



## Research on the Construction and Optimization of Global Competence Based on AI Algorithms in American Educational Practice

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**SUMMARY:** *With the large-scale global competence assessment carried out by the Organization for Economic Cooperation and Development, the international talent cultivation goal of global competence has received extensive international attention. This study, from the perspective of conceptual history, conducts an in-depth analysis of the origin and diffusion mechanism of the global competence education concept. Taking the United States, which promotes global competence assessment or achieves outstanding results in such assessment, as the main case, it deeply analyzes the United States' understanding and cultivation path of the global competence concept, in order to gain a global understanding to gain a deeper understanding of the essence of competence. Research has found that the global competence developed by the United States falls under the category of integrated talent cultivation goals, mainly including four similar elements: willingness to participate in international affairs, an open and inclusive attitude, cross-cultural communication, and taking action. The survey found that the total scores for American students' global competence were concentrated between 300 and 330 points, with an average of 314.53 points. The average total score for students' global competence was at an above-average level, which to some extent indicates that the overall level of American students' global competence is good. As the initiator of the global competence concept, although the United States does not have a powerful central government like China, the federal Department of Education has a top-level design awareness in the promotion and implementation of the concept, demonstrating a clear overall design and multi-party participation promotion model.*

**KEYWORDS:** *Global competence; International talent; Cross-cultural communication; Cultivation path*

## 1 Introduction

As globalization and informatization continue to deepen, the cultivation of global competence has increasingly drawn international attention [1]. The United States is the birthplace of the concept of “global competence” and was among the first countries to engage in research and practice related to global competence education [2, 3]. Faced with the major challenge of teacher shortages hindering the development of global competence education, the United States has actively conducted research and practical experiments to address this issue [4, 5]. For example, exploring the qualities that teachers teaching global competence should possess, examining existing teacher education programs focused on global competence, and discussing how to optimize the effectiveness of global competence teacher education through methods

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such as critical pedagogy and authentic simulations. These studies and practices have primarily focused on pre-service teacher education, with research primarily at the micro-level [6-9].

Global competence refers to an individual's ability to understand and appreciate the differences between nations and cultures, and to effectively communicate, collaborate, and address global issues with people from around the world [10-12]. It is not merely about acquiring knowledge but rather a reflection of comprehensive competencies [13]. A globally competent individual must first have an open mindset, willing to embrace diverse cultures, perspectives, and lifestyles [14, 15]. They do not harbor biases or reject differences but approach them with curiosity and respect [16, 17]. Cross-cultural communication skills are also a key component of global competence [18]. This means being able to communicate effectively with individuals from diverse cultural backgrounds using appropriate methods [19]. Language is the foundation of communication, but it is not enough to simply speak a foreign language; one must also understand the cultural implications behind different languages, differences in body language, and communication habits [20-22]. Understanding global issues and being able to propose solutions is also an important manifestation of global competence. Many issues today, such as climate change, environmental pollution, and resource shortages, cannot be solved by a single country alone, so it is necessary for all countries around the world to work together [23-26].

This paper analyzes the connotation of global competence, dividing it into language and cross-cultural communication skills, global perspective, and national sentiment. It outlines the practical pathways for cultivating global competence among American students. It briefly mentions the governance of artificial intelligence algorithms in the United States. Design an AI algorithm teaching system and incorporate a global competence module into the system. To optimize the performance of the AI algorithm teaching system, establish a scenario information construction system task and propose resource allocation strategies based on data volume and priority. Survey the level of global competence among American students and analyze the relationship between the AI algorithm teaching system and the development of global competence among American students.

## 2 The Meaning and Deconstruction of Global Competence

International talent should possess global competence, which refers to an individual's ability to participate in global cooperation and competition. Specifically, this includes a global perspective, understanding of international rules, and the ability to participate in international affairs and competition. Compared to general competence, global competence places greater emphasis on “global” and “cross-cultural” aspects.

Global competence can be divided into three dimensions: knowledge, skills, and values [27, 28]:

In terms of knowledge: mastery of relevant languages, professional knowledge, social and cultural understanding, and international law is required.

In terms of skills: proficiency in cross-cultural communication, application of international rules, teamwork, and information technology is necessary.

At the values level: It requires a global perspective, a sense of national pride, a healthy mind and body, self-directed learning, and innovative thinking. Among these, the core competencies that international talent particularly needs to possess include strong language skills, cross-cultural communication abilities, international knowledge, a global perspective, and a sense of national pride.

## 2.1 Language and Cross-Cultural Communication Skills

First, international talent must be able to communicate fluently with international peers or colleagues in terms of language. They need to be proficient in English and other internationally recognized languages to achieve effective communication, which is the foundation of international cooperation and exchange. There are thousands of languages in the world, and over 50 commonly used languages along the Belt and Road Initiative route. This requires international talent to possess strong bilingual or even multilingual capabilities.

Second, international talent must possess cross-cultural communication skills. Cross-cultural communication skills generally refer to the comprehensive abilities required for individuals from different linguistic and cultural backgrounds to achieve appropriate and effective communication and interaction.

The essence of cross-cultural communication skills can be analyzed from three dimensions: cognitive, emotional, and behavioral [29]. At the cognitive level, international talent must possess the ability to understand different languages and cultures, master the fundamentals of language, and recognize the significant impact of cultural differences on communication. At the emotional level, accepting and understanding the values and behavioral patterns of different cultures helps reduce cultural conflicts and misunderstandings, while adapting to different cultural environments helps maintain a positive mindset and emotional stability. At the behavioral level, cross-cultural communication skills include communication techniques, problem-solving abilities, relationship-building abilities, and the ability to complete tasks in cross-cultural contexts.

## 2.2 Global Perspective and Patriotic Sentiment

International talent must possess extensive international knowledge, a broad global perspective, and a deep sense of national pride. International knowledge refers to a multifaceted understanding of the politics, economics, culture, history, and geography of countries around the world, as well as a thorough understanding of international rules. A global perspective requires international talent to uphold the concept of a community with a shared future for mankind, to be grounded in reality, and to look to the world. They must be able to discern global trends and pay attention to differences and dynamic changes in international politics, economics, culture, and society.

Additionally, global competence requires international talent to have a solid foundation of professional knowledge, understand the current state of their field, international cutting-edge developments, and future directions. They should also possess innovative thinking and capabilities, keep pace with international trends and technological advancements, continuously update their knowledge and skills, and explore new approaches and methods in global competition.

# 3 The Evolution and Practice of the Global Competence Concept in the United States

## 3.1 Concept and evolution

The United States is the initiator of the concept of global competence. It was initially proposed by the American International Exchange Association, a non-governmental organization [30]. After being studied and promoted by institutions such as the Council of State Chief Education Officers and the Asia Society, it was gradually officially incorporated and explicitly written into the United States' international education strategy. Ultimately, relevant institutions and experts

in the United States gradually internationalized the concept of global competence by cooperating with the OECD, an international organization, and promoting international assessments.

### **3.1.1 The initial stage of the concept's emergence**

As a world leader, the United States has always attached great importance to international exchanges and cooperation. In 1988, the American Institute for International Exchange released the report "Teaching for Global Competence", which explicitly used the concept of "global competence" in its title and pointed out that higher education needs to cultivate American youth to understand and lead the changes of the future world. In terms of training paths, efforts are made to promote cooperation between the economic, business, political and non-profit organizations in the United States and the higher education sector to cultivate globally competent American youth.

Since the concept of global competence was born in the United States, it has emphasized its ability to "lead change". In terms of the training path, it has focused on the extensive participation of various fields and entities in the United States, reflecting the essential purpose of the United States in cultivating students' global competence. However, in the early days when the concept of global competence emerged, its connotation was not clear and it did not receive widespread attention.

### **3.1.2 The period of local officialization**

In 2012 year, "Succeeding Globally Through International Education and Engagement: U.S. Department of Education International Strategy " proposes that global competence refers to an individual's ability to succeed in a flat world that is increasingly closely connected globally and to fully participate in international affairs with global influence [31]. And the knowledge and skills required to function effectively, which mainly include the knowledge and ability to understand the cultures, languages and positions of other countries.

On this basis, the Global Competence Task Force led by the Council of State Chief Education Officers of the United States and the Asia Society pointed out that global competence is interrelated and an important skill that all individuals should possess. Individuals with global competence can use the knowledge and skills they have to understand the world, be aware of their own and others' perspectives and positions, communicate effectively with different people, and put their ideas into practice [32]. This global competence can be regarded as 21st-century competence that is actually applied to the world. During this period, official institutions in the United States began to explicitly use the concept of global competence as an important strategic component of international education, and the concept of global competence gained some influence and gradually became official.

### **3.1.3 The period of concept internationalization**

In December 2017, the Education and Skills Division of the Organization for Economic Cooperation and Development and the "Zero Point" project team of the Harvard Graduate School of Education jointly released the "PISA Global Competence Framework"[33], which explains the connotation of global competence and its assessment design, that is, "individuals can perceive local, global and cross-cultural issues, understand and appreciate the viewpoints and worldviews of others, and interact with them. The concept of global competence involves people from different cultural backgrounds interacting in a way that is both respectful and effective, and taking responsible actions for collective well-being and sustainable development. This concept is not significantly different from the report released by the Asia Society in 2011.

Through cooperation with the OECD and the promotion of the Global Competence Assessment, the idea of global Competence has received broader attention internationally. Note: The concept of global competence has entered an international stage.

In the process of internationalizing the concept of global competence, the United States has also been constantly strengthening the concept of global competence by updating its international education strategy, making it more detailed, rich and operational.

### **3.2 Practices for Cultivating Global Competence in American Students**

#### **(1) Top-level design and policy guidance for global competence development**

In terms of global competence development, the US federal government has gradually shifted its focus from higher education to basic education, recognizing the need to strengthen language and cultural learning among students at the basic education level.

#### **(2) Curriculum construction and tiered promotion of global competence integration**

In terms of curriculum construction, the US has adopted a tiered strategy to promote the integration of global competence.

National level: Emphasize the importance of cultivating critical thinking, problem-solving, and analytical skills in subject-specific learning requirements, which aligns with the core competencies of global competence.

Local government level: State governments with educational autonomy actively promote global education, incorporate global concepts into curriculum frameworks, translate them into school practices, and provide teachers with adequate resources and professional training to better cultivate students' global competence.

At the school district and school level: The cultivation of students' global competence is primarily reflected in curriculum design. Subject-based courses are primarily used for general education, such as language, mathematics, science, social sciences, arts, and physical education, which are divided into 2–5 difficulty levels to accommodate students with different learning abilities and goals, with elements of global competence cultivation integrated throughout.

#### **(3) Teaching implementation: Interdisciplinary integration to cultivate global competence**

In terms of teaching implementation, the United States actively promotes interdisciplinary integration to cultivate students' global competence.

The integration and complementarity of on-campus and off-campus curricula also play an important role. Schools actively collaborate with social institutions and businesses to create abundant practical opportunities for students.

In terms of teaching methods, emphasis is placed on openness, collaboration, and application. An open teaching environment encourages students to ask questions actively and explore boldly, fostering innovative thinking.

#### **(4) Multi-stakeholder collaboration to jointly enhance global competence**

The cultivation of global competence among American students benefits from the collaborative efforts of multiple stakeholders. Higher education institutions, research organizations, and non-governmental organizations actively participate and play an important role.

Non-governmental organizations also play a unique role in the cultivation of global competence. Some non-governmental organizations organize international exchange programs, providing students with opportunities to interact with students from other countries.

### **3.3 The AI algorithm teaching system is integrated with the global competence module**

#### **(1) Overall System Design**

This system is an application system in a network environment and adopts the B/S model. The advantages of the B/S model include: First, the user interface is consistent and easy to use, enabling different personnel to access and operate the system from different locations using different access methods. Second, general clients do not need to install additional software; they only need a browser to operate the system. Third, the application runs on the server side, which facilitates system management, updates, and upgrades, reducing dependency between clients and the server. It also enhances application security, effectively protecting the system platform and server database. Finally, due to the system's open architecture, the B/S architecture offers better cross-platform compatibility and scalability. It also reduces system operating costs and better meets the needs of various users.

The B/S model of this system is divided into three layers: data access layer, business logic layer, and user interface layer. This approach enhances database security and program maintainability while reducing system maintenance costs. Users only need to install the corresponding browser on the client side to access the system for online learning. Minor system modifications or version upgrades can be performed on the server side without requiring changes on each client, thereby reducing client maintenance efforts.

## (2) Global Competence Module

The in-depth application of AI technology is reshaping the cultivation paradigm of global competence. AI teaching systems are transforming the four core dimensions of global competence from "standardized output" to "adaptive growth" by building learner profiles, cross-cultural scenario simulations, and real-time cognitive diagnoses.

The integration and innovation of the global Competence module are as follows:

Step 1: Construction of a personalized capability map.

By analyzing the language features of students in cross-cultural discussions through ai algorithms and combining digital technologies such as knowledge graphs, a visualized global competency growth trajectory of students is generated.

Step 2: Generate an immersive cross-cultural event field.

For instance, AI generates sudden international events, requiring students to collaborate with multi-time zone teams to formulate plans, and algorithms issue early warnings for cultural biases in decision-making.

## **3.4 Strategies for optimizing AI algorithm teaching systems to enhance global competence**

### **3.4.1 Establish a scene information construction system**

The main models of the system and the relationships between them are shown in Figure 1.

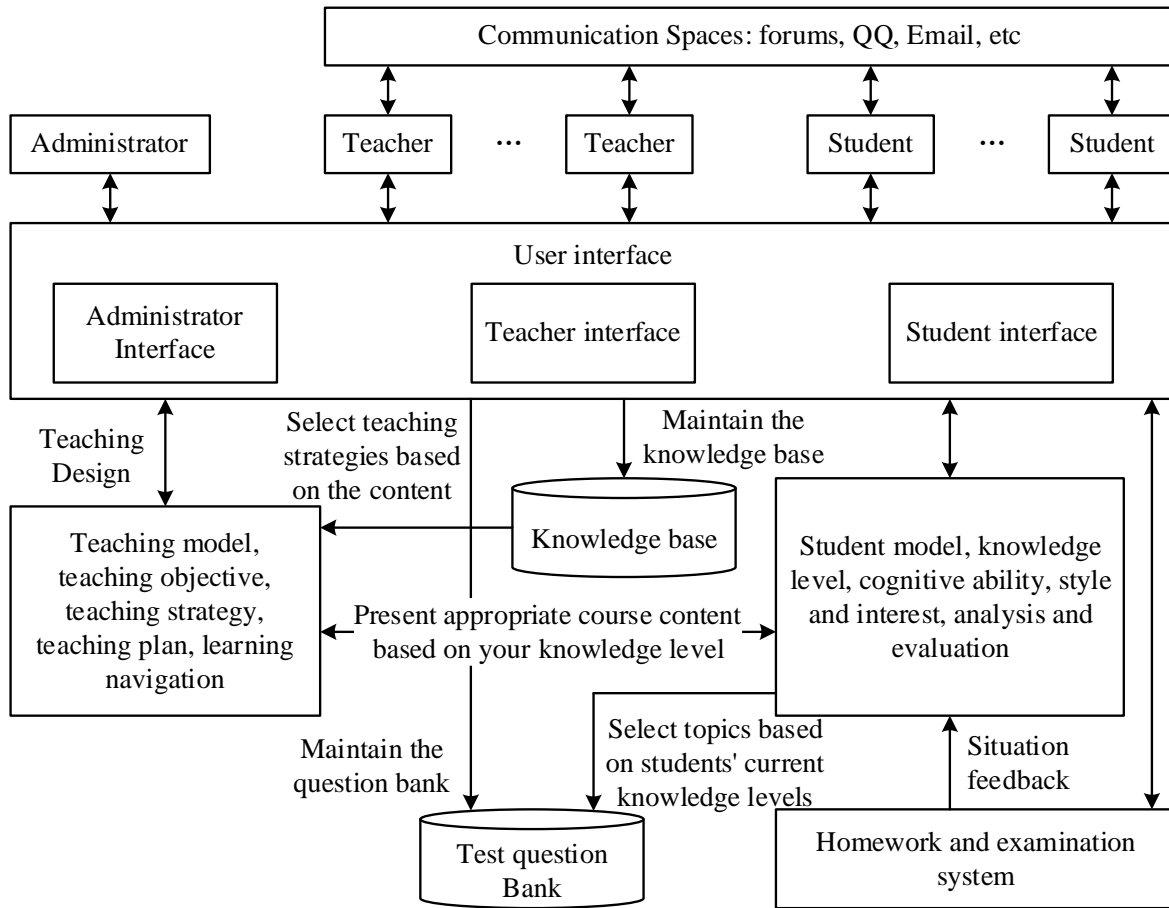


Figure 1: The main model of the system and the relationship between the models

Knowledge representation design: division of knowledge points, attributes of knowledge points, and relationships between knowledge points.

The knowledge representation module incorporates a global competence development module. The global competence development module draws on the comprehensive curriculum development experience of Winton Middle School in Massachusetts to build a cross-disciplinary global competence curriculum, including computer science courses, communication courses, and global systems courses. AI algorithms are used to optimize the operation of computer science courses, communication courses, and global systems courses.

American high schools place great emphasis on the guiding role of interdisciplinary courses in enhancing students' global competence, aiming for students to achieve a comprehensive understanding of disciplines within a globalized perspective. In 2021, Winton School integrated various foundational academic disciplines to establish three comprehensive curricula: computer science, communication studies, and global systems. Under each curriculum theme, the school designs distinct learning tasks, with teachers organizing relevant instructional content around each theme while incorporating global competence principles to promote students' comprehensive understanding and deep mastery of knowledge.

### 3.4.2 Allocate resources based on the volume of data and priority

**Student Model:** The student model reflects students' learning foundations, ability characteristics, and personality traits. The system can provide appropriate teaching content based on the student model to offer the most suitable teaching mode for students. Therefore, the student model

records students' personalities, learning situations, and learning characteristics as the basis for the system to select teaching content and methods.

The student model primarily includes student characteristics that are highly useful for effective navigation. The records of the student model serve as the basis for intelligent navigation.

After completing each meta-knowledge point, students take a test. Each knowledge point's test questions consist of three types: multiple-choice, true/false, and fill-in-the-blank. The question bank is constructed such that each question, during the input process, defines the cognitive ability it aims to assess (recall, understanding, application, analysis, synthesis, evaluation). Each question in the question bank can assess at least one of the six cognitive abilities.

Step 1: When students take the test, if they answer the question correctly, the corresponding cognitive ability value for that question is set to 1. If they do not answer or answer incorrectly, the value is set to -1. After completing the three sections of the test, students receive a test record sheet.

Step2: Calculate the accuracy rate of each cognitive ability's answers.

Step3: Calculate the comprehensive cognitive ability of students after learning this knowledge point.

Teaching model: The teaching model of this system can automatically select different teaching strategies for different students. The following designs should be reflected in the entire teaching model: personalized navigation design for the learning process and hypertext navigation design.

## **4 Global Competence Education Practices in the United States under the Background of AI Algorithms**

### **4.1 Current Status of Students' Global Competence**

To enhance the scientific rigor and reliability of the survey, this study first conducted a pilot test of the questionnaire. During the pilot test, problematic sections were identified and promptly revised to improve the quality of the questionnaire items.

The pilot test used students from two schools as the survey sample, with a total of 180 questionnaires distributed. All 180 questionnaires were returned, resulting in a 100% response rate. Due to the small sample size of the pilot test, only reliability testing and item analysis were conducted on the pilot test data.

To gain a comprehensive understanding of the current state of global competence among American students, the questionnaire was primarily distributed on-site. A total of 850 questionnaires were distributed, with 812 returned, achieving a response rate of 95.5%.

Statistical analysis of the questionnaire scale revealed that the total scores for students' global competence followed a normal distribution. The total global competence scores of American students are shown in Figure 2.

The total global competence scores of students are concentrated between 300 and 330 points, with an average of 314.53 points out of a maximum of 380 points. Therefore, the average total global competence score of students is at an above-average level, which to some extent indicates that the overall level of global competence among American students is good.

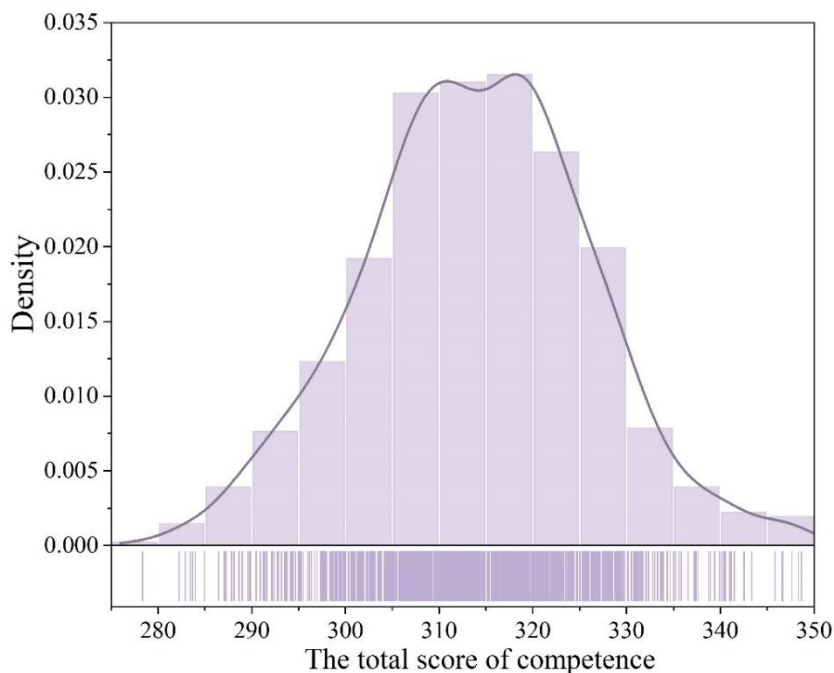


Figure 2: American students' global ability

Descriptive statistics and analysis of the scores for the four dimensions of students' global competence revealed significant differences in the internal structural levels of students' global competence.

The internal structural levels of American students' global competence are shown in Table 1.

The mean scores for the dimensions of “Attitudes and Values,” “Knowledge,” “Skills,” and “Action” were 4.17, 3.99, 4.25, and 4.03, respectively. The mean score for the overall global competence of students is 4.11.

By comparing the scores of each dimension with the overall global competence score, it was found that the mean scores for the “Attitudes and Values” and ‘Skills’ dimensions are higher than the mean score for the overall global competence, while the mean scores for the “Knowledge,” “Attitudes and Values,” and “Action” dimensions are all lower than the mean score for the overall global competence.

Looking at the average scores across the four dimensions of global competence, the skill dimension scores > attitude and values dimension scores > action dimension scores > knowledge dimension scores.

Table 1: The internal structure of American students' global competence

Item	Mean	Standard deviation	Variance	Min	Max
Attitudes and values	4.17	0.75	0.33	1.53	4.86
Knowledge	3.99	0.63	0.45	1.67	4.93
Skill	4.25	1.19	0.29	1.48	4.95
Act	4.03	1.21	0.51	0.95	4.77
Overall level	4.11	1.43	0.79	3.43	4.96

The scores for the four dimensions of global competence among American students are shown in Table 2. This paper further divides the knowledge dimension of global competence into three sub-dimensions: ethnic awareness, world awareness, and cultural integration. The

attitude and values dimension of global competence is divided into three sub-dimensions: openness and inclusiveness, local confidence, and global responsibility. The skills dimension of global competence is divided into three sub-dimensions: cultural adaptation, communication and collaboration, and professional skills. The action dimension of students' global competence is further divided into two sub-dimensions: daily actions and international actions.

*Table 2: The four dimensions of American students' global competence*

Dimension	Item	Mean	Standard deviation	Variance
Knowledge	National cognition	4.15	0.53	0.32
	World cognition	4.13	1.64	0.57
	Cultural blending	3.98	0.79	0.56
Attitudes and values	Open inclusiveness	4.04	0.83	1.27
	Local confidence	4.59	0.94	0.69
	Global responsibility	3.83	0.51	1.23
Skill	Cultural adaptation	4.25	0.63	0.91
	Communication collaboration	4.47	0.75	1.12
	Professional skill	4.39	0.69	1.03
Act	Daily action	4.25	0.87	1.25
	International action	4.16	0.82	1.36

Overall, the scores for the four dimensions of global competence among American students are all good.

## 4.2 AI Algorithm and Students' Global Competence

To investigate the relationship between the AI algorithm teaching selected in this paper and students' global competence, this paper uses the product-moment correlation method to analyze the strength and direction of the correlation between each continuous variable.

The results of the data analysis are shown in Figure 3. The variables include cognition, skills, attitudes and values, global competence, the international teaching ability of the AI algorithm teaching system, teaching content, and teaching tasks.

The international teaching capability of the AI algorithm teaching system shows significant positive correlations with global competence and its various dimensions, with correlation coefficients of 0.365, 0.451, 0.526, and 0.612, respectively. Since the correlation coefficients for the overall level and its various dimensions all exceed 0.3, this indicates that there is a significant moderate positive correlation between the international teaching capability of the AI algorithm teaching system and the overall level and its various dimensions.

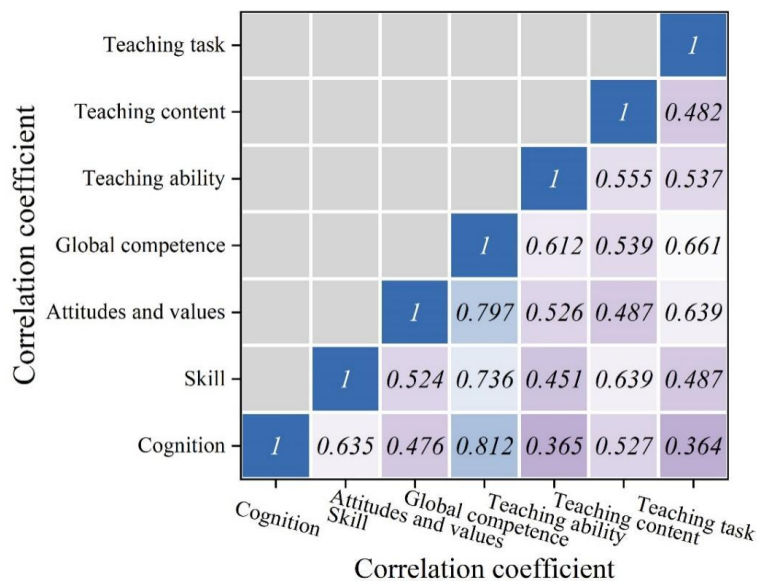


Figure 3: Data analysis results

### 4.3 The Global Competency Development Strategy of the United States

Under the guidance of the global Competence concept, the United States Department of Education regards the cultivation of global competence as an important part of its international education strategy. Through the participation of multiple departments, it focuses on the cultivation of teachers' global competence and has gradually formed a practical path characterized by carrying out practical projects to enhance global competence and integrating the global competence concept into the curriculum.

#### 4.3.1 Implement the practice project for enhancing global competence

Over the years The United States Department of Education, through the Department's Office of International and Foreign Language Education (IFLE), supports programs that cultivate experts proficient in world languages and regional and international affairs [34].

Based on specific project setting goals, the Office of Foreign Language Education Research cultivates the global competence of researchers, teachers and learners by setting up concrete and operational projects. For example, the overseas seminar program developed for American educators and administrators, in which participants enhance their understanding of other countries by studying abroad for four weeks during the summer and participating in educational and cultural activities Understanding the family, folk customs and culture, and then enabling participants to design cross-cultural courses that are in line with their local culture based on their experiences abroad; In addition, there is an overseas faculty research scholarship program that supports faculty and staff. Through scholarships awarded by colleges and universities, this program enables faculty and staff to conduct modern foreign language research and regional studies overseas for three to 12 months.

In addition, there are projects that fund higher education institutions to establish, strengthen and operate as modern foreign language training and regional/international research resource centers, providing guidance at the undergraduate, postgraduate and professional levels, and focusing on world regions or a series of global themes and interdisciplinary issues. Carry out outreach activities to involve different stakeholders in international education themes and events. The Office of Foreign Language Education provides unique opportunities for American students, teachers, researchers and administrators through practical projects, enabling them to master world languages proficiently and acquire knowledge of the regions where these

languages are used, and cultivate the global talents needed by the United States.

#### **4.3.2 Integrate global competence cultivation into the curriculum**

As one of the earlier countries to carry out global competency cultivation practices, the United States has already formed a relatively complete cultivation path. On the one hand, the United States has fully integrated the concept of global competence into various disciplines. In the curriculum of social sciences (history and social studies, etc.) and languages (mother tongue and other foreign languages), the latest local and global hotspots and themes are integrated to subtly cultivate students' global competence to meet the challenges of the real world, and in addition, in the context of global issues and challenges. Interdisciplinary courses have become one of the effective ways to combine local requirements with global concerns in the present era of warfare [35].

Many schools in the United States have begun to create interdisciplinary courses within the school client layer, such as deepening learners' understanding of the history, culture, language, religion, art, and literature of a certain region in the world through regional studies courses. In terms of teaching methods, teachers attach great importance to creating simulated situations, encouraging students to engage in open exploration, and using learning experiences to participate in project collaboration and themes. In an applied teaching environment such as debate, learners' understanding of the current world of life is enhanced, and they think about and contribute their own solutions to the problems they are facing.

#### **4.3.3 Cultivate teachers with global competence**

Teachers with global competence are a necessary condition for cultivating learners' global competence. Therefore, the United States attaches great importance to the cultivation of teachers' global competence. After years of improvement and development, the United States has initially formed an integrated training model of teachers' global competence with the participation of multiple subjects [36]. When providing pre-service education for teachers, the United States often enhances the global competence of prospective teachers by setting up general education courses related to the world for normal school students, infusing a global perspective into subject-specific courses, and offering overseas study and teaching internship programs for students.

In addition, all states, universities and academic groups in the United States have developed global education network training courses for basic education, providing offline training for teachers to develop international knowledge and skills and conducting teacher exchange programs to broaden their international horizons. And through a series of course studies, teachers can enhance their cutting-edge teaching skills and methods, such as digital teaching methods, peer learning, and inquiry-based learning, thereby supporting teachers in conducting global competence teaching.

## **5 Conclusion**

In the context of globalization and when the world is confronted with common challenges, cultivating talents with global competence is of vital importance for enhancing China's international status and influence, playing a greater role in global governance, and promoting the building of a community with a shared future for mankind. At the international level, the United States was the first country to propose the concept of global competence, develop a framework for global competence cultivation, and carry out global competence cultivation practices. It has formed an overall design and multi-participation model, regarding the

cultivation of students' global competence as an important strategy to strengthen American education and enhance the priority of international education in the United States.

To address the issue of insufficient representation of talents in international organizations that China is facing, in recent years, China has attached great importance to the cultivation of international talents, and all sectors of society have continuously made beneficial attempts. From the perspective of the global competence cultivation system in the United States, integrating the existing international talent cultivation resources and integrating the international talent cultivation goals to build a global competence cultivation system supported by administrative, academic, educational and social forces is an effective path for China to carry out global competence education. Finally, this study still has many deficiencies. Especially for the information in the United States, it mainly relies on text analysis methods and has not been actually examined. The depth of relevant analysis can be further enhanced. Secondly, as the theory and practice of global competence are still in their early stages of development, there are still certain deficiencies in the relevant data, and it is worth further attention and research in the future.

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