

# Study on the Reasons Why the Ability of Junior High School Students about Data Analysis is Weak

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## ABSTRACT

Through the survey of 320 junior high school students and the interviews with some junior high school math teachers, we analyzed the reasons comprehensively why junior high school students' ability of data analysis were weak. The results showed that the following aspects were quite prominent: junior high school students ignored practice of the data analysis; they had a low demand for basic knowledge; teachers seldom guided the basic method of data analysis; teachers seldom supervised and evaluated students study results of data analysis in time and their frequency of summary was low. Therefore, in order to improve students' ability of data analysis effectively, math teachers should dig into the basic methods of data analysis when they prepare lessons, select and arrange the students' exercises carefully, strengthen the teaching of basic knowledge and basic method of data analysis, and pay attention to the classroom inspection and supervision of study results of students' data analysis. Students should selectively increase the practice according to their actual situation.

**Keywords:** Data analysis, Mathematics, Ability, Junior, Students.

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## 1. INTRODUCTION

With the change and development of the society, current mathematics education around the world has attached great importance to the cultivation of data analysis ability of junior high school students (Zhang *et al.*, 2002; Shi *et al.*, 2008; Wang, 2008; The Ministry of Education of the People's Republic of China, 2012). Chinese mathematics education is no exception (Dong *et al.*, 2014; Hong *et al.*, 2015). However, after several years of teaching practice, the data analysis ability of Chinese high school students was not high, especially junior high school students (Qu *et al.*, 2006). What was the reason for that? Reviewing previous studies, there has been no in-depth discussion yet. Therefore, we selected some junior high school students and front-line teachers in Shandong province and conducted a survey.

## 2. METHODOLOGY

### 2.1. Participant

The survey selected 320 junior high school students randomly from three junior high school in Jinan, Zibo and Rizhao in Shandong, province, as well as 15 mathematics teachers from the three schools as participants. Among the students, there were 152 male and 156 female. And among the teachers, there were 6 male teachers and 9 female teachers.

### 2.2. Instrument

The test problems, questionnaire survey and interview questionnaire were all self-made in basic of relevant materials. The main content of the test and interview mainly includes the basic knowledge and basic method of data analysis, practice, and the processing of the study result.

### 2.3. Data Collection

After the test papers were recovered, the test questions were graded and coded. Interviews with teachers were finished in a single way and the recording equipment was adopted. After the interview, we put the recording into words. We used qualitative analysis software nvivo10 to encode and count the words, then analyzed the statistical data table.

## 3. RESULTS

### 3.1. Results of Junior High School Students' Test and Questionnaire

#### 3.1.1. Basic Knowledge of Data Analysis

The number of questions about the basic knowledge of data analysis in the test paper was six. The total score of every question was 4. The students with scores of 2.4 or above were moderate. The students with scores of 3.2 or above were excellent. The results of the student's performance were shown in table 1.

Table-1. The grasp of basic knowledge of data analysis

The type of the Basic knowledge of data analysis	the average score(point)
Basic knowledge of data consolidation	2.51
Basic knowledge of data description	3.01
Basic knowledge of data arithmetic	2.55
Basic knowledge of data interpretation	2.30
Basic knowledge of data reasoning	3.22

Source: Researchers' analysis of results of test, October, 2016

It could be seen from table 1 that the grasp of basic knowledge of data interpretation was the worst. The average score was only 2.3, failing to reach moderate level. Other types of basic knowledge were moderate, failing to reach high level. As a result, the students' grasp of the basic knowledge of data analysis was general.

### 3.1.2. Basic Method of Data Analysis

According to scoring standards, the total score of every question was 5. The moderate level was 3 and the high level was 4. The results of the student's performance were shown in table 2.

**Table-2.** The grasp of the basic method of data analysis

<b>The type of the Basic method of data analysis</b>	<b>the average score(point)</b>
Basic method of data consolidation	1.07
Basic method of data description	2.44
Basic method of data arithmetic	2.03
Basic method of data interpretation	1.35
Basic method of data reasoning	1.42

Source: Researchers' analysis of results of test, October, 2016

It could be seen from table 2 that students' scores from low to high in the basic method of data analysis was: basic method of data consolidation, basic method of data interpretation, basic method of data reasoning, basic method of data arithmetic, basic method of data description. All students were poor. Among them, the grasp of the basic method of data consolidation was the worst, as low as 1.07. As a result, most students mastered the basic method of data analysis badly.

### 3.1.3. Practice of the Basic Knowledge and Basic Method of Data Analysis

We investigated the practice of basic knowledge and basic method through 2 aspects, for example whether did they practice and how often did they practice. The detailed situation was shown in table 3.

**Table-3.** Practice statistics on data analysis

	<b>Match very well (percentage)</b>	<b>Match basically (percentage)</b>	<b>General (percentage)</b>	<b>Not match (percentage)</b>
Whether did they practice	25.6	12.3	36.0	19.5
How often did they practice	12.0	10.1	34.7	29.9

Source: Researchers' analysis of answered questionnaires, October, 2016

It could be see from table 3 that for the questionnaire "We have practiced the relevant topics of data analysis", 36 percent of students thought it matched generally the actual situation, accounting for the largest proportion. 6.5 percent of students thought they did not practice relevant topics of data analysis. For the question "We often practice relevant topics of data analysis", 12 percent of students thought they often practiced relevant topics of data analysis, accounting for small proportion. 13.3 percent of students thought it was not real for them that they often practiced relevant topics of data analysis.

### 3.1.4. Students' Evaluation of Teachers' Activities of Data Analysis

We investigated students' evaluation of teachers' activities of data analysis through 2 aspects, such as summarizing method of data analysis and checking and evaluating data analysis homework. The detailed situation was shown in table 4.

**Table-4.** Statistics on students' evaluation of teachers' activities of data analysis

	Match very well (percentage)	Match basically (percentage)	General (percentage)	Not match (percentage)	Not match totally (percentage)
Summarize method of data analysis	14.0	17.5	32.8	20.5	15.3
Check and evaluate data analysis homework	15.3	14.6	29.5	30.8	9.7

Source: Researchers' analysis of answered questionnaires, October, 2016

It could be seen from table 4 that students had different evaluation of teachers' activities of data analysis. 32.8 percent of students thought the methods of data analysis that teachers summarized matched the real situation. 20.5 percent of students thought teachers did not summarize too many methods. For the question "Teachers often check and evaluate data analysis homework", 30.8 percent of students thought teachers did not often check data analysis homework .

### 3.2. The Results of Junior High School Math Teachers' Interview

#### 3.2.1. The Teaching of the Basic Knowledge of Data Analysis

The basic knowledge of data analysis used by junior high school mathematics teachers was slightly different. The teaching situation of junior high teachers was shown in table 5.

**Table-5.** Statistics on the teaching of basic knowledge of data analysis

	Answer coding	The percentage of teachers (percentage)
The method of teaching	Teachers give learning case and students self-study	26.7
	Teachers teach directly	66.7
	Students demonstrate and teachers emphasize difficulties	20.0
The requirements for students	Learn knowledge easily	53.3
	Understand knowledge	46.7
	Master knowledge	20.0

Source: Researchers' analysis of answered questionnaires, October, 2016

It could be seen from table 5 that most teachers taught directly, accounting for 66.7%. 20 percent of teachers chose the method that students demonstrated and teachers emphasized difficulties, accounting for the minimum proportion. Junior high school teachers' requirements for students' basic knowledge of data analysis was learning and understanding knowledge easily. Few teachers asked students to master knowledge, accounting for 20 percent.

#### 3.2.2. The Teaching of the Basic Method of Data Analysis

All teachers we investigated had taught the basic method of data analysis. The detailed situation was shown in table 6.

**Table-6.** Statistics on the teaching of the basic method of data analysis

	<b>Answer coding</b>	<b>The percentage of teachers (percentage)</b>
The number of teaching	one	66.7
	two	20.0
	More than two	13.3
The degree of teaching	Speak a little	60.0
	Speak and demonstrate	26.7
	Speak, demonstrate and practice carefully	13.3

Source: Researchers' analysis of answered questionnaires, October, 2016

It could be seen from Table 6 that 66.7 percent of the teachers taught basic method of data analysis, accounting for the largest proportion. Few teachers taught more than two methods, accounting for only 13.3 percent. When teachers were asked "How much do you teach about data analysis methods?", 60 percent of teachers said "I just speak the basic method of data analysis and do not explain deeply." The rate of teachers who spoke carefully and guided students' practice was just 13.3 percent.

### 3.2.3. The Practice of Guiding Students' Data Analysis

We investigated junior high school teachers' practice of guiding students' data analysis through 2 aspects, such as the number of practice and the method of practice. All teachers let students practice the basic knowledge and basic method of data analysis. The detailed situation was shown in table 7.

**Table-7.** Statistics on the number of data analysis' practice

	<b>Answer coding</b>	<b>The percentage of teachers (percentage)</b>
The number of practice	A little practice	60.0
	Part practice	33.3
	Lots of practice	6.67
The method of practice	Oral practice at class	46.7
	Time practice at class	33.3
	Homework practice after class	86.7

Source: Researchers' analysis of answered questionnaires, October, 2016

It could be seen from Table 7 that most teachers who let students do a little practice was 60 percent and teachers who let students do lots of practice was below 10 percent. In terms of the method of practice, homework practice after class was the most and it was over 85 percent. Time practice at class was less and it was 33.3 percent.

### 3.2.4. Teachers' Treatments of The Study Results of Data Analysis

We investigated junior high school teachers' treatments of the study results of data analysis through 3 aspects, such as the method of inspection and supervision, the method of correcting errors, the frequency of summarizing. The detailed situation is shown in table 8.

**Table-8.** Statistics on teachers' treatments of the study results of data analysis

	<b>Answer coding</b>	<b>The percentage of teachers (percentage)</b>
The method of inspection and supervision	Inspect at class	26.7
	Inspect ordinary paper homework examination	40.0 80.0
The method of correcting errors	Teachers correct carefully	6.67
	Teachers offer answer and students correct themselves	80.0
	Teachers inspect and do not correct after class. Teachers and students correct errors together.	33.3
The frequency of summarizing	Never	40.0
	occasionally	73.3
	Often	6.67

Source: Researchers' analysis of answered questionnaires, October, 2016

It could be seen from table 8 that for the method of inspection and supervision, all teachers inspected and supervised study results of data analysis, accounting for 80 percent, but only in the way of examination. For the method of correcting errors, 80 percent of teachers chose the method that teachers offered answer and students corrected themselves. Teachers who corrected carefully were below 10 percent. For the frequency of summarizing, 73.3 percent of teachers occasionally summarized the part of data analysis, accounting for the largest proportion. The number of teachers who often summarize was little.

#### 4. RESULTS AND DISCUSSIONS

According to the results of the above survey, the overall characteristics of junior high school students' data analysis learning were mainly reflected in the following aspects:

- (1) Students' grasp of the basic knowledge of data analysis was general. The average scores even were mostly moderate but did not reach high level yet.
- (2) Students' grasp of the basic method of data analysis was bad. The average scores were mostly below moderate.
- (3) Most students reported that they had done the practice of the basic knowledge and basic method of data analysis, but the frequency of practice was low.
- (4) Students thought that teachers did not pay attention to summarize the method of data analysis, did not often check their data analysis homework, and rarely evaluated and instructed their data analysis assignments.

According to the results of the above survey, the overall characteristics of junior high school math teachers' data analysis teaching were mainly reflected in the following aspects:

- (1) Teachers spoke more and students spoke less when teacher taught the basic knowledge of data analysis. Teachers focused on teaching students to learn and understanding knowledge simply.
- (2) The quantity that teachers taught the basic method of data analysis was small. Most teachers explained the basic methods of data analysis simply.
- (3) Most teachers conducted a few exercises when they instructed students the basic knowledge and basic method of data analysis.
- (4) The method that teachers inspected students' learning of data analysis was mainly examination. Students' errors were seldom corrected by teachers carefully. The frequency of the data analysis summary was low.

## 5. CONCLUSIONS AND SUGGESTIONS

Through the survey of 320 junior high school students and the interviews with 15 junior high school math teachers, the results showed that ability of junior high school students about data analysis were weak. Combining the characteristics of students learning and teachers teaching, the reason should be the followings:

(1) Students did not pay attention to the practice of data analysis, had low requirements for the basic knowledge, especially in application.

(2) Teachers taught the basic method of data analysis less, explained vaguely, did not often check their learning results, did not timely evaluate students' homework, seldom focused on correcting students' errors. And the frequency of summarizing the data analysis was low.

Therefore, to improve students' ability of data analysis, the suggestions made were as follows:

(1) Before the course of data analysis, teachers should dig into the basic methods of data analysis and make careful choices and arrangements for the exercises assigned to students.

(2) In data analysis class, teachers should strengthen the teaching of basic knowledge of data analysis, explain the basic method thoroughly, encourage students to think about a variety of methods at the same time, pay attention to inspect students' study results of data analysis, play a leading role in correcting students' errors in data analysis, timely summarize the content of data analysis.

(3) After the class of data analysis, students should selectively increase the practice according to their actual situation. Teachers should pay attention to inspect students' study results and timely evaluate.

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