Research on Data Literacy Cultivation Strategies for Normal University Students under the Background of Big Data

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Abstract: In December 2021, the National Conference on Education Informatization Work was held, proposing the digital transformation of traditional schools. With the advancement of global digitalization, the value impact of intelligent education on society is inestimable. How to make normal university students improve the awareness of applying data in future teaching in the trend of big data, cultivate their initiative in learning teachers' data literacy courses, improve their ability to obtain data information, and enable them to correctly process relevant data and further analyze, is what we need to think and study. This paper mainly takes Zhaoqing University as an example, through SPSS data analysis of the factors affecting the data literacy of normal university students, combined with the basis of big data background, to find suitable methods for normal university students to improve comprehensive data literacy, so as to provide some reference suggestions for normal university students to improve data literacy.

Keyword: Big Data; Normal University Students; Data Literacy; Influencing Factor

1. Introduction

In today's digital age, data plays an indispensable role. As future educators, normal university students are an important group responsible for cultivating all kinds of talents in the future, and data literacy is crucial to their professional development. Especially during COVID 19, data is the key bridge of real-time distance teaching and learning between teachers and students in the field of education. The Ministry of Education has also released the education informatization 2.0 action plan, the artificial intelligence booster teachers team construction action pilot notice and other documents, promote artificial intelligence, intelligent learning environment and teacher education course comprehensive fusion [1] and improve teachers' information literacy, to ensure that teachers take the initiative to adapt to the challenge of information technology such as artificial intelligence. The 2022 "Teacher Digital Literacy" education industry standard issued by the Ministry of Education clearly points out that teachers' awareness, ability and responsibility of teachers to optimize, innovate and change education and teaching activities by using digital technology [2].

In response to the call of national education digitalization, schools and institutions at different levels have introduced new education models and introduced new digital equipment to varying degrees. Facing the effective use of these educational and teaching resources to realize the optimization of teaching process, they all test the overall level of data literacy of normal university students. However, data literacy can help normal university students to build a new teaching system and constantly improve it, and solve the difficulties and challenges faced in the process of digital teaching. Based on this, this paper will take the normal students of Zhaoqing University as an example, study various factors affecting the data literacy of the cultivation of normal students under the background of big data, and put forward feasible suggestions for this kind of training strategy.

2. The Concept of Data Literacy for Normal University Students

In recent years, the investigation of data literacy ability in China has been gradually added to the teacher qualification evaluation content. The data literacy level of normal university students will directly affect the effect of using data to guide teaching practice in the future [3]. Therefore, in response to the era of big data, cultivating teachers with data

literacy advancing with The Times has become an important content of the training of college normal university students. What exactly is data literacy? Data literacy refers to people's awareness and ability to effectively and properly discover, evaluate and use information and data, to keenly construct, acquire, process and analyze from the scene, and finally take the results dialectically as a kind of ability literacy [4] of information support decision making. And normal data literacy concept is normal information literacy concept in education big data application background of expansion and extension, is the face of education big data show a comprehensive processing ability, it mainly includes data consciousness, data acquisition ability, data analysis and understanding ability, data using decision-making ability and data ethics five aspects. Through literature analysis, we found that the research and less on normal students data literacy at home and abroad, this paper is based on the background of big data to normal data consciousness, skills, data ethics, data requirements, etc, explore the status quo, understanding and comb the big data under the background of the connotation of data literacy.

3. Factors Affecting the Training of Normal University Students' data Literacy

In order to understand the actual situation of data literacy of normal university students, this paper takes Zhaoqing University normal University students as the investigation object, and randomly sends questionnaires to normal university students of different grades and majors to investigate the current situation of data literacy of normal university students and various factors affecting the cultivation of data literacy of normal university students. The core content of the questionnaire is mainly aimed at the core elements and willingness needs of normal university students' data literacy, including data awareness, data skills, data ethics and data needs.

This survey on normal university students' data literacy was mainly conducted by sending online questionnaires, and 347 valid questionnaires were collected. The subjects of this survey are four-year undergraduate normal university students, which are representative from the aspects of region and gender, as shown in Figure 1.
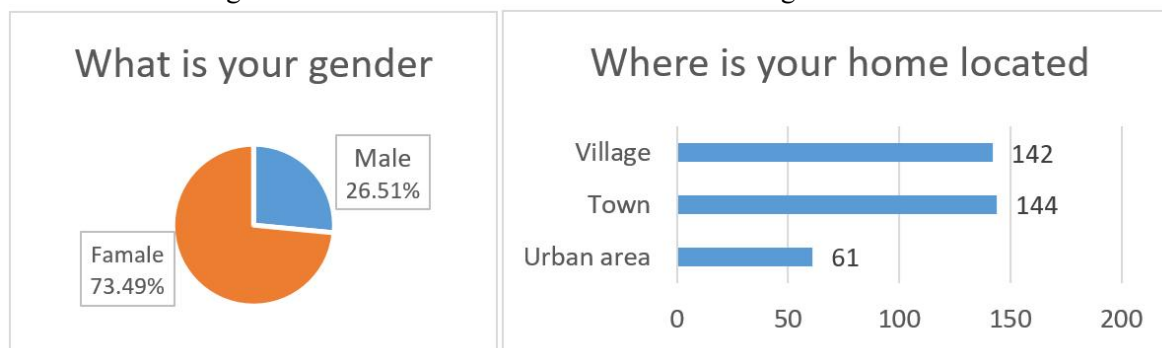

Figure 1. Gender and Geographical Proportion of Normal University Students

3.1 Data Awareness

Data awareness refers to the psychological tendency that normal university students show when collecting, sorting and analyzing data through observation, experiment and other exploratory activities. It is also an important factor affecting the training of teachers' data literacy and an important means to improve scientific literacy, as shown in Figure 2. The attitude of normal university students towards the application of data and its resources includes the willingness to actively learn and use data resources, as well as the initiative to carry out digital practice, exploration and

innovation in education. According to the investigation results of the current situation of data literacy of normal University students in Zhaoqing University, the computer level of normal university students is generally low, most of them stay in the examination level of computer courses offered by colleges and universities, the evaluation of self-data literacy is not ideal, and the overall degree of data awareness is not high. According to statistics, about 96.25% realize the importance of data in today's education field, but only 40.06% of normal university students understand the concept of data literacy, 23.92% of normal

university students have a superficial understanding of the connotation of data literacy, and only 2.94% of them have a good understanding of data literacy, as shown in Table 1. Therefore, focusing on improving the data awareness of normal university students is the most important part of the integration of normal universities into digital education, and we must pay attention to it.

As can be seen from the analysis of Table 2: In the variance interpretation table, when the number of principal components is 1, the feature root of variable interpretation is higher than 1, and the contribution rate of variable interpretation reaches 51.3%.
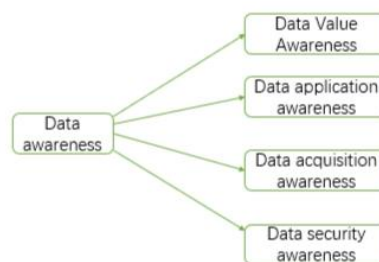

Figure 2. Classification of Data Awareness

Table 1. Data Awareness Questionnaire Analysis Frequency Graph

Name	Option	Frequent and continuous	Percentage (%)	Cumulative Percentage (%)
Do you have an understanding of the concept of "data literacy"?	1	10	2.882	2.882
	2	46	13.256	16.138
	3	83	23.919	40.058
	4	133	38.329	78.386
	5	75	21.614	100
You can describe at least one basic data tool or software (such as using Excel, SPSS, etc.) and its purpose, and be able to perform basic functional Operations.	1	49	14.121	14.121
	2	137	39.481	53.602
	3	130	37.464	91.066
	4	21	6.052	97.118
	5	10	2.882	100
You can understand the requirements for data quality, including data integrity, accuracy, consistency, and timeliness.	1	34	9.798	9.798
	2	95	27.378	37.176
	3	129	37.176	74.352
	4	66	19.02	93.372
	5	23	6.628	100
As a normal Student, you can have a very clear understanding of the position of data in today's education field.	1	80	23.055	23.055
	2	149	42.939	65.994
	3	105	30.259	96.254
	4	11	3.17	99.424
	5	2	0.576	100
Total		347	100	100

Table 2. Chart of Variance Analysis of Data Awareness

Component	Eigenvalue			Explanation of variance after rotation		
	Characteristic grain	Variance explanatory rate (%)	Cumulative Percentage (%)	Characteristic grain	Variance explanatory rate (%)	Cumulative Percentage (%)
1	3.08	51.300000000000004	51.300000000000004	3.08	51.300000000000004	51.300000000000004
2	0.948	15.8	67.10000000000001			
3	0.674	11.200000000000001	78.4			
4	0.536	8.9	87.3			
5	0.461	7.7	95			
6	0.3	5	100			

3.2 Data Skills

Data skill covers both hard skills such as programming and statistics, and software skills such as analytical ability and logical thinking. It is a comprehensive ability that can discern information from data and guide decision making. Data skills have become a necessary professional quality for normal university students to cope with the smart environment in the era of big data, which has been integrated into the education of normal university students and various kinds of teacher vocational training. The state has also introduced policies to emphasize that normal university students should pay special attention to the cultivation [5] of data technology ability.

Based on the survey results of Zhaoqing University normal students and SPSS analysis, it can be seen that only 42.93% of normal university students can accurately obtain the required data, 38.33% of normal university students can skillfully use Excel and SPSS for statistical analysis of teaching data, but only a small number of normal university students use SPSS software for in-depth data analysis, as shown in Table 3. Normal university students are often unable to flexibly exert their own data skills and reasonably apply them to today's digital teaching and teaching result evaluation, and can not efficiently complete teaching decisions. According to the research, this factor is the core driving force to improve the data acquisition ability and data analysis and processing ability of normal university students. In order to better adapt to the intelligent environment, major normal universities should train normal university students to master new information technology, timely update professional knowledge and ability structure, and actively encourage normal university students to participate in relevant skill competitions to ensure the freshness of data skills in education.

3.3 Data Ethics

Data morality is related to ethics, and it is an important factor to measure the level of data literacy of normal university students. Data ethics requires people to collect and use data ethically and responsibly, and interpret, analyze or act on it without bias. In the context of big data, ethical and legal issues related to all kinds of data resources emerge in an endless stream. How to safeguard intellectual property rights, how to reasonably protect personal privacy, and how to strengthen the security of network data are particularly important [6]. By using the questionnaire survey method, in the 347 valid questionnaires collected, through the SPSS data analysis, the questions about data ethics show that 84.72% of normal university students will consciously indicate the source of data in the process of using the Internet data survey to make relevant teaching plans and teaching documents, and 12.68% of them strongly agree. 34.58% agree, 37.46% agree. 92.51% of normal university students will privacy the real names in the negative impact data to be recorded in the course of teaching and lesson preparation, of which 24.21% strongly agree, 35.16% agree

and 33.14% agree. In addition, 67.15 percent of normal students believe that the rise of artificial intelligence will pose a potential threat to data privacy and security, and 51.59 percent of normal students believe that it will increase people's attention to data ethics issues. This shows that normal students in Zhaoqing University, for example, almost unanimously believe that it is very important to abide by data ethics when collecting and processing data, and the awareness of data ethics is deeply rooted in people's hearts. If normal students do not follow data ethics when making teaching plans and other documents, such as not marking the source of data collection and use, it may lead to infringement of others' intellectual property rights, which will lead to more serious consequences; If the privacy of real names is not processed in the negative impact data that needs to be recorded, negative public opinions may be generated for them, and even indirectly lead netizens to violence them online, which seriously affects their real life. Therefore, when normal university students collect, process and use data, they must develop a good sense of data literacy.

Table 3. Frequency Analysis Diagram of Data Skills Questionnaire

Name	Option	Frequent and continuous	Percentage (%)	Cumulative Percentage (%)
When consulting materials, you are often able to quickly and accurately obtain the data you need.	1	36	10.375	10.375
	2	113	32.565	42.939
	3	141	40.634	83.573
	4	52	14.986	98.559
	5	5	1.441	100
You can organize and integrate the original data well, eliminate erroneous or invalid data, and identify the relationships between the data	1	30	8.646	8.646
	2	106	30.548	39.193
	3	144	41.499	80.692
	4	62	17.867	98.559
	5	5	1.441	100
If there is no Ready-made data, you can organize corresponding activities or design questionnaires to generate and collect new data according to your needs.	1	32	9.222	9.222
	2	108	31.124	40.346
	3	139	40.058	80.403
	4	61	17.579	97.983
	5	7	2.017	100
You can proficiently use basic data statistical analysis tools and methods, such as using SPSS, Excel, and other software to conduct statistical analysis of teaching data.	1	34	9.798	9.798
	2	99	28.53	38.329
	3	135	38.905	77.233
	4	64	18.444	95.677
	5	15	4.323	100
You can explain the teaching meaning represented by each indicator in the statistical results and explain the current teaching/learning situation based on it.	1	36	10.375	10.375
	2	115	33.141	43.516
	3	134	38.617	82.133
	4	57	16.427	98.559
	5	5	1.441	100
You can effectively retrieve and obtain target data through databases or other means.	1	42	12.104	12.104
	2	114	32.853	44.957
	3	152	43.804	88.761
	4	34	9.798	98.559
	5	5	1.441	100
Total		247	100	100

3.4 Data Demand

The definition of data demand in the Data Management Maturity Assessment Model (DCMM) standard is: refers to the organization's description [7] of the classification, meaning, distribution and flow

of data generated and used in the process of business operations, business analysis and strategic decision-making. The data requirements management process identifies the required data, prioritizes the data requirements, and records and manages the data requirements in a documented manner. Applied to the practice of normal university students' data literacy, it is shown that they can clearly know what kind of data they need to collect when making teaching-related materials, and how to search on the Internet or in the library according to their needs. In the 347 valid questionnaires collected, SPSS data analysis shows that more than 85% of normal university students are satisfied with the construction and management of teachers' data literacy in the school library, among which 8.07% are very satisfied, 34.01% are satisfied and 41.79% are relatively satisfied. In addition, Normal university students have a strong demand for data, which indicates that Zhaoqing University's library can basically meet the data needs of normal university students. In the offline random interview, more than half of normal university students support the school library to carry out this service, which is conducive to improving their data literacy level; Under the background of big data, the rapidly developing information technology and the ever-expanding knowledge data make it more convenient for contemporary normal university students to search for data. This is reflected in the fact that 78.09% of normal university students are satisfied with the way to obtain data literacy knowledge, among which 7.78% are very satisfied, 31.12% are satisfied and 39.19% are relatively satisfied. It can be seen that it is very important to know your data needs before collecting data. Only by knowing your needs can you screen out the data you need in the flood of information.

4. Data Literacy Cultivation Strategy for Normal University Students

4.1 Establish the Standard System of Data Literacy Ability for Normal University Students

In the context of big data, data is widely used in the field of education, so it is very important to build a standard system of data literacy ability for normal university students. Normal

students are the educational practitioners of the future and need to be equipped with data-related knowledge, awareness and skills to suit their needs. However, at present, there are many problems and challenges in cultivating normal university students' data literacy. According to the evaluation index system of data literacy ability of teachers and students in colleges and universities constructed by LongQian [8], major colleges and universities should combine national policies and their own school-running characteristics to create a standard training system for their data literacy ability, provide scientific guidance, and ensure that the development of normal professional development meets the needs of The Times.

The content of constructing the data literacy ability system of normal university students should include many aspects. For example, in terms of subject concept and knowledge induction, normal university students need to understand the nature and characteristics of the subject, organically combine data analysis with subject content, and guide students to consciously carry out data-driven learning and research in teaching activities; In the training of data analysis and interpretation ability, normal university students can use correct data analysis methods to identify, quantitatively analyze and explain problems, and draw reasonable teaching conclusions and decisions; In the training of data ethics and expression level, normal university students, under the premise of fully respecting personal privacy and copyright, and following the principle of objective truth, use visual tools such as charts to effectively present and convey data information, so that data becomes easier to understand and use.

The construction of the standard system of data literacy ability of normal university students needs to be continuously improved and implemented in order to cultivate more education professionals with data wisdom and professional ability, so as to continuously promote the vigorous development of education.

4.2 Universities Take the Initiative to Offer Data Literacy Assessment Courses for Normal University Students

The data literacy assessment course for normal university students is a comprehensive course covering related knowledge fields such as data

management, data analysis and data security, which is an important guarantee for determining whether normal university students have the ability level of data literacy in line with digital education.

Setting up the data literacy assessment course for normal university students has an important influence and effect on cultivating high-quality and professional normal university students. Through the in-depth study and practice of the course, normal students can acquire comprehensive and systematic data literacy knowledge, including data management, analysis and application skills. This will help improve their ability to understand and use education data, and better use data to optimize education and teaching methods to meet the needs of digital education reform and development.

In addition, the implementation of data literacy assessment courses can effectively improve normal university students' ability of data processing and innovative thinking. In the course, normal students will face a variety of practical cases and need to introduce common data tools and technologies, such as Excel, Python programming, etc., for data analysis and research methods to solve problems. Through such practical training, normal university students will not only have a solid theoretical foundation, but also have the ability to think independently and innovate. Therefore, universities take the initiative to set up data literacy assessment courses for normal students to play a key role in the development of the education field and provide strong support for the formulation of new educational policies.

4.3 Innovate and Improve the Data Literacy Training and Qualification of Normal University Students

In the context of big data, the data content and types involved in the development of higher education are constantly increasing, and the requirements for data literacy of college teachers are also gradually improved [9]. Normal university students are the predecessor of future teachers, that is, pre-service teachers. In order to meet the requirements of the society on teachers, they need to improve their data literacy level, such as improving their data awareness, understanding their data needs, improving the ethical level of data processing,

and more importantly, cultivating their data literacy ability. Therefore, normal university students not only need to rely on self-discipline, but also need schools, society, government and other external forces to provide them with a training environment for data literacy. First of all, the government should give full play to its leading role in promoting the training of normal university students' data literacy, absorbing successful foreign training experience in accordance with the actual national conditions, and guiding normal university students to strengthen their data literacy ability. At the same time, China's education Bureau and relevant departments should attach importance to the training of normal university students' data literacy and relevant qualification recognition policies, and use information technology to open a series of relevant data resources in an orderly manner under the premise of ensuring data security and private information of normal university students, so as to realize the effective sharing of real data resources. In addition, relevant policies should be introduced to further innovate and improve the assessment content of data literacy of normal university students by referring to the training methods of data literacy of foreign normal university students, create a harmonious and excellent data cultural atmosphere, and effectively drive the data literacy of college teachers.

In addition, when improving the relevant policies for the qualification of data literacy of normal university students, the policies should not be too general and divorced from reality, but should be formulated according to the requirements for improving data literacy of normal university students in reality. Secondly, as the cradle of high-quality talent output in society, schools should implement the national innovation and development strategy and the strategy of strengthening talent under the original standards of improving the data literacy level and ability of normal university students, and adhere to the relevant policies issued by the government. At the same time, it is necessary to build a platform for normal university students to improve their data literacy and create good training conditions. First of all, each university should fully tap the internal scientific research data, administrative data and teaching data, expand the database capacity. Secondly, build a data platform

among universities to realize information sharing and reduce intermediate links. Then, through the data literacy improvement platform for college teachers, the education practice of data application is explored and the experience of data use is exchanged. Finally, the data literacy training of teachers within the platform should be strengthened to gradually improve their data application skills [10].

4.4 Under the Background of Big Data, the Advantages of Data Literacy of Normal University Students should be Mined to Establish a Good Data Environment

In the context of big data, it is indispensable for us to actively explore the advantages of normal university students in cultivating data literacy and establish a good data environment for them to learn and improve. To establish a good data environment for normal university students and cultivate their data literacy efficiently, the following measures can be taken:

(1) Carry out professional training: Normal colleges should provide relevant training courses on data analysis and processing for normal students, including data statistical methods, data mining techniques, data visualization, etc. Through systematic training, help them understand the basic concepts and techniques of data, improve the ability of data processing and analysis.

(2) Provide practical opportunities: Student institutions can provide practical cases and projects, and organize normal students to carry out data collection, cleaning, analysis and visualization. Through practical operation, help them to get familiar with the process and method of data processing, and cultivate the ability of practical application of data technology.

(3) Learning resource support: Normal universities should provide necessary data analysis tools and software platforms for normal students, such as SPSS, Python, etc., and provide data sets and related documents. This gives them more opportunities to practice and master data analysis skills.

(4) Focus on enhancing the awareness of data ethics and privacy protection: It is important to educate normal students to enhance the awareness of data ethics and privacy protection, so as to ensure that they understand the principles and ethics of lawful use of data,

do not violate the privacy rights of students, and comply with relevant laws and regulations.

(5) Encourage interdisciplinary cooperation: Promote exchanges and cooperation between normal university students and relevant disciplines such as data science and computer science. Through interdisciplinary collaboration, normal students can gain broader knowledge and experience in data technology from professionals in different fields.

Through the above measures, a good data environment can be established for normal university students, and their data literacy can be cultivated, so that they can better apply data technology in the field of education and promote the development and innovation of education.

5. Summary

Data comes out with The Times, and the data literacy of normal university students has become a hot topic in the field of education. For the cultivation of data literacy of normal university students, we should not only pay attention to the training of technical ability, but also improve the awareness of relevant data, especially for data security and moral awareness. With the increasing increase of education-related data, the risk of personal information leakage is increasing, normal university students should strengthen the awareness of the rationality and feasibility of data use, protect others' privacy and information security, and always keep in mind to practice good safety and moral standards in data processing and application. In this paper, the research and cultivation of data literacy of normal university students in all aspects is not only preparing for the development of information education, but also laying a foundation for the society to cultivate new talents with good data literacy.

This paper is the result of the topic of "investigation and cultivation of data Literacy status research —— Take Zhaoqing University as an example".

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