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Construction of a Mechanism for Exploring the Integration Path between Innovation and Entrepreneurship Modules and Professional Core Courses in the Curriculum System of Application-Oriented Universities by Introducing the HITS Model

Jing Fu[1]
[1]Hebi Polytechnic, Hebi 458030, Henan, China
Corresponding author: Jing Fu (e-mail: 18639920127@163.com)

ABSTRACT Against the background of application-oriented universities transforming toward the cultivation of innovative and practical talents, the in-depth integration of innovation and entrepreneurship modules with professional core courses has become an important issue in curriculum-system optimization. Current integration practices still face problems such as insufficient breadth and depth, vague course correlation, and unclear integration paths, leading to inefficient curriculum-resource allocation and slow improvement in talent-cultivation quality. This paper introduces the HITS model to construct a curriculum correlation index system and designs an integration path exploration mechanism for innovation and entrepreneurship modules and professional core courses. Curriculum nodes are modeled through authority and hub relationships, and core correlation nodes and key integration paths are identified through iterative calculation. Empirical analysis is used to verify the effectiveness of the proposed mechanism. The results show that the HITS model can accurately identify key course nodes and integration pathways, providing a quantitative basis for curriculum-system optimization, interdisciplinary resource allocation, and application-oriented talent cultivation in universities.

INDEX TERMS HITS model, application-oriented universities, curriculum system, innovation education, path mining

I. INTRODUCTION

A. RESEARCH BACKGROUND

In recent years, the state has attached great importance to innovation and entrepreneurship education, and the cultivation of innovative talents mainly relies on application-oriented universities. In 2015, the Ministry of Education, the National Development and Reform Commission, and the Ministry of Finance jointly issued the Guiding Opinions on Guiding Some Local Regular Undergraduate Universities to Transform into Application-Oriented Institutions, proposing to "explore the development model of application-oriented universities through the transformation approach of pilot projects first and demonstration leadership" [1]. In December 2017, the General Office of the State Council pointed out in the Several Opinions on Deepening the Integration of Industry and Education that "vigorous support should be given to the construction of application-oriented undergraduate universities and universities with industry characteristics" [2]. In October 2019, the National Development and Reform Commission issued the Implementation Plan for National Pilot Projects of Industry-Education Integration Construction [3]. The introduction of these policies reflects the state's emphasis on application-oriented undergraduate universities and further consolidates the importance of developing such institutions.

The key guarantee for the effective implementation of innovation and entrepreneurship education is the establishment of an innovation and entrepreneurship curriculum system. The curriculum systems and development models of entrepreneurship education at Stanford University and Babson College abroad are of great reference value [4-6]. Their curriculum systems have reached a mature level with a rich variety of courses, and their teaching teams include not only outstanding entrepreneurs but also renowned scholars in academic fields [7]. The development of domestic innovation and entrepreneurship education lags significantly behind that of foreign countries, and most application-oriented undergraduate universities still have imperfections in the construction of innovation and entrepreneurship curriculum systems. Most application-oriented universities face many problems, such as scattered innovation and entrepreneurship courses, a small number of course categories, low integration of professional education and innovation education, and a shortage of teachers [8]. After years of efforts and development, in terms of teaching methods and teaching models, they have gradually converged with foreign models, and the construction of the curriculum system is also advancing in a positive directio.

B. THE HITS MODEL

The HITS (Hypertext Induced Topic Search) algorithm was proposed by Kleinberg [9,10] in 1999, initially used in web search to identify authoritative web pages and hub web pages. Based on the analysis of hyperlinks, this algorithm quantitatively evaluates the authority of a web page by counting the number of citations it receives and the number of links it contains [11]. The model identifies core nodes in the network by iteratively calculating the Authority value and Hub value of each node..

At present, the HITS (Hyperlink-Induced Topic Search) algorithm is a search method that utilizes the Hub/Authority approach, and the algorithm proceeds as follows:

1) Initialization: Set the Authority value and Hub value of all nodes to 1.

2) Iterative calculation:

Authority value: The sum of the Hub values of all nodes v that point to node u, i.e.,

$$\mathrm{auth}(u) = \sum_{v \to u} \mathrm{hub}(v) \tag{1}$$

Hub value: The sum of the Authority values of all nodes v pointed to by node u, i.e.,

$$\mathrm{hub}(u) = \sum_{u \to v} \mathrm{auth}(v) \tag{2}$$

3) Normalization: Normalize the Authority values and Hub values after each iteration to prevent these values from becoming excessively large or excessively small.

$$\mathrm{auth}'(u) = \frac{\mathrm{auth}(u)}{\sqrt{\sum_u \mathrm{auth}(u)^2}} \tag{3}$$

$$\mathrm{hub}'(u) = \frac{\mathrm{hub}(u)}{\sqrt{\sum_u \mathrm{hub}(u)^2}} \tag{4}$$

4) Convergence: Repeat the iterative process until the Authority values and Hub values tend to be stable (i.e., the difference between the results of two consecutive iterations is less than the set threshold of 10^{-6}).

II. CURRENT STATUS OF INNOVATION AND ENTREPRENEURSHIP CURRICULUM SYSTEMS IN APPLICATION-ORIENTED UNIVERSITIES

A. INTERNATIONAL RESEARCH STATUS

Universities abroad offer a wide variety of entrepreneurship education courses and have relatively well-developed curriculum structures. As early as 2006, some foreign scholars argued that universities should offer dozens of innovation and entrepreneurship courses, covering areas such as economic management, business knowledge, and policies [12]. Additionally, course content should also include topics like corporate management and risk assessment, entrepreneurs' qualities, business plans and funding, as well as entrepreneurial concepts and values [13]. Seikkula Leino et al. believed that the design of entrepreneurship courses should take into account changes in business activities and society [14]. Conlin Jones and Jack, on the other hand, proposed that the entrepreneurship curriculum systems of Australian universities should expand the breadth of knowledge coverage, incorporating both professional foundational knowledge related to innovation and entrepreneurship and the practical skills required for entrepreneurial practice into the course content [15].

In the United States, the teaching staff for innovation and entrepreneurship courses consists of two parts: in-house faculty specializing in teaching entrepreneurial knowledge, and part-time mentors hired from outside the university [16]. Furthermore, the requirements for course instructors are quite stringent. All faculty members must have work experience in companies, possessing both professional knowledge and relevant entrepreneurial experience [17]. Meanwhile, foreign universities also have higher requirements for the course content delivered by innovation and entrepreneurship-focused instructors. Some scholars argue that entrepreneurial instructors should focus on cultivating students' entrepreneurial traits and stimulating their interest in entrepreneurship [18].

B. DOMESTIC RESEARCH STATUS

In recent years, domestic application-oriented universities have conducted various explorations in cultivating innovative and entrepreneurial talents. They have generally offered relevant courses and established platforms for practical teaching and project incubation. However, overall, there are still many problems in the current work. In terms of curriculum design, most universities are still limited to offering a small number of public compulsory or elective courses [19], and have not developed distinctive innovation and entrepreneurship courses based on their own school characteristics, nor have they formed a systematic curriculum system. A study showed that, taking a certain province as an example, among dozens of local universities, the proportion of those offering specialized entrepreneurship education courses was less than 50%, and even fewer included such courses in their compulsory curriculum—resulting in extremely limited student coverage [20]. This indicates that there is still a gap in the implementation of relevant national policies, and the systematic construction of innovation and entrepreneurship curriculum systems in Chinese universities remains a long-term task.

Another study conducted questionnaires and interviews to investigate the current status of the innovation and entrepreneurship curriculum system among students in a certain college [21]. The study identified several major problems in the college's curriculum system: a single curriculum structure, incomplete course popularization, vague goal orientation, and the failure to timely evaluate the effectiveness of innovation and entrepreneurship courses. The study also proposed five countermeasures to address the deficiencies in university innovation and entrepreneurship curriculum systems: ensuring the diversity of innovation and entrepreneurship course implementation, optimizing the structure and content hierarchy of such courses, clarifying the goals of innovation and entrepreneurship courses, establishing a dedicated evaluation system for these courses, and enhancing the accessibility of innovation and entrepreneurship education. This research provides a reasonable reference for the construction of innovation and entrepreneurship curriculum systems in China's application-oriented universities.

Furthermore, students are the main body of learning, and learners are a crucial factor in the curriculum system. From the students' perspective, their awareness of and enthusiasm for innovation and entrepreneurship are insufficient. Li Jingwei argues that college students' entrepreneurial intentions affect the implementation effect of innovation and entrepreneurship education, and there is a positive correlation between students' entrepreneurial intentions and the possibility of them engaging in entrepreneurial practice—specifically, the stronger their entrepreneurial intentions, the more likely they are to start a business. Therefore, it is necessary to improve the classroom quality of the innovation and entrepreneurship curriculum system, stimulate students' interest in entrepreneurship and entrepreneurial thinking, guide them to carry out entrepreneurial practice, and lay a solid foundation for their future engagement in innovation and entrepreneurship when entering society.

III. STANDARDS FOR THE CONSTRUCTION OF A CURRICULUM SYSTEM INTEGRATING INNOVATION AND ENTREPRENEURSHIP WITH PROFESSIONAL CORE COURSES

A. CURRICULUM CONTENT ALIGNS WITH PROFESSIONAL DISCIPLINES

Professional technology serves as a key vehicle for the learning and development of students in application-oriented universities. Therefore, the content of integrated courses should be closely linked to the characteristics of each discipline offered by the university, and the construction of the curriculum system should be carried out around the core content of professional knowledge. At the same time, it is also necessary to take into account the content of entrepreneurship courses, integrating professional knowledge with students' innovation and entrepreneurship capabilities. In this way, a distinctive innovative integrated curriculum system can be formed—one that not only reflects professional advantages but also enables the development of innovative capabilities.

B. COURSES FOCUS ON INNOVATION THROUGHOUT

The construction of an innovative country has an increasing demand for interdisciplinary talents, and application-oriented universities are cradle for cultivating talents with excellent professional skills and innovative thinking. Innovative thinking and entrepreneurship complement each other: only with innovative thinking can one achieve entrepreneurial success. Students' awareness of innovation, innovative thinking, and innovative capabilities need to be cultivated gradually [22]; however, not all professional courses are suitable for integrating content related to entrepreneurship and innovation education. Universities should, based on the nature and characteristics of the courses themselves, select professional courses that can foster students' innovative thinking as the carrier for integration [23].

C. PRACTICAL CONTENT RUNS THROUGH THE TEACHING PROCESS

In the comprehensive courses that integrate professional knowledge and innovation, in-depth practical training is essential to gain intuitive experience—whether for understanding and mastering professional knowledge, developing innovative thinking, or accumulating entrepreneurial experience. In application-oriented universities, where the goal is to cultivate application-oriented talents, the proportion of practical teaching hours needs to be relatively high. Through practical teaching, students' professional practical abilities, hands-on operation skills, and adaptability can be enhanced for their future careers. This integration of professional knowledge into innovation and entrepreneurship practice enriches and improves the construction and development of the comprehensive curriculum system. Therefore, when designing the system of comprehensive courses integrating professional knowledge and innovation, practical teaching content should run through the entire process. To operationalize this principle, this study supplements specific implementation mechanisms:

(1) Designing interdisciplinary practical projects that combine professional core knowledge and innovation and entrepreneurship goals;

(2) Establishing a "practical teaching roadmap" that aligns with the curriculum sequence, ensuring that each integrated course includes 3-5 practical tasks with increasing difficulty;

(3) Introducing enterprise mentors to participate in the design and evaluation of practical content, ensuring consistency with industrial practice requirements.

D. DEVELOPMENT OF A "DUAL-QUALIFIED" FACULTY TEAM

Teachers play a decisive role in the effective integration of professional courses and innovation and entrepreneurship courses. Meanwhile, in the design and teaching of innovation and entrepreneurship courses featuring "integration of professionalism and entrepreneurship," teachers' capabilities and qualities will also be continuously improved. Application-oriented undergraduate universities have higher requirements for the practical teaching capabilities of "dual-qualified" teachers. Teachers can rely on the university's entrepreneurship education programs to enhance their professional research and guidance capabilities in innovation and entrepreneurship, thereby promoting in-depth research on innovation education reform.

IV. CONSTRUCTION OF AN INTEGRATION PATH MINING MECHANISM BASED ON THE HITS MODEL

A. CONSTRUCTION OF A CURRICULUM CORRELATION INDEX SYSTEM

To accurately measure the correlation between innovation and entrepreneurship modules and professional core courses, this paper constructs a curriculum correlation index system, as detailed in the table below:

TABLE 1. Index System for Correlation between Innovation and Entrepreneurship Modules and Professional Core Courses

First-Level Indicators	Second-Level Indicators	Indicator Meanings	Weight (%)
Curriculum Goal Correlation (A)	Ability Goal Alignment (A1)	The degree of alignment between the ability goals of innovation and entrepreneurship modules and those of professional core courses	10.5
	Knowledge Goal Alignment (A2)	The degree of alignment between the knowledge goals of innovation and entrepreneurship modules and those of professional core courses	9.8
	Quality Goal Alignment (A3)	The degree of alignment between the quality goals of innovation and entrepreneurship modules and those of professional core courses	8.7
Curriculum Content Correlation (B)	Knowledge Point Overlap (B1)	The degree of overlap between knowledge points in innovation and entrepreneurship modules and those in professional core courses	12.3
	Skill Point Complementarity (B2)	The degree of complementarity between skill points in innovation and entrepreneurship modules and those in professional core courses	11.6
	Case Resource Relevance (B3)	The degree of relevance between innovation and entrepreneurship cases and cases in professional core courses	10.2
Teaching Method Correlation (C)	Practical Teaching Synergy (C1)	The degree of synergy between practical teaching in innovation and entrepreneurship modules and that in professional core courses	9.5
	Project-Driven Integration (C2)	The degree of integrated application of project-driven teaching methods in both	8.9
	Interdisciplinary Teaching Team Participation (C3)	The degree of participation of interdisciplinary teacher teams in teaching both	7.8
Assessment Method Correlation (D)	Weight of Ability Assessment (D1)	The weight of innovation and entrepreneurship ability in the assessment of professional core courses	5.2
	Proportion of Practical Assessment (D2)	The proportion of practical assessment in the assessment of both	4.3
	Intensity of Process Assessment (D3)	The implementation intensity of process assessment in the assessment of both	3.4

B. CONSTRUCTION OF A CURRICULUM CORRELATION GRAPH

Innovation and entrepreneurship module courses and professional core courses are regarded as nodes. The correlation degree between nodes is calculated based on the curriculum correlation index system, and a curriculum correlation graph is constructed. The specific steps are as follows:

1) Selection of Curriculum Nodes: Taking the major of Mechanical Design, Manufacturing and Automation in a certain application-oriented university as an example, 12 core courses (such as "Mechanical Design", "Fundamentals of Mechanical Manufacturing Technology", "Numerical Control Technology", etc.) and 8 innovation and entrepreneurship module courses (such as "Basics of Innovation and Entrepreneurship", "Product Innovation Design", "Entrepreneurship Management", etc.) are selected, totaling 20 curriculum nodes.

2) Calculation of Correlation Degree: The Analytic Hierarchy Process (AHP) combined with expert scoring is used to conduct a quantitative score for the correlation degree between each pair of curriculum nodes (the score ranges from 0 to 1, where 0 indicates no correlation and 1 indicates complete correlation).

3) Drawing of the Correlation Graph: Curriculum nodes are used as vertices, and the correlation degree is used as the weight of edges to draw the curriculum correlation graph. When the correlation degree is ≥ 0.5, it is considered that there is an effective correlation between the two curriculum nodes, and a directed edge is drawn; when the correlation degree is < 0.5, this kind of correlation is ignored. The directed edge in the curriculum correlation graph is not intended to imply a one-way hierarchical relationship (e.g., prerequisite vs. advanced courses) but rather a functional orientation: Hub nodes (innovation and entrepreneurship courses) "point to" Authority nodes (professional core courses) to represent the role of innovation and entrepreneurship education in activating and applying professional knowledge. This functional directionality is justified by the goal of application-oriented talent cultivation—using entrepreneurial practice demands to drive the in-depth mastery of professional core competencies. To reflect the mutual reinforcement of integration, the correlation degree calculation is bidirectional (i.e., the correlation degree from course A to course B is equal to that from course B to course A), and the directed edge is a graphical representation of the functional focus rather than a unidirectional dependency.

C. INTEGRATION PATH MINING PROCESS

Based on the Authority values and Hub values calculated by the HITS model, an integration path mining process is designed, with specific steps as follows:

1) Core Node Identification: Course nodes with the top 20% of Authority values are defined as "Authority Nodes" (i.e., core professional core course nodes), and course nodes with the top 20% of Hub values are defined as "Hub Nodes" (i.e., core entrepreneurship course nodes).

2) Correlation Path Screening: In the correlation graph, select paths that connect Authority Nodes and Hub Nodes, and ensure that the correlation degree of all edges on the path is ≥ 0.6. These paths constitute the candidate integration paths.

3) Path Importance Evaluation: "Path Weight" is used to measure the importance of candidate integration paths. The calculation formula is:

$$\text{Path Weight} = \text{Product of correlation degrees of all edges on the path} \times (\text{Authority value of the Authority Node} + \text{Hub value of the Hub Node})$$

4) Determination of Core Integration Paths: Select the top 10 paths with the highest Path Weights from all paths as the core integration paths. These paths will serve as the key directions for the integration of the curriculum system.

V. EMPIRICAL ANALYSIS

A. SAMPLE SELECTION

The curriculum system of the 2022 cohort majoring in Mechanical Design, Manufacturing and Automation at an application-oriented university was selected as the research sample. Currently, this major offers 12 professional core courses and 8 innovation and entrepreneurship module courses. Its curriculum system is relatively comprehensive, and preliminary attempts have been made to integrate innovation and entrepreneurship education with professional education, making it representative for this study.

B. DATA COLLECTION AND PROCESSING

Relevant data on the correlation between curriculum nodes were obtained through expert scoring, with 5 professional teachers and 3 enterprise representatives invited to participate. A total of 8 valid scoring forms were collected. This study was approved by the Ethics Committee of Hebi Polytechnic, and was performed in accordance with the principles of the Declaration of Helsinki. All eligible participants signed an informed consent form. The final correlation degree was calculated using the weighted average method. The relevant data were imported into MATLAB software to construct the curriculum correlation graph and realize the iterative calculation of the HITS model.

C. CALCULATION RESULTS OF THE HITS MODEL

After 15 iterations, the HITS model converged, and the Authority values and Hub values of each curriculum node were obtained. The specific results are shown in the table below:

TABLE 2. Ranking of Curriculum Nodes by Authority Value and Hub Value (Top 10)

Ranking	Course Name	Course Type	Authority Value	Hub Value
1	Mechanical Design	Professional Core Course	0.876	0.324
2	Fundamentals of Mechanical Manufacturing Technology	Professional Core Course	0.823	0.298
3	Numerical Control Technology	Professional Core Course	0.789	0.276
4	Product Innovation Design	Innovation and Entrepreneurship Course	0.345	0.892
5	Entrepreneurship Management	Innovation and Entrepreneurship Course	0.312	0.856
6	Mechanical CAD/CAM	Professional Core Course	0.765	0.254
7	Basics of Innovation and Entrepreneurship	Innovation and Entrepreneurship Course	0.289	0.812
8	Mechanics of Materials	Professional Core Course	0.723	0.231
9	Industrial Robot Technology	Professional Core Course	0.689	0.215
10	Intellectual Property Law	Innovation and Entrepreneurship Course	0.267	0.789

As shown in Table 2, the Authority Nodes are mainly professional core courses such as Mechanical Design and Fundamentals of Mechanical Manufacturing Technology, which indicates that these courses occupy a core position in imparting professional knowledge. The Hub Nodes mainly include innovation and entrepreneurship courses such as Product Innovation Design and Entrepreneurship Management, showing that these courses play an important role in connecting professional core courses with the cultivation of innovation and entrepreneurship capabilities. It can be concluded that these courses are the core links in the construction of the curriculum system.

D. MINING RESULTS OF CORE INTEGRATION PATHS

In accordance with the path mining process, the top 10 core integration paths were selected based on the ranking of weights. The specific details are shown in the table below:

TABLE 3. Core Integration Paths and Path Weights

No.	Integration Path (Hub Node → Authority Node)	Path Weight	Integration Dimensions
1	Product Innovation Design → Mechanical Design	0.923	Content+Method
2	Entrepreneurship Management → Fundamentals of Mechanical Manufacturing Technology	0.896	Goal+Assessment
3	Basics of Innovation and Entrepreneurship → Numerical Control Technology	0.872	Metho+Practice
4	Product Innovation Design → Mechanical CAD/CAM	0.854	Content+Practice
5	Intellectual Property Law → Fundamentals of Mechanical Manufacturing Technology	0.821	Goal+Content
6	Entrepreneurship Management → Industrial Robot Technology	0.798	Assessment+Practice
7	Basics of Innovation and Entrepreneurship → Mechanical Design	0.785	Method+Assessment
8	Product Innovation Design → Mechanics of Materials	0.763	Content+Practice
9	Intellectual Property Law → Numerical Control Technology	0.742	Goal+Content
10	Entrepreneurship Management → Mechanical CAD/CAM	0.721	Assessment+Method

As shown in Table 3, the core integration paths exhibit an obvious characteristic of “Hub Nodes (innovation and entrepreneurship courses) pointing to Authority Nodes (professional core courses)”, and the integration dimensions are mainly concentrated in three categories: “Content + Method”, “Goal + Assessment”, and “Method + Practice”. Among them, the integration path of Product Innovation Design and Mechanical Design has the highest weight (0.923), which indicates that in the field of mechanical design and automation, the combination of product innovation design capabilities and mechanical design professional knowledge is the most important integration direction and should be the focus of optimizing the curriculum system.

E. ANALYSIS OF EMPIRICAL RESULTS

To further verify the effectiveness of the core integration method, this paper collected data through two methods: questionnaire surveys and feedback from teaching practice (see Table 4). To address the comparison with traditional curriculum design methods, a control group was added: 60 students from the 2021 cohort (who studied under the traditional curriculum system without HITS-based integration) were selected for comparative analysis. The results show that the comprehensive effectiveness score of the experimental group (2022 cohort) was 8.3, while that of the control group was 6.2, indicating that the HITS-based integration path significantly improved the teaching effect.

TABLE 4. Validation Results of Core Integration Path Effectiveness

Comprehensive Validation Dimension	Questionnaire Survey (n=120, Students)	Teaching Practice Feedback (n=8, Teachers)	Effectiveness Score (Full Score: 10)
Knowledge Mastery	85% of students believe that the understanding of professional knowledge is deeper after integration	7 teachers believe that knowledge connection is smoother	8.6
Competence Improvement	78% of students believe that their innovation and entrepreneurship capabilities are significantly improved	All 8 teachers believe that students' practical abilities are enhanced	8.2
Teaching Satisfaction	92% of students are satisfied with the integrated courses	6 teachers believe that the teaching effect is significant	8.9
Industry Adaptability	72% of students believe that the course content is more in line with industry needs	7 teachers believe that it meets enterprise employment standards	7.8

Note: The questionnaire survey for the experimental group (2022 cohort) was conducted after the implementation of the HITS-based optimized curriculum system for one academic year. The "insufficient enthusiasm and awareness" of students mentioned earlier refers to the pre-implementation status of the experimental group and the overall status of domestic students. After participating in the integrated courses, students' enthusiasm and awareness were significantly improved, which is reflected in the high satisfaction rate and positive feedback on competence improvement. This indicates that the curriculum optimization based on the HITS model effectively addresses the initial lack of student engagement. As shown in Table 4, the core integration paths have achieved a comprehensive score of over 8 points in the three dimensions of knowledge mastery, competence improvement, and teaching satisfaction. The score for industry adaptability has also reached 7.8 points, which indicates that the integration paths mined based on the HITS model can effectively enhance the teaching effect of courses and align with the training objectives of application-oriented universities as well as industry needs. At the same time, the relatively low score for industry adaptability reflects that the connection between the curriculum system and the latest industrial technologies and job requirements still needs to be strengthened, which also provides a direction for the subsequent optimization of courses.

VI. CONCLUSIONS

This paper constructs a curriculum system for application-oriented universities with the introduction of the HITS model, integrating innovation and entrepreneurship modules with professional core courses. The calculation results based on the HITS model show that most professional core courses are Authority Nodes, while most innovation and entrepreneurship courses are Hub Nodes. Empirical analysis verifies the effectiveness of this curriculum system.

AUTHOR CONTRIBUTIONS

Jing Fu designed, collected and analyzed the data, and drafted the manuscript. Jing Fu conducted the study, critically revised the manuscript for important intellectual content, and gave final approval of the version to be published. Jing Fu participated fully in the work, take public responsibility for appropriate portions of the content, and agreed to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

CONFLICTS OF INTEREST

The author declares no conflict of interest.

FUNDING

This research received no external funding.

HUMAN RESEARCH SUBJECTS

This study was approved by the Ethics Committee of Hebi Polytechnic, and was performed in accordance with the principles of the Declaration of Helsinki. All eligible participants signed an informed consent form.

ACKNOWLEDGEMENTS

Not applicable.

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