ability to make mathematical interpretations using this understanding in a flexible way; the ability and tendency to develop useful and effective strategies regarding numbers and operations. On the other hand, Altay [10] explained the number senseas "using numbers in a flexible manner, thinking practically in operations with numbers, choosing the most effective and useful solution, creating non-standard ways appropriate to the situation in some cases,

using the comparing (reference) point to facilitate the problem, conceptual thinking in fractions and using different ways of representation in fractions". According to Hope [3] number sense, with its most general definition, is the sense of being able to make rational predictions about the various uses of numbers, being able to choose the most effective calculation method, being able to recognize arithmetic errors, and being able to recognize number patterns.

Despite the fact that the exact starting point of the concept of the number sense, it can be said that it becomes prominent with the studies of the National Council of Teachers of Mathematics (NCTM) in the USA. According to NCTM [11] standards, students from pre-school to the end of the secondary education period understand numbers, ways of representing numbers, relationships between numbers and number systems and understand the meaning of operations and their interrelationship, can calculate fluently and make appropriate estimations. It was emphasized that the concept of number sense should have developed on the basis of these standards. Briefly, an individual who has the number sense can use mathematics in school and daily life in a flexible and facilitating way in his/her life.

Being a difficult concept to define, the number sense has caused debates among mathematics educators (teachers, program developers, and researchers) and cognitive psychologists [4]. These debates have also come out while determining the components that constitute the number sense. Şengül and Dede [12] investigated the classifications of number sense components in their study and concluded that there was no common classification for the components of number sense in the related literature. The classification made by McIntosh *et al.* [4] was considered as the most comprehensive one. This result guided them to consider the number sense as a concept without certain boundaries.

Singh [13] used five basic components: understanding the concept of number, using multiple representations, understanding the effect of the operation, using equivalence representation, using calculation and counting strategies in his study on the basis of the classification made by McIntosh *et al.* [4]. Understanding the concept of number component includes understanding the value that is represented by the number and understanding the size which is indicated by the number. In the using multi-representation component, the matter is finding the value that expresses the shaded region in a given whole best. Understanding the effect of the operation component is about being able to realize how the result will change when the value of a number or operation changes in calculations. For example, being able to realize that if an integer is multiplied by a decimal number, the result may be a smaller number than that integer. In other words, it means being able to feel that multiplication doesn't always make numbers bigger and division doesn't always make numbers smaller. Using equivalence representation component is related with representing the numbers in various types. Using calculation and counting strategies component is related with estimating the result without using any paper and pencil.

When the literature is reviewed, it is seen that most of the studies, which were conducted on the concept of number sense, were carried out with secondary school students with normal development. Also, there is a study on the comparison of the number sense of gifted students and normal students. In these studies, students' number sense performances were investigated according to different variables and the strategies they used [10], [14]–[18]. Every individual in the education and training environment does not have the same ability to learn at the same speed and does not have the same skills. There are individual differences between students. In this context, one of the student groups that differ individually is the group of gifted students.

Special talent is defined as a person's high level of performance in abstract thinking and reasoning skills and a person’s having an intelligence age higher than normal peers [19]. Doğan and Paydar [20] expressed that individuals with special talent have high level of task awareness and creativity skills and they have higher academic skills than average. Gagné [21] mentioned gifted individuals as the ones who have analytical intelligence, creativity and who are practically talented. In addition, he stated that individuals with special talents how high performance in all or one of their analytical, creative and practical fields and they reach success by using the combination of these abilities.

In our country, being a gifted individual is defined as learning faster than their peers, being ahead in terms of capacity of creativity, art and leadership, having special academic ability, being able to understand abstract ideas, enjoying to act independently in his areas of interest, and showing a high level of performance according to the Guideline of Science and Art Centres, which were established for the education of gifted individuals. Gifted students have different learning needs beyond the traditional understanding of education offered in regular classrooms. The nature of the abilities these students have requires differentiated learning experiences and opportunities to maximize their potential [22]. In the Specially Talented Children and their Education Commission Report of the First Special Education Council [23], which was organized by the Ministry of National Education, special talent is defined as "individuals who are determined to be performing at a higher level than their peers in terms of general and/or special abilities by the field experts".

It is observed in the literature review that there are some studies which were conducted on number sense with primary school students [10], [16], [24]–[29] and with pre-service teachers [8], [24], [30]–[33].

There are also studies, which were carried out with a group of gifted students, one of the group of students which show individual difference [18], [34]–[38]. It becomes important to determine the number sense skills of gifted students, a group of students with individual differences, since it produces significant results to be able to meet the educational needs of these individuals. Moreover, the study might have some contributions to create awareness about the importance of number sense of gifted and talented students in mathematics education. Among the available ones in the literature, no studies in which the number sense skills of gifted 5th, 6th, 7th and 8th grade secondary school students were focused in terms the components of the number sense was found. In this context, following research questions were formulated: i) Is there a statistical difference between the students' number sense performances according to gender?; ii) What are the students' number sense performances according to grade level?; iii) Is there a statistical difference between the students' number sense performances according to grade level?; iv) What are the students' performances about number sense components according to grade level?; v) Is there a statistical difference between the students' performances about number sense components according to grade level?

2. RESEARCH METHOD

2.1. Research design

This was a descriptive survey study that approved by the ÇukurovaUniversity of the committee (approval dated 17.01.2021- numbered E-91770517-604.02.01-10574) and the office of the University Research and Extension beforehand. It investigated the gifted students' existing status of number sense skills. In descriptive research, the purpose is to only describe and introduce the sample or the study group [39]. Also in this study, the number sense skills of gifted secondary school students are described.

2.2. Participants

Participant of this research consisted of 123 gifted secondary school students. They were selected according to the convenience sampling method in Adana Science and Art Centre in Turkey. The reason of preferring convenience sampling in this study is that the selected students were easily accessible as they were studying in the central district of Adana and they were voluntary to participate in the study. In convenience sampling, the researcher chooses a situation that is close and easy to access in order to provide speed and practicality to the research. This sampling method is less generalizable to the results in addition to being widely used [40]. The distribution of the students in the sample of the study according to grade level and gender is shown in Table 1.

Table 1. The distribution of gifted secondary school students according to grade level and gender

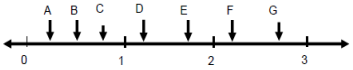
Gender	5th grade	6th grade	7th grade	8th grade	Total
Female	15	21	17	5	58
Male	24	21	12	8	65
Total	39(31.7%)	42(34.1%)	29(23.6%)	13(10.6%)	123

Table 1 shows that of 123 students participated in the study: 58 were female and 65 were male. It is also seen that of 123 students: about 31.7% was 5th grade, about 34.1% was 6th grade, about 23.6% was 7th grade and about 10.6% was 8th grade students.

2.3. Data collection tool

As the data collection tool of the study, Number Sense Test (NST) which was adopted by NCTM [13] from Gliner *et al.* [41] and which was translated into Turkish by the researchers was used. The form which was translated into Turkish was presented to three teachers of English and two mathematics educators who were experts in mathematics teaching. The measurement units (miles and gallons) that are not used in Turkey were adapted. In the test, there are five components consisting of 20 items to determine the concept of number, the use of multiple representations, the effect of operations, the use of equivalent expressions, and the use of calculation and counting strategies. The components of NST, the distribution of the questions about the components and some sample items are presented in Table 2.

Table 2. The components of NST, the distribution of the questions about the components and some sample items

Components	Items	Sample item
Understanding the concept of number	Number of items: 4 Item No: 1,6,11,16	Item 1: Is there a fraction between $\frac{2}{5}$ and $\frac{3}{5}$? If yes, how many?
Using multiple representations	Number of Items:4 Item No:2, 7,12,17	 Item 7: Some letters are given on the numerical axis. Form a fraction of letters in which the numerator is about two times the denominator. Answer :_____
Understanding the effect of the operation	Number of Items:5 Item No:3,8,13,18,20	Item 20: Which of the following operations' result is correct? A) 45 x 1.05 = 39.65 B) 4.5 x 6.5 = 292.5 C) 87 x 1.076 = 93.61 D) 589 x 0.95 = 595.45
Using the equivalent expressions	Number of Items:4 Item No:4,9,14,19	Item 4: Which of the following is the same as the result of 0.5 x 840? A) 840 ÷ 2 B) 840 + 2 C) 5 x 8400 D) 5 x 840 E) 0.50 x 84
Using the calculation and counting strategies	Number of Items:3 Item No:5,10,15	Item 15: 3 / 4 of the tomatoes in a basket are undamaged. If there are 48 tomatoes in total in the basket, how many of these tomatoes are undamaged? Answer: _____
Total	20items	

2.4. Data collection and analysis

NST was administered to the students individually. It was stated in the instruction of the data collection tool that the students should spend 30-45 seconds for answering each item as it was attempted to make them use number sense skills instead of calculating. First, the data which was obtained in the study was analysed in the digital environment. Then, it was checked whether all the items were answered in line with the instructions in the number sense test, and whether there was anything missing in the answers of the items.

The data was analysed by using SPSS 15.0 package program, and the frequency (f), percentage (%) and arithmetic mean (X) values of the number sense skills of the participants in terms of number sense components were calculated with regards to the purpose of the study. Items which were answered correctly were scored as "1", and items which were answered incorrectly were scored as "0". T test (independent groups T-Test) was performed to test the significance of the NST scores of gifted secondary school students according to gender, single factor variance analysis (one-way Anova) was performed for the independent measurements to see whether there was a significant difference between the scores of gifted secondary school students according to their grade level. Besides, Manova was performed to test the significance of the gifted secondary school students' scores about the components of number sense in the number sense test of according to grade level.

3. RESULTS

3.1. Results and interpretations about the number sense score of gifted secondary school students according to gender variable

T test (independent groups T-Test) was performed to test the significance of the number sense test scores of gifted students according to gender. The results obtained are given in Table 3. The table reveals that the mean score of the number sense test is 9.13 for females and 11.50 for males. Furthermore, it is seen that the standard deviation which was calculated for males is higher than the one for girls. This suggests that males show a more heterogeneous distribution within themselves while females have a more homogeneous structure. As a result of the independent groups t-test, a significant difference was found according to gender($t(23)=2.91 p<0.05$).

Table 3. T-test results of the number sense test scores of gifted secondary school students according to gender

Gender	N	$\bar{x}$	SD	Df	T	P
Female	58	9.13	4.40	121	2.91	0.004
Male	65	11.50	4.59			
Total	123					

3.2. Results and interpretations about the number sense performances of gifted secondary school students according to grade level

The mean values and standard deviations about the number sense performances of gifted secondary school students according to grade level are presented in Table 4. The table shows that the highest mean (14.84) belongs to 8th grade gifted secondary school students and the lowest mean (9.47) belongs to 6th gifted secondary school students. Considering that the highest score that can be obtained from the number sense test is 20, it can be said that the number sense performances of gifted secondary school students are at a moderate level. The basic information about the mean and standard deviation of the grade levels are presented in the table.

Table 4. Number sense performances of gifted secondary school students according to grade level

Grade level	$\bar{x}$(Max.20)	SD
5th grade	9.79	3.98
6th grade	9.47	3.92
7th grade	10.51	5.04
8th grade	14.84	5.56
Mean	10.39	4.64

A one-way analysis of variance (one-way anova) for independent samples was performed for independent measurements and it was seen that there was a significant difference between the scores of the gifted secondary school students according to their grade levels. Results are shown in Table 5. The table describes that there is a significant difference between the students' number sense performances according to their grade levels ($F(3.119)=0.943p<0.05$). In other words, the students' number sense performances differ significantly according to their grade levels. According to the results of Scheffe Test, it was determined that the number sense performances of 8th grade students were higher than of 5th and 6th grade students.

Table 5. ANOVA results of gifted secondary school students' number sense test performances according to grade level

Source of variance	Sum of squares	Sd	Mean of squares	F	P	Significant difference
Between-groups	307.499	3	102.500	5.254	.002	8-5, 8-6
Within-groups	2321.769	119	19.511			
Total	2629.268	122				

3.3. Results and interpretations about the gifted secondary school students' components of number sense according to grade level

3.3.1. Results and interpretations about the component of understanding the concept of number

Table 6 shows the frequency and percentage distribution of the correct answers given by gifted secondary school students to the items about this component. The table reveals that the mean of the correct answer percentage of gifted secondary school students to the component of understanding the concept of number is 27.23%. It is also seen in Table 6 that the highest achievement percentage belongs to 8th grade students and the lowest achievement percentage belongs to 5th grade students. It is also understood from Table 6 that the lowest achievement was observed in Item 6 (13%) and Item 1 (15.4%) as presented in the Figure 1.

Table 6. The frequency and percentage distribution of the correct answers given by gifted secondary school students to the items about the component of understanding the concept of number

Item No	5th grade	6th grade	7th grade	8th grade	Total
1	2(5.1%)	3(7.1%)	5(17.2%)	9(69.2%)	19(15.4%)
6	1(2.6%)	3(7.1%)	4(13.8%)	8(61.5%)	16(13.0%)
11	4(10.3%)	9(21.4%)	7(21.1%)	8(61.5%)	28(22.8%)
16	21(53.8%)	22(52.4%)	17(58.6%)	11(84.6%)	71(57.7%)
Mean	19.94%	22%	27.67%	69.2%	27.23%

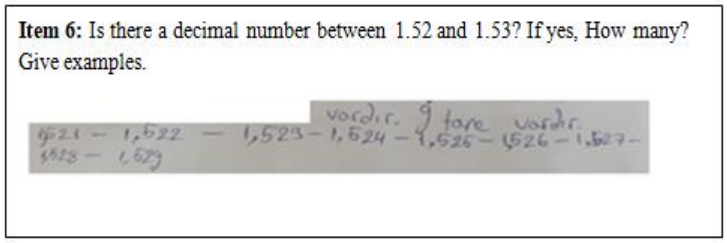


Figure 1. Item 6 and an example solution

In this item, gifted secondary school students were expected to say that there were unlimited decimal numbers and to give examples. However, in this question, it was said that there are nine as an answer and examples were written.

3.3.2. Results and interpretations about the component of using multiple representations

Table 7 shows the frequency and percentage distribution of the correct answers given by gifted secondary school students to the items about using multiple representations. According to Table 7, the mean of the correct answer percentage of gifted secondary school students to the component of using multiple representations is 40.22%. It is also seen in this table that the highest achievement percentage belongs to 8th grade students and the lowest achievement percentage belongs to 5th grade students.

It is also understood from Table 7 that the lowest achievement was observed in Item 7 (17.1%) as presented in Figure 2. It can be said that the gifted secondary school students had difficulties in finding the value which the number on the numerical axis represents and expressing it in a way in which the numerator two times the denominator. The majority of the students answered this question as "I don't know, I couldn't find it".

Table 7. The frequency and percentage distribution of the correct answers given by gifted secondary school students to the items about the component of using multiple representations

Item No	5th grade	6th grade	7th grade	8th grade	Total
2	15(38.5%)	20(47.6%)	18(62.1%)	11(84.6%)	64 (52%)
7	7(17.9%)	4(9.5%)	6(20.7%)	4(30.8%)	21(17.1%)
12	25(64.1%)	30(71.4%)	15(51.7%)	9(69.2%)	79(64.2%)
17	8(20.5%)	10(23.8%)	11(37.9%)	5(37.5%)	34(27.6%)
Mean	34.57%	38.07%	43.1%	55.52%	40.22%

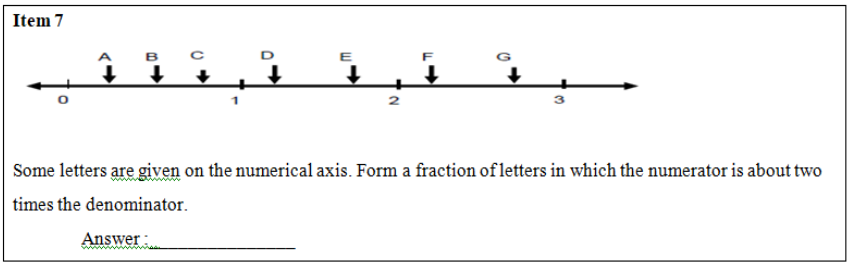


Figure 2. Item 7

3.3.3. Results and interpretations about the component of understanding the effect of the operation

This component is about how the result will change when the value of a number or an operationchanges while making calculations. The frequency and percentage distribution of the correct answers given by gifted secondary school students to the items about this component is given in Table 8. The table shows that the mean of the correct answer percentage of gifted secondary school students to the component of understanding the effect of the operation is 61.36%. It is also seen in Table 8 that the highest achievement percentage belongs to 8th grade students and the lowest achievement percentage belongs to 5th grade students.

Table 8. The frequency and percentage distribution of the correct answers given by gifted secondary school students to the items about the component of understanding the effect of the operation

Item No	5th grade	6th grade	7th grade	8th grade	Total
3	18(46.2%)	18(42.9%)	20(69%)	10(76.9%)	66(53.7%)
8	27(69.2%)	32(76.2%)	22(75.9%)	11(84.6%)	92(74.8%)
13	18(46.2%)	24(57.1%)	18(62.1%)	11(84.6%)	71(57.7%)
18	22(56.4%)	28(66.7%)	16(55.2%)	11(84.6%)	77(62.9%)
20	23(59%)	19(45.2%)	19(65.5%)	10(76.9%)	71(57.7%)
Mean	55.4%	57.62%	65.54%	81.52%	61.36%

It is also understood from Table 8 that the lowest achievement was observed in Item 3 (53.7%) as presented in Figure 3. It was seen that some of the gifted secondary school students who gave incorrect answer to Item 3 perceived the operation as the division of two integers and thought that the result would be smaller than 29. Therefore, it was observed that the fact that division will increase the value of the number if the divider is a decimal number was ignored while making the calculations.

Item 3: Mark the correct choice for the result of (29:0.8).

A) Smaller than 29 B) Equal to 29

C) Bigger than 29 D) Result can not be found without making operations

Figure 3. Item 3

3.3.4. Results and interpretations about the component of using equivalence representation

With equivalence representation, the gifted secondary school students were expected to find the equivalent value of the operation's result and place the appropriate symbol of equal, big or small. The frequency and percentage distribution of the correct answers given by gifted secondary school students to the items aboutthis component is given in Table 9. The table reveals that the mean of the correct answer percentage of gifted secondary school students to the component of using equivalence representation is 65.05%. It is also seen in Table 9 that the highest achievement percentage belongs to 8th grade students and the lowest achievement percentage belongs to 6th grade students.

Table 9. The frequency and percentage distribution of the correct answers given by gifted secondary school students to the items about the component of equivalence representation

Item No	5th grade	6th grade	7th grade	8th grade	Total
4	36(92.3%)	24(57.1%)	21(72.4%)	10(76.9%)	91(74%)
9	36(92.3%)	35(83.3%)	25(86.2%)	12(92.3%)	108(87.8%)
14	28(71.8%)	26(61.9%)	20(69%)	12(92.3%)	86(69.9%)
19	10(25.6%)	10(23.8%)	7(24.1%)	8(61.5%)	35(28.5%)
Mean	70.5%	56.52%	62.92%	80.75%	65.05%

It is also understood from Table 9 that the lowest achievement was observed in Item 19 (28.5%) as presented in Figure 4. In this item, the students were expected to use the symbol of "<". Most of the students thought that two expressions were equal to each other and used the symbol of "=".

Item 19

Write the appropriate symbol from>, <, = between the numbers.

$5x7\frac{1}{2} \ldots\ldots 35 \div \frac{1}{2}$

Figure 4. Item 19

3.3.5. Results and interpretations about the component of using calculating and counting strategies

Table 10 shows the frequency and percentage distribution of the correct answers given by gifted secondary school students to the items about the component of using calculating and counting strategies. The table shows that the mean of the correct answer percentage of gifted secondary school students to the component of using calculating and counting strategies is 67.5%. It is also seen in Table 10 that the highest achievement percentage belongs to 8th grade students and the lowest achievement percentage belongs to 7th grade students. It is also understood from Table 10 that the lowest achievement was observed in Item 5 and Item 10 (60.2%).

Table 10. The frequency and percentage distribution of the correct answers given by gifted secondary school students to the items about the component of using calculating and counting strategies

Item No	5th grade	6th grade	7th grade	8th grade	Total
5	25(64.1%)	26(61.9)	13(%44.8)	10(%76.9)	74(%60.2)
10	22(56.4%)	22(52.4)	18(%62.1)	12(%92.3)	74(%60.2)
15	34(87.2%)	33(%78.6)	23(%79.3)	11(%84.6)	101(%82.1)
Mean	69.23%	%64.3	%62.06	%84.6	%67.5

MANOVA was performed to test whether the scores of gifted secondary school students about number sense components in the number sense test create a significant difference according to grade level or not. The results of the analysis showed that grade levels were effective on the performance of number sense components (Wilks Lambda (Λ)=0.589, $F(15,317)=4.48$, $p<0.05$). When the results obtained for the dependent variables are considered separately, a Benferonni was set at the level of 0.01. It was found that the only difference which reached statistical significance was related with the component of understanding the concept of number by using the alpha level $F(3,119)=15.288p<0.01$. The mean and standard deviation values of the number sense components and MANOVA results according to grade levels are shown in the Table 11.

Table 11. Mean and standard deviation values of number sense test and Manovaresults

Number sense components	Grade level	$\overline{X}$	SD	Df	F	P
Understanding the concept of number	5th grade	.71	.79	3-119	15.288	.000
	6th grade	.88	.83			
	7th grade	1.13	1.12			
	8th grade	2.76	1.48			
	Total	1.08	1.13			
Using multiple representation	5th grade	1.41	1.18	3-119	1.654	.181
	6th grade	1.52	1.04			
	7th grade	1.72	1.38			
	8th grade	2.23	1.36			
	Total	1.60	1.21			
Understanding the effect of the operation	5th grade	2.76	1.73	3-119	2.834	.041
	6th grade	2.88	1.38			
	7th grade	3.27	1.33			
	8th grade	4.07	1.55			
	Total	3.06	1.54			
Using equivalence representation	5th grade	2.82	.82	3-119	3.757	.013
	6th grade	2.26	1.06			
	7th grade	2.51	1.18			
	8th grade	3.23	1.16			
	Total	2.60	1.06			
Using calculating and counting strategies	5th grade	2.07	.87	3-119	1.720	.167
	6th grade	1.92	.89			
	7th grade	1.86	1.15			
	8th grade	2.53	.87			
	Total	2.02	.96			

4. DISCUSSION

This study investigated the number sense skills of gifted students through the results obtained from 123 gifted secondary school students. It was seen in this research that mean score of the female gifted students in the number sense test was 9.13 while it was 11.50 for the male gifted students. The results of the analysis which was made to determine whether this difference, in which number senses of gifted students differed according to gender, was statistically significant or not presented that there was a significant difference in favour of male students according to gender. It was seen in some studies [42] in the related

literature that there was no significant difference between the number sense and gender variables. On the other hand, there are some other researches [6], [10], [14], [16], [42], [43] which concluded that number sense mean scores differed according to gender variable. On the contrary to these researches, there are some studies [13], [44] in which a significant difference was found in favour of male students in the relationship between number sense and gender factor. This supports the finding of this study which claims that male students are at a higher level than female students in terms of number sense skills related to the relationship between number sense and gender.

In this research, it was observed that the highest mean (14.84) belonged to 8thgrade gifted students and the lowest mean score (9.47) belonged to 6th grade gifted students. It was seen that the number sense skills of 5thgrade gifted students was higher than of 6th grade gifted students. This difference, however, was not significant. Therefore, it can be said that number sense performances of gifted secondary school students are at a moderate level. Moreover, it was concluded that the number sense performances of the students changed significantly according to the grade level and the higher the grade level, the higher the number sense performance. In the literature, various views have been presented in studies which investigated number sense skills and grade level. Previous study by Aunio*et al.* [6] expressed that number sense skill improves when the grade level goes up. On the contrary, there are some studies which suggest that number sense skill decreases as grade level increases [12]. In addition, Karabey [37] stated that the gifted individuals' number sense averages increase as their grade level increases from 5th grade to 7th grade, and it was observed that there was a decrease in number sense averages of 8th grade gifted students compared to 7th grade gifted students. Similarly, Şengül and Gülbağcı [18] stated in their study that 4th grade gifted students are far behind their 5th grade gifted students in terms of number sense. Thus, it can be said that this research finding is similar to the research results in the literature.

In this research, it was observed that the percentage of correct answers in all components was the highest in eighth grade students in terms of number sense components. When the average of correct answers for the components was investigated separately, it was concluded that the highest mean number sense skill was in the component of understanding the effect of the operation, and the least mean number sense skill was in the component of understanding the concept of number, respectively.

In the literature, there are studies which investigated students' number sense skills in terms of components [14], [45]–[48]. However, the results differ as there is not a common naming of number sense component in the literature. Purnomo *et al*. [47] conducted a study with 80 sixth grade students studying at 3 different schools from different income levels and investigated the number sense performances of the students according to number sense components. They concluded that the sub-component of understanding the nature of numbers was at the lowest level. Çekirdekçi *et al*. [46] investigated the number sense performances of 4th grade students according to number sense components in their study and concluded that students displayed poor performance especially in two number sense components. They stated that those components were "judging the rationality of numerical calculation results" and "understanding the relative effect of operations on numbers". Şengül and Dede [14] investigated the current situation of 6th grade students according to the number sense components in his study. As a result of his analyses, it was found that the highest mean of correct answers was in the questions about the component of "understanding the equivalent representations of numbers" and the lowest mean of correct answers was in the questions about the component of "understanding the meanings and effects of operations".

In their study Şengül and Gülbağcı [18] found that fifth grade students diagnosed as gifted have reached the desired learning level in the subcomponents of "understanding the meaning and effect of operations" and "counting and flexible operation strategies for mental operations, written operations and calculator use", which are the components of number sense. In addition, the researchers stated that the students were not atet the desired level for the subcomponent of "understanding and using the equivalent representations of numbers", but they were close to the desired level.

It was seen in this study that the highest mean number sense skill was in the component of understanding the effect of the operation and the lowest mean was in the component of understanding the concept of number. Therefore, it can be said that the finding related to the component of understanding the concept of number is similar to the results of other researches. Moreover, it can be said that the reason for the difference in the finding about the component of understanding the effect of the operation is that the research group consisted of gifted individuals.

5. CONCLUSION

This study concluded that the number senses of gifted secondary school students differed according to gender and that difference was in favour of the male students. It was also found that the highest number sense performance belonged to the eighth-grade level students according to the grade levels. Furthermore, it

was observed that the number sense performances of the students increased as their grade level increased. Besides, it was seen when the mean correct answer of the number sense components was investigated that the highest mean was in the component of understanding the effect of the operation, and the lowest mean was in the component of understanding the concept of the number, respectively.

In line with these results, it is recommended to integrate more acquisitions about number sense in the secondary school mathematics program and science and arts center curricula. In addition, it is recommended to add activities intended for the development of number sense skills into the textbooks. It is also suggested to review teacher training programs in terms of the development of number sense skills.

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