Research on the Influence Mechanism of Collaborative Education in Science and Education Integration in the Age of Digital Intelligence

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Abstract: *With the advancement of the scientific and technological revolution, industrial revolution, and educational revolution, integration of science and education collaborative education has become an important initiative for universities to cultivate top-notch innovative talents in the age of digital intelligence. It is a systematic project involving multidimensionality, characterized by many factors and a high degree of complexity. Therefore, clarifying the hierarchical relationship between the influencing factors and identifying the key influencing factors are crucial for improving the effectiveness of science-education fusion collaborative education. In this study, 15 key influencing factors of science-education integration collaborative parenting were identified through literature review and expert interviews. The ISM-MICMAC method was used to construct a model and draw a multilevel hierarchical model of the influencing factors of science-education integration collaborative parenting in the era of digital intelligence. The results show that the influencing factors can be divided into a five-level step structure. The fundamental level includes educational philosophy, cultivation objectives, and organizational system. It can be seen that universities need to align with national policy needs as well as social and economic development requirements. Universities should optimize their top-level design, clarify talent cultivation objectives, establish an organizational system that promotes effective collaboration in science-education integration.*

Keywords: *Age of digital intelligence; Integration of science and education; Collaborative education; ISM-MICMAC*

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1. Introduction

The era of digital intelligence, characterized by digital technology, artificial intelligence, Internet of Everything, and human-machine collaboration, is rushing forward. A new generation of digital intelligence technologies such as ChatGPT, Sora, and humanoid robots are accelerating their iterative evolution. The development of these technologies is profoundly changing the way of human social production and work and life (Xu Pingli, 2024). The development of these technologies has profoundly changed the social production and working life style of human beings. Meanwhile, it has driven the intelligent transformation and change of the industrial chain, industrial chain, economic chain and education chain. Education, as an important way to cultivate future talents with unlimited potential, must synchronize with economic development. High education should focus on cultivating top innovative talents with value as priority, ability as important and knowledge as foundation through digital transformation. Of course, education should continue to promote the innovative development of itself while promoting the development of new productivity and digital economy (Yang Xianmin, et al. 2024).

The integration of science and education is one of the means to cultivate outstanding innovative talents in the new era. It can effectively promote the in-depth integration of education, industry and scientific research. It also can promote the transformation and application of scientific and technological achievements in the process of talent cultivation. Universities can integrate and optimize educational resources, improve the efficiency and quality of education via integration of science and education. It is of great significance to realize the synergistic development of science and technology, education and talents, enhance the comprehensive competitiveness of the country and realize the goal of sustainable development (Dun Shuai, et al. 2022).

2. Domestic and international research status

The integration of science and education can be traced back to the 19th century German educator Humboldt's concept of "combining scientific research and teaching", which essentially involves integrating the latest scientific research results into textbooks and classrooms so that they can be taught to students (Tang Feng, 2024). Subsequently, top universities at home and abroad have made a lot of exploration and practice in the integration of science and education. The University of Berlin pioneered the model of "integrating education and research". Universities in Germany and the United States regard scientific research as an effective way to reproduce knowledge and cultivate the next generation of disciplinary successors. They attach great importance to the role of scientific research in cultivating innovative talents. With the introduction of the concept of "student-centered research universities", the integration of science and education has developed into "inquiry-based" and "seminar-based" collaborative education. The seminar model of the University of Berlin, the Ximingna model of Harvard University, the FOCUS model of Duke University and the guided reading model of Stanford University are more typical.

Aalborg University in Denmark builds a project-based curriculum system oriented to projects or problems, breaking through the traditional mode of theory and practice successively. It requires students to learn project theory knowledge and cooperate with peers, enterprises and research institutions to complete the project. It also requires teachers to break the limitations of teaching and improve their research strengths, and feed back the results of scientific research into the classroom. Chinese universities are also actively exploring the integration of science and education for collaborative education. Some scholars emphasize that "the integration of scientific research and teaching is the essential feature of modern universities, and both scientific research and teaching should serve the cultivation of talents" (Liu Jian, et al. 2020). Tsinghua University has cooperated with the University of Washington and Microsoft to create the Global Innovation Academy, reflecting the new normal of "science and education integration". The University of Chinese Academy of Sciences (UCAS), with the philosophy of "fusion of science and education, educating people, collaborative innovation, and serving the country", has implemented a mentorship system, small class size, personalized, and internationalized cultivation mode, and is actively exploring the path of fusion of science and education and collaborative educating people with Chinese characteristics.

Scholars at home and abroad have carried out certain theoretical research on the connotation and characteristics of the integration of science and education, the essential significance, collaborative education, etc., and have reached a unified viewpoint that "teaching and scientific research should ultimately be unified in the cultivation of talents". The current academic research on the integration of science and education mainly focuses on three levels:

First, the development of the concept of integration of science and education and paradigm update. These scholars think that the integration of science and education is a kind of university concept. With the continuous development of the integration of science and education, its connotation is from the simple integration of scientific research activities and teaching activities, extends to the deep integration of multi-subject deep participation and rich content.

Secondly, based on the cultivation of university talents, the application of the integration of science and education in the teaching of a certain type of discipline or a specialty is explored as an important means to improve the quality of talent cultivation. In conclusion, current research has explored the process elements of the integration of science and education, which provides an important reference for this study, but there is also room for further research. First, the current distribution of related research is fragmented, especially from the dimension of education ecology and talent cultivation conditions in colleges and universities is not enough attention, and the effect of science-education integration and collaborative education is not as expected. Secondly, because the development of science-education integration at home and abroad is not yet fully mature, especially the research and practice of science-education integration in Chinese universities are still in the development stage, and different groups have not yet reached a consensus on the key influencing factors of science-education integration and collaborative parenting.

Thirdly, collaborative education in science and education integration has a systematic and all-round characteristic, which is not only influenced by educational concepts, cultivation objectives, system establishment, curriculum system, teaching mode, faculty, etc., but also by external systems such as the national macro policy, economic development, social needs, and so on.

Due to the systematic and diversified nature of the factors influencing science-education integration and collaborative parenting, the development of digital education in the intelligent era has had a fundamental impact on science-education integration and collaborative parenting , increasing the complexity of the interaction mechanism between the factors. Different factors may have different hierarchical structures or have causal relationships. In order to make up for the lack of correlation or internal logical relationship between the influencing factors in the new situation in the existing research, it is necessary to make clearer the main and secondary factors of science-education fusion and collaborative parenting, explore the deep logical relationship and mechanism of the influencing factors. Consequently, help colleges and universities to accurately implement policies, improve the quality of talent cultivation, promote the implementation of the strategy of a nation of talented people and sustainable development. This study combines the theoretical research and practical experience of science-education integration and collaborative parenting, analyzing the structural relationship between the influencing factors of science-education integration and collaborative parenting by using the ISM-MICMAC method, and draws out the key influencing factors, so as to provide references for universities to cultivate top-notch and innovative talents in the era of digitization.

3. Research design

3.1 Research methodology

This study integrates ISM and MICMAC methods to explore the influencing factors of science-education integration and collaborative education in the digital age, employing qualitative methods to analyze complex systemic issues. Specifically, this study will use the ISM method to determine the interactions and system structure of the influencing factors, and then use the MICMAC method for modeling to determine the strength of the influencing and influenced relationships between the factors. By synthesizing the computational results from both ISM and MICMAC models, the key influencing factors of collaborative education for science-education integration in the digital age can be further identified.

3.2 Research framework

This study combines the methods of literature review related to science-education integration and collaborative education, expert opinion survey, and statistical analysis of questionnaire data to identify the set of factors influencing science-education integration and collaborative education in the digital intelligence era. On this basis, the ISM model and MICMAC model are constructed to determine the mechanism of action between the factors, identify key influencing factors, and propose corresponding policy recommendations. This approach aims to provide both theoretical and practical reference for universities in cultivating top-tier innovative talents in the digital intelligence era. Accordingly, the designed research framework is shown in Figure 1.

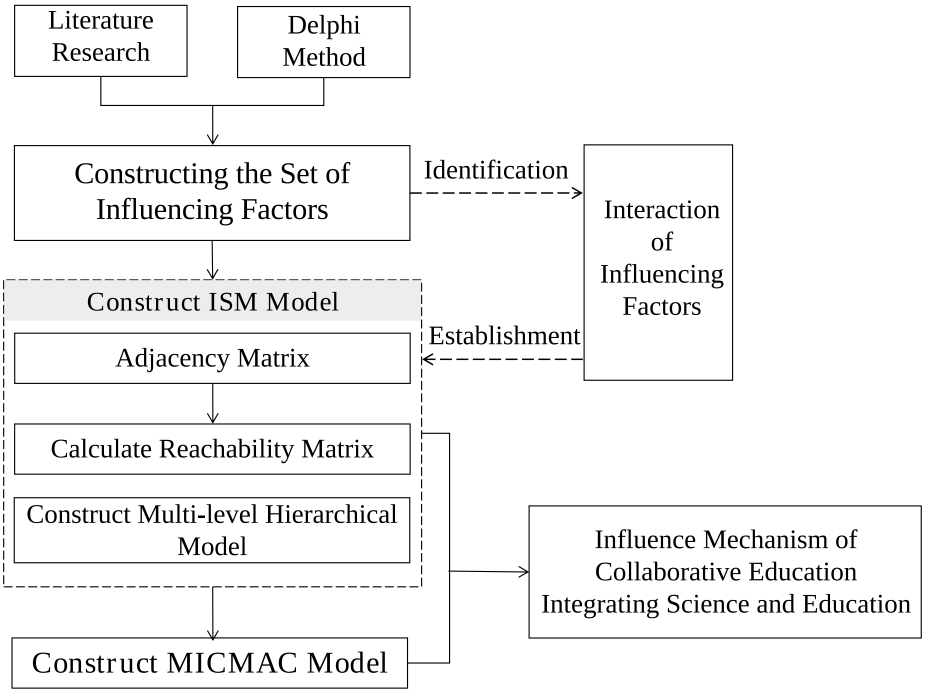

Figure1. Research framework on the influencing factors of collaborative education in science and education integration based on ISM-MICMAC.

4. Research on the influencing factors of collaborative education in science and education integration in the digital intelligence era based on ISM-MICMAC

4.1 Collection of influencing factors of science-education integration and collaborative parenting in the digital intelligence era

Focusing on the theme of "science-education integration and collaborative education", we conducted extensive literature searches using databases such as Web of Science, Elsevier, and China Knowledge Network (CNKI). The search encompassed literature in the fields of science-education integration and talent cultivation, including academic journals, dissertations, and conference papers, to ensure the comprehensiveness and authority of the theoretical research. The collected literature was then screened, organized and systematically analyzed to form the initial set of influencing factors related to science-education integration and collaborative cultivation. Subsequently, 10 experts related to higher education and industry were consulted through the Delphi method, and the influencing factors were adjusted until a consensus was reached by all experts. The final set of influencing factors for collaborative education in science and education integration was determined, including 15 factors such as educational philosophy, cultivation objectives, organizational system, management mode, operation mechanism, faculty, curriculum system.

Table1. Factors influencing the integration of science and technology in collaborative education.

No	Influencing factor	Connotation	References
1	Educational philosophy	Rational understanding and subjective requirements of education formed by educational subjects in teaching practice and educational thinking activities in the digital intelligence era.	Liu W, 2023 Wang Yang, 2023
2	Cultivation objectives	Specific requirements for student training proposed by schools based on national educational purposes, social needs, school characteristics, and school positioning.	Gao Peiyong, 2022 She Ming, 2020
3	Quality assurance	Ensuring the quality and effectiveness of teaching in the integration of education and technology.	Zheng Chunyan, et al. 2023
4	Organizational system	Relevant regulations to ensure the coordinated operation of scientific research and teaching.	Li Lin, et al. 2018 Wei Lina, 2024
5	Management mode	Strategic planning, organizational structure, and personnel management methods for the integration of scientific research and teaching.	Wang Ying, et al. 2020
6	Operating mechanism	Promoting, regulating, and restricting the normal operation of various elements in the process of science-education integration and collaborative education.	Wei Lina, 2024 Wang Xinfeng, 2023
7	Faculty	Teachers are the primary resource for educational development and the key force for the digital transformation of education.	Wang Xinfeng, et al. 2023 Jang S-J, 2008
8	Curriculum system	Curriculum is the core element of talent training, and its reform and innovation play a crucial role in improving the quality of talent training.	Curie Kingland, et al. 2022 Pérez-Foguet A, et al. 2019
9	Teaching material system	Teaching materials are one of the important tools for teaching, serving as the main carrier of the knowledge taught in courses.	Curie Kingland, et al. 2022 Hao Fujin, 2023

10	Teaching mode	Teachers construct teaching modes that link courses and scientific research.	Wei Lina, 2024 Li Maoguo, 2017
11	Practical teaching	Organizing students to participate in scientific research projects, competitions, etc., in laboratories and practice bases.	She Ming, 2020 Curie Kingland, et al. 2022
12	Evaluation mechanism	Evaluating students' learning outcomes and teachers' teaching effectiveness, shifting from "result evaluation" to "multiple evaluation".	Li Maoguo, 2017
13	Intelligent environment	Building an intelligent teaching environment from hardware and software to provide necessary conditions for the mutual integration of scientific research and teaching.	Chen Youyuan, et al. 2023
14	Teaching methods	Specific teaching strategies and methods adopted in the integration of science and education in the digital intelligence era.	Wu Fei, et al. 2022 An Lizhe, 2017
15	International exchange	Building international cooperation platforms, participating in international exchange conferences on scientific research and teaching, and cultivating students' international perspectives.	She Ming, 2020 Zhang Liang, et al. 2023 Sun Zengyao, et al. 2022

4.2 ISM model construction and analysis

4.2.1 Construction of the autocorrelation matrix

The autocorrelation matrix is the basis for constructing the ISM model, which reflects the direct relationship between the two-by-two comparisons of the influencing factors. A questionnaire was distributed to an expert panel to obtain comparative data on the importance of these factors. The expert panel consisted of 10 higher education, industry industry related experts. The questionnaire was paper-based rather than electronic to facilitate interpretation and completion in person during the expert research. The questionnaire introduced the background, purpose and scoring rules of the questionnaire in turn, and after the experts had no objections, they independently began to fill in the questionnaire to judge the relationship between the two or two factors and form the autocorrelation matrix of the factors influencing the collaborative education of science and education in the era of digital intelligence, as shown in Table 2. In the table, only the upper triangular portion of the matrix contains the comparative information of the factors, indicating the mutual influences between pairs of factors using X, V, and A, the factor in the *ith* row has an influence on the factor in the *jth* column, and the factor in the *jth* column has an influence on the factor in the *ith* row.

Table2. Autocorrelation matrix of factors influencing the integration of science and education for collaborative education in the age of digital intelligence.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1		O	V	O	O	V	O	O	O	O	O	V	O	O	V
2			V	O	V	V	V	O	O	V	V	V	O	O	V
3				O	O	O	O	V	V	O	V	A	O	O	V
4					V	V	V	O	O	O	O	O	O	O	V
5						X	V	O	O	V	O	O	O	O	O
6							O	O	O	V	V	O	O	O	O
7								V	V	O	V	A	O	O	V
8									O	O	A	O	O	O	A
9										O	O	O	O	O	A
10											V	A	O	O	V
11												A	V	A	O
12													O	O	O
13														O	A
14															O
15															

4.2.2 Construction of reachable matrices

The reachability matrix is built on top of the autocorrelation matrix. The reachable matrix $M = (A+I)^k$ can be obtained by transforming the autocorrelation matrix into an adjacency matrix A containing only 0-1, and adding the unit matrix I for Boolean operation: $(A+I)^{k-1} \neq (A+I)^k = (A+I)^{k+1}$. In this study, the reachable matrix M was calculated by MATLAB software (as shown in Table 3). The "1" between the factors indicates that the factor in row *i* can be associated with the factor in column *j* either directly or through other factors.

Table3. Final reachable matrix of factors influencing the integration of science, education and collaborative parenting in the age of digital intelligence.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	1	0	1	0	1	1	1	1	1	1	1	1	1	0	1
2	0	1	1	0	1	1	1	1	1	1	1	1	1	0	1
3	0	0	1	0	0	0	0	1	1	0	1	0	1	0	1
4	0	0	0	1	1	1	1	1	1	1	1	0	1	0	1
5	0	0	0	0	1	1	1	1	1	1	1	0	1	0	1
6	0	0	0	0	1	1	1	1	1	1	1	0	1	0	1
7	0	0	0	0	0	0	1	1	1	0	1	0	1	0	1
8	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
10	0	0	0	0	0	0	0	1	1	1	1	0	1	0	1

11	0	0	0	0	0	0	0	1	0	0	1	0	1	0	0
12	0	0	1	0	0	0	1	1	1	1	1	1	1	0	1
13	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
14	0	0	0	0	0	0	0	1	0	0	1	0	1	1	0
15	0	0	0	0	0	0	0	1	1	0	0	0	1	0	1

4.2.3 Hierarchy of impact factors

Hierarchization is a crucial step in constructing the ISM model to elucidate the relative position of each influencing factor among all factors. The final reachability matrix is applied to solve for the reachable set $R(S_i)$, the prior set $A(S_i)$ and its intersection, i.e., the common set $C(S_i) = R(S_i) \cap A(S_i)$. The system is divided into layers and when $R(S_i) = C(S_i)$, then S_i is divided to the first layer. After all the eligible factors are divided, the first layer of factors are removed from the factor set, and then continue to repeat the above steps to determine the second, third and other levels in turn, until all the factors are determined the corresponding level, you can get the stratification results of all the factors. According to the calculation results from Matlab software, the final stratification results are shown in Table 4.

Table4. Stratified results of the factors influencing the integration of science and technology in collaborative education.

Level	Influencing factor
I	8 Curriculum System，9 Teaching Material System，13 Intelligent Environment
II	11 Practical Teaching，15 International Exchange
III	3 Quality Assurance，7 Faculty，10 Teaching Mode，14 Teaching Methods
IV	5 Management Mode，6 Operating Mechanism，12 Evaluation Mechanism
V	1 Educational Philosophy，2 Cultivation Objectives，4 Organizational System

4.2.4 ISM modeling

Based on the final reachability matrix and the hierarchical results of the influencing factors, the recursive ISM model structure diagram of the influencing factors of science-education integration and collaborative parenting in the digital age can be constructed as shown in Fig. 2.The ISM model diagram provides a clear visualization of the interrelationships among the influencing factors of science-education integration and collaborative education in the digital age. It can be seen that the 15 influencing factors are divided into five hierarchical levels, and the arrows in the diagram indicate the relationship between influencing and being influenced by the factors.

Influencing factors can be divided into three categories: source, process and outcome factors and can also be divided into three levels: surface, middle and bottom levels. The results of the two classifications are summarized as follows. The combined results of the two classifications, the influencing relationships that exist between the factors are specified below:

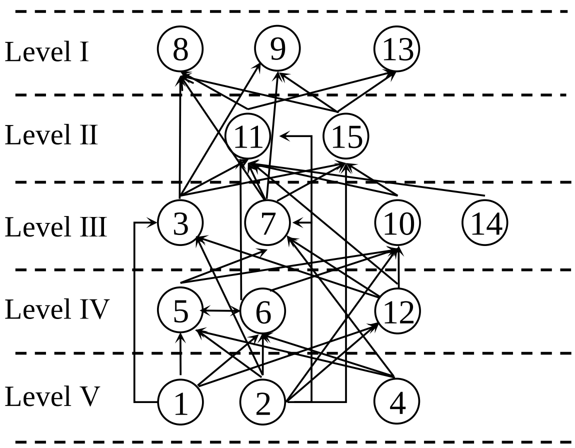

Figure2. ISM model diagram of influencing factors of collaborative education in science and technology integration.

Influencing factors at the surface level include Curriculum system (8), Teaching material system (9), and Intelligent environment (13), corresponding to Level I. These factors are direct influence factors that are closely related to the level of collaborative education in science and education integration in the digital intelligence era. They are all result factors meaning they can only be influenced by other factors but cannot influence other factors. As important factors in the process of talent cultivation, the curriculum system and teaching material system are closely related to the teaching of knowledge, the cultivation of ability, and the broadening of horizons. Therefore, it is necessary to optimize the curriculum system in terms of knowledge structure, course content, classroom teaching, etc., and improve the quality of teaching materials in terms of textbook content and arrangement to realize the quality of teaching resources, in accordance with the development trend and requirements of talent cultivation in the era of mathematics and intelligence, and by combining with the means of emerging technologies such as AI and knowledge mapping. The quality of teaching materials and the iterative upgrading of teaching resources should be realized, so that students can learn all the time and everywhere relying on the intelligent education platform.

The influencing factors in the middle layer include practical teaching (11), international exchange (15), quality assurance (3), faculty (7), teaching mode (10), teaching methods (14), management mode (5), operation mechanism (6), evaluation mechanism (12), corresponding to layers II, III and IV. These are indirect influencing factors, with progressive impact levels on surface factors and influence from bottom factors. The results show that the teaching method is the source factor, and the rest of the influencing factors in the middle layer are process factors, possessing a cascading relationship. The management mode, operation mechanism and evaluation mechanism of colleges and universities have a functional impact on the collaborative education of science and education integration in the digital intelligence era by influencing the faculty, teaching mode, practical teaching and international exchanges.

Influential factors at the bottom include educational philosophy (1), cultivation objectives (2), organizational system (4), corresponding to the hierarchy V. These are fundamental source factors with a significant impact on the overall system.. Therefore, for colleges and universities to determine the educational philosophy, cultivation objectives and organizational system is the development of the digital era of science and education integration of the fundamental collaborative education, digital era of talent training and traditional talent training concepts have produced a qualitative leap from a single, solidified, focus on professional training of educational concepts, to the full range of diversified, innovative talent training changes, pay more attention to cultivate solid foundations, a strong concept of the system, Compound talents with solid foundation, strong system concept and practical ability. Therefore, according to the social development needs and education macro policy, timely updating the education concept and talent cultivation objectives, and constantly optimizing the organization system are the fundamentals of the sustainable development of science and education integration and collaborative education.

4.3 MICMAC analysis

The ISM model identifies interaction between factors but does not indicate the strength of these interactions. MICMAC analysis, a complementary method to the ISM model, provides information on interaction strength through driving force and dependency degrees. MICMAC is applied to further analyze the strength of the inter-influence relationship between the influencing factors, which reflects the strength information of the interrelationships of the influencing factors through the driving force and the degree of dependency of the factor. The driving force of an influencing factor is the number of factors that the factor influences, while the dependency is the number of factors that are influenced by it, as shown in Figure 3.

The identified influencing factors are divided into four categories through the dimensions of driving force and dependence: class-I (independent) contains three influencing factors, class-II (dependent) contains five influencing factors, class-III (linked) contains zero influencing factors, and class-IV (driven) contains seven influencing factors. The three factors of organizational system, cultivation objectives, and educational philosophy are all driving factors in the MICMAC model, which have a greater influence on other factors and are the factors that should be paid most attention to in the development of collaborative education in science and education integration. Management mode, operation mechanism, evaluation mechanism and faculty are the driving factors in the MICMAC model, which have a strong influence on other factors. Colleges and universities should introduce modern management mode, strengthen the management and supervision of science and education integration, improve the flexible and efficient operation mechanism and comprehensive evaluation mechanism, and strengthen the faculty to provide guarantee for the development of collaborative education in science and education integration. Moreover, the curriculum system, teaching material system, and intelligent environment directly impact science-teaching integration and collaborative education. Colleges and universities can optimize the curriculum system, enhance the timeliness and cutting-edge of teaching materials, develop a smart campus, and establish intelligent classrooms and laboratories to foster the advancement of science-teaching integration and collaborative education.

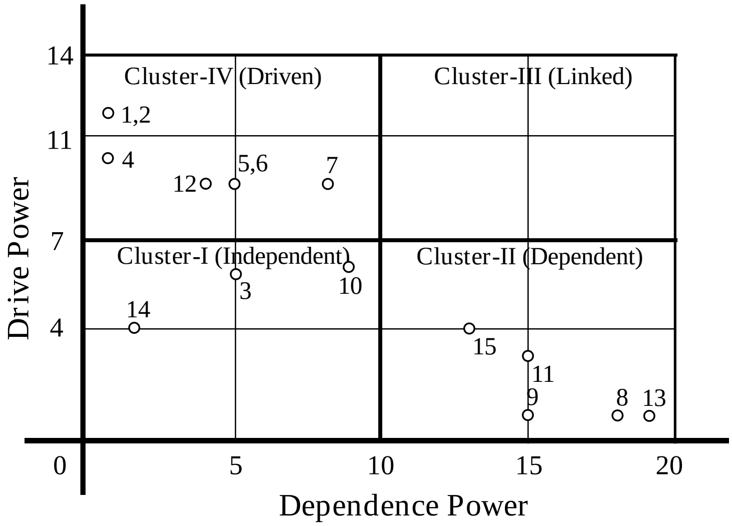

Figure3. MICMAC model diagram of factors influencing the integration of science and technology into collaborative education.

5. Conclusions and recommendations for countermeasures

There are many challenges in the development process of science-education fusion collaborative parenting in the digital age, and the existing research results mainly focus on the analysis of collaborative parenting development problems and path countermeasures, and there is insufficient research on the deep-level influence mechanism of science-education fusion collaborative parenting in the digital age. By constructing the index system of influencing factors of science-education fusion collaborative parenting and combining ISM and MICMAC methods, this study analyzes in-depth the influencing mechanism of science-education fusion collaborative parenting in the era of digital intelligence, and provides theoretical references to universities in the era of digital intelligence to promote the development of science-education fusion collaborative parenting. Based on the results of the study, four suggestions are put forward.

5.1 Strengthen the top-level design of science and education integration, and smooth the virtuous cycle of education, science and technology and human resources.

Deeply grasp the scientific connotation and basic characteristics of the new quality of productive forces, in accordance with the essential requirements of the development of the new quality of productive forces collaborative innovation and joint development.

Universities should strengthen the top-level design of school work to break down departmental barriers, deepen the institutional mechanism for the integration of science and education to break through the blockage points. Further more, universities should vigorously promote close cooperation between institutions of higher learning and scientific research institutes to create an integrated model, jointly undertake major research and development tasks for the country's strategic needs to carry out cross-research. Universities can cultivate students' innovative ability, practical ability and innovative confidence through organized high-level scientific research practice, which can truly implement the concept of "science and technology is the first productive force, talent is the first resource, and innovation is the first driving force". Universities can build a new type of production relations including science and technology innovation system, education development system and talent supply system to provide strong impetus for the development of new quality productive forces.

5.2 Broaden the depth and breadth of science and education integration to form a multiplier effect of education, talents, science and technology.

Facing the urgent demand for high-level scientific and technological self-reliance and the cultivation of national strategic talents, colleges and universities and scientific research institutions, which are the main force of talent cultivation and source innovation in China, should give full play to their policy advantages, educational advantages, resource advantages, and systemic advantages. They also should jointly explore new paths, new modes, and new mechanisms for the fusion of education, talents, science and technology. Colleges and universities and scientific research institutions should work in the common goal, interact with each other and jointly innovate, deeply integrate in educational concepts, institutional mechanisms, cultivation modes, educational contents and methods and means. To accelerate the layout of basic, emerging and cross-disciplines, and accelerate the construction of disciplines and specialties in the fields of artificial intelligence, quantum science and technology, new energy and other fields, so as to provide leading support and driving force for the development of new quality productive forces.

5.3 Gathering high-end resources for science and education integration, and constructing a highland for education, science and technology, and talent cultivation

Universities should aim to the cultivation of first-class talents and high-level scientific research, closely follow the direction of national strategy, regional development, industrial transformation, and market demand. Converging and integrating the first-class disciplines, specialties, and talents of universities with the high-quality resources of scientific and technological fronts, major problems, and research technologies of scientific research institutes. Universities can collaborate and cooperate with the scientific research institutes in the key links of talent cultivation, such as cultivation programs, curricula, teaching materials, internships, theses, laboratories, and innovative practices. .In order to create a new high ground for talent cultivation that is closely integrated with science and technology, highly matched with industrial structure and precisely coupled with market demand. So as to practically promote the transformation of scientific research results into teaching effects and the advantages of scientific research into advantages of talent cultivation, and to provide intellectual support and human resources for the development of new quality productivity.

5.4 Create an intelligent environment for the integration of science and education, and strengthen the digital empowerment of education, science and technology, and talents

The digital transformation of education is becoming a global trend in education reform and development, and the era of digital intelligence has put forward new requirements for talent training, with more emphasis on cultivating students' innovative awareness, practical ability and digital literacy. Relying on artificial intelligence, big data, virtual simulation and other information technology carriers, can build an online and offline integration, reality and virtual integration and "cloud integration" of digital learning platforms. In order to provide comprehensive support for the organic integration of learning resources, learning activities, learning processes and learning data, universities should create a learning space that organically integrates physical space, resource space and social space. So that providing students with an open, shared and lifelong learning environment, realizing the deep integration of science and technology and education, synchronous resonance and bi-directional empowerment, and providing new impetus and vitality for the development of new quality productivity.

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