

On the Performance of Teaching Digitalization by Use of Linear Regression Mathematical Method

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Abstract – With the extensive use of information technology and the development of education informatization infrastructure, the educational sector is placing increasingly high demands on the quality of instructors' informatization. The progress of education implementation is largely determined by level of informatization of instructors. Teachers are the most important entity of learning and determining factor. The modern and scientific assessment of the development of information learning is an essential element of education. This paper uses regression method to assess the teacher development information platform and numerical facts to confirm and determine a linear regression concept for the community. The multiple linear regression assessment techniques are used to develop the linear regression computational formula of the educational development of information stage, and the influence of different factors is analysed to develop a science-based assessment method to assess the education of instructors' information on the basis of the statistical analysis of the assessment indexes of the schooling implementation of the information stage.

Keywords – digitalization, linear regression, mathematical approach, IT, ICT.

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1. Introduction

With the creation of the digital gateway, the notion of digitization of education is introduced. The "Knowledge gateway" concept, that particularly promoted the use of knowledge technology within education, is formally suggested by the administering as a critical component of bringing education reform into the twenty-first decade. This approach by the United States has elicited encouraging responses from countries all around the world, and several governments have established plans to boost educational digitization with their own countries. Education and learning practices that are primarily conducted through the Internet are referred to as E-Learning. It tends to make comprehensive adoption of the educational environment offered by modern digital technologies, as well as a modern communication process and affluence of resources, to create an innovative learning approach [1], [2]; this learning approach will modify the responsibility of the teachers in conventional educating, as well as the correlation among teachers and students, significantly changing the educational structure and nature of learning. The following are the key characteristics of educational information technology. Digital teaching materials make use of multimedia, particularly hypermedia technologies, to structure, dynamically present, and depict content. Multimedia is increasingly being used in educational materials and research materials. They include not only information and images, and also sounds, animations, films, and three-dimensional simulations [3], [4], [5].

The Web can unite the world's academic materials into a pool of information being shared and accessed among instructors and students at any time and from any location, eliminating the previous exclusivity and limitations of many aspects of learning sources. The effective use of technology is the most effective component of education informatization today. The internet has been the most open object-oriented platform now, as evidenced by open content, analysis

of the design, and open functionality [6], [7], [8]. Open contents are defined as a seamless link among local and remote sources that may be increased at any moment; the open structure is defined as the usage of networking technologies to update education resources and enhance the functionality of the software at any time. The availability of detailed educational facilities which can endorse on-demand knowledge, timely acquiring knowledge, flexible having to learn, and personalized customized services are referred to as functional openness. The smart tutor platform implemented with artificial intelligence technological advances can learn and practice as well as provide assistance based on the various personality features and requirements of students. Educational informatization has substantially enhanced students' autonomy and independence throughout learning as a result of a growing acknowledgment of student-centered educational ideals. Students can get their texts and lecturers, as well as their courses and class times. The education system is also currently moving in the direction of cooperative learning activities. To encourage cooperative learning, technological advancement can be very useful [9], [10], [11]. Computer collaboration takes several forms, including online collaborative learning, collaboration at the front of the computers (including group activities), and computing cooperation (in which the system acts as a student's partner). Education's service aims are no longer restricted to university children; to foster continuous learning, a networking platform is provided by the teaching and learning community. This paper proposes an approach to effective model for learning implementation of the information assessment based on having inherited domestic and foreign scholars' studies on informatization and education implementation of the information assessment techniques [12], [13], after trying to sort out, analyzing, absorbing, having to learn from, and continuing to expand the research study. A descriptive assessment and overview of the existing state of academic achievement informatization assessment as well as related research findings; the classical grey theory is expanded, and a detailed assessment procedure for learning informatization depending on interval systems approach is suggested, all guided by qualitative approach. This research builds a linear regression mathematical model of education implementation of the information levels on every secondary index using multiple linear regression analytic techniques [14].

The use of digital technologies in the educational and studying procedure does not see the use of technologies in the education department. Which can be seen in the predictor system applications of

educational informationization in various countries? It must be linked to a grasp of the idea of educational informatization. The term "IT in Learning" is used while the theory of learning informationization is more widespread. As a result, most assessments focus solely on teaching digitization rather than education digitization [15].

In China, education informatization is defined as "not just responsible for regulating the advancement of services and the effectiveness and quality of teaching and acquiring knowledge, and also encourages academic management and university administration, and to accomplish its activities proficiently"; it has a wider connotation than IT in Learning. In terms of the categorization of an index, such indicator schemes are notably different from one another. Worldwide, there is no universal standard or assessment for educational informationization. For a country, area, or industry, there are no universal measurement standards. By each country's circumstances, every country is developing some norms that are appropriate for that country's situation." Furthermore, when examining these assessment findings on the effect of information technologies on education, the majority of the findings are pessimistic, and it is not clear that data technologies play a significant role in learning [16], [17].

In its "Knowledge Map: The Importance of Technology in Teaching," the World Bank reviewed the findings of these recent reviews and identified the issue: The effect of ICT in teaching is ambiguous and contentious. It is because there is still a shortage of generally accepted standard methodologies and indication systems for evaluating the impact of ICT in learning, and there is a disconnect among assumptions about the influence of ICT in learning and actual situations.

The Wuhan University of Technology performed research that looked at the complete procedure of higher learning informatization through many perspectives, developed a conceptual framework for higher learning informationization, and performed an experimental assessment of the situation in Henan Province. The educational architecture index, educational data resource index, educational network design index, educational data main structure level index, and educational data usage level index are created by University's Education Information Measurement Index. It is a system of indexes for assessing educational informatization [18].

Regarding the strategic aims of institutions, the research explores the development concepts and basic aspects of a higher learning informatization assessment index system and provided a series of higher learning implementations of the information assessment index system. Based on the Chinese

enterprise informatization indexes which have been declared and developed the fundamental index and assessment index of the informatization index system of universities and colleges depending on an examination of the domestic and international university implementation of the information evaluation system.

In regards to actual implementation, they performed a quantitative approach, an interviewing, and a survey method in 2018 to assess the current state of elementary and secondary education throughout China. For investigation, a variety of methodologies were being used. Peking University's School of Education investigated the implementation of the information progress of universities from October to November 2018. The building of network systems at Chinese universities isn't excellent, and the digital resources given by institutions are all still severely minimal, according to the relevant metrics [19].

2. Theory of Linear Regression and Basic Algorithmic

The so-called linear assessment is predicated on memorizing a massive amount of observational data and establishing the regression correlation among the dependent and independent variables that used a statistical approach. It is named regression analysis evaluation when the significant association analyzed only includes the dependent variable and one predictor variable; it is named multiple linear regression assessment when the correlation coefficient analyzed includes the dependent variable and multiple independent variables; it is separated into line linear regression once it is predicated on explaining the correlation among the independent variable and the dependent variable regardless the function representation of the correlation is linear or nonlinear, and it is separated into different linear regression once it is predicated on explaining the cause-effect relationship among the independent variables and dependent variables. A most fundamental analysis approach is generally linear regression evaluation. They evaluate the quantitative measures of the teaching implementation of the information educational assessment process, which may be considered as linear or near to linear, using a huge amount of data. First, specify the exact contents of the performance measures in the assessment process and their appropriate weights; secondly, evaluate the data, construct the associated matrix model, and execute computations; and lastly, identify what we require the weight matrix is the outcome of the study [20], [21], [22].

We summarised the educator development of information learning evaluation process into 3 evaluation criteria from three factors: theory, function, and practical application, that are basic theoretical expertise assessment index (concept), practical execution capabilities assessment index (action), and used during auxiliary educational evaluation metric (practice). They are represented by S1, S2, and S3, respectively, through investigation and research. There are various thorough and easy-to-measure numeric criteria within the 3 evaluation metrics, that are indicated by $x_1, x_2, x_3, x_4, x_5, x_6, x_7, x_8$, and x_9 . x_i ($0 \leq x_i \leq 1, 0 \leq i \leq 9$) is the basic cardinal value that corresponds to every quantitative index. Figure 1. depicts the link between evaluative indicators and quantitative variables [23], [24].

The basic conceptual information assessment criteria, practice operational capability assessment metrics, and real usage of auxiliary education evaluation criteria make up the teacher development of the information education evaluation process. There are various comprehensive and easy-to-measure variables under the 3 performance measures. Usage of regularly deployed applications, the using instructional media, process of learning via educational websites, usage of digital education web application, basic information of database, current teaching course materials, and classroom teacher feedback are examples of evaluation metrics.

3. Evaluation Method

We employ statistical approaches to create the linear correlation functional expressions among the dependent variable and the independent variable after learning a huge amount of observational data. The most fundamental analysis approach is usually linear regression analysis. Based on a huge amount of data, we examine the quantitative measures of the educator development of the information education testing system. To develop a comprehensive assessment method system for teacher development of information education, we must first evaluate the particular data of the evaluation criteria and their weights; then analyze the data, create the correlating decision matrix, and perform operations; and eventually, locate the weight matrix we require [25].

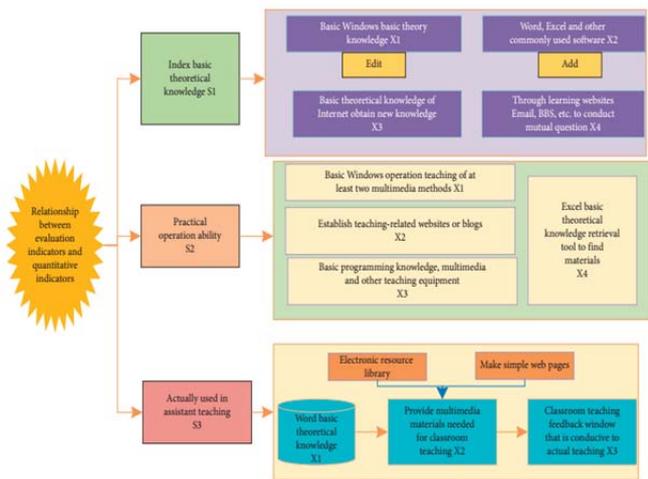


Figure 1. The correlation between performance measures and numerical variables is shown

Consider that the teacher data education numeric indicator model is linear or nearly linear, as described below:

- (1) The sample acquired is i ($i \in R$).
 - (2) The estimation index is S_j ($j \in R, 1 \leq j \leq 3$).
 - (3) The total of the quantitative index elements inside the evaluation metric makes up the column vector Y_j .
 - (4) The quantitative index is Y_i ($i \in R, 1 \leq i \leq 8, 0 \leq Y_i \leq 1$), and the j -th quantitative index under the i -th sample whose evaluation index is Y_j .
 - (5) The assessment index weights w_i .
 - (6) The mean square error is σ_i .
 - (7) Evaluation plan set
- $E = \{X_1, X_2, X_3, X_4, X_5, X_6, X_7\} = \{0.2, 0.3, 0.4, 0.6, 0.8\}$

The next equation must also be completed, as per the definition of linear regression:

$$S_i \beta = Y$$

Then, there is

$$S_i = [(x_{11}, x_{12}, \dots, x_{1j})],$$

$$Y_j = [(A_1, A_2, \dots, A_j)]^T,$$

$$S\beta = \begin{pmatrix} x_{11} & \cdots & x_{1j} \\ \vdots & \ddots & \vdots \\ x_{i1} & \cdots & x_{ij} \end{pmatrix} \beta = Y$$

Figure 2. depicts the appropriate evaluation method. To calculate x , conduct a linear regression using the least square approach.

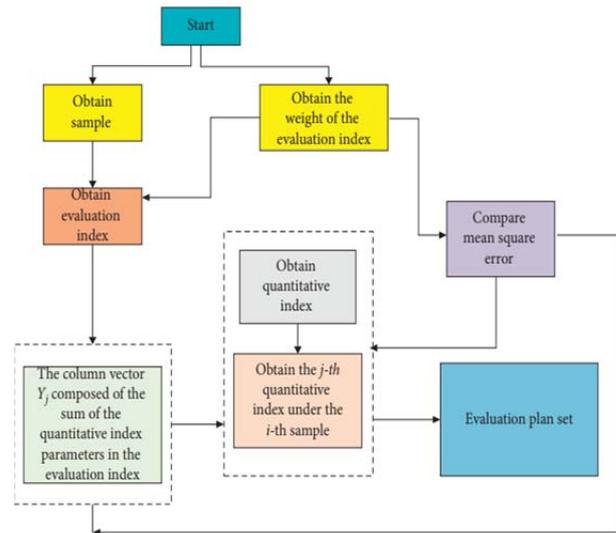


Figure 2. Professor Implementation of the information educational quantitative assessment algorithm

Planning and implementation, infrastructural development, teaching infrastructure development, implementation of the information applications, and informatization abilities are the five first-level predictors in the assessment indexes for educational informatization standard, with 20 second-level indicators and 50 three-level indicators [26]. Only the fundamental and supplementary indicators are examined in this research.

To evaluate the overall institution's level of academic informatization, it must be studied and generally validated from a variety of perspectives. Questionnaire survey, survey method, teacher-student conversation, and aptitude tests are some of the approaches employed in this issue. The general state of the university is explored in the survey method by constructing questionnaires for several objects [27], [28], [29]. The numerous data relating to every index gathered in various methods are weighted and totaled to produce the educational informatization assessment index and cumulative ranking of each institution by using the analytical hierarchy process. The data can describe the objective fact of educational informatization since it was collected using numerous methodologies and criteria [30].

4. Educational Assessment Using the Algorithm

The assessment and performance index system for educational development of information level is built around five first-level metrics: institution and strategic planning, infrastructural development, learning resource development, informatization implementations, and informatization abilities, as well as 25 second-level indicators and 50 third-level metrics. The primary and secondary indicators are the only ones considered in this paper's evaluation.

To objectively assess an institution's level of academic informatization, it must be studied and jointly verified from a variety of perspectives. Questionnaire surveys, field study, teacher-student dialogue, and ability tests are some of the approaches employed in this issue. The general condition of the institution was studied using questionnaires for several items in the survey questionnaires. The diverse data relating to each index gathered in various methods are weighted and totaled to create the educational implementation of the information evaluation index and the overall score of each institution applying the analytical hierarchy process. The data can represent the actual reality of education informatization because it was collected using numerous methodologies and metrics. The information comes from 70 elementary and secondary education, with 60 universities remaining once inaccurate data is removed.

5. Model Testing

The Regression Equation's Quality of Fit Of the model. The considerable significance of the regression analysis is indicated by the assessment coefficient $R^2 = 0.932$, which is extremely near to 1. The linear effects of $\{X_1, X_2, X_3, X_4, X_5, X_6, X_7\}$ on Y as a whole are quite substantial. The statistical significance for joining the analysis is set to 0.06, as does the probability value for rejected or maintained variables. Figure 3. depicts the analysis method of identifying factors and conducting analysis.

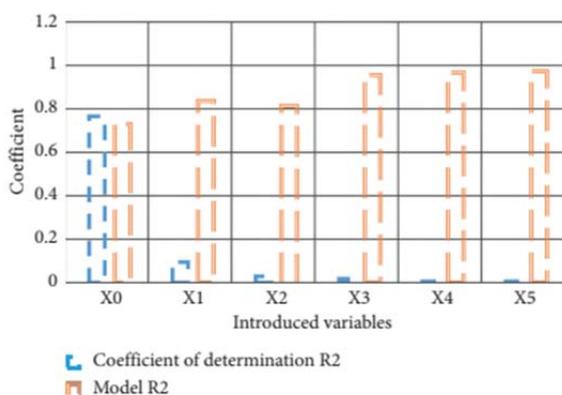


Figure 3. The regression equation's iterative linear coefficient

6. Conclusion

The properly functioning guidelines suggest that the proposed fill throughout differences in learning informatization culpability standards, theoretically enhance the architecture of the education-informatization system model, and in practice are crucial to boosting the emphasis of learning informationization from development to implementation via the normative role of guidelines transformation. Survey methods, field surveys, instructor conversations, and ability testing are among the methods used in this study. We apply the analysis methodology to weight and sum diverse data relating to key factors gathered in various methods of generating the excellent education assessment indicators and rating scale of each institution, even though we do not have simulation. The ideas in this article about functional criteria can be valuable resources for scholars, decision-makers, and professionals.

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