Research on the Evaluation of Information Awareness of Teachers in Contemporary Colleges and Universities Based on Grey Relation Degree Analysis

Juan Xu *
Hunan Modern Logistics Vocational and Technical College, Changsha, China

* Corresponding author e-mail: xujuan0822@163.com

Abstract. The information awareness of college teachers directly affects their speed and ability to obtain, judge and use information, and then affects the effectiveness of information teaching. In view of this, on the basis of constructing a scientific and systematic Information awareness evaluation index system for university teachers in the information age, eight experts were invited to empower the first-level indicators of the constructed indicator system; The evaluation model of information consciousness of college teachers in the information age was constructed by using grey correlation degree analysis method. Ten teachers of university in Changsha were selected to make an empirical evaluation of their information awareness, and the evaluation results were analyzed briefly.

1. Introduction
With the rapid development of information technology, the impact of information technology in all areas of society has become more and more obvious. Informatization has led to changes in all areas of society, and education is no exception. Since the leaders of the country put forward the "Internet +" action plan, The education sector has set off an upsurge of information technology integration education, and education has entered the era of great changes in education informatization. In the information age, how to change the educational methods and means and how to improve the teaching effect by information technology is a problem that teachers have to think.

2. Significance of Information Consciousness Evaluation for Teachers in Colleges and Universities
The information consciousness of college teachers directly affects their speed and ability to obtain, judge, and use information, which in turn affects the effectiveness of information teaching. It also indirectly affects students' learning, students' ability to obtain, judge, and use information, and students' quality. Therefore, It is very important to cultivate and enhance teachers' information consciousness.

With the rapid development of information technology, it is necessary to carry out the evaluation and research on the information consciousness of college teachers to meet the new demands of today's informatization and to meet the needs of education informatization. Through the comprehensive evaluation of the teacher's information consciousness, it provides a reference for teachers to better understand self-information consciousness, cultivate information consciousness, promote teachers to
improve their personal information awareness and information ability, and cultivate information literacy. At the same time, it is helpful for teachers to better understand the position of information consciousness in information teaching and to stimulate teachers' subconscious information behavior.

3. System of information consciousness evaluation index for college teachers

The evaluation index system is the key to the objective evaluation of teachers' information consciousness. A set of scientific and systematic Information awareness evaluation index system for university teachers in the information age provides a basis for objective evaluation of teacher information consciousness[1].

### Table 1 Information Consciousness Evaluation Indicator System of Teachers in the Information Age

| Primary Indicator | Weight (%) | Secondary Indicators |
|-------------------|------------|----------------------|
| Information awareness and demand awareness | 0.25 |  
|  |  | Have a correct understanding and understanding of information and information activities in the information society X11  
|  |  | Correct understanding of information education, active attention to education informationization and maintaining high enthusiasm X12  
|  |  | Recognizing the importance of information technology to education and teaching and willing to learn information technology knowledge X13  
|  |  | Actively face the rapid and massive information technology challenges in the information age, not afraid of information technology X14  
|  |  | Have a strong desire for knowledge X15  
|  |  | Strong sensitivity, judgment, and insight into information, enabling rapid and keen capture of information X16  
|  |  | Willing and consciously improve their level of informationization and maintain a high enthusiasm for new information X17  
|  |  | Awareness of lifelong learning X18  
|  |  | Innovative X19  
| Awareness of information acquisition and dissemination | 0.275 |  
|  |  | willing to learn and use information tools frequently X21  
|  |  | Skilled use of information acquisition methods X22  
|  |  | Willing to use information technology as a basic means of work X23  
|  |  | Ability to screen and judge information in a variety of information X24  
|  |  | Skilled in obtaining valid information X25  
|  |  | Frequently discuss with peers, exchange methods for capturing information, accessing information, and using tools X26  
|  |  | Ability to pass on the value, function, access, and use of information to students X27  
|  |  | Information technology can be used to provide students with information on pre-course exploration and after-school development X28  
|  |  | Can use the information technology such as network platform to communicate with students and discuss X29  
|  |  | Pay Attention to the Cultivation of Students' Information Consciousness X30  
| Information exchange and application awareness | 0.24 |  
|  |  | Can apply information reasonably to education and teaching X31  
|  |  | Can use information means to improve the effect of education and teaching X32  
|  |  | Ability to effectively integrate information with the courses taught X33  
|  |  | Ability to integrate information with personal knowledge systems X34  
|  |  | Effectively exchange information and cooperation with colleagues and subject experts in teaching and research, and actively influence others to enhance information awareness X35  
|  |  | The information resources collected can be processed and integrated into the information resources that they need. X36  
| Information Economy and Value Awareness | 0.15 |  
|  |  | Can recognize and tap the value of the information itself X41  
|  |  | Ability to process and deliver correct, timely information X42  
|  |  | Ability to integrate existing information and generate new information X43  
|  |  | Have the habit of inducing, classifying, and storing information X44  
|  |  | Can use information to solve problems in education and teaching, let information play its greatest value X45  
|  |  | Can effectively use information to solve problems in scientific research and let information maximize economic and social benefits X46  
|  |  | Can effectively use information to solve problems in life and let information play the most economic and social campus X47  
| Information Ethics and Safety Awareness | 0.083 |  
|  |  | Understand information laws and comply with information laws and regulations X51  
|  |  | In the process of obtaining, using, and exchanging information, you can abide by the various ethics in information activities. X52  
|  |  | Can consciously resist interference from harmful information X53  
|  |  | Can shield and clean up unwanted spam interference X54  
|  |  | Being able to maintain the security of social information by yourself X55  
|  |  | Deliver information that is good for students X56  
|  |  | Have a strong sense of confidentiality X57  

On the basis of reading a large number of relevant documents and understanding the connotation of information consciousness, defining the information consciousness of university teachers, it draws on the evaluation criteria of information literacy at home and abroad and the process of generating information needs, forming information psychological motives, recognizing information and consciously obtaining information, absorbing information, using information, and forming information capabilities. On the basis of taking full account of the opinions of experts in the field of colleges and universities, a system of information awareness evaluation indicators for university teachers with 5 primary indicators and 39 secondary indicators was established[2]. (As shown in table 1). Eight experts were invited to rank the importance of the indicators at each level and to calculate the weights of the indicators at each level, as shown in table 1. Due to the large number of secondary indicators, the weight of secondary indicators is assumed to be the same.

4. Gray Relativity Analysis[3] Evaluation model

Grey correlation analysis measures the degree of similarity between factors according to the degree of similarity of the direct development of factors. The degree of similarity between each evaluation object and the reference object, the higher the degree of similarity, the greater the degree of correlation; conversely, the smaller the degree of association[4]. According to the degree of correlation between each evaluation object and the reference object, the evaluation object can be sorted. In this paper, the grey correlation analysis method is used to evaluate the informatization consciousness of university teachers. Steps for grey correlation analysis:

1) Set the system to have n evaluation indicators, there are m objects to be evaluated, $x_{ij}(i=1,2,...,m; j=1,2,...,n)$ is the value of the first evaluation object under the jth evaluation indicator. The value matrix $X = (x_{ij})$ $m \times n$ can be formed.

2) In the standardized evaluation indicator data matrix $T$, calculate the "corresponding difference list" of each comparative series $t'_i = (t'_{i1}, t'_{i2}, ..., t'_{in})$ and the normalized reference series $T'_0$ (ie, find the absolute value of the difference between the normalized comparative series and the reference series $(1 \ldots 1)$ $\Delta y_j = |t_j - 1|$. Find the maximum and minimum values of all corresponding differences.

3) Take the resolution coefficient $\rho = 0.5$. Calculation of the correlation coefficient $\xi(k)$ and correlation degree $r_i$ of each comparative series and reference series based on the formula of grey correlation coefficient.

$$\xi(k) = \frac{\Delta \min + \rho \Delta \max}{\Delta_{0i}(k) + \rho \Delta \max} \quad (i = 1 \ldots m, k = 1 \ldots n)$$

$$r_i = \frac{1}{n} \sum_{k=1}^{n} \xi(k)$$

4) Evaluate the information awareness of the teachers surveyed according to the degree of correlation.
5. An Example of the Evaluation of Teachers’ Information Consciousness in the Information Age

Random selection of Changsha 10 college teachers to conduct Information awareness survey, 10 out of 10 teachers asked to score themselves, 10 teachers scored as follows Table 2

Table 2 The 10 selected teachers scored against their own information awareness evaluation indicators

| Index | A1 | A2 | A3 | A4 | A5 | A6 | A7 | A8 | A9 | A10 |
|-------|----|----|----|----|----|----|----|----|----|-----|
| X11   | 7  | 7  | 8  | 10 | 9  | 8  | 9  | 9  | 9  | 9   |
| X12   | 5  | 6  | 5  | 8  | 9  | 8  | 8  | 8  | 8  | 5   |
| X13   | 9  | 7  | 5  | 10 | 9  | 8  | 8  | 8  | 9  | 5   |
| X14   | 8  | 5  | 9  | 9  | 8  | 5  | 10 | 7  | 5  | 8   |
| X15   | 7  | 6  | 5  | 8  | 9  | 8  | 6  | 9  | 7  | 5   |
| X16   | 8  | 5  | 9  | 9  | 8  | 6  | 7  | 9  | 5  | 5   |
| X17   | 8  | 5  | 9  | 9  | 8  | 5  | 6  | 9  | 9  | 6   |
| X18   | 8  | 5  | 9  | 9  | 8  | 5  | 6  | 9  | 9  | 6   |
| X19   | 8  | 5  | 9  | 9  | 8  | 5  | 6  | 9  | 9  | 6   |
| X20   | 8  | 5  | 9  | 9  | 8  | 5  | 6  | 9  | 9  | 6   |
| X21   | 8  | 5  | 9  | 9  | 8  | 5  | 6  | 9  | 9  | 6   |
| X22   | 8  | 5  | 9  | 9  | 8  | 5  | 6  | 9  | 9  | 6   |
| X23   | 8  | 5  | 9  | 9  | 8  | 5  | 6  | 9  | 9  | 6   |
| X24   | 8  | 5  | 9  | 9  | 8  | 5  | 6  | 9  | 9  | 6   |
| X25   | 8  | 5  | 9  | 9  | 8  | 5  | 6  | 9  | 9  | 6   |
| X26   | 8  | 5  | 9  | 9  | 8  | 5  | 6  | 9  | 9  | 6   |
| X27   | 8  | 5  | 9  | 9  | 8  | 5  | 6  | 9  | 9  | 6   |
| X28   | 8  | 5  | 9  | 9  | 8  | 5  | 6  | 9  | 9  | 6   |
| X29   | 8  | 5  | 9  | 9  | 8  | 5  | 6  | 9  | 9  | 6   |
| X30   | 8  | 5  | 9  | 9  | 8  | 5  | 6  | 9  | 9  | 6   |

5.1 Analysis of grey correlation degree of secondary index

Since the dimensions of the indicators are the same, the standardization processing is omitted here to find a comparative sequence \( T^0 \). Calculate the difference \( |x_{ij} - \max_j x_{ij}| \) between the comparative series and the reference series (the difference between the comparative series of information cognition and demand awareness and the reference series is as shown in Table 3. The calculation results of the secondary indicators under other first-level indicators are abbreviated.) Find the maximum value \( \Delta \max = 9 \) and the minimum value \( \Delta \min = 0 \) in all corresponding differences in information cognition and demand awareness indicators. Find out the maximum value \( \Delta \max = 8 \) and the minimum value \( \Delta \min = 0 \) in all corresponding differences in information acquisition and dissemination awareness indicators. Find out the maximum value \( \Delta \max = 8 \) and the minimum value \( \Delta \min = 0 \) in all corresponding differences in information exchange and application awareness indicators. Find out the maximum value \( \Delta \max = 9 \) and the minimum value \( \Delta \min = 0 \) in all corresponding differences in information economy and value awareness indicators. Find the maximum value \( \Delta \max = 9 \) and the minimum value \( \Delta \min = 0 \) in all corresponding differences in information morality and security awareness indicators.
Based on the grey correlation coefficient $\rho = 0.5$, the correlation coefficient $\xi_j(k)$ and correlation degree $r_i$ of each comparative series and reference series are calculated. The 10 teachers’ relevance matrix $R_1$ in information awareness and demand awareness, information acquisition and dissemination awareness, information exchange and application awareness, information economy and value awareness, information morality and security awareness were calculated.

$$
R_1 = \begin{pmatrix}
0.692 & 0.549 & 0.702 & 0.396 & 0.720 & 0.435 & 0.755 & 0.449 & 0.755 & 0.524 \\
0.694 & 0.619 & 0.770 & 0.455 & 0.678 & 0.507 & 0.808 & 0.571 & 0.645 & 0.673 \\
0.678 & 0.520 & 0.757 & 0.378 & 0.645 & 0.418 & 0.779 & 0.393 & 0.817 & 0.451 \\
0.679 & 0.564 & 0.726 & 0.482 & 0.565 & 0.542 & 0.790 & 0.407 & 0.790 & 0.481 \\
0.733 & 0.432 & 0.667 & 0.419 & 0.661 & 0.463 & 0.612 & 0.56 & 0.541 & 0.574
\end{pmatrix}
$$

### 5.2 Comprehensive evaluation of level I indicators

Using the weight $W = (0.25, 0.275, 0.24, 0.15, 0.083)$ of the five first-level indicators as the right, the correlation degree $R = WR_1$ of 10 teachers is calculated in combination with the gray correlation degree of 10 teacher-level indicators. The correlation degree of 10 teachers is:

$$
R = (R_1, R_2, R_3, R_4, R_5, R_6, R_7, R_8, R_9) = (0.689, 0.553, 0.733, 0.422, 0.661, 0.468, 0.767, 0.471, 0.725, 0.544)
$$

### 6. Analysis of evaluation results

1. According to the calculated degree of correlation, the information consciousness of 10 teachers can be comprehensively evaluated: Since the maximum degree of association of 10 teachers’ information consciousness is 0.767 and the minimum value is 0.422, it can be said that the information consciousness of 10 teachers is generally not very high. It can also be speculated that the information consciousness of current college teachers is not very high. Although informatization has already had a certain impact on teachers, how to obtain, absorb, and use information is still in the exploration stage.

2. According to the degree of association, the information consciousness of 10 teachers can be sorted: the information consciousness of the 7th teacher is relatively strong, the information consciousness of the 3rd teacher is second, and the information consciousness of the 4th teacher is the weakest. Careful observation, the top two teachers information acquisition and dissemination awareness is relatively large degree of correlation.

According to the evaluation results, teachers can not only recognize the strength of their own information consciousness, but also improve their own information consciousness. Therefore, it can be said that in the information era, the evaluation of college teachers’ information consciousness can not only better measure the strength of information consciousness. It can also stimulate teachers
'awareness of information, and help teachers to obtain, judge, absorb, use, and exchange information, thus affecting teachers' teaching effectiveness and personnel training quality.

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