

# Survey Research on Data Literacy of Pre-Service Primary and Secondary School Teachers in the Context of Big Data Era

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## **Abstract:**

The influence of big data on education is becoming tremendous day by day along with the development of information technology. It has gradually become the basic requirement of teachers in the new era to be able to make scientific teaching decisions basing on data in the teaching process. Therefore, it is necessary to enhance the training of data literacy in the training process of pre-service primary and secondary school teachers. In order to investigate the data literacy status of pre-service primary and secondary school teachers, this study conducts a questionnaire survey on 366 pre-service primary and secondary school teachers in Liaoning Province, China. According to the survey results, this paper analyzes the current situation of data literacy of pre-service primary and secondary school teachers in Liaoning Province as well as the differences between different genders, and puts forward training suggestions aimed at improving the data literacy of pre-service primary and secondary school teachers.

**Keywords:** *Big data, Pre-service primary and secondary school teachers, Data literacy.*

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## I. INTRODUCTION

The rapid development of big data has driven changes in all walks of life. In the context of big data era, it has become one of the necessary qualities for practitioners in various fields to be able to collect, sort out, analyze, utilize and manage data [1]. Teachers have to make educational decisions every day, and these educational decisions should not only rely on experience since this is the era of big data, instead, teachers should learn to obtain relevant data and teaching resources, to analyze data with data processing software, and make more scientific teaching decisions basing on data [2]. One way for teachers to make scientific decisions in education and teaching is to implement data-based decision-making [3]. When teachers can

make high-quality, data-based decisions, the quality of education and learning in the classroom would be much improved [4].

In this research, data-based decision-making is defined as based on a wide range of data types available [4]. Data in this research refers to information systematically collected and organized to represent some aspects of school education [4]. The ability of educators to implement data-based decision-making is called "data literacy", which is defined in this research as the ability of educators to set goals, collect, analyze and interpret data, and take guiding actions [5].

In order to deeply understand the current situation of data literacy development of pre-service primary and secondary school teachers in China, this study designed the Data Literacy Questionnaire of Pre-service Primary and Secondary School Teachers, in hope of discovering the current situation of data literacy of pre-service primary and secondary school teachers, and drawing lessons from the relevant research results, as well as putting forward corresponding development suggestions and training strategies to help training institutions better cultivate the data literacy of pre-service primary school teachers.

## **II. METHODS**

### **2.1 Design of Questionnaire**

Teachers' data literacy can be categorized into four dimensions: conscious attitudes, basic knowledge, core skills and thinking methods [6]. According to the four dimensions of primary school teachers' data literacy, this study designed a questionnaire to survey data literacy of pre-service primary and secondary school teachers.

The questionnaire consists of two parts: the first part is the basic information of the respondents, which is the demographic part, mainly including the gender, age, region of school, educational background, etc. This part of information is used to describe the basic situation of the respondents. The second part is the survey of data literacy status of pre-service primary and secondary school teachers, which is the core content of this study. In this part, there are 40 items designed for the 4 dimensions of conscious attitudes, basic knowledge, core skills and thinking methods. Each dimension is designed with 10 options, and the 5-Point Likert Scale is adopted, where 1 represents strongly disagree, 2 represents disagree, 3 represents neither agree nor disagree, 4 represents agree and 5 represents strongly agree. The higher the score, the higher the data literacy level of the pre-service primary and secondary school teachers, vice versa, the lower the score, the lower the data literacy level of the pre-service primary and

secondary school teachers.

In order to make the questionnaire more reasonable and scientific, the questionnaire has been revised, improved and tested for many times on the basis of consulting experts in the field of educational technology and primary and secondary school teachers, so that it is of good reliability and validity.

## 2.2 Data Collection

The questionnaire is distributed online via the WJX.cn (<https://www.wjx.cn/>). The survey was conducted in the period between May 21, 2021 to August 14, 2021. A total of 397 questionnaires were collected, of which 366 were valid questionnaires, with an effective rate of 92.2%. The subjects of this survey are pre-service primary and secondary school teachers in Liaoning Province, China, of which 23.4% are men and 76.6% are women; The age distribution is mostly focused between 20 and 25; In terms of regional distribution, cities account for 73.2% and rural areas account for 26.8%; In terms of educational background distribution, master's degrees account for 12.8%, bachelor's degrees account for 62.1%, and junior colleges account for 25.1%.

## III. RESULT

SPSSAU was used to analyze the questionnaire data in this research, and the average data literacy of pre-service primary and secondary school teachers was 3.79. From the four dimensions of conscious attitudes, basic knowledge, core skills and thinking methods, the mean value of each dimension is higher than 3 points. Among them, the mean value of basic knowledge is the highest, reaching 3.91; The mean value of conscious attitudes is the lowest, which is 3.68. Descriptive statistical analysis is detailed in the Table I.

**TABLE I. Descriptive statistical analysis**

VARIABLE	N	MEAN VALUE
CONSCIOUS ATTITUDES	366	3.68
BASIC KNOWLEDGE	366	3.91
CORE SKILLS	366	3.76
THINKING METHODS	366	3.79

Independent Samples T Test was used to analyze the differences of pre-service primary and secondary school teachers of different genders, to explore the differences of data literacy level

of pre-service primary and secondary school teachers of different genders. The F value of conscious attitudes dimension of pre-service primary and secondary school teachers of different genders is 11.268, and the P value is  $0.006 < 0.05$ , indicating significant difference; for the dimension of basic knowledge, the F value is 12.395, and the P value is  $0.003 < 0.05$ , indicating the P value reaches a significant level; for the core skills dimension, the F value is 10.128, and the P value is  $0.001 < 0.05$ , indicating the P value reaches a significant level; In the dimension of thinking methods, the F value is 9.251, and the P value is  $0.001 < 0.05$ , indicating the P value reaches a significant level. Therefore, there are significant differences of data literacy in conscious attitudes, basic knowledge, core skills and thinking methods among pre-service primary and secondary school teachers of different genders, and the data literacy level of male pre-service primary and secondary school teachers is generally higher than that of female pre-service primary and secondary school teachers. As shown in Table II.

**TABLE II. Independent samples T test**

<b>VARIABLE</b>	<b>F</b>	<b>SIG.</b>
CONSCIOUS ATTITUDES	11.268	.006
BASIC KNOWLEDGE	12.395	.003
CORE SKILLS	10.128	.001
THINKING METHODS	9.251	.001

#### **IV. CONFERENCES AND DISCUSSION**

Teachers can effectively improve education and teaching by making educational decisions basing on data [7]. It is indicated by the analysis based on the survey documents that the data literacy of pre-service primary and secondary school teachers is on the upper-middle level as a whole. Male pre-service primary and secondary school teachers have better data literacy than female ones. Male teachers can have stronger data literacy concepts and awareness, can better understand data knowledge, can better use skills of data acquisition, collation and analysis, and then can better apply data to assist teaching and optimize teaching strategies.

In view of the above research results, the data literacy training of pre-service primary and secondary school teachers should be strengthened. Training courses related to data literacy should be offered for pre-service primary and secondary school teachers in colleges and universities, and data literacy should be regarded as a mandatory requirement for graduation, so as to ensure that pre-service primary and secondary school teachers have corresponding data literacy before officially becoming teachers.

#### 4.1 Limitations of Research

This study is an exploratory small-scale study, so the results cannot be considered as universally true. The research samples of this study are limited to pre-service primary and secondary school teachers in Liaoning Province, China, and the range of samples does not cover the whole country. Due to the differences in economic and educational development in different regions and provinces, there may be great differences in the data literacy of pre-service primary and secondary school teachers in different regions. Therefore, this study is somehow limited, and the number and coverage of samples should be expanded in future research.

#### 4.2 Enlightenment for the Future

This study has a better understanding of the data literacy of pre-service primary and secondary school teachers via the survey. Teachers can use data information to improve their education and teaching [8]. And the way to use data information to improve teaching will be the focus of the following research.

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