# 7TH GRADE VASI STUDY: THE CASE OF BEIJING

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ABSTRACT: One of the key components of scientific literacy is having deep understanding about Scientific Inquiry (SI). So it is important for curriculum designer and researcher to know students' understanding about SI. And Lederman et al (2014) published the VASI questionnaire, which can evaluate students' idea about SI in a valid and reliable way. This study is to investigate 7th grade students' notions about SI, who came from mainland China. The sample are all selected from public schools in Beijing, the capital, where there is plenty of educational resources and access to international education program that might focus on SI teaching and learning. Two raters code all sample's data together. One of them had one-year experience of coding the data from VASI and trained another researcher for coding first. Both joined in the code training meeting with the VASI designers' team online to be consistent with other international groups. The inter-rater reliabilities of eight aspect of SI are at least higher than 0.80. The results show students did well on the aspect of "procedures are guided by the question asked" and "conclusions consistent with data collected", and did not well on the rest of aspects. Especially over 40% of students had naïve understanding or no idea on three aspects of SI, including "data does not equal evidence", "multiple methods", and "same procedures may not get the same results". And less than 10% of students held informed idea on these three aspects of SI. This finding is consistent with no emphasis on these SI aspects in national curriculum standards, even in implicit way. But learning in SI way does be emphasized in the standards. It might indicate that doing SI is not sufficient for developing understandings about SI. Also these might be related with the eastern philosophies of education, such as Confucianism which have been extensively discussed in the literature.

KEY WORDS: Scientific Inquiry, View About Scientific Inquiry (VASI), Junior Middle School, Mainland China

OBJECTIVE: The aim of this study was to investigate the 7th grade Chinese students' understanding about scientific inquiry, from mainland China.

## INTRODUCTION

Teaching and learning knowledge about NOS and SI is known as an international, rather than domestic (in China mainland), educational topic. Although doing scientific inquiry has already been emphasized in the grade 7-9 national standards, understanding about NOS and knowledge about SI have not been explicitly stressed as the goal of grade 7-9 science curriculum (MOE, 2011a, 2011b, 2011c). So it is not fair and reasonable to hope students know about NOS and SI. The previous researches also indicate that, much like research on understandings of NOS, neither teachers nor students typically hold informed views of scientific inquiry (Lederman & Lederman, 2004; Schwartz et al., 2002). But some researchers believe that doing SI is a sufficient condition for developing understandings about SI. (e.g., Wong & Hodson, 2009, 2010). Above all, students from the city where teachers have more international perspectives and communications would be meaningful sample to this research. So the sample was selected from Beijing, the capital, where there is plenty of educational resources and access to international education program.

Public schools were focused in this study because most of the middle schools were ran by government in China mainland. Elementary (grade 1-6) and middle (grade 7-9) school education are compulsory for all children. The Year 2014 Educational Statistics (MOE, 2015) reported that there were 52,623 junior secondary schools all over the country and more than 90 percent of them were ran by government, including 47,315 schools ran by educational department and 539 schools ran by non-educational department.

## METHODOLOGY

There were 166 grade 7 students, 12-13 years old, answered the VASI by paper and pencil. Eighty-two of them came from a public school which is about 5 kilometers away from the center of city as the crow flies. The rest, eighty-four students, came from another public school which is about 11 kilometers away from the center as the crow flies. Most of students were enrolled into school nearby where they lived. And the closer one lives in the center of Beijing, generally the more expensive the cost of living will be. From this perspective, students in different economic levels were involved. Based on the descriptions above, this sample is representative to our country in this research topic. The data from these two public schools can be combined together in order to represent the sample from different economic levels.

Two raters coded 166 sample's data together. One of them had one-year experience of coding the data from VASI and trained another researcher for coding first. Then both researchers joined in the code training meeting with the VASI designers' team online to be consistent with other international groups. Every sample's answers were coded by both raters. The inter-rater reliabilities of eight aspect of SI are 0.89, 0.88, 0.95, 0.95, 0.94, 0.84, 0.90, and 0.91 respectively.

## RESULTS AND CONCLUSION

### Begins with a question

For this aspect of SI, 10.8% of the students could tell an activity was or wasn't a scientific inquiry based on whether there was a question to be answered or not, no matter what methods were used, such as descriptive, correlational, and cause and effect researches. More than half of the sample (55.4%) held mixed understanding since they were not sure about whether descriptive and correlational studies could be scientific even there was a research question. Besides, there were 30.7% of students held the naïve idea and 1.8% of them had no idea for this aspect.

### Not simple method

Only 3.0% of the students thought there was multiple methods rather than one single set of steps could be taken to answer the question scientifically. More than half of the sample (50.6%) held mixed understanding since they didn't agree with only one way to answer question but don't know other ways. Over one-third of students (33.1%) held the naïve idea that there was only one set of steps to answer question. Besides, 12.0% of them had no idea for this aspect.

### Procedure guided by question

More than half of the students (57.2%) chose the appropriate procedure based on question asked, with an explicit explanation about their relationship. Over one-fourth of the sample (25.9%) held mixed understanding since they chose the right procedure but didn't give clear explanation. Also, 13.9% of them had naïve understanding and 2.4% of students had no idea about this relationship and gave irrelative answers.

### Same procedure, different result

Only 7.8% of the students agreed same procedures may not get the same results and could explained people still might interpret the data in different ways based on their own prior knowledge and experience even they followed the same procedures. Over one-third of the sample (30.7%) held mixed idea since they thought the results might be different but gave no explain in details about how this difference occurred. More than half of students (57.8%) thought the same procedures must lead to the same results and there must be some mistake or errors if the results were not the same. Besides, 2.4% of them had no idea for this aspect.

### Conclusion consistent with data collected

Over one-third of students (36.7%) chose the appropriate conclusion based on the data collected and gave explicit explanation about conclusions consistent with data collected. Almost half of the sample (45.2%) held mixed idea that not only the data collected but also the prior experiences inconsistent with data should be considered. Besides, there were still 16.9% of them had naïve idea that they got the conclusion merely based on what already known even when the data collected was inconsistent with it.

### Different procedures, different result

For this aspect, 15.7% of the students thought procedures can influence the results and explained how it might happen. More than half of the sample (58.4%) held mixed idea since they agreed the results from different procedures could be different but gave no explain in details about how procedures might influenced. Over one-fifth of students (21.7%) had naïve idea that the result for the same question should be the same even different procedures had been used. Besides, 3.0% of them had no idea for this aspect.

### Data different from evidence

Only 3.6% of the students explained well about the connections and differences between the data and evidence. More than half of the sample (51.8%) were aware of the difference but didn't explain it clearly. Also, many students (43.4%) held the naïve idea that data is the same as evidence. Besides, 0.6% of them had no idea and gave irrelative answers.

### Explanations developed from data and existing knowledge

Only 4.8% of the students were aware of and explained both the data and what was already known were used to develop an explanation. And most of the sample (80.7%) held mixed idea, feeling about some explanations very strange for its inconsistent with what is already known, but lack of further explanations in which way the things already known were used to develop the explanation. Besides, 12.0% of the sample held the naïve idea and 1.2% of them had no idea for this aspect.

The results above indicated students did well on the aspect of "procedures are guided by the question asked" and "conclusions consistent with data collected". In both aspects, over one-third of sample held informed understanding and less than one-fifth of them held naïve idea or no idea. One of the possible reason is that these two aspects are mentioned to some extent for scientific inquiry was required in curriculum standards (MOE, 2011a, 2011b, 2011c). Identifying the variable consistent with research question and controlling irrelative variables, as well as the developing conclusion based on the data collected, has been always emphasized while doing inquiry.

The results above also showed students did not well on the rest of aspects, especially on "data does not equal evidence", "multiple methods" , and "same procedures may not get the same results". In these three aspects, over 40% of sample had naïve understanding or no idea and less than 10% of students held informed idea. These three aspects are not mentioned by standards even in implicit way to some extent (MOE, 2011a, 2011b, 2011c). Also, neither argumentation nor social science issue (SSI) learning is emphasized by curriculum standards, which was implied by some studies that might be correlated with some aspects of nature of science (Khishfe, 2012, 2014). These also might be related with the eastern philosophies of education, such as Confucianism which have been extensively discussed in the literature (Lee & Sriraman, 2013). Khine (2015) mentioned it is a common belief that Chinese students are rote learners and choose passive approach to learning. And Lau, Ho, and Lam (2015) pointed that the western students are relatively better in understating the process and the nature of science, while the East Asian students are relatively better in science contents than science process.

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