Research Article

Research on Evaluation Algorithm of Innovation and Entrepreneurship Effect of College Graduates Based on DL

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In recent years, there have been more than 7 million college graduates in China every year. Management, teachers, teaching, family, and society. Finally, a summary of the whole article is made. Deep learning (DL) emphasizes the understanding, application, and creation of knowledge and forms a natural close relationship with the cultivation of innovation and entrepreneurship. DL with thinking training, knowledge migration, the flexible use of the learning method, learning state of balance and other characteristics, to improve college students’ knowledge absorptive capacity, knowledge integration capability, knowledge conversion capability, and knowledge application ability, improve students’ ability of knowledge creation, and then improve the ability of innovative undertaking. Therefore, the cultivation of college students’ innovation and entrepreneurship ability (EA) based on DL should start with the construction of teaching design, the reform of teaching methods and methods, and the innovation of teaching assessment methods. Deepening the reform of innovation and entrepreneurship education is an important way for universities to put students first, improve the talent training system, and improve the talent training level. It is the key content for universities to further promote the reform of innovation and entrepreneurship education to create specialized courses, build high-quality courses in innovation and entrepreneurship education, improve the teaching effectiveness of innovation and entrepreneurship education, and realize more effective learning for students.

1. Introduction

Deep learning (DL) emphasizes the understanding, application, and creation of knowledge, and forms a natural close relationship. Although there is abundant research on DL in the academic world, the contents mainly focus on concepts, modes, strategies, and methods of DL, and there is little research on the mechanism of DL [1]. Based on this, this paper focuses on the formation mechanism of DL on innovation and EA and explores countermeasures for DL to promote innovation and entrepreneurship talent cultivation [2].

DL was first proposed by American scholars Marton and Sergio in 1976. Compared with “shallow learning” that merely reproduces knowledge, DL is a learning method that creates new knowledge or uses knowledge to solve practical problems on the basis of a deep understanding of existing knowledge. DL emphasizes learning processes rather than outcomes; DL emphasizes understanding, processing, and reuse of knowledge rather than simple knowledge acquisition. DL emphasizes the integration of knowledge and environment and changes with the environment rather than simply copying [3]. DL emphasizes the absorption and innovation of knowledge rather than the reuse of original knowledge.

Compared with traditional learning (TL), DL has the following characteristics: first, DL emphasizes the training of students’ thinking abilities. It is a form of training for improving thinking [4]. Through DL, students are equipped with critical and creative thinking. Instead of passively accepting knowledge, they take the initiative to think, question authority, innovate, and create [5]. Second, DL emphasizes the transfer and application of knowledge. DL requires digestion and absorption in acquiring knowledge and transfers knowledge to new situations for application on the basis of understanding its profound connotation. Therefore, the key to DL lies in the understanding of the core
and essence of knowledge so as to break away from the original situation and transfer application to a new situation. Knowledge has situational attachment, and the influence of environmental changes should be paid attention to when applying knowledge in different situations [6]. Without a deep understanding of the core and essence of knowledge, the simple application of knowledge in different environments will backfire and fail to achieve the desired effect. Thirdly, DL emphasizes the flexible application of learning methods. TL is mainly taught by teachers and passively accepted by students, while DL can adopt heuristic teaching, case teaching, group discussion, completion of project tasks and other methods, and flexibly adopt various teaching methods or even method combinations [7]. The TL method is only about knowledge acquisition, without learners’ active participation in the learning process, without deep understanding and processing process, which is easy to forget and difficult to form in the thinking ability of learners. Heuristic teaching, case teaching, group discussion, project tasks, and other methods will enable learners to understand and apply knowledge in the process of problem-solving and generate new knowledge. Finally, DL emphasizes the interaction and balance between the learner, environment, and behavior. Under strong learning motivation, learners set goals to optimize their learning behaviors according to environmental changes, constantly break the original balance state to find a new balance and seek optimal learning strategies to achieve high-quality learning results [8, 9].

The innovation of entrepreneurial universal learning strategies teaching introduced in-depth can take the student as the center, enhance the level of innovative entrepreneurial universal course construction and teaching effect, can effectively stimulate students’ learning motivation, and can promote the students’ innovative entrepreneurship knowledge, thinking, consciousness and spirit culture, ability, and quality promotion, output, and entrepreneurship and innovation achievements transformation [10].

Based on depth of learning strategies, this paper discusses the innovative and entrepreneurial universal course construction and reform of the new path through clear learning objectives, updated teaching content, teaching mode innovation, optimizing the teaching environment, DL motivation, solving the students’ innovative undertaking specialized courses and content system construction, high-quality course construction, and solving the students’ innovative undertaking depth problems of learning and result output [11].

In this article, DL encourages knowledge understanding, application, and creation and has a natural link to the development of creativity and entrepreneurship. They define the entrepreneurial universal learning strategies that are being developed. Teaching introduced in-depth can put the student in the center, improve the level of innovative entrepreneurial universal course construction and teaching effects, effectively stimulate students’ learning motivation, promote students’ innovative entrepreneurial knowledge, thinking, consciousness, and spirit culture, ability, and quality promotion, output, and entrepreneurship and innovation achievements.

The organization of the paper is as follows:

Section 2 discusses the related work of innovative concepts for college students and defines the DL based on knowledge training. Section 3, the evaluation research and analysis based on AHP, discusses the inability to determine the lack of a solution and defines the hierarchical single ordering for the consistency test. Section 4 examines the different experiments. Section 5 concludes the article.

2. Related Work

The innovation and EA will be incorporated into the talent training target system for all students and integrated into the whole process of talent training. And through the analysis of economic and social and industrial classic cases and facts, the significance of innovation and entrepreneurship to the country, enterprises, and individuals: innovation leads to development, innovation is eliminated; through the study of innovation, consciousness, thinking, and methods, it is clear that innovation has methods, thinking has tools, and success has ways; through the study of entrepreneurship knowledge and the broad sense of entrepreneurship, it is clear that entrepreneurship can be based on business opportunities, value appreciation, the establishment of enterprises in a narrow sense, or all activities with pioneering and innovative characteristics to enhance economic value or social value [12]. Through innovative entrepreneurship education, so that students can activate the creative consciousness, learning, understanding, analysis, and application of innovative entrepreneurship knowledge master and apply creative thinking and methods; improve innovation ability and quality; to shape innovative entrepreneurial spirit; to integrate into national grand strategy "innovation-driven development", "public entrepreneurship, people innovation environment," to be a senior professional with a sense of social responsibility, innovative spirit, and strong practical ability [13].

In the first year of college, we should focus on developing universal innovation education and training college students’ innovation consciousness, spirit, and methods. In my sophomore year, I will focus on professional innovation education and universal entrepreneurship education, integrate innovation and entrepreneurship education into relevant professional courses, and synchronously cultivate innovative knowledge, entrepreneurial consciousness, and spirit with professional ability. In my junior and senior years, I will focus on operational innovation and entrepreneurship practice education to promote the simultaneous improvement of innovation and entrepreneurship practice and professional practice ability [14].

"DL is an advanced stage of learning, a complex cognitive process, and a highly engaging way of learning. The pursuit of knowledge construction, meaning generation, and ability development is the inevitable appeal of DL. "Therefore, in the design of the teaching mode, we should comprehensively promote project-oriented and cooperative learning as the characteristics of heuristic, case, flip, experiential, discussion, and other teaching methods [15]."
It actively explores diversified evaluation subjects, diversified evaluation methods, oriented evaluation content, stage evaluation, process evaluation, achievement evaluation, intelligent evaluation, and other evaluation methods of course learning effect using a flipped classroom platform and project-oriented cooperative learning teaching method. DL is an advanced stage of learning, a complex cognitive process, and a highly engaging way of learning from the timely feedback on the evaluation results [16].

Knowledge creation abilities can improve students’ innovation and EA through resource combination, opportunity grasping, and team integration. DL further deepens and improves on the basis of knowledge absorption, integration, transformation, and utilization; organically integrates different knowledge elements; summarizes and extracts solutions and key links from practical problems; and forms new knowledge for storage, which can effectively improve students’ knowledge creation ability. In other words, DL can improve the knowledge creation ability of college students through knowledge absorption, integration, transformation, and application so as to improve their innovation and EA [17–19].

According to the above discussion about the influence of DL on the knowledge creation ability of college students as well as the innovation and EA of college students, this paper constructs the mechanism of DL on the cultivation of college students’ innovation and EA. DL impacts on the knowledge-establishment talent of college students. This method is based on thinking training, flexible methods, and equilibrium state effects on the students’ knowledge creation. Through knowledge absorption, integration, transformation, and application, DL can help college students increase their knowledge production abilities, which will improve their innovation and EA. Based on the knowledge creation of students’ ability to innovate and entrepreneur as shown in Figure 1.

3. Evaluation Research and Analysis Based on AHP

3.1. Lack of AHP. Here this paper discusses the evaluation analysis and what has been determined during model construction. They are unable to provide a new solution and are affected by certain human subjective factors. The alternative solutions cannot allow any other solutions. There is error in human judgment, and it is also an explanation of the decision-making error. Due to the lack of AHP, they will not carry out the discussed detailed operations.

3.1.1. Unable to Provide New Solutions. Because AHP is systematic, the alternative solutions have been determined during model construction, so it cannot provide other solutions than the original ones.

3.1.2. Affected by Certain Human Subjective Factors. The AHP method is not suitable for high-precision problems. When constructing hierarchical structure models and pair-comparison matrixes, the AHP method mainly relies on human subjective judgment, which has a great influence on the whole decision-making process. If there is an error in human judgment, it may cause a decision-making error. In addition, AHP comparison, judgment, and result calculation are relatively rough and not suitable for high-precision problems.

3.1.3. Greater Randomness in AHP. Combined with other decision-making methods, they make decision-making more scientific and reliable.

Let us assume that the total goal of the total problem to be solved is Z, there are n criteria layers, and there are n alternative solutions. The simple hierarchical model thus constructed is shown in Figure 2.

The numerical representation of the judgment matrix indicates the importance of one element relative to another at the same level. Assuming that there are n factors in a certain layer, \( X = \{X_1, X_2, \ldots, X_n\} \), and \( Xi \) and \( Xj \) are taken out for pair-by-pair-comparison each time, referring to Sadie’s 1–9 scale method (as shown in Table 1), \( aij \) is recorded as the relative influence ratio of \( Xi \) and \( Xj \) on \( Z \) of the upper layer.

3.2. Hierarchical Single Ordering and Consistency Test

3.2.1. Hierarchical Single Sort. Hierarchical single sorting refers to the sorting calculation of the relative importance of all the factors of the judgment matrix to its criteria, mainly consisting of the following steps:

1. The judgment matrix is normalized as follows:

   \[
   \bar{a}_{ij} = \frac{a_{ij}}{\sum_{k=1}^{n} a_{ij}}. \tag{1}
   \]

   According to (1), \( \bar{A} = [\bar{a}_{ij}] \).

2. The mean of the sum of rows \( \bar{A} \) is calculated. According to (2), the feature vector \( w = [w_1, w_2, \ldots, w_n]^T \) can be obtained.

   \[
   w_i = \frac{1}{n} \sum_{j=1}^{n} \bar{a}_{ji}. \tag{2}
   \]

3. The maximum eigen root of the judgment matrix is calculated.

   \[
   \lambda_{max} = \sum_{i=1}^{n} (AW)_i \tag{3}
   \]

   According to (3), the largest characteristic root \( \lambda_{max} \) can be obtained, where \( (AW) \) is the i-th component vector of \( AW \).

3.2.2. Consistency Test. The consistency test is mainly used to judge whether the constructed judgment matrix has high consistency. Only through the consistency test can the constructed judgment matrix be considered logically rationality, and then ensure that the subsequent research
results are reasonable and effective. The steps of the consistency check are as follows:

\[ CI = \frac{\lambda_{\text{max}} - n}{n - 1}. \]  (4)

Search for the average random consistency index RI (random index).

The random consistency indicator RI can be obtained by searching Table 2.

Calculating consistency ratio (CR) as

\[ CR = \frac{CI}{RI}. \]  (5)

According to (5), according to the obtained CR value. When the obtained CR < 0.1, the established judgment matrix can be observed to be meaningful, and its consistency test is in line with the quality. When CR ≥ 0.1, it indicates that the practical guidance of the constructed judgment matrix is not ideal and needs to be adjusted again.

\[ b_i = \frac{1}{m} \sum_{j=1}^{m} b_{ij}a_j \text{ (i = 1, 2, \ldots, n).} \]  (6)

Now suppose A layer of A1, A2, Amn total factor, the next layer B has B1, B2, Bn n factors, using B1j, B2j, Bnj said B layer of A layer of single sorting weight, B layer of the weight of each factor to the overall goal b1, b2, bn can be calculated by equation (6).

As with hierarchical single sort, the hierarchical total sort needs to be checked. Let us assume that B layer, some factors on from Aj single sort of consistency index for Cij, useable Rij (j = 1, 2, \ldots, m) said the average consistency index, total 7B layer can be sorted according to the type random consistency ratio CR.

\[ CR = \frac{\sum_{j=1}^{m} CI_j a_j}{\sum_{j=1}^{m} RI_j a_j}. \]  (7)

When the obtained CR < 0.1, it indicates that the consistency of hierarchical total ordering is good and within the acceptable range. When CR ≥ 0.1, it indicates that the consistency of hierarchical total ordering is good but not ideal, and assignment calculation needs to be carried out again.

A restricted Boltzmann machine (RBM) is a neural network (NN) model based on energy patterns. Its neurons are divided into two layers: the visible layer and the hidden layer. The visual layer is used for data input and output, while the hidden layer is understood as the internal representation of data. The energy function of RBM is
Table 1: Relative importance scale method.

| Scale | Define |
|-------|--------|
| 1     | In comparison, both factors are equally important |
| 2     | In comparison, the former is slightly more important than the latter |
| 3     | In comparison, the former is more important than the latter |
| 4     | In contrast, the former is strongly more important than the latter |

| Scale | Define |
|-------|--------|
| 5     | In contrast, the former is more important than the latter |
| 6     | In comparison, the scale values corresponding to the intermediate states of the two judgment matrices are presented between the two factors |
| 7     | The bottom |
| 8     | If the importance ratio of factor A to factor B is C, so \( a_{ij} = 1/a_{ji} \). |
| 9     | \( a_{ij} = 1 \) |
| 10    | \( a_{ij} = 0 \) |

\[
E(v, h) = - \sum_{i=1}^{N} a_i v_i - \sum_{j=1}^{M} b_j h_j - \sum_{i=1}^{N} \sum_{j=1}^{M} v_i w_{ij} h_j, \tag{8}
\]

where \( v_i \) and \( h_j \) represent the state of visible layer element I and hidden layer element j, respectively, \( A_i \) and \( B_j \) are the bias of each layer, and \( W_{ij} \) is the connection weight of visible layer element I and hidden layer element J.

\[
p(v, h) = \frac{1}{Z} e^{-E(v,h)}. \tag{9}
\]

Train RBM by using the idea of maximum likelihood and the algorithm of contrastive divergence (CD) proposed by Hinton, and we get the parameter updating formula as follows:

\[
\Delta w_{ij} = \eta (\langle v_i h_j \rangle_{data} - \langle v_i h_j \rangle_{recon}). \tag{10}
\]

As a nonlinear classifier, it can get good classification accuracy when combined with the DL algorithm. Let us define the assumed function as follows:

\[
h(x^{(i)}) = \begin{bmatrix} p(y^{(i)} = 1 | x^{(i)}; \theta) \\ p(y^{(i)} = 2 | x^{(i)}; \theta) \\ \vdots \\ p(y^{(i)} = k | x^{(i)}; \theta) \end{bmatrix}, \tag{11}
\]

where \( a_i \) defines the cost function as follows:

\[
C(\theta) = -\frac{1}{N} \left( \sum_{i=1}^{N} \sum_{j=1}^{k} I\{y_i^{(i)} = j\} \log \frac{e^{\theta y_i^{(i)}}}{\sum_{k=1}^{k} e^{\theta y_k^{(i)}}} \right). \tag{12}
\]

4. Analysis of Experimental Results

After all the matrices are input in YAAHP, the calculation results of the analytic hierarchy model are viewed, and the analysis results are summarized to obtain the index weights of the single ranking of graduate innovation and entrepreneurship education evaluation levels, as shown in Table 3.

According to the above data, the distribution of weight coefficients of first-level indicators and second-level indicators on graduate innovation and entrepreneurship education can be drawn as shown in Figures 4 and 5.

As shown in the figure above, resource allocation has the greatest impact on postgraduate innovation and entrepreneurship education, accounting for 35.24%, followed by emphasis (24.17%), motivation intention (15.99%), ability level (10.42%), implementation method (6.41%), incentive support (4.50%) and faculty allocation (3.27%). According to the research data and the above figure, the conclusions of the evaluation research on graduate innovation and entrepreneurship education based on AHP can be summarized as follows.

The same method is used to perform operations on the judgment matrices of other professionals and conduct consistency tests. Due to the lack of space in the article, this chapter will not carry out detailed operations. The weights of the indicators for eight different professionals are published (see Figure 6 for details).

As can be seen from the classification of the weight of each index above, the weight of entrepreneurs’ characteristics and entrepreneurial ability (EA) is high, while the weight of evaluation indexes for entrepreneurial projects (industry and market factors, economic factors, and political factors) is low. This research involved a questionnaire survey and conversation among excellent entrepreneurial college students to test the authenticity of the final results. College students believe that the key to starting a startup is the characteristics and abilities of the entrepreneur, while the project and fit of the entrepreneur is also key factors in the success of the startup. In addition, the project’s familiarity, inner strength, market demand, innovative spirit, and the ability to grasp opportunities have a greater impact on the other indicators.
In view of the fact that entrepreneurial traits and EA in the evaluation indicators cannot be determined by intuitive judgment, we decided to first understand this problem through the expert group interview and then evaluate the entrepreneurial traits and EA according to the results of the written self-evaluation of entrepreneurs. The evaluation of

Table 3: Index weights of graduate innovation and entrepreneurship education evaluation levels in a single order.

| Level indicators             | Weight coefficient | Secondary indicators                        | Weight coefficient | Consistency test of secondary indicators | Consistency test of first-level indicators |
|------------------------------|--------------------|---------------------------------------------|--------------------|------------------------------------------|-------------------------------------------|
| Incentives to support        | 0.045              | Encourage measures                          | 0.20               | 0                                        |                                           |
|                              |                    | Support policy                              | 0.80               |                                          |                                           |
|                              |                    | Individual aspiration                        | 0.527              |                                          |                                           |
|                              |                    | Entrepreneurial motivation                  | 0.225              |                                          |                                           |
| Motivation will              | 0.159              | Innovation motivation                        | 0.507              | 0.0227                                   |                                           |
|                              |                    | The opportunity to grasp                    | 0.05               |                                          |                                           |
| The allocation of resources  | 0.352              | Hardware support                            | 0.785              | 0.0557                                   |                                           |
|                              |                    | Innovative courses                          | 0.254              |                                          |                                           |
|                              |                    | Entrepreneurship                            | 0.082              |                                          |                                           |
|                              |                    | Humanities                                  | 0.054              |                                          |                                           |
|                              |                    | Independent ability                          | 0.055              |                                          |                                           |
|                              |                    | Theoretical knowledge                       | 0.087              |                                          | 0.0216                                   |
| Ability level                | 0.104              | Decision-making ability                     | 0.529              | 0.0272                                   |                                           |
|                              |                    | Ability to learn                             | 0.275              |                                          |                                           |
|                              |                    | Beginning ability                            | 0.229              |                                          |                                           |
|                              |                    | Activity form                               | 0.725              |                                          |                                           |
| Emphasis                     | 0.241              | Education support                           | 0.097              | 0.0029                                   |                                           |
|                              |                    | Teaching methods                            | 0.287              |                                          |                                           |
| Staffed                      | 0.032              | Innovative support                          | 0.245              | 0                                        |                                           |
| Implementation of the way    | 0.064              | Entrepreneurial faculty                     | 0.857              | 0                                        |                                           |
|                              |                    | Entrepreneurship practice                   | 0.299              |                                          |                                           |
|                              |                    | Entrepreneurship practice                   | 0.800              | 0                                        |                                           |
Figure 4: Weight coefficient of the first-level evaluation index on graduate innovation and entrepreneurship education.

Figure 5: Weight coefficient of the secondary evaluation index on graduate innovation and entrepreneurship education.

Figure 6: Summary table of weight values determined by experts.
the entrepreneurial project is based on the judgment of the relevant content of the entrepreneurial plan, and then the final comprehensive evaluation is given in combination with the question-and-answer session of the interview process. The grade membership degree of each indicator is expressed using the scoring data, as shown in Figure 7.

According to the grading method of evaluation results, it can be seen from Figure 7 that the ratings of projects 1 and projects 2 are good and good, respectively. Through the reality survey, we can get the actual operational situation of the two entrepreneurs. The second project is more suitable for college students because of services and its previous social experience. At present, the collective activities of classes or societies in college life are also increasing day by day. Campus enterprises in the environment of a campus have good market demand and market potential.

5. Conclusion

After years of practice and exploration, combined with the practical experience of other universities, the evaluation system for college students’ innovation and EA has been preliminarily constructed. However, the evaluation system is still not perfect. In future studies, various criteria relating to college students’ entrepreneurship will be summarized, and scores will be reassigned. Further improve the professional and scientific level of the CTP evaluation model of college students’ innovation and entrepreneurship talent. Innovative universal course construction based on the DL strategy to "originate from practice, begins with the problem, and the application and creation of value” for the idea, combining innovation entrepreneurship education and practice education, into students’ values and spiritual shape, through optimizing teaching content, teaching mode innovation, and teaching environment, stimulates students’ intrinsic motivation, positive attitudes, and positive behaviors. Improving students’ autonomy and effectiveness in independent learning, innovative practice, and knowledge transfer is beneficial to improving the level of innovation and entrepreneurship course construction and teaching effect. As a platform for entrepreneurial college students to share experience and operate offices, the entrepreneurial base has been established in many universities, but it still fails to match the current situation of entrepreneurship. To build a business incubator, the government, businesses, colleges, and universities must work together to hire a professional consultant, who will work closely with social enterprises to introduce advanced production, supply, sales, and management experience, promote information sharing, strengthen management training, and create a business site for college students to solve problems. We should also focus on policy publicity, technical support (TS), experience sharing, and other aspects to build the incubator base into a comprehensive platform.

Data Availability

The data used to support the findings of this study are available from the corresponding author upon request.

Conflicts of Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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