Evaluating the Economic Significance of Labor Education in Colleges and Universities within the Digital Era of Big Data

Meng Li[1] and Ye Liu[2*]

[1]School of Foreign Languages, CangzhouJiaotong College, Cangzhou, Hebei 061199, China
lm010368@163.com
[2]School of Public of Administration, Hebei University of Economics and Business, Shijiazhuang, Hebei 050061, China

Corresponding Author: Ye Liu, liuye_0618@163.com

Abstract. In order to improve the research effect of the economic value of labor education in colleges and universities, this paper combines big data technology to process labor education data. this study harnesses the power of big data technology to scrutinize labor education data. In order to solve the complex computational problem of the non-steady-state method, the Mass isotopomer of EMU is reorganized to model it separately, and the Mass isotopomer network is decomposed into strongly connected components to process ordinary differential equations in a parallel manner. The calculation results show that for the fixed step size model, the parallel method can achieve a speedup of 15 times at the fastest, and for the adaptive step size model, it can also achieve a speedup of 5 times. The analysis shows that the economic value research model of college labor education based on big data analysis proposed in this paper can play an important role in the research of labor economic value in colleges and universities, and at the same time verifies that college labor education has certain economic value.

Keywords: big data; labor education; economy; value; Digital Era
DOI: https://doi.org/10.14733/cadaps.2024.S16.239-254

1 INTRODUCTION

The application of technologies such as the Internet and virtual reality in labor education has expanded the place of labor education from the traditional classroom environment to the off-campus learning environment, and from offline to online. The training methods of labor education are diverse, and the online and offline blended teaching can enrich the classroom form of labor education. The first is scientific distribution and convergence. Different types of labor education should be carried out in different classroom forms. Technology and knowledge labor education should be taught online, while practical and service labor education is suitable for offline teaching [8].

According to the students' age characteristics and the law of physical and mental development, "tailor" for students. Teachers make full use of the platform data to analyze students' learning effects, timely feedback and adjust the teaching progress. Secondly, teachers should strengthen guidance. Online teaching requires teachers to screen and integrate online learning resources, make autonomous learning plans for students, arrange students to study independently and review after class, and set up Q&A, interaction, questioning, classroom testing and other links to ensure high-quality completion of teaching tasks [5]. It not only ensures students' independent learning time, dabbles in high-quality educational resources, but also timely communicates with teachers to achieve the desired learning effect. In the process of guiding students' online learning, teachers should not only respect students' autonomy and creativity, but also pay attention to cultivating students' self-consciousness and self-control. In addition, teachers should properly control the length of students' online learning so as not to affect students' visual health [2].

First of all, make rational use of labor education resources in family life, provide family education guidance for parents, and jointly achieve the goal of educating people. "It is necessary to teach students to learn the most commonly used and increasingly intelligent scientific and technological knowledge and labor skills in housework and daily life, which not only helps students to use new technologies, but also helps improve their ability to take care of their own lives [11]." We should change parents' inherent cognition of labor education, intentionally increase students' labor practice in daily life, and fill the gap in family labor education.

Schools should assume the main responsibility of labor education, improve the curriculum system of labor education, regularly carry out professional training on teachers' information education technology, set up unique labor education courses in combination with local characteristics, and improve students' labor skills from various aspects. For example, we set up billboards on the campus, broadcast micro videos to promote labor on the large screen in the corridor, and carried out works collection activities to honor the most beautiful labor [1].

The diffusion of campus culture will enable students to understand the beauty of labor in a subtle way and form a correct view of labor. Finally, actively coordinate the labor education resources in the society, form the resultant force of education, and create an integrated educational environment. In addition to organizing students to participate in labor education in the school practice base, the school can also carry out outdoor practice activities such as outdoor wind gathering and research travel [4]. Digital can further enhance its impact on students' economic prospects and society as a whole.

From the perspective of schools, through school-based training integrating information technology and education and teaching, organizing teachers to carry out online seminars on labor education or to observe and learn in other schools, teachers can improve communication, accumulate educational experience and bring forth new ideas. At the same time, teachers are encouraged to pay attention to the new concept of labor education, such as Guangming Daily Educators' Labor Education Round Table Forum. In addition, improve the assessment requirements for teachers' labor education and teaching ability, stimulate teachers to learn independently and consolidate their skills [14].

From the perspective of teachers themselves, improve professional ability and information literacy through online communication and learning, and use modern educational technology to guide labor education teaching practice. Establish a labor education research group with the help of the Internet, share and integrate labor education resources, and learn from advanced theoretical achievements at home and abroad. Actively participate in school-based training and off campus probation, adhere to the concept of lifelong learning, and timely update the education and teaching methods. With the help of big data and cloud computing on the Internet, the teaching model is evaluated, and teaching methods are adjusted to improve teaching quality. Reasonably position, make full use of existing education conditions, and combine local natural and cultural resources to develop labor education courses with regional characteristics [6].

From the perspective of curriculum, we should set up the labor education teacher major, improve the discipline status of labor education, and promote the professional development of teachers. First, teachers colleges and universities can set up labor education teacher training programs to provide professional teachers for universities, middle schools and primary schools, improve teachers' labor literacy, and promote the comprehensive development of students' moral, intellectual, physical, aesthetic and labor. Second, set labor education as a compulsory course in universities, middle schools and primary schools, improve the discipline status of labor education, and avoid psychological conflicts caused by the marginalization of teachers' roles [13].

Schools should actively self implement the national requirements for the development of labor education, and effectively incorporate labor education into the school's curriculum system planning, rather than writing labor education in the class schedule in name only. On this basis, it is of practical significance to develop systematic and open labor education textbooks [10].

The teaching materials of labor education in the "Internet+" perspective should not only focus on the systematicness of knowledge, but also on the interdisciplinary integration of knowledge systems. The education content should be inclusive, diversified and open. Vertically, textbooks are compiled according to the characteristics of physical and mental development of students at different ages, while maintaining the internal logical connection of the knowledge system of textbooks at different stages, so that students can build a complete knowledge system [3]. Horizontally, integrate the knowledge of various disciplines and the distinctive labor skills of various nationalities, and enrich the content and form of labor education. Then, according to the development of the times and social changes, timely update the teaching material system. Finally, improve the construction of electronic resource library, accelerate the completion of electronic construction of teaching materials, and facilitate the promotion of labor education practice [15].

As the primary carrier of implementing educational goals, the construction of labor education curriculum is extremely urgent. At present, there is no national textbooks for labor education, and teachers of labor education are the main force in curriculum development. "The construction and implementation of labor education curriculum is a systematic project, which requires systematic and holistic thinking to understand, grasp and promote the implementation" [12]. Secondly, relevant teachers need to do a good job of investigation and research, fully understand the characteristics of the college and the actual situation of students, and build a "comprehensive, practical, open and targeted labor education curriculum system" in line with the characteristics of the school [7]. According to the teachers' personal strengths and interests, a team of teachers will be formed to work together, collect and sort out the classic stories, audio and video, pictures and objects about the deeds and spirits of the advanced workers in the college, the industry, and the modern and contemporary times, focus on the development of digital resources to show the labor process, ensure labor safety, spread labor skills, and promote labor spirit, and compile typical cases from the front line of labor, Form a special teaching resource package for labor education to assist theoretical teaching and improve teaching effect [9]

In order to improve the research effect of the economic value of labor education in colleges and universities, this paper combines big data technology to process labor education data to improve the processing effect of labor education data.

2 A NEW LABELING ALGORITHM FOR NON-STEADY-STATE METABOLIC EDUCATIONAL FLOW DATA OMICS

2.1 Related Concepts

EMU (Elementary Metabolite Unit) refers to a fragment containing n educational traffic data particles, and the set of any educational traffic data particles. The EMU concept is similar to Isotopomer, but the meaning is different. EMU refers to educational traffic data particle fragments, not Isotopomers. The number of educational traffic data particles contained in a fragment is called EMU size (size). Each EMU has its corresponding Mass isotopomer.

Tensors can be regarded as data containers. The goal is to store high-dimensional data of multiple dimensions. The data is accessed through the subscript index of each dimension. Tensors are an extension of the concepts of vectors and matrices. First-order tensors are vectors, second-order tensors are matrices, and third-order tensors are called higher-order tensors. Figure 1 is a third-order tensor, and the three dimensions are I, J, and K, and higher-order tensors above fourth-order cannot be visually represented by graphics.

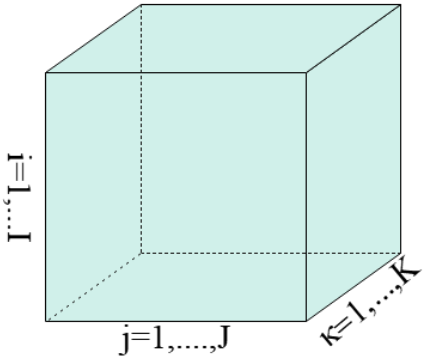
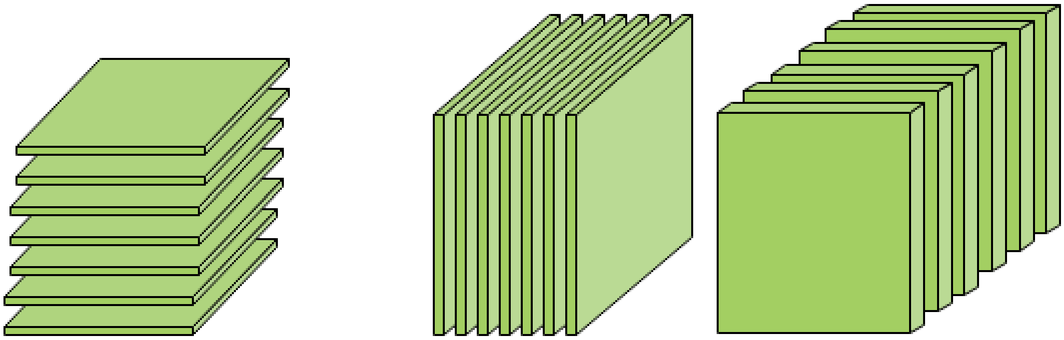


Figure 1: Third-order tensor.

Figure 2 is the horizontal, lateral and frontal three slices of the tensor, where the colon indicates that the subscript index is not fixed.



(a)Horizontal slices: Xi :j: (b)Lateral slices: X:j: (c)Frontal slices: X k (or Xk)

Figure 2: Tensor slices.

Tensor matrixing refers to rearranging the elements in a tensor and converting it into a matrix, such as a $2\times3\times4$ tensor can be converted into a 6×4 or 2×12 matrix, etc. The matrixing here is mode-n matrixing, and the corresponding relationship between the tensor element $(i_1,i_2,\cdots,i_N)$ and the matrix element (i_n,j) is as shown in formula 1.

$$j=1+\sum_{\substack{k=1\\k\neq n}}^{N}(i_k-1)J_k, J_k=\prod_{\substack{m=1\\m\neq n}}^{k-1}I_m \tag{1}$$

The two basic operations in tensor operations are the multiplication of tensors with matrices and vectors. For a tensor $X\in R^{I_1\times I_2\times\cdots\times I_N}$, the n-mode product $X\times_n U$ of a matrix $U\in R^{J\times I_n}$ is still a tensor with the same order, which is expressed as $I_1\times\cdots\times I_{n-1}\times J\times I_{n+1}\times\cdots\times I_n$, as in formula 2. The n-mode product of a tensor X and a vector $V\in R^{I_n}$ is also a tensor, but the order is reduced by 1, which is expressed as $I_1\times\cdots\times I_{n-1}\times I_{n+1}\times\cdots\times I_n$, as in formula 3. Multiplication of tensors and vectors is a common operation for dimensionality reduction of tensors.

$$(X\times_n U)_{i_1\cdots i_{n-1}ji_{n+1}\cdots i_N}=\sum_{i_n=1}^{I_n}x_{i_1i_2\cdots i_N}u_{ji_n} \tag{2}$$

$$(X\otimes_n V)_{i_1\cdots i_{n-1}i_{n+1}\cdots i_N}=\sum_{i_n=1}^{I_n}x_{i_1i_2\cdots i_N}v_{i_n} \tag{3}$$

Transitive closure is an important concept in graph theory. For a directed graph $G=\langle V,E\rangle$, the set of vertices is $V=\{1,2,\cdots,n\}$, and its transitive closure is defined as $G^*=\langle V,E^*\rangle$, where $E^*=\{(i,j)$: there is a path between vertices i and j}. The adjacency matrix and transitive closure of a directed graph are shown in Figure 3.

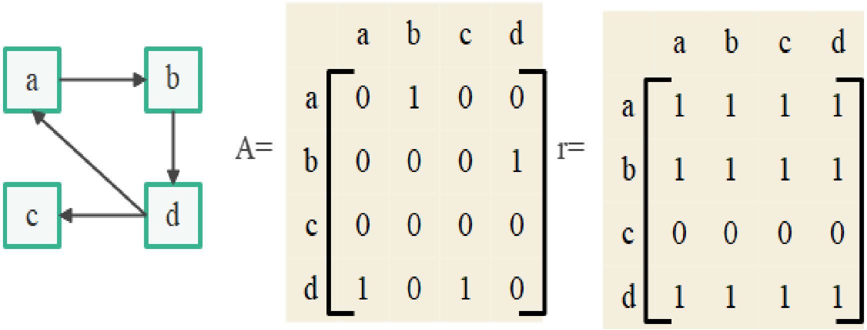


Figure 3: Directed graph with its adjacency matrix and transitive closure.

The classic algorithm for solving transitive closures is the Floyd-Warshall algorithm. The algorithm adopts a multiple traversal method, which is simple and easy to implement, and an example is shown in Figure 4.

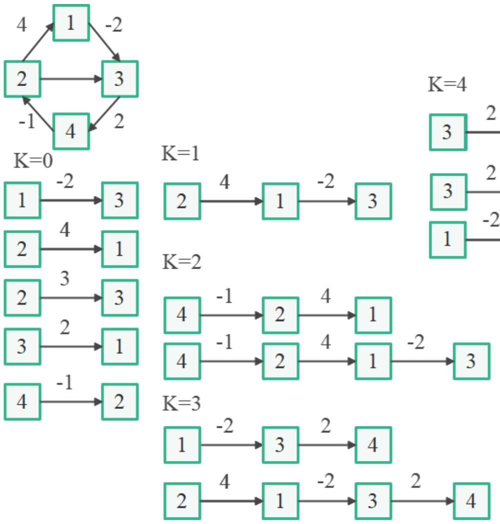


Figure 4: Example of the Floyd-Warshall algorithm.

For two vertices v_i and v_j in a directed graph G, if there is a directed path from v_i to v_j, and there is also a directed path from v_i to v_j, then vertices v_i and v_j are said to be strongly connected. If any two vertices of a directed graph G are strongly connected, then G is called a strongly connected graph. A strongly connected component is defined as a maximally strongly connected subgraph of a directed graph. Figure 5 is an example of strong connectivity components, including 3 strong connectivity components.

2.2 Network Construction

Each metabolic reaction has a response education flow data value. According to the metabolic network structure and constraint information, the education flow data is divided into free education flow data and constrained education flow data. The following describes the determination methods of free educational traffic data and restricted educational traffic data. We expand the number of rows of the metering matrix S, and add the content of the NET sub-block in the EQUALITIES and FLUXES blocks. Among them, each row in EQUALITIES can be represented as a linear combination of responses, as in formula 4. Moreover, each row in FLUXES can also be expressed in the form of Equation 4. The expanded matrix S^A is shown in formula 5, where a^i represents a row in EQUALITIES or FLUXES, and the value of the position of the corresponding column is the response coefficient value a_i. The algorithm performs elementary row transformation on S^A, and turns it into a row simplified echelon matrix, then the reflected education flow data corresponding to the column where the first non-zero element of the non-zero row is located is the constrained education flow data, and the rest of the education flow data is the free education flow data.

$$a_1 * V1 + a_2 * V2 + \cdots a_i * Vi = b \tag{4}$$

$$S^A = \begin{pmatrix} S \\ a^1 \\ \vdots \\ a^i \end{pmatrix} \tag{5}$$

The data values that reflect the initial educational flow are collected by the collection program. The realization of the acquisition program uses the OptGPSampler in COBRApy, which needs to pass in the response and various constraint information. For the small-scale FTBL network file, the resulting response network is shown in Figure 5. Among them, the yellow circles represent the EdF data particles for intracellular metabolites, the blue circles represent the EdF data particles for extracellular metabolites, and the green and blue arrows represent the EdF data particles transfer paths between metabolites.

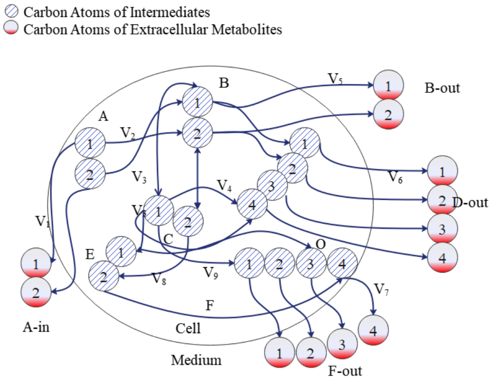


Figure 5: Small-scale metabolic network.

According to the EMU reaction information, the generation relationship between Mass isotopomers can be obtained, and the Mass isotopomer network is constructed, as shown in Figure 6, where the right side is the Mass isotopomer reaction expression corresponding to the EMU reaction on the left.

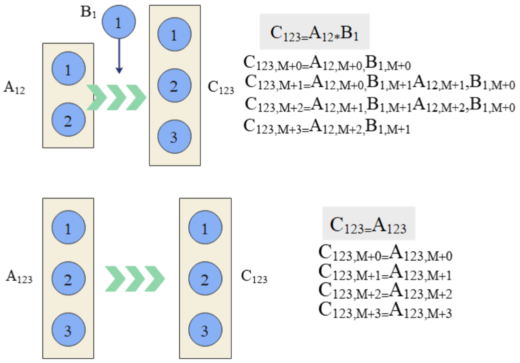


Figure 6: EMU and mass isotopomer reactions.

The Mass isotopomer network is represented in the form of a directed graph. The vertices in the graph are Mass isotopomers. If there is a generative relationship between two Mass isotopomers, there is a directed edge between the two vertices. According to the generative relationship, the Mass isotopomer marker network is transformed into a directed graph. To remove some unwanted Mass isotopomers, the measured Mass isotopomer under the MASS_SPECTROMETRY tag in the FTBL file was used as the endpoint. The transitive closure of the directed graph is calculated by the Floyd-Warshall algorithm, the Mass isotopomers that are not in the transitive closure are deleted, and the directed graph of the labeling network is reconstructed.

For an orphaned Mass isotopomer, treat it as an SCC with only one node. If a node in SCCA has a directed edge pointing to a node in SCCB, the topology priority of SCCA is considered to be higher than SCCB, SCCA is called the parent SCC of SCCB. The SCCs are reorganized by topological priority to demonstrate the dependencies among them, as shown in Figure 7a, representing the SCC decomposition reorganization of the Mass isotopomer network with quality 0(M_0).Through SCC decomposition, the Mass isotopomer network is transformed into different SCCs, and each SCC contains the original Mass isotopomer, as shown in Figure 7b. The purpose of SCC decomposition and recombination is to split the Mass isotopomer network into a series of small-scale SCCs for easy processing, and similar operations are generally applicable to other isotope labeling algorithms, such as Cummer and Isotopomer.

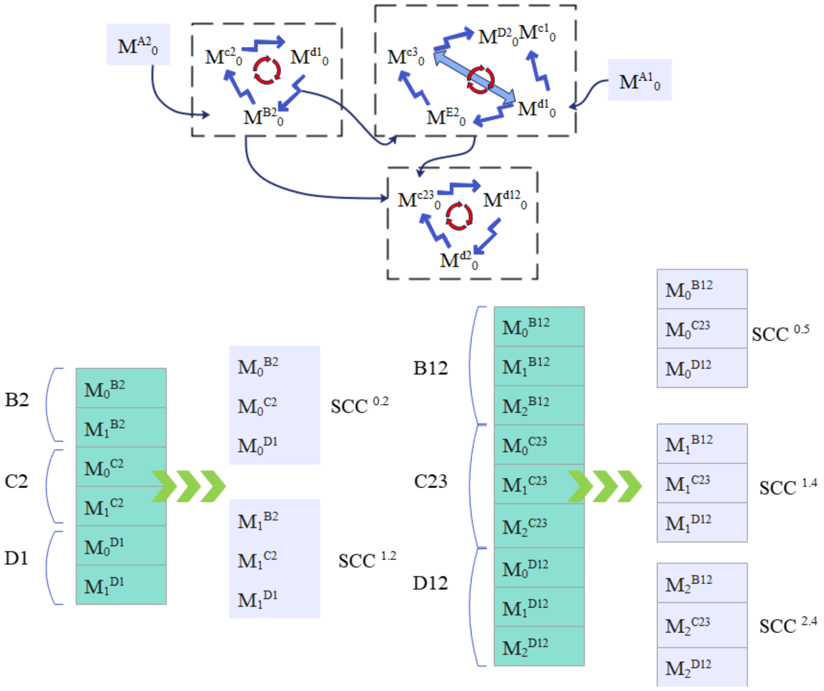


Figure 7: Mass isotopomer network SCC.

A. SCC decomposition and recombination of Mass isotopomer network with quality 0; B) SCC containing the original Mass isotopomer, the green background box represents the EMU vector, the yellow background box represents the Mass isotopomer SCC, the M subscript represents the quality, the superscript represents the EMU encoding, and the SCC superscript represents the quality and the same quality SCC index, respectively.

2.3 Labeling Algorithms in Tensor Form

This paper considers Mass isotopomer as an independent unit, and the algorithm is based on Mass isotopomer's SCC. Through the decomposition and aggregation of SCCs, the entire Mass isotopomer network can be split into a series of small and dependent SCCs, all of which can be expressed as formula 6.

$$SCC = \left(SCC^{1,1}SCC^{1,2}\cdots SCC^{i,j}\right) \tag{6}$$

EMU responses can be expressed uniformly by defining SCC responses. An SCC reaction with n reactants and one product is defined as formula 7.

$$SCC_1 + SCC_2 + \cdots + SCC_n \Rightarrow SCC_P \tag{7}$$

The Mass isotopomer distribution vector of SCC_P can be generated from the transfer tensors of all reactants, as in Equation 8. Among them, SCC_P represents the Mass isotopomer vector of the product SCC, and SCC_{R_n} represents the Mass isotopomer vector of the reactant SCC.

$$SCC_P = Q \otimes SCC_{R_1} \otimes SCC_{R_2} \otimes \cdots \otimes SCC_{R_n} \tag{8}$$

Q in formula 8 is a transfer tensor whose order is the sum of the number of reactants and products. The exact definition of Q is as in formula 9.

$$Q_{r,(i_1,i_2,\cdots,i_n,j)} = \begin{cases} 1, & if\ SCCR_{R_1}, SCC_{R_2}, \cdots, SCC_{R_n}\ of\ i_1, i_2, \cdots i_n\ individual\ \ MassIsotopomer \\ & On\ the\ \ r\ It\ is\ formed\ by\ combining\ three\ reactions\ \ SCCS_P\ \ of\ \ j\ individual\ \ MassIsotopomer \\ 0, & Other\ information \end{cases} \tag{9}$$

Every EMU reaction, whether it is a monomolecular reaction or a bimolecular reaction, consumes the Mass isotopomer for the reactants, which can be represented by the elimination matrix. The elimination matrix is defined as formula 10.

$$E_{K(i,j)} = \begin{cases} -1, & if\ \ i = j,\ \ And\ the\ \ K\ \ Each\ reaction\ consumes\ \ i\ \ individual\ \ MassIsotopomer \\ 0, & Other\ information \end{cases} \tag{10}$$

Based on the intermediate EMU reaction and Mass isotopomerSCC, a cascade of equations can be established, and the final Mass isotopomerSCC ordinary differential equations (ODEs) to be calculated are shown in formula 11.

$$C_{i_k,j_k}\frac{dSCC^{i_k j_k}}{dt} = \sum_p v_p Q_p^{(i_1,j_1),(i_2,j_2),\cdots,(i_p j_p)} \otimes SCC^{i_1,j_1} \otimes SCC^{i_2,j_2} \otimes \cdots \otimes SCC^{i_p j_p} + \sum_c v_c E_C SCC^{i_k,j_k} + \sum_{inp} v_{inp} Q_{inp} SCCC^{inp} \tag{11}$$

Formula 11 is a system of equations, in which each equation is generated by the EMU reaction. This paper takes an intermediate bimolecular EMU reaction as an example to illustrate a specific equation and the form of the sensitivity equation. The vectors of Mass isotopomer of each mass of the two reactant EMU fragments are x_{k1} and x_{k2} respectively, and the Mass isotopomer vector of the product EMU fragment is x_n. This reaction will contribute to the differential value of x_n, and the resulting equation is shown in formula 12.

$$\sum_n v * Q_n^{S1-1,S2-1} * x_{k1}^{S1-1} * x_{k2}^{S2-1} + \sum_m \sum_i v_m * T^i * x_m^i = C_{jj}^n \frac{dx_n}{dt} \tag{12}$$

The value of $\frac{\partial v^{cons}}{\partial v^{free}}$ needs to be obtained before solving the sensitivity equations. For the free education flow data, since they are independent of each other, there is formula 13.

$$\frac{\partial v_j^{free}}{\partial v_i^{free}} = \begin{cases} 1, i = j \\ 0, i \neq j \end{cases} \tag{13}$$

Our goal is to find the differential value of v^{cons} for each free educational flow data. From the meaning of the metrology matrix, we can know that S*V=0, and after rearranging S and V, formula 14 can be obtained, where cons represents constraint and free represents freedom.

$$\begin{pmatrix} S^{cons} & S^{free} \end{pmatrix} \begin{pmatrix} v^{cons} \\ v^{free} \end{pmatrix} = 0 \Rightarrow S^{cons} v^{cons} + S^{free} v^{free} = 0 \tag{14}$$

Formula 14 is a matrix equation system. For the kth row of the equation group, a specific equation can be written, and each v_l^{free} is used to find the implicit differential of the k-th row, and the formula 15 can be obtained. Combining Equation 13 and solving the system of equations 15, we get:

$$\sum_i S_{ki}^{cons} \frac{\partial v_i^{cons}}{\partial v_l^{free}} + \sum_j S_{kj}^{free} \frac{\partial v_j^{free}}{\partial v_l^{free}} = 0 \tag{15}$$

The sensitivity equation of formula 12 for each free educational flow data v_k^{free} is shown in formula 16, and the sensitivity equation for each compound C^L in the network is shown in formula 17. Among them, $C^L = C_{jj}^n$ means that the compound involved in the reaction is the same as the compound of the desired sensitivity equation.

$$\sum_n \frac{\partial v}{\partial v_k^{free}} * Q_n^{S1-1,S2-1} * x_{k1}^{S1-1} * x_{k2}^{S2-1} + \sum_n v * Q_n^{S1-1,S2-1} * \frac{\partial x_{k1}^{S1-1}}{\partial v_k^{Sree}} * x_{k2}^{S2-1} + \Sigma_n v * Q_n^{S1-1,S2-1} * \\ x_{k1}^{S1-1} * \frac{\partial x_{k2}^{S2-1}}{\partial v_k^{free}} + \sum_m \sum_i \frac{\partial v_m}{\partial v_k^{free}} * T^i * x_m^i + \sum_m \sum_i v_m * T^i * \frac{\partial x_m^i}{\partial v_k^{free}} = C_{jj}^n \frac{d}{dt} \frac{\partial x_n}{\partial v_k^{ree}} \tag{16}$$

$$\sum_n v * Q_n^{S1-1,S2-1} * \frac{\partial x_{k1}^{S1-1}}{\partial C^L} * x_{k2}^{S2-1} + \sum_n v * Q_n^{S1-1,S2-1} * x_{k1}^{S1-1} * \frac{\partial x_{k2}^{S2-1}}{\partial C^L} + \sum_m \sum_i v_m * T^i * \frac{\partial x_m^i}{\partial C^L} - \begin{cases} \frac{dx_n}{dt}, if C^L = C_{jj}^n = C_{jj}^n \frac{d}{dt} \frac{\partial_n}{\partial C^L} \\ 0, else \end{cases} \tag{17}$$

According to EMU reaction and EMU Mass Isotopomer, the intermediate EMU reaction Mass isotopomer vector is defined as Equation 18. Among them, the superscript of m represents the mass number, and N is the maximum mass number of the Mass isotopomer in all intermediate EMU reactions. The inner element of m is defined as formula 19, where m^1 is used as an example. The superscript of the elements inside m indicates the EMU composition, and the subscript indicates the mass number. The Mass isotopomer vector definition for the input reaction is the same as for the intermediate reaction.

$$\mathrm{M} = \begin{pmatrix} m^0 \\ m^1 \\ \vdots \\ m^N \end{pmatrix} \tag{18}$$

$$m^1 = \begin{pmatrix} A_1^1 \\ A_1^{23} \\ B_1^2 \\ B_1^3 \\ \vdots \\ F_1^3 \end{pmatrix} \tag{19}$$

Q and T are generated based on M, and each EMU reaction generates a set of Q and T. According to the meaning of the reaction type, for the input reaction, only Q is produced, the output reaction only produces T, and the intermediate reaction produces Q and T. We take the bimolecular reaction $R1 + R2 \rightarrow P$ as an example to describe the generation process of Q in detail. This reaction produces a Q group $\{Q_J^{S1-1,S2-1}\}$, where J is the mass of the product, S1 and S2 are the mass of the reactants, and let the maximum mass of the product be Z, the maximum mass in the EMUMassisotopomer vector be Y, and $K = max(Z, Y)$. Then, there are $1 \le S1, S2 \le K+1, 0 \le J \le K$, $Q_J^{S1-1,S2-1}$ order is 3, the length of the first dimension is m^{s1-1}, the length of the second dimension is m^{s2-1}, and the length of the last dimension is m^J. The $Q_J^{S1-1,S2-1}$ generation process is as follows:

A. The algorithm sets the integer J to range from 0 to K, and sets n to the number of reactants, where $n = 2$, divides each (J+n) in an orderly manner, and denote (J+n) into the sum of 2 positive integers, namely $S1+S2=J+2 \Leftrightarrow (S1-1)+(S2-1)=J$. This split is not only related to the value of Si, but also to their order. Each set of ordered 2 splits corresponds to a set of (S1-1, S2-1, J), which means that a product of mass J is generated from reactants of mass ($S1-1,S2-1)$ respectively. For each ordered split, the algorithm checks whether it satisfies the mass constraint $Si-1 <= M(Ri)$, where M(Ri) represents the mass of the reactant Ri.

B. The algorithm finds the position index i in m^{s1-1} of the Mass isotopomer with mass S1-1 in R1, and the position index j in m^{s2-1} of the Mass isotopomer with mass S2-1 in R2. Because of $(S1-1)+(S2-1)=J$, the algorithm finds the mass isotopomer of mass d in product P at position k in m^J.

C. The algorithm sets $Q_J^{S1-1,S2-1}(i,j,k)=1$.

The elimination matrix K indicates that the reactant Mass isotopomer will be consumed in the EMU reaction, and one EMU reaction corresponds to a K set $\{T^i\}$. Among them, i represents the mass, and the value is from 0 to the maximum mass number of the reactant. T^i is a square matrix with rows and columns of length m^i. The T^i construction method is to go through the Mass isotopomers of all masses of all reactants one by one. If a Mass isotopomer is assumed to be at position j in m^i, then $T^i(j,j)=-1$.

2.4 Labeling Algorithm in Vector Form

For each SCCEMU vector $m_{scc}^{i,j}$, where i represents the EMUsize and j represents the SCC topology priority, four additional EMU vectors can be constructed according to the EMU response. The first one is through the single-molecule EMU reaction to generate $m_{scc}^{i,j}$ and the reactant to react to generate $m_{scc}^{i,j}$ and the reactant is not an element, and the product of the two reactant EMU fragments can be combined to form a vector EMU fragments form a new vector $m_{scc,D^\circ}^{i,j}$.

The algorithm adopts the SCC representation similar to Mass isotopomer, and the formula 20 can be expressed in the form of 22, where $\circledast$ is the user-defined vector product operation, and M is the coefficient matrix.

$$A_{SCC,A}^{i,j} * m_{SCC,A}^{i,j} + A_{SCC,B}^{i,j} * m_{SCC,B}^{i,j} + A_{SCC,C}^{i,j} * m_{SCC,C}^{i,j} + A_{SCC,D}^{i,j} * m_{SCC,D}^{i,j} + A_{SCC,input}^{i,j} * m_{SCC}^{i,input} = C_{i,j} \frac{dm_{SCC}^{i,j}}{dt} \tag{20}$$

$$A_{SCC,v_l}(row,col) = v_l * 1 \tag{21}$$

$$\begin{bmatrix} M_{i_1,j_1} & M_{i_2,j_2} & \cdots & M_{i_n j_n} \end{bmatrix} \begin{bmatrix} SCC^{i_1,j_1} \\ SCC^{i_2,j_2} \\ \vdots \\ SCC^{i_{n1} j_{n1}} \circledast SCC^{i_{n2},j_{n2}} \end{bmatrix} = C_{i,j} \frac{dSCC^{i_p,j_p}}{dt} \tag{22}$$

Formula 20 also requires the calculation of the sensitivity equations for each free educational flow data v_k^{free} and each compound C^L in the network, formulas 23 and 24, respectively, and the input responses are not considered when calculating the sensitivity equations.

$$\frac{\partial A_{SCC,A}^{ij}}{\partial v_k^{free}} * m_{SCC,A}^{i,j} + A_{SCC,A}^{i,j} * \frac{\partial m_{SCC,A}^{i,j}}{\partial v_k^{free}} + \frac{\partial A_{SCC,B}^{i,j}}{\partial v_k^{free}} * m_{SCC,B}^{i,j} + A_{SCC,B}^{i,j} * \frac{\partial m_{SCC,B}^{i,j}}{\partial v_k^{free}} + \frac{\partial A_{SC,C,C}^{i,j}}{\partial v_k^{free}} * m_{SCC,C}^{i,j} + A_{SCC,C}^{i,j} * \frac{\partial m_{SCC,C}^{i,C}}{\partial v_k^{ree}} + \frac{\partial A_{SCC,D}^{i,j}}{\partial v_k^{ree}} * m_{SCC,D}^{i,j} + A_{SCC,D}^{i,j} * \frac{m_{SC,D}^{i,j}}{\partial v_k^{free}} = C_{i,j} \frac{d}{dt} \frac{\partial m_{SCC}^{i,j}}{\partial v_k^{free}} \tag{23}$$

$$A_{SCC,A}^{i,j} * \frac{\partial m_{SCC,A}^{i,j}}{\partial C^L} + A_{SCC,B}^{i,j} * \frac{\partial m_{SCC,B}^{i,j}}{\partial C^L} + A_{SCC,C}^{i,j} * \frac{\partial m_{SCC,C}^{i,C}}{\partial C^L} + A_{SCC,D}^{i,j} * \frac{m_{SC,,D}^{i,j}}{\partial C^L} - \begin{cases} \frac{dm_{SCC}^{i,j}}{dt}, if C^L = C_{i,j} = \\ 0, else \end{cases} C_{i,j} \frac{d}{dt} \frac{\partial m_{SCC}^{i,j}}{\partial C^L} \tag{24}$$

3 RESEARCH ON THE ECONOMIC VALUE OF LABOR EDUCATION IN COLLEGES AND UNIVERSITIES IN THE ERA OF BIG DATA

The key to improving the quality of labor education in the new era is to make full use of the rules of field operation and to consolidate and maintain the cooperative relationship of general vocational linkages. On the basis of excavating the logical starting point of general vocational linkage within its system, it is necessary to further straighten out the logical relationship between guarantee, incentive and specific operation, and to clarify the boundaries of powers and powers of vocational education and general education implementers in the labor education community. Moreover, it is necessary to give full play to the statute effect of mechanism construction, to form a theoretical model for the construction of a general vocational linkage labor education community, and to achieve the linkage effect of “full sharing of knowledge within the community and spillover of knowledge boundaries outside the community” (Figure 8).

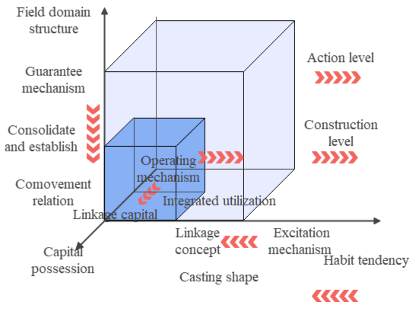


Figure 8: Theoretical model of labor education community.

After constructing a research model of the economic value of labor education in colleges and universities based on big data analysis, the effect of the model is verified, and the statistical economic value of the model is shown in Table 1.

Number	*Economic Value*	*Number*	*Economic Value*	*Number*	*Economic Value*
1	*84.306*	*25*	*80.327*	*49*	*78.699*
2	*79.210*	*26*	*82.046*	*50*	*83.299*
3	*78.671*	*27*	*84.586*	*51*	*81.765*
4	*77.373*	*28*	*82.727*	*52*	*80.650*
5	*81.426*	*29*	*85.829*	*53*	*79.413*
6	*77.351*	*30*	*82.008*	*54*	*84.457*
7	*78.209*	*31*	*81.844*	*55*	*81.638*
8	*80.815*	*32*	*77.052*	*56*	*78.480*
9	*79.837*	*33*	*77.354*	*57*	*82.058*
10	*80.167*	*34*	*84.096*	*58*	*85.289*
11	*84.769*	*35*	*81.428*	*59*	*83.566*
12	*83.309*	*36*	*81.221*	*60*	*85.459*
13	*85.490*	*37*	*83.269*	*61*	*78.004*
14	*79.077*	*38*	*84.506*	*62*	*77.354*
15	*85.271*	*39*	*80.937*	*63*	*83.628*
16	*83.349*	*40*	*79.467*	*64*	*78.131*
17	*84.303*	*41*	*80.030*	*65*	*81.914*
18	*82.932*	*42*	*84.258*	*66*	*80.230*
19	*77.109*	*43*	*84.122*	*67*	*82.328*
20	*77.448*	*44*	*83.071*	*68*	*77.456*
21	*85.285*	*45*	*77.328*	*69*	*80.683*

22	*84.805*	*46*	*81.940*	*70*	*83.255*
23	*85.989*	*47*	*82.541*	*71*	*84.917*
24	*85.531*	*48*	*84.251*	*72*	*79.317*

Table 1: Economic value analysis of the economic value research model of labor education in colleges and universities based on big data analysis.

Through the above analysis, it can be seen that the economic value research model of college labor education based on big data analysis proposed in this paper can play an important role in the research on labor economic value in colleges and universities, and it also verifies that college labor education has a certain economic value.

4 CONCLUSION

Labor education in the new era should keep pace with the times, create conditions for students to participate in service-style labor, creative labor, etc., forming a new direction for contemporary labor education. This means that labor education from the perspective of Internet + should innovate the way of labor education on the basis of giving full play to the value of existing resources, so as to promote the healthy development of labor education. Moreover, labor education is not only an important part of comprehensive development education, but also an effective supplement to other education (moral, intellectual, physical, and aesthetic).In addition, labor education plays its unique educational value. With the development of society, the connotation of labor education has been continuously enriched and deepened, and the content and form of labor education have gradually diversified. This paper combines big data technology to process labor education data to improve the processing effect of labor education data. Through the experimental analysis, it can be seen that the economic value research model of college labor education based on big data analysis proposed in this paper can play an important role in the research of labor economic value in colleges and universities.

Ye Liu, https://orcid.org/0009-0000-3123-6348
Meng Li, https://orcid.org/0009-0005-3031-7054

REFERENCES

[1] Arruti, A.; Paños-Castro, J.: How Do Future Primary Education Student Teachers Assess Their Entrepreneurship Competences? An Analysis of Their Self-Perceptions, Journal of Entrepreneurship Education, 23(1), 2020, 1-13.
[2] Baskaran, A.; Chandran, V. G. R.; Ng, B. K.: Inclusive Entrepreneurship, Innovation and Sustainable Growth: Role of Business Incubators, Academia and Social Enterprises in Asia, Science, Technology and Society, 24(3), 2019, 385-400. https://doi.org/10.1177/0971721819873178
[3] Buchnik, T.; Gilad, V.; Maital, S.: Universities'influence on Student Decisions To Become Entrepreneurs: Theory And Evidence, Journal of Entrepreneurship Education, 21(3), 2018, 1-19.
[4] Eckhardt, J. T.; Harris, C.; Chen, C.; Khoshimov, B.; Goldfarb, B.: Student Regional Origins and Student Entrepreneurship, Regional Studies, 56(6), 2022, 956-971. https://doi.org/10.1080/00343404.2021.1987408

[5] Ge, P.: The Strategy of Cultivating the Students' Innovation and Entrepreneurship Ability under the Student Association, Journal of Frontiers in Educational Research, 1(8), 2021, 26-30.

[6] Jixiang, Z.; Yuezhou, Z.: Research on Innovation and Entrepreneurship Talent Training Model for Application-Oriented University Under Perspective of Collaborative Innovation, International Journal of Information and Education Technology, 9(8), 2019, 575-579. https://doi.org/10.18178/ijiet.2019.9.8.1269

[7] Linton, G.; Klinton, M.: University Entrepreneurship Education: a Design Thinking Approach to Learning, Journal of Innovation and Entrepreneurship, 8(1), 2019, 1-11. https://doi.org/10.1186/s13731-018-0098-z

[8] Malinda, M.: Effectiveness of Entrepreneurship and Innovation Learning Methods, Case study at Universitas Kristen Maranatha, Bandung, Indonesia, International Journal of Business and Administrative Studies, 4(3), 2018, 122-128. https://doi.org/10.20469/ijbas.4.10004-3

[9] Neumeyer, X.; Santos, S. C.: A lot of Different Flowers Make a bouquet: The Effect of Gender composition on technology-based entrepreneurial student teams, International Entrepreneurship and Management Journal, 16(1), 2020, 93-114. https://doi.org/10.1007/s11365-019-00603-7

[10] Ng, F.; Au, K.: Entrepreneurship and Innovation in a Metropolis: Education and Policy Implications in Hong Kong, Journal of Product Innovation Management, 39(4), 2022, 489-491. https://doi.org/10.1111/jpim.12636

[11] Paladino, A.: Innovation or Entrepreneurship: Which comes first? Exploring the implications for Higher Education, Journal of Product Innovation Management, 39(4), 2022, 478-484. https://doi.org/10.1111/jpim.12637

[12] Schoonmaker, M.; Gettens, R.; Vallee, G.: Building the Entrepreneurial Mindset Through Cross-Functional Innovation Teams, Entrepreneurship Education and Pedagogy, 3(1), 2020, 41-59. https://doi.org/10.1177/2515127419866429

[13] Severo, E. A.; Becker, A.; Guimarães, J. C. F. D.; Rotta, C.: The Teaching of Innovation and Environmental Sustainability and its Relationship with Entrepreneurship in Southern Brazil, International Journal of Innovation and Learning, 25(1), 2019, 78-105. https://doi.org/10.1504/IJIL.2019.096553

[14] Syam, A.; Sudarmi, S.: Analysis of Student Entrepreneurship Decision Making in the Learning Prerspective, JurnalAd'ministrare, 6(1), 2019, 51-60. https://doi.org/10.26858/ja.v6i1.9707

[15] Wang, X.: Research on the Path of College Students' Innovation and Entrepreneurship Education, Open Journal of Social Sciences, 8(3), 2020, 298-305. https://doi.org/10.4236/jss.2020.83027