IOSR Journal of Research & Method in Education (IOSR-JRME)
e- ISSN: 2320–7388,p-ISSN: 2320–737X Volume 8, Issue 3 Ver. IV (May. – June. 2018), PP 01-07
www.iosrjournals.org

The Application of Fuzzy Comprehensive Evaluations in The College Education Informationization Level

Ling Ling Lu[1], Ming Xue Guo[2], Yong Wei Yang[2]
1. Faculty of History and Archaeology, Anyang Normal University, China
2. School of Mathematics and Statistics, Anyang Normal University, China
Corresponding Author: Yong Wei Yang

Abstract: *In this paper, the method of combining two-layer fuzzy comprehensive evaluation with two-level fuzzy comprehensive evaluation is used to quantitatively evaluate the informatization level of colleges and universities, which in some certain extent can overcome the subjective assumptions in the process of evaluation. The empirical analysis shows that this model can be used to evaluate and analyze the level of information efficiency in colleges, which can explore a new way to evaluate the college education informationization level.*
Keywords: *college education informatization, fuzzy comprehensive evaluation, index system*

Date of Submission: 02-06-2018 Date of acceptance: 18-06-2018

I. Introduction

As a part of the information society, the colleges informatization involves aspects such as the idea of running a school, the management system, the scientific research system, and the teaching method. It plays an important role in promoting the development of the educational theory, cultivating innovative talents adapted to the information age, and improving the quality of all people. The merits and demerits of the effectiveness evaluation system of university informationization have a direct impact on the objectivity and science of university information effectiveness. To make the informationization of colleges and universities develop in a rapid and healthy direction, it is necessary to establish a scientific and complete evaluation index system and corresponding evaluation methods which makes a reasonable measurement and evaluation of the informatization construction level of different universities, then it will guide universities and colleges to strengthen the construction and management of informatization and strengthen the service consciousness in the process of information planning.

The construction and development of colleges informatization in China has gone through three stages: the first stage is the construction stage of the campus network hardware platform, which belongs to the initial stage; and the third stage is that the colleges and universities moves towards the digital campus stage. The third stage is the digital campus planning and platform stage [1]. The evaluation of informatization in China began in 2002 with the "indicator system of Chinese Enterprise Informatization", which is mainly used to evaluate the level of informatization development and application of domestic enterprises [2]. At present, compared with other industries in China, the informatization construction of colleges and universities in China is still in the primary stage of exploration, but it has attracted the attention of many scholars. Based on the data of Jiangsu Provincial Informatization Yearbook (2010), Xiong analyzes the technical efficiency, scale efficiency and projection analysis of the investment benefit of educational informatization in some colleges and universities by using the data envelopment analysis method [3]. In view of the fact that the application system of informatization in higher vocational colleges involves a wide range of fields and has a large number of application service groups, as well as factors affecting the efficiency of informatization in higher vocational colleges, Guo [4] adopts the design method of "multi-factor analysis and multi-level progressive revision" to study the construction of the overall framework of information efficiency evaluation system in higher vocational colleges and uses the analytic hierarchy process (AHP) to comprehensively evaluate the evaluation system. Aim at the problem that it is difficult to determine the datum of quantitative index in the index system, Wu and Hu [5] used the fuzzy comprehensive evaluation method to evaluate the informationization level of colleges and universities. In order to overcome the subjective assumptions and obtain fair and reasonable results to a certain extent, the scientific evaluation of the informatization level of colleges and universities is carried out quantitatively.

Due to the wide range of information systems in colleges and universities and the numerous types of application services, the indicator benchmarks in the index system are difficult to keep constant, and it is difficult to make accurate and reasonable calculations based on traditional mathematical methods. To solve this problem, the method of combining two-layer fuzzy comprehensive evaluation and two-level fuzzy comprehensive evaluation in fuzzy set theory is used to quantitatively evaluate the informatization level of colleges and universities, so as to overcome the subjective assumptions in the process of evaluation to a certain extent. The effectiveness of this method is verified by empirical analysis.

II. Establishmenting The Evaluation Index System Of Informatization In Colleges

In 2001, the Ministry of Information Industry announced the "National Informatization Indicators Composition Program", which consists of 20 indicators. According to the system structure of national information technology, the program is based on the development and utilization of information resources, the construction of information networks, and the application of information technology, information technology and industry development, information talents, information policies and standards. The purpose of evaluating the effectiveness of the informationization level in colleges and universities is to provide a reliable basis for the decision making of the informationization of the education sector. According to the current research status, combined with the actual situation of Chinese universities, and based on the principles of comprehensive objectivity, scientificity, dynamics, and operability of index system construction, we have established a multi-level evaluation index system for university information effectiveness. (See Table 1).

Table 1 The colleges information efficiency hierarchical structure

Factors	Sub-factors
Information strategy U_1	Information construction planning level u_{11}
	The highest leader status of information work u_{12}
	The proportion of total investment in information construction to the total investment in colleges u_{13}
	Information policy u_{14}
	Per capita funding growth rate u_{15}
Infrastructure construction U_2	Campus network construction level u_{21}
	Proportion of multimedia classrooms u_{22}
	Computer networking rate u_{23}
	Network equipment and servers u_{24}
	Electronic reading room u_{25}
	Per capita computer ownership u_{26}
	Video and audio on demand system u_{27}
Information resources U_3	Multimedia software and courseware level u_{31}
	Resource retrieval level u_{32}
	Network resource database total capacity u_{33}
	Digitization ratio of teaching resources u_{34}
	Http and ftp resource ownership u_{35}
	Electronic book ownership u_{36}
Information application U_4	Digital teaching application level u_{41}
	Office automation application level u_{42}
	Campus card construction level u_{43}
	Teaching management system u_{44}
	Scientific research management system u_{45}
	Application of distance Education u_{46}

Human resources U_5	The popularization rate of teachersundefined information-based teaching skills u_{51}
	Pass rate of Information Technology Certification examination u_{52}
	Information technology talent ratio u_{53}
	Information technology training program and measures u_{54}
Information security and management U_6	Improvement and implementation of Information Security rules and regulations u_{61}
	Information services programmes and measures u_{62}
	User Unified identity Authentication system u_{63}
	Investment ratio of information security funds u_{64}

III. Fuzzy Comprehensive Evaluation Method Of Informatization In Colleges

Fuzzy comprehensive evaluation is an application of fuzzy mathematics. It uses the principles of fuzzy transformation and maximum membership degree, evaluating all relevant factors to make a comprehensive evaluation. This is an efficient evaluation method to evaluate objects that are affected by various factors. For objects that are influenced by a few factors, we can use one-layer models. If the objects are complicated and the number of the factors is large, we can use models with two or more layers. In this paper, we used a fuzzy comprehensive evaluation model with two layers and two levels as a tool for teaching performance evaluation. The application steps of fuzzy comprehensive evaluation are as follows:

Step 1: Establishment of The factor set and the comments set. The factor set is a set of factors that affect the object of evaluation, which is generally established by experts according to their research results and experience. According to the nature of the characteristics of the evaluation index system, the factor set in the evaluating relationship is as follows: $U=\{u_1,u_2,\cdots,u_m\}$. The evaluation comment set is as followed: $V=\{v_1,v_2,\cdots,v_n\}$. In the comprehensive evaluation of complex systems, because there are many factors to be judged and each factor should be given a certain weight, there must be the following problems: (1) it is difficult to assign weights; (2) no meaningful results can be obtained. For this kind of problem, we need to divide the elements of the factor set U into s classes $U_i=\{u_{i1},u_{i2},\cdots,u_{im_i}\}$ according to some attributes: they satisfy: (i) $m_1+m_2+\cdots+m_s=m$, (ii) $U_1\bigcup U_2\bigcup\cdots\bigcup U_{m_s}=U$, (iii) $\forall i,j$, $i\neq j\Rightarrow U_i\bigcap U_j=\Phi$.

Step 2: Establishing of the single-factor evaluation matrix R from U to V. Each factor u_i ($i\le m$) should be evaluated as a single-factor. As there are different types of evaluation levels, the evaluation result of each factor is a fuzzy set of evaluation set V which can be written as the fuzzy vector $r_i=\{r_{i1},r_{i2},\cdots,r_{in}\}$, $i=1,2,\cdots,m$. The results of these evaluations meet the normalized conditions and the sum of the weight of the vector is 1, that is, there is: $r_{i1}+r_{i2}+\cdots+r_{in}=1$.

All of the single-factor evaluations constitute the fuzzy relationship R from U to V: $R=(r_{ij})_{m\times n}$. That is, $R=(r_{ij})_{m\times n}=\begin{bmatrix} r_{11} & r_{12} & \cdots & r_{1n} \\ r_{21} & r_{22} & \cdots & r_{2n} \\ \cdots & \cdots & \cdots & \cdots \\ r_{m1} & r_{m2} & \cdots & r_{mn}\end{bmatrix}$, where r_{ij} presents the grade of membership of factor u_i aiming at the comment v_j. We denote the single-factor evaluation matrix from the sub-factor set $U_i=\{u_{i1},u_{i2},\cdots,u_{im_i}\}$ to the comments set V by $R_i=\begin{bmatrix} r_{i_1 1} & r_{i_1 2} & \cdots & r_{i_1 n} \\ r_{i_2 1} & r_{i_2 2} & \cdots & r_{i_2 n} \\ \cdots & \cdots & \cdots & \cdots \\ r_{m_i 1} & r_{m_i 2} & \cdots & r_{m_i n}\end{bmatrix}$.

Step 3: Determining of the factor weighs. In the concentration of factors, the importance of each factor in the evaluation system is not the same. Therefore, in order to reflect the importance of each factor, each factor must be given corresponding weight. That is, we give a fuzzy set on the set of factors $A=(a_1,a_2,\cdots,a_m)$, where a_i is a measure of the influence degree of the factor $u_i(i=1,2,\cdots,m)$ in the total evaluation, and to a certain extent represents the ability to evaluate the grade according to the single factor, A is called the index weight set. The weight subset of the sub-factor set $U_i=\{u_{i1},u_{i2},\cdots,u_{im_i}\}$ subset is $A_i=(a_{i1},a_{i2},\cdots,a_{im_i})$, On the basis of making full use of expert wisdom and experience, this paper uses Delphi method to determine the weight of factors. Here we take the evaluation of a college's informatization level as an example to illustrate the application of the above-mentioned fuzzy comprehensive evaluation model.

Step 4: The method of combining two-layer fuzzy comprehensive evaluation with two-level fuzzy comprehensive evaluation. (i) The *results* of an evaluation can be obtained through multiplying the vector of the factor weight A_i and the matrix R_i of single-factor evaluation: $B_i=A_i*R_i=(b_{i1},b_{i2},\cdots,b_{in})$, where $*$ is fuzzy composite operation. The fuzzy composite operation between two fuzzy sets has many operational models to choose, such as the main factor protruding type $M(\cdot,\vee)$, the weighted average type $M(\cdot,+)$, the small upper bound type $M(\wedge,\oplus)$, etc. Each model has its own characteristics and scope of use. In general, we usually adopt the weighted average type $M(\cdot,+)$, which takes all factors into account according to the weight. (ii) Carrying on the two-layer fuzzy comprehensive evaluation. Let $A=(A_1,A_2,\cdots,A_s)$ be the index weight set of $U=\{U_1,U_2,\cdots,U_s\}$. A two-level fuzzy comprehensive evaluation matrix based on one-layer fuzzy comprehensive evaluation is

$$R=\begin{bmatrix} B_1 \\ B_2 \\ \vdots \\ B_s \end{bmatrix}=\begin{bmatrix} A_1*R_1 \\ A_2*R_2 \\ \vdots \\ A_s*R_s \end{bmatrix}.$$

The two-layer fuzzy comprehensive evaluation is obtained as follows: $B=A*R=(b_1,b_2,\cdots,b_n)$, where B is evaluation result based on all factors in index system U. The k-th element b_k is membership of the evaluation object with regard to k-th element in the comment set. (iii) In the process of one layer fuzzy comprehensive evaluation, if only one kind of evaluation index is used to analyze the result, the final result may be one-sidedness. Therefore, we give a two-level fuzzy comprehensive evaluation model. It is combined with the two-layer fuzzy comprehensive evaluation. In the process of one layer fuzzy comprehensive evaluation, if only one evaluation model is used to analyze the results, the final result may be one-sided. Therefore, we further provide a two-level fuzzy comprehensive evaluation model to combined with two-level fuzzy comprehensive evaluation. From different perspectives, some representative models (such as $M(\cdot,\vee)$, $M(\cdot,+)$, $M(\wedge,\oplus)$, etc.) are selected to carry out two-layer fuzzy comprehensive evaluation. Let the resulting fuzzy comprehensive evaluation matrix be as follows:

$$A*_1R=B_1^*=(b_{11}^*,b_{12}^*,\cdots,b_{1n}^*),$$

$$A*_2R=B_2^*=(b_{21}^*,b_{22}^*,\cdots,b_{2n}^*),$$

$$\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots$$

$$A*_tR=B_t^*=(b_{t1}^*,b_{t2}^*,\cdots,b_{tn}^*),$$

Denote $U_0=\{B_1^*,B_2^*,\cdots,B_t^*\}$, which is called a second-level evaluation index set. Let the weight index set $A_0=(a_1^*,a_2^*,\cdots,a_t^*)$ of U_0. Taking $B_1^*,B_2^*,\cdots,B_t^*$ as rows to form a two-level comprehensive judgment matrix

$$R_0 = \begin{bmatrix} B_1^* \\ B_2^* \\ \vdots \\ B_t^* \end{bmatrix} = \begin{bmatrix} b_{11}^* & b_{12}^* & \cdots & b_{1n}^* \\ b_{21}^* & b_{22}^* & \cdots & b_{2n}^* \\ \cdots & \cdots & \cdots & \cdots \\ b_{t1}^* & b_{t2}^* & \cdots & b_{tn}^* \end{bmatrix}.$$

(iv) Using the weight set $A_0 = (a_1^*, a_2^*, \cdots, a_t^*)$ and the comprehensive evaluation matrix R_0 to do the fuzzy linear transformation $B_0 = A_0 * R_0 = (b_{01}, b_{02}, \cdots, b_{0n})$. The conclusion of the comprehensive evaluation can be obtained by the maximum membership principle.

IV. Experimental Results

Here we take the evaluation of a college's informatization level as an example to illustrate the application of the above-mentioned fuzzy comprehensive evaluation model.

Step 1: Establishment of the comments set. The comment set is a rating hierarchy established according to different needs. Here we consider the reliability and reality of the evaluation results. In the information effectiveness evaluation of colleges and universities, the comments are divided into five levels: "excellent", "good", "fair", "worse" and "very poor", then the comment set is

$V = \{v_1(\text{excellent}), v_2(\text{good}), v_3(\text{fair}), v_4(\text{worse}), v_5(\text{very poor})\}$.

Step 2: Establishing of the single-factor evaluation matrix R. The director of the college information center, the information officer, the representative of teachers and the representative of students are invited as assessors, and the content of the indicator is evaluated through the questionnaire form. The comprehensive evaluation matrix

$$R_i = \begin{bmatrix} r_{i_1 1} & r_{i_1 2} & \cdots & r_{i_1 n} \\ r_{i_2 1} & r_{i_2 2} & \cdots & r_{i_2 n} \\ \cdots & \cdots & \cdots & \cdots \\ r_{i_m 1} & r_{i_m 2} & \cdots & r_{i_m n} \end{bmatrix}$$

of the school's information efficiency level is obtained, where r_{kj} is the membership degree of the evaluation factor u_{ik} for the comment level v_j,

and the t experts gave their ratings T_{kj} on the evaluation factors, then $r_{kj} = \frac{T_{kj}}{\sum_{j=1}^{n} T_{kj}}$. According to the factor of Table 1, U is divided into 5 categories $U = \{U_1, U_2, U_3, U_4, U_5, U_6\}$. Then it can be concluded that the comprehensive evaluation matrices from $U_i = \{u_{i1}, u_{i2}, \cdots, u_{im_i}\}$ to $V = \{v_1, v_2, v_3, v_4, v_5\}$ are:

$$R_1 = \begin{bmatrix} 0.4 & 0.2 & 0.2 & 0.1 & 0.1 \\ 0.3 & 0.3 & 0.4 & 0 & 0 \\ 0.5 & 0.3 & 0.1 & 0.1 & 0 \\ 0.45 & 0.2 & 0.25 & 0 & 0.1 \\ 0.3 & 0.2 & 0.2 & 0.1 & 0.2 \end{bmatrix}, \quad R_2 = \begin{bmatrix} 0.4 & 0.3 & 0.2 & 0.1 & 0 \\ 0.3 & 0.2 & 0.3 & 0.2 & 0 \\ 0.5 & 0.4 & 0.1 & 0 & 0 \\ 0.45 & 0.25 & 0.1 & 0.1 & 0.1 \\ 0.35 & 0.2 & 0.15 & 0.2 & 0.1 \\ 0.2 & 0.25 & 0.3 & 0.1 & 0.15 \\ 0.4 & 0.2 & 0.3 & 0 & 0.1 \end{bmatrix},$$

$$R_3 = \begin{bmatrix} 0.2 & 0.5 & 0.1 & 0.2 & 0 \\ 0.3 & 0.4 & 0.2 & 0 & 0.1 \\ 0.3 & 0.3 & 0.2 & 0.1 & 0.1 \\ 0.1 & 0.3 & 0.4 & 0.2 & 0 \\ 0.2 & 0.4 & 0.1 & 0.1 & 0.2 \\ 0.4 & 0.2 & 0.2 & 0.1 & 0.1 \end{bmatrix}, \quad R_4 = \begin{bmatrix} 0.25 & 0.2 & 0.3 & 0.15 & 0.1 \\ 0.4 & 0.2 & 0.15 & 0.2 & 0.05 \\ 0.6 & 0.2 & 0.1 & 0.1 & 0 \\ 0.4 & 0.1 & 0.3 & 0.2 & 0 \\ 0.3 & 0.3 & 0.2 & 0.1 & 0.1 \\ 0.5 & 0.25 & 0.15 & 0.1 & 0 \end{bmatrix},$$

$$R_5=\begin{bmatrix}0.7&0.1&0.2&0&0\\0.4&0.2&0.1&0.2&0.1\\0.3&0.2&0.3&0.1&0.1\\0.5&0.3&0.1&0&0.1\end{bmatrix},\ R_6=\begin{bmatrix}0.6&0.2&0&0.1&0.1\\0.2&0.3&0.1&0.2&0.2\\0.7&0.1&0.1&0.1&0\\0.2&0.4&0.2&0.2&0\end{bmatrix}.$$

Step 3: Determining of the factor weighs. Twenty experts are invited to comment on the set of factors, according to the Delphi method we can gives the indicator weight set:

$A_1=(0.1922,0.1867,0.2376,0.1961,0.1874)$,

$A_2=(0.1436, 0.1272, 0.1298, 0.1326, 0.1535, 0.1677, 0.1456)$,

$A_3=(0.1673, 0.168, 0.1502, 0.1625, 0.175, 0.177)$,

$A_4=(0.1576, 0.1743, 0.1548, 0.1675, 0.1623, 0.1835)$,

$A_5=(0.2434, 0.2392, 0.2556, 0.2618)$,

$A_6=(0.2641, 0.2349, 0.2173, 0.2837)$,

$A=(0.1678, 0.1801, 0.1684, 0.1802, 0.1667, 0.1368)$.

Step 4: The method of combining two-layer fuzzy comprehensive evaluation with two-level fuzzy comprehensive evaluation. (i) The comprehensive evaluation results can be obtained by using the weighted average type $M(\cdot,+)$ to carry out a layer of fuzzy evaluation $B_i=A_i*R_i=(b_{i1},b_{i2},\cdots,b_{in})$, the results are as follows:

$B_1=(0.3962,\ 0.2424,\ 0.2234,\ 0.0617,\ 0.0763)$,

$B_2=(0.3657,\ 0.2553,\ 0.2101,\ 0.1005,\ 0.0683)$,

$B_3=(0.2510, 0.3501, 0.1983, 0.1162, 0.0845)$,

$B_4=(0.4094,\ 0.2087,\ 0.1991, 0.1421,\ 0.0407)$,

$B_5=(0.4736, 0.2018, 0.1755, 0.0734, 0.0757)$,

$B_6=(0.4143, 0.2585, 0.1020, 0.1519, 0.0734)$.

(ii) Carrying on the one-layer fuzzy comprehensive evaluation. Since the index weight set $A=(0.1678, 0.1801, 0.1684, 0.1802, 0.1667, 0.1368)$ of $U=\{U_1,U_2,\cdots,U_s\}$ and

$$R=\begin{bmatrix}B_1\\B_2\\B_3\\B_4\\B_5\\B_6\end{bmatrix}=\begin{bmatrix}0.3962&0.2424&0.2234&0.0617&0.0763\\0.3657&0.2553&0.2101&0.1005&0.0683\\0.2510&0.3501&0.1983&0.1162&0.0845\\0.4094&0.2087&0.1991&0.1421&0.0407\\0.4736&0.2018&0.1755&0.0734&0.0757\\0.4143&0.2585&0.1020&0.1519&0.0734\end{bmatrix},$$

then we use the main factor protruding type $M(\cdot,\vee)$, the weighted average type $M(\cdot,+)$, the small upper bound type $M(\wedge,\oplus)$ into two-layer fuzzy comprehensive evaluation, respectively, and we obtain that

$B_1^*=A*_1R=(0.0790, 0.0590, 0.0378, 0.0256, 0.0142)$,

$B_2^*=A*_2R=(0.3840, 0.2522, 0.1878, 0.1066, 0.0693)$,

$B_3^*=A*_3R=(1.0000, 1.0000, 0.9652, 0.6307,\ 0.4189)$,

Let the weight index set $A_0=(\frac{1}{3},\frac{1}{3},\frac{1}{3})$ of a second-level evaluation index set $U_0=\{B_1^*,B_2^*,B_3^*\}$. We get the two-level comprehensive judgment matrix

$$R_0 = \begin{bmatrix} B_1^* \\ B_2^* \\ B_3^* \end{bmatrix} = \begin{bmatrix} 0.0790 & 0.0590 & 0.0378 & 0.0256 & 0.0142 \\ 0.3840 & 0.2522 & 0.1878 & 0.1066 & 0.0693 \\ 1.0000 & 1.0000 & 0.9652 & 0.6307 & 0.4189 \end{bmatrix}.$$

(iv) The weighted average $M(\cdot, +)$ model is used to evaluate the weight index set $A_0 = (\frac{1}{3}, \frac{1}{3}, \frac{1}{3})$ and the comprehensive evaluation matrix R_0, that is,

$B_0 = A_0 * R_0 = (0.4877, 0.4371, 0.3969, 0.2543, 0.1675)$.

The result shows that the "excellent" probability of the college's informatization level performance is 0.4877; the probability of "good", "fair", "worse" and "very poor" is 0.4371, 0.3969, 0.2543, and 0.1675, respectively. According to the maximum membership degree principle, the comprehensive evaluation result of the college's informatization level performance is "excellent". Besides this, another implication from the distribution of $B_1, B_2, B_3, B_4, B_5, B_6$ vector weights is that the achievements regarding the "Information security and management" factor are not good as those for other factors. If we only use two-layer fuzzy comprehensive evaluation to reach the result, then according

$B_3^* = A *_3 R = (1.0000, 1.0000, 0.9652, 0.6307, 0.4189)$,

we cannot determine whether the college' informatization level performance is "excellent" or "good". The evaluation result is based on the method of combining two-layer fuzzy comprehensive evaluation with two-level fuzzy comprehensive evaluation. can largely overcome the subjective assumptions in the assessment process.

Acknowledgements

The works described in this paper are partially supported by Chinese Overseas Communications Ministry Collaborative Innovation Center-Study of Chinese Character Culture, Higher Education Key Scientific Research Program Funded by Henan Province (No. 18A110008, 18A630001) and Undergraduate Innovation Foundation Project of Anyang Normal University (No. ASCX/2018-Z112).

References

[1]. H Wang, H Wu, and Y Wang, Research about the evaluation system on the performance of university infromation, *Journal of East China Normal University (Natural Science) , S1,* 2015, 24-28.

[2]. D Li, Research on the performance evaluation of higher vocational colleges' informatization construction based on fuzzy-DEA, *Jilin Unversity,* 2014.

[3]. Q Xiong, Data envelopment-based analysis on performance evaluation in college education—taking Jiangsu province as an example, *Journal of Xuzhou Normal University(Educational Sciences Edition), 2(3),* 2011, 30-34.

[4]. P Guo, Research on the evaluation system of higher vocational colleges informatization efficiency, *Journal of Guangdong Communications Polytechnic, 13(1),* 2014, 13-15.

[5]. Y Wu, K, Hu, A study of evaluation of college informatization based on fuzzy comprehensive method,*Theory and Practice of Education, 30(7),* 2010, 7-9.

Ling Ling Lu "The Application Of Fuzzy Comprehensive Evaluations In The College Education Informationization Level" IOSR Journal of Research & Method in Education (IOSR-JRME) , vol. 8, no. 3, 2018, pp. 01-07.