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Analyzing The Metaphorical Perception of Secondary Education Students Related to Mathematics Teacher and Mathematics Course

Ortaokul Öğrencilerinin Matematik Öğretmeni ve Matematik Dersine Yönelik Metaforik Algılarının İncelenmesi

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Abstract

The main purpose of this research was to reveal the perceptions of secondary education students related to the concepts of "mathematics teacher" and "mathematics course" through metaphors. This research was designed qualitatively, and phenomenology research model was used. In this research, the phenomenon that was focused during the research process was determined as how secondary education students conceptualized their thoughts on mathematics teacher and mathematics course through the metaphors. The attitudes towards the mathematics course and mathematics teacher affect them mutually. Moreover, 6th grade students resembled the mathematics course to the science course. Upon emergence of this situation, too much numerical subjects in the 6th grade Science and Technology curriculum and encountering the subjects in mathematics course as well as in the science course was efficient. In accordance with these obtained results, it can be suggested to search for the real factors that cause the perception of mathematic course's being difficult and boring in some students' mind.

Keywords: *Mathematics teaching, mathematical information, mathematical perception, communication*

Özet

Bu araştırmanın temel amacı ortaokul öğrencilerinin "matematik öğretmeni" ve "matematik dersi" kavramlarına ilişkin algılarını metaforlar aracılığıyla ortaya çıkarmaktır. Bu araştırma nitel olarak desenlenmiş ve olgubilim (fenomenoloji) araştırma modeli

kullanılmıştır. Bu araştırmada araştırma sürecinde üzerine odaklanılan olgu ortaokul öğrencilerinin matematik öğretmeni ve matematik dersi hakkındaki düşüncelerini metafor yardımı ile nasıl kavramsallaştırdıkları olarak belirlenmiştir. Matematik dersine yönelik ve matematik öğretmenine yönelik tutumlar karşılıklı olarak birbirini etkilemektedir. Ayrıca 6.sınıf öğrencileri matematik dersini fen dersine benzetmektedirler. Bu durumun ortaya çıkmasında, 6.sınıf Fen ve Teknoloji dersi müfredatının sayısallığının fazla olması ve bu nedenle de matematik dersinde işlenen konuların fen dersinde de öğrencilerin karşısına sık sık çıkması etkili olmuştur. Elde edilen bu sonuçlar doğrultusunda alana katkı sağlaması adına; öğrencilerin belli bir bölümünün zihninde oluşan matematik dersinin zor ve sıkıcı bir ders olduğu algısına neden olan gerçek faktörlerin araştırılması önerisinde bulunulabilir.

Anahtar Kelimeler: *Matematik eğitimi, matematiksel bilgi, matematiksel algı, iletişim*

1. Introduction

The metaphors that help us on naming the world outside are one of the ways we express ourselves and establish relationships. The concept of metaphor in Turkish is used as benzetme (simile), eğretileme, istiare and mecaz (Eraslan, 2011, 3). As Şengül, Katrancı and Cantimer quoted from Modell (2009), "Metaphors establish a bridge between knowledge and feelings" (Modell, 2009). For that reason, we frequently benefit from metaphors to reveal perceptions. On the other hand, mathematical information is as important as any information in knowledge-based societies. According to Yenilmez (2010), mathematics teaching is essential for development of a country, creating a knowledge-based society and for the future of the country. Mathematics teaching enhances individuals' world of thought, and contributes upon development of several thinking skills such as creative thinking and critical thinking.

Mathematical power is the skill of using mathematical relationships and mathematical techniques efficiently The individuals with this skill will be able to use the conveniences this skill creates in several areas of the life. However, the fear of mathematics and relevant worries can sometimes occur in students. The anxiety of mathematics is the mode of illogical fear that prevents the use of numbers and solution of mathematics problems in daily and academic life (Richardson and Suinn, 1972) or that causes students to be petrified with mathematical thinking, and that decreases students' performances and accordingly prevents them to their learning (Miller and Mitchell, 1994). This fear and anxiety can sometimes create an obstacle in front of students' learning mathematics. Mokhtar, Yusof & Misiran (2012) mentioned four factors determining the mathematics performance of students; interest, role of teacher, peers, and attitude. True knowledge of these factors related to mathematics will both increase the efficiency of mathematics teaching activities and improve mathematics success.

Education is a comprehensive field (Botha, 2009). It includes several concepts such as students, teachers, managers and teaching inside. For that reason, all these components should separately be evaluated in order to make educational activities more qualified. According to Giles (2008), students and teachers interact face-to-face every day. As result of this interaction, they acquire experiences and new learning related to teaching and learning. According to Larson, families and researches primarily

accept the need for teaching the curriculum efficiently in order to be more successful at school. Prior to this, revealing the perceptions of students towards the course and teacher of that course is undoubtedly a fairly important process.

Araştırmanın Amacı

The basic purpose of this research was to reveal perceptions of secondary education students related to the concepts of "mathematics teacher" and "mathematics course" through metaphors. Within the framework of this general purpose, the answers to the questions below were sought: What are the metaphors secondary education schools had related to the concept of "mathematics teacher"? Under which conceptual categories can metaphors secondary education students has related to the concept of "mathematics teacher" be grouped? What are the metaphors secondary education schools had related to the concept of "mathematics course"? Under which conceptual categories can metaphors secondary education students has related to the concept of "mathematics course" be grouped?

Araştırmanın Problemi

There are researches revealing the perceptions of students in order to increase mathematics course success and quality of education. However, as different from the others, in this research, both the perceptions towards mathematics course and mathematics teacher were analyzed together, and the students at all secondary education grades including the 5th grade students, as well, who have been included in the secondary education soon were discussed separately.

2. Method

This research was designed qualitatively, and phenomenology research model was used. Phenomenology design is defined as focusing on phenomenon that is known without having a deep and detailed understanding (Yıldırım and Şimşek, 2013). In this research, the phenomenon that was focused during the research process was determined as how secondary education students conceptualized their thoughts on their mathematics teacher and mathematics course through metaphors.

The study group of the research included secondary education students studying at state schools in Adana in 2014-2015 academic year. Totally 200 out of 150.000 secondary education students, as average, participated into the research. Providing maximum variety was regarded in selection of the students in order to make them represent the population. For that reason, the students studying in districts, provinces, villages and towns were selected. Furthermore, selected students were regarded to be from different schools, and so that it was aimed to reveal perceptions related to more than one mathematics teacher and mathematics course

The form that was used as data collection tool included two sections. In the first section, gender, age and grade of the participants were asked. In the second section, two semi-structured fill-in-the-gap questions were asked. The first of these two questions was written to be completed; the first one was the sentence of "Mathe-

matics teacher is like ….. Because ……" that was created to reveal the metaphors participants developed for the concept of mathematics teacher; and the second one was "Mathematics course is like …… Because…." That was created to reveal the metaphors participants developed related to the concept of mathematics course In studies in which metaphor is used as a research tool, the concept of "like" is used in order to evoke the relationship between the subject of the metaphor and the source of metaphor in general (Saban, 2008, 6). The reason for asking the participants to justify the metaphors they create was to group metaphors in correct categories during the process of categorization.

Content analysis method was used for analyzing the data. Content analysis can be defined as the process of quantification-digitize what people say and write coding according to clear instructions (Balcı, 2013, 220). During the analysis period, descriptive analysis techniques were also used. In descriptive analysis, it has been mentioned that the purpose is to present obtained findings to the readers in an organized and interpreted way, and direct quotations are frequently included for that purpose (Yıldırım and Şimşek, 2013). This research was designed qualitatively, and phenomenology research model was used. Phenomenology design is defined as focusing on phenomenon that is known without having a deep and detailed understanding (Yıldırım and Şimşek, 2013). In this research, the phenomenon that was focused during the research process was determined as how secondary education students conceptualized their thoughts on their mathematics teacher and mathematics course through metaphors. During the analysis method of the metaphors developed by the secondary education students, the stages of naming, selecting, creating a sample metaphor list, categorization, providing validity and reliability and transferring data to SPSS program for quantitative data analysis were all actualized.

3. Findings And Comments

In research of Bagaka (2011), it was concluded that teacher properties and practices developed the competence of secondary education students. Namely, behaviors of teachers directly affected the success of students. For that reason, it would be appropriate to analyze teachers in students' eyes.

Table 1. The metaphors 5th and 6th grade students developed for the concept of "mathematics teacher"

Line of Metaphor	Name of Metaphor	Frequency (f)	Percentage (%)	Line of Metaphor	Name of Metaphor	Frequency (f)	Percentage (%)
5th grade				6th grade			
1	Mother	13	25,5	1	Calculator	4	11.11
2	Angel	10	19,61	2	Angel	4	11.11
3	Princess	6	11,77	3	Princess	3	8,33

Line of Metaphor	Name of Metaphor	Frequency (f)	Percentage (%)	Line of Metaphor	Name of Metaphor	Frequency (f)	Percentage (%)
5th grade				6th grade			
4	Scientist	3	5,88	4	Answer key	3	8,33
5	Book	2	3,92	5	Flower	3	8,33
6	Fairy	2	3,92	6	Fairy godmother	3	8,33
7	Calculator	2	3,92	7	Test book	2	5,55
8	Rose	1	1,96	8	Red flag	1	2,78
9	Friend	1	1,96	9	Computer	1	2,78
10	Problems	1	1,96	10	Toy	1	2,78
11	Information box	1	1,96	11	Book	1	2,78
12	Moon	1	1,96	12	Queen	1	2,78
13	Atatürk	1	1,96	13	Sun	1	2,78
14	Leader	1	1,96	14	Substructure of my life	1	2,78
15	Water	1	1,96	15	Butterfly	1	2,78
16	Star	1	1,96	16	Best things	1	2,78
17	Professor	1	1,96	17	Snow White	1	2,78
18	Narrator	1	1,96	18	My self	1	2,78
19	September	1	1,96	19	Robot	1	2,78
20	Model	1	1,96	20	Cover page of journal	1	2,78
				21	Everything that is useful	1	2,78

Table 2. The metaphors 7th and 8th grade students developed for the concept of "mathematics teacher"

Line of Metaphor	Name of Metaphor	Frequency (f)	Percentage (%)	Line of Metaphor	Name of Metaphor	Frequency (f)	Percentage (%)
7th grade				8th grade			
1	Harezmi	16	40	1	Calculator	7	13,50
2	Tree	3	7,5	2	Bank director	4	7,7
3	Book	2	5	3	Computer	4	7,7
4	Brain box	2	5	4	Machine	3	5,77
5	Butcher	2	5	5	General	2	3,85
6	Scientist	2	5	6	Judge	2	3,85
7	Biruni	2	5	7	Professor	2	3,85
8	Blackboard	1	2,5	8	Ant	2	3,85
9	Azrael	1	2,5	9	Grocer	2	3,85
10	Mathematics	1	2,5	10	Old	2	3,85
11	Number	1	2,5	11	Projection	1	1,92
12	İbni Sina	1	2,5	12	Lion	1	1,92
13	Ali Kuşçu	1	2,5	13	Anesthetist	1	1,92

Line of Metaphor	Name of Metaphor	Frequency (f)	Percentage (%)	Line of Metaphor	Name of Metaphor	Frequency (f)	Percentage (%)
	7th grade				8th grade		
14	Einstein	1	2,5	14	Leaf	1	1,92
15	Funfair	1	2,5	15	Information box	1	1,92
16	Cloud	1	2,5	16	Flower root	1	1,92
17	Enemy of number	1	2,5	17	Government office	1	1,92
18	Bank director	1	2,5	18	Guardian	1	1,92
				19	Prison director	1	1,92
				20	Female soldier	1	1,92
				21	Brainbox	1	1,92
				22	Lamp	1	1,92
				23	Japan	1	1,92
				24	Flower	1	1,92
				25	Candle	1	1,92
				26	Rose	1	1,92
				27	Tree	1	1,92
				28	Candy	1	1,92
				29	Princess	1	1,92
				30	Operation	1	1,92
				31	Film	1	1,92
				31	Repeating record	1	1,92

Table 3. The metaphors 5th and 6th grade students developed for the concept of "mathematics course"

Line of Metaphor	Name of Metaphor	Frequency (f)	Percentage (%)	Line of Metaphor	Name of Metaphor	Frequency (f)	Percentage (%)
	5th grade				6th grade		
1	A joyful course	12	23,53	1	Science course	5	14,71
2	A part of my life	3	5,9	2	Nature	2	5,88
3	Brain	2	3,92	3	Life	2	5,88
4	Information	2	3,92	4	Entertainment	2	5,88
5	Numbers	2	3,92	5	Calculator	2	5,88
6	Hobby	2	3,92	6	Brain box	1	2,94
7	Science course	2	3,92	7	Operation course	1	2,94
8	Multiplication	2	3,92	8	Mathematics box	1	2,94
9	Playground	2	3,92	9	Line	1	2,94
10	Story	2	3,92	10	Answer key	1	2,94
11	Difficulty	1	1,96	11	Iron of a building	1	2,94
12	Calculator	1	1,96	12	Light	1	2,94

Line of Metaphor	Name of Metaphor	Frequency (f)	Percentage (%)	Line of Metaphor	Name of Metaphor	Frequency (f)	Percentage (%)
	5th grade				6th grade		
13	Physical education course	1	1,96	13	Computer	1	2,94
14	Geometry	1	1,96	14	Everything that is useful	1	2,94
15	Life	1	1,96	15	Information	1	2,94
16	Star	1	1,96	16	Clock	1	2,94
17	Free course	1	1,96	17	Military service	1	2,94
18	Square	1	1,96	18	Science	1	2,94
19	Kingdom	1	1,96	19	Happiness	1	2,94
20	Party	1	1,96	20	Beautiful	1	2,94
21	Achievement	1	1,96	21	Watermelon	1	2,94
22	Computer	1	1,96	22	Age	1	2,94
23	War	1	1,96	23	House	1	2,94
24	Happiness	1	1,96	24	Water	1	2,94
25	Multiplication table	1	1,96	25	Physical education course	1	2,94
26	Number car	1	1,96	26	Toy course	1	2,94
27	Triangle	1	1,96				
28	Japan	1	1,96				
29	Flower	1	1,96				
30	Science	1	1,96				

Table 4. The metaphors 7th and 8th grade students developed for the concept of "mathematics course"

Line of Metaphor	Name of Metaphor	Frequency (f)	Percentage (%)	Line of Metaphor	Name of Metaphor	Frequency (f)	Percentage (%)
	7th grade				8th grade		
1	Joyful	10	24,39	1	Prison	6	12,5
2	Game	3	7,31	2	Hell	5	10,42
3	Torture	3	7,31	3	Torture	4	8,33
4	Forest	3	7,31	4	Labyrinth	2	4,2
5	Mathematics	1	2,44	5	Technology	2	4,2
6	Grocer	1	2,44	6	Calculator	2	4,2
7	Space	1	2,44	7	Tree	2	4,2
8	Heaven	1	2,44	8	Computer	2	4,2
9	Bank	1	2,44	9	Electric current	1	2,08
10	Hell	1	2,44	10	Record player	1	2,08
11	Computer	1	2,44	11	Turkish course	1	2,08
12	Summer holiday	1	2,44	12	Heaven	1	2,08
13	Number	1	2,44	13	Science	1	2,08

Line of Metaphor	Name of Metaphor	Frequency (f)	Percentage (%)	Line of Metaphor	Name of Metaphor	Frequency (f)	Percentage (%)
7th grade				8th grade			
14	Geometry	1	2,44	14	Dead end	1	2,08
15	Zero	1	2,44	15	Apple	1	2,08
16	Ferris Wheel	1	2,44	16	Brainbox	1	2,08
17	Life	1	2,44	17	Information class	1	2,08
18	A part of my life	1	2,44	18	Light	1	2,08
19	Group of numbers	1	2,44	19	Building construction	1	2,08
20	Informative meeting	1	2,44	20	Office	1	2,08
21	Intelligence course	1	2,44	21	Chinese	1	2,08
22	Comedy course	1	2,44	22	Nonsense	1	2,08
23	Brainbox	1	2,44	23	Life triangle	1	2,08
24	Bad	1	2,44	24	Multiplication table	1	2,08
25	Job application	1	2,44	25	Number World	1	2,08
26	Party	1	2,44	26	Everything	1	2,08
				27	School	1	2,08
				28	Pomegranate	1	2,08
				29	Desert drought	1	2,08
				30	Game box	1	2,08
				31	Plain paper	1	2,08

Table 5. The categories 5th and 6th grade students created related to the concept of "mathematics teacher"

Categories	5th Grade Metaphors	Metaphor frequency	Number of Metaphors	6th Grade Metaphors	Metaphor frequency	Number of Metaphors
1.Mathematics teacher as an entertaining person	----------	---	---	Toy(1)	1	1
2.Mathematics teacher as an informed person	Book(2) information box(1) calculator(2) scientist(3) professor(1)	9	5	Calculator(4) answer key(3) test book(2) computer(1) robot(1) book(1) butterfly(1)	13	7
3.Mathematics teachers as a guide	Moon(1) narrator(1) Leader(1) star(1)	4	4	Everything that is useful(1) substructure of my life(1)	2	7
4.Mathematics teacher as a negative person	--------	---	---	-------	---	---
5.Mathematics teacher as an expression of goodness	Mother(13) angel(10) Atatürk(1) fairy(2) rose(1) friend(1) princess(6)	34	7	Princess(3) red flag(1) angel(4) flower(3) sun(1) fairy godmother(3) best things(1) snow White(1) queen(1) cover page of journals(1)	19	10
6.Other	Problems(1) water(1) September (1) model(1)	4	4	My self(1)	1	1

Table 6. The categories 7th and 8th grade students created related to the concept of "mathematics teacher"

Categories	7th Grade Metaphors	Metaphor frequency	Number of Metaphors	8th Grade Metaphors	Metaphor frequency	Number of Metaphors
1.Mathematics teacher as an entertaining person	Funfair(1)	1	1	-----	---	---
2.Mathematics teacher as an informed person	Book(2) Harezmi(16) scientist(2) İbni Sina(1) Biruni(2) Ali Kuşçu(1) Einstein(1) brainbox(2) tree(1)	28	9	Information box(1) operation(1) calculator(7) machine(3) brainbox(1) computer(4) professor(2) grocer(2) ant(2) leaf(1)	24	10
3.Mathematics teachers as a guide	Tree(1)	1	1	Candle(1) flower root(1)projection(1) prison director(1) lamp(1)	5	5
4.Mathematics teacher as a negative person	Cloud(1) tree(1) butcher(2) Azrael(1) bank director(1)	6	5	Judge(2) bank director(4) japan(1) repeating record(1) guardian(1) female soldier(1) general(2) anesthetist(1) lion(1) film(1) government office(1)	16	11
5.Mathematics teacher as an expression of goodness	----------	----	----	Rose(1) princess(1) candy(1) flower(1)	4	4
6.Other	Blackboard(1) number(1) enemy of number(1) mathematics(1)	4	4	Tree(1) old(2)	3	2

Table 7. The categories 5th and 6th grade students created related to the concept of "mathematics course"

Categories	5th Grade Metaphors	Metaphor frequency	Number of Metaphors	6th Grade Metaphors	Metaphor frequency	Number of Metaphors
1.Mathematics as a joyful course	A joyful course(12) free course(1) playground(2) party(1) hobby(2)	18	5	Entertainment(2) toy world(1) happiness(1)	4	3
2.Mathematics as a hard and boring course	War (1) difficulty(1)	2	2	Military service(1)	1	1
3.Mathematics as a part of my life	Life(1) a part of my life(3)	4	2	Everything that is useful(1) life(2) light(1) iron of a building(1) nature(2) water(1)	8	6
4.Mathematics as a course possible to be associated with different disciplines	Science course(2) physical education course(1) geometry(1)	4	3	Science course(5) physical education(1)	6	2
5.Mathematics as an information and science course	Kingdom(1) information(2) computer(1) numbers(2) multiplication table(1) number car(1) calculator(1) triangle(1) science(1) achievement(1) multiplication(2) brain(2)	16	12	Calculator(2) science(1) information(1) computer(1) answer key(1) operation(1) brainbox(1) mathematics box(1) clock(1) age(1)	11	10

Categories	5th Grade Metaphors	Metaphor frequency	Number of Metaphors	6th Grade Metaphors	Metaphor frequency	Number of Metaphors
6.Other	Happiness(1) square(1) star(1) flower(1) japan(1) story(1)	6	6	Home(1) watermelon(1) line(1) beautiful(1)	4	4

Table 8. The categories 7th and 8th grade students created related to the concept of "mathematics course"

Categories	7th Grade Metaphors	Metaphor frequency	Number of Metaphors	8th Grade Metaphors	Metaphor frequency	Number of Metaphors
1. Mathematics as a joyful course	Game(3) comedy course(1) entertainment(10) summer holiday(1) ferris wheel(1) party(1)	17	6	Game box(1)	1	1
2. Mathematics as a hard and boring course	Torture(3) hell(1) bad(1) job application(1) bank(1) forest(3)	10	6	Prison(6) dead end(1) hell(5) Chinese(1) nonsense(1) torture(4) desert drought(1) electric current(1) plain paper(1) labyrinth(2)	23	10
3. Mathematics as a part of my life	Life(1) part of my life(1) zero(1) grocer(1)	4	4	Everything(1) light(1) life triangle(1)	3	3
4. Mathematics as a course possible to be associated with different disciplines	Mathematics(1) geometry(1)	2	2	Turkish course(1)	1	1
5.Mathematics as an information and science course	Number(1) computer(1) brainbox(1) intelligence course(1) informative program(1) number group(1) space(1)	7	7	Computer(2) brainbox(1) multiplication table(1) number world(1) calculator(2) information class(1) science(1) pomegranate(1) technology(1) tree(2)	13	10
6.Other	--------	---	---	School(1) technology(1) heaven corner(1) record machine(1) office(1) building construction(1) apple (1)	7	7

4. Discussion

It was noticed that the students used several metaphors in order to explain the concepts of mathematics teacher and mathematics course. Such a similar situation was also noticed in the study of Güveli, İpek and Atasoy (2011) who carried out a study upon the perceptions of pre-service classroom teachers related to the mathematics teacher. In the research of Guerrero and Villamil (2002), as well, several metaphors were noticed to be created for the concept of teacher. Pre-service classroom teachers also used several metaphors in order to express the concept of mathematics teacher.

Most of the metaphors 5th and 6th grade students created for the concept of mathematics teacher was determined to be in the category of "mathematics teacher as an expression of goodness." In the study of Şengül, Katrancı and Gerez Cantimer (2014) upon secondary education students, it was also concluded that students had positive attitudes towards the mathematics teacher. This was associated with the result obtained in this research. It was possible to mention that attitudes of 7th and 8th grade students towards the mathematics course were efficient upon their noticing their mathematics teacher as an informed person. Similarly, mathematics teacher was also considered as an informed and guide for reaching to information in researches carried out previously (Achinstein and Barrett, 2004; Martinez, Souleda and Huber, 2001). However, 8th grade students regarded mathematics course as difficult and boring.

"The perception of teachers towards mathematics is important as they influence the society they are part of, and have important roles in education" (Şahin, 2013). In fact, the attitudes towards mathematics course and the attitudes towards mathematics teacher affected each other mutually. This result was associated with the results obtained by Vinson (2001) and Martino (2010) in his research related to the fact that teachers affected the attitudes and behaviors towards mathematics directly. In the study of Oflaz (2011) upon the elementary education students, it was also concluded that mathematics teachers had a role upon students' perception of mathematics. Such a similar situation resembling to mutual interaction of these two concepts noticed in secondary education students' age group was also noticed in pre-service mathematics teachers. In the study of Güler, Akgün, Öçal and Doruk (2012) they carried out upon pre-service mathematics teacher, it was concluded that some of the pre-service teachers who would teach this course accepted this course as entertaining, and some considered the course as difficult and boring. In the study of Peker and Mirasyedioğlu (2003), results of data analysis indicated that more than half of students had positive attitudes towards mathematics. However, more than third five (68,4%) failed to mathematics according to score of mathematics achievement test. Another result obtained from the research was that 6th grade students identified mathematics course with the science course. Upon emergence of this situation, too much numerical subjects in the 6th grade Science and Technology curriculum and encountering the subjects in mathematics course as well as in the science course was efficient.

The attitudes towards the mathematics course and mathematics teacher affect them mutually. Moreover, 6th grade students resembled the mathematics course to the science course. Upon emergence of this situation, too much numerical subjects in the 6th grade Science and Technology curriculum and encountering the subjects in mathematics course as well as in the science course was efficient. In accordance with these obtained results, it can be suggested to search for the real factors that cause the perception of mathematic course's being difficult and boring in some students' mind. This research can be adapted to younger ages, and carried out upon students at elementary education grades. So that, reaching the source of this problem at the earliest time will facilitate the solution of the problem.

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