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The Impact of Improving College Mathematics Instruction to Better Impact Future Employability and Research

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SUMMARY: *This paper adopts the USEM Employability Model as a theoretical model to classify college students' employability into disciplinary comprehension, comprehensive skills, self-efficacy, and metacognition, and to classify college mathematics teaching into basic theory courses, applied skill development, and professional expansion. The questionnaire data were collated, the reliability and validity of the questionnaire were examined, and the differences in university mathematics teaching as well as students' employability were analyzed in four school types: double first-class colleges and universities, general undergraduate colleges and universities, specialized colleges and universities, and others. The correlation analysis of the dimensions of university mathematics teaching and employability is conducted, the correlation coefficient is calculated, the logistics regression analysis of university mathematics teaching and employability is launched, and the moderating effect analysis is conducted for the double first-class colleges and universities and the general undergraduate colleges and universities respectively. School type showed significance ($p < 0.05$) for college mathematics teaching overall and for college students' employability overall and for the four dimensions of subject comprehension, comprehensive skills, self-efficacy and metacognition. The explanatory degree of the demographic characteristics variable in the overall regression analysis on college students' employability is 33.5%, R^2 value is 0.335. After adding the college mathematics teaching variable, R^2 is 0.672, which gives us that college mathematics teaching positively affects employability. That is to say, improving university mathematics teaching can positively promote students' employability, and the effect is more significant in double first-class colleges and universities.*

KEYWORDS: *logistics regression analysis; correlation analysis; moderating effect; university mathematics teaching; employability*

1 Introduction

As far as the social demand for talents is concerned, at the present stage, all enterprises and employers in the society have higher requirements for the comprehensive quality and professional ability of college students, which not only require students to have rich professional knowledge, but also pay attention to the practical operation ability and level of students [1-3]. The scope and kinds of employment of college students majoring in mathematics after graduation are very wide, including different fields such as production, computer, technology, intelligent management and so on. Several studies have shown the importance of valuing mathematical understanding and mathematical skills for student

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employment in mathematics majors or majors where mathematics courses exist. Among them, King et al [4] (2017) stated that mathematics majors value the outcomes of specialized knowledge and skills, but there are discrepancies in the coverage of migrating skills in the actual mathematics major programs, and there is a lack of confidence among students in the use of these skills, which leads to concerns about the employability of graduates. Mirzaev [5] (2018) emphasized the need to combine theoretical knowledge and practical applications in the teaching of higher mathematics in engineering disciplines to develop mathematical comprehension and engineering thinking in students-engineers, which further develops their professional competence. Pozzi and Bonson [6] (2019) included a curricular intervention in a mathematics degree capstone project, and the results of the intervention showed that explicitly teaching transferable skills in the curriculum was an effective way to improve students' employability practices. Karupu et al [7] (2021) proposed a model of professional skills development for future aviation and information technology professionals based on practical mathematical training and information technology applications to develop both hard and soft skills in students to best prepare them for future jobs. Farkacová et al [8] (2024) investigated that 47% of university students' mathematical comprehension mediated the extent to which students' perceived importance of employability skills in their future job performance and provided explanations for the importance of skills. Ubat et al [9] (2024) tracked the employment of Bachelor's degree in secondary education among mathematics majors in a university, with 47%, 34%, and 42% employed in the government sector, private sector, and as teachers, respectively, and recommended that students' mathematical competencies be improved in order to broaden their employment opportunities. Shirima [10] (2025) reported that economic education divorced from the applied mathematics curriculum weakened the students' and teachers' learning skills in data reasoning and economic analysis, leading to limited career mobility and ambiguous career development for students.

At the present stage, the teaching of high mathematics still commonly adopts the traditional teaching mode of one-way lectures by teachers, focusing on the theoretical knowledge and calculation results of mathematics, ignoring the students' own degree of understanding, coupled with the differences in the level of teaching ability of teachers, resulting in insufficient reasoning ability and innovation ability of students at the postgraduate level [11-14]. In addition, in order to improve the systematicity and rigor of the university high mathematics course, some colleges and universities ignore the relevance of the high mathematics teaching materials to the needs of practical talents when choosing high mathematics teaching materials, failing to give full consideration to the actual social needs of professional courses, resulting in the teaching content of high mathematics placing more emphasis on the teaching of theoretical knowledge, and lowering the practicability and utility of the course [15-18]. Furthermore, the backwardness and rigidity of the teaching mode lead to the difficulty of combining the professional knowledge of mathematics with social employment, which in turn leads to the lack of practical ability of the educated to apply mathematical knowledge. At the same time, teachers' teaching emphasizes too much on the logic and formalization of knowledge, and fails to combine with professional needs and enterprise practice, which is not conducive to the enhancement of the employability and professional practice ability of the educated [19-22].

Innovations in mathematics teaching methods can improve the level and effectiveness of mathematics teaching and learning, contributing to student engagement, student professionalism, problem-solving skills, mathematical thinking, and academic achievement, thus promoting future employability and mathematical studies. Gainutdinova et al [23] (2017) included a computer algebra system in the process of teaching higher mathematics to visualize the knowledge related to definite integrals with its graphical capabilities in order to develop professional competence of future mathematics teachers. Hu et al [24] (2018) confirmed that a problem-oriented approach to teaching mathematics can improve college students' academic performance and reduce the score gap between urban and rural students, and suggested that teachers should guide students to ask questions in order to promote independent thinking and innovation, which is conducive to the development of well-rounded employability. Vintere [25] (2018) The use of constructivist pedagogy in the teaching and learning of mathematics at the university level enables the integration of mathematics with real life, promotes the ability to solve mathematical problems, and improves the skills needed for sustainable development of students. Vintere and Briede [26] (2019) developed a systematic pedagogical framework with real-life contexts for competency-based mathematics education for information technology (IT) students, which develops integrated professional and mathematical competencies and provides effective career development opportunities for IT students. Wei et al [27] (2019) addressed the cultivation of innovation ability of mathematics graduate students by proposing the reform of the core curriculum system of graduate students, the development of a more specialized training program, and the promotion of students' participation in research projects and scientific and technological practices, so as to improve the innovation ability of students in mathematics research and future employability. Lovianova [28] (2020) describes an online course for teaching mathematics based on technologically oriented undergraduates and its integration into practical training for graduate students in internships, which improves student initiative and performance in the application of skills. Shin and Shim [29] (2021) tracked a survey revealing that students' perceived professional competence of mathematics teachers affects students' classroom engagement and achievement, and influences students' professional choices, which in turn affects their career development. Arthur et al [30] (2022) used structural equation modeling to confirm that the quality of college mathematics instruction (reliability, responsiveness, assurance, and empathy of instruction) all positively and significantly affect student academic achievement. Zhu and Huang [31] (2022) made it clear that we should be oriented to professional needs, strengthen the importance of mathematics courses in the cultivation of applied talents, and reform the teaching of mathematics with the construction of multiple platforms, the application of the teaching mode of central learning, and the innovation of teaching and assessment in order to meet the requirements of students for innovation, knowledge, ability and quality. Zhang and Xu [32] (2024) proposed two optimization strategies (modularization of teaching content, integration of mathematics and vocational skills, innovation of teaching mode, and innovation of teaching evaluation) to solve the current problem of theorizing the teaching content of higher mathematics, optimize students' practical ability, and improve their employability. The above research provides theoretical support for the teaching innovation of university mathematics curriculum and its impact on students' comprehensive ability after innovation. However, the non-systematic and non-structural nature of the mathematics curriculum system, students' ability cultivation, and the level of teachers are still important issues that limit the effectiveness of mathematics teaching. Therefore, the teaching of high mathematics should be scientifically adjusted on the basis of the original foundation, and the contents of the curriculum system and teaching system should be reformed and innovated, so as to effectively improve the students' knowledge application ability and employment and entrepreneurial ability.

This paper incorporates the USEM model of employability, which categorizes employability into four dimensions: disciplinary comprehension, general skills, self-efficacy, and metacognition. It points out the dimensions in college mathematics competencies and analyzes the impact of each competency on employment separately, which leads to the importance of improving college mathematics teaching for the development of employability. The survey questionnaire is organized, the reliability of the questionnaire is tested, and the demographic characteristic variables of the respondents are descriptively analyzed. Variable difference analysis of university mathematics teaching and students' employability in different school types. Analyze the correlation between university mathematics teaching and employability, establish a regression analysis model of the overall university mathematics teaching on employability, and select double first-class colleges and universities, ordinary undergraduate colleges and universities to carry out the analysis of the moderating effect of different types of colleges and universities.

2 Theoretical basis for improving the impact of university mathematics teaching on employability

2.1 USEM Employability Model

This paper uses the USEM employability model as the theoretical model for the study, and the USEM employability model is shown in Figure 1. The model divides employability into four dimensions: disciplinary comprehension, comprehensive skills, self-efficacy and metacognition. Among them, subject comprehension refers to students' learning and internalization of professional knowledge during their school years, as well as their ability to have their own thoughts and experiences about it and to master the ability to apply knowledge beyond books. Comprehensive skills refers to one of the important contents that can be acquired through learning, which is a specific technique or ability that reflects the combination of specialized knowledge and practical operation. Self-efficacy refers to a series of processes in which students actively adjust and adapt to the qualitative changes and externalization of their own consciousness and ability, which transforms them into self-confidence or satisfaction. Metacognition refers to the deepening of self-understanding and examination through the educational environment provided by colleges and universities, continuous introspection, reflection, and a clear understanding of their own positioning and planning.

The model can reflect the interrelationship between students' employability and their comprehensive qualities and personal abilities, which is of great theoretical value and practical significance for exploring the factors and strategies affecting college students' employability.

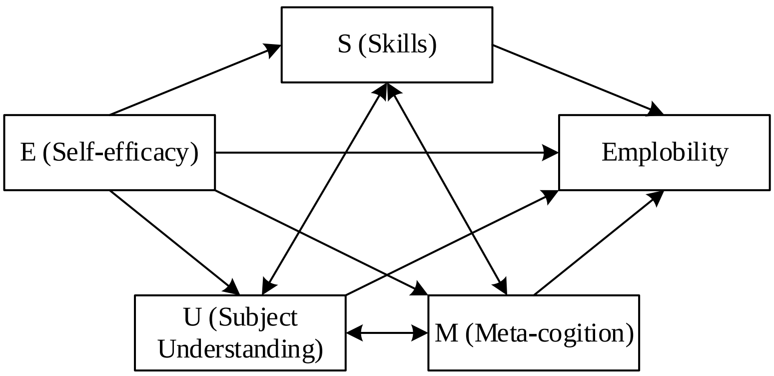

Figure 1: USEM employment capability model

Relevance of the USEM Employability Model:

(1) The USEM model is a representative model of employability in the field of employability research, which includes self-efficacy, comprehensive skills, disciplinary comprehension and metacognition, taking into account that in addition to professional knowledge and skills, the employability should also include students' cognitive ability, reflection ability and career planning ability, which is in line with the goal of university

mathematics teaching to cultivate talents with comprehensive quality. This is in line with the goal of university mathematics teaching to cultivate talents with comprehensive quality.

(2) This division of employability structure integrates the perspectives of students and employers, and is able to summarize the structure of employability in a comprehensive way.

(3) The USEM Employability Model provides a way for college students to obtain feedback on their internal and external perception through self-assessment, which enables them to adjust and improve their quality and ability according to the cultivation objectives of relevant disciplines and market demand in a timely manner during the stage of higher education, and then form positive feedback.

The above analysis shows that there is a certain correlation and appropriateness between the USEM employability model and university mathematics teaching. The application and expansion of the USEM model can more comprehensively understand and study the impact of university mathematics teaching on college students' employability. Therefore, the current situation of college students' employability and college mathematics teaching is explored by measuring students' self-assessed indicators of subject comprehension, comprehensive skills, self-efficacy and metacognition, and the mechanism of the influence of college mathematics teaching on college students' employability is analyzed in depth.

2.2 The role of aspects of mathematical competence in employment

Mathematical ability includes observation, analysis, thinking, graphing and statistical reasoning.

First, observation ability is an important prerequisite for mathematical ability. This ability is able to observe the problem in detail and make a correct understanding and awareness of the nature of the problem. When seeking employment, observation ability can help college students understand the history of the employer, so that they can pay attention to the employer's production status, corporate culture, sales performance and scope of business, which directly affects the correctness of the college students to make employment decisions.

Secondly, analytical ability is the basic ability of mathematical ability. In the process of employment, through the application of analytical ability, college students can find the most suitable industry, so that they can make the correct planning for their career.

Thirdly, for thinking ability, it mainly includes two functions, namely, the application function of calculation and science and technology and the function of forming scientific thinking method, both of which are part of its powerful transfer function.

Among them, the application function of calculation and science and technology can help college students find the entry point for solving mathematical problems and establish the goal of solving the problems, so that they can play the role of scientific reasoning and arithmetic tools in the process of employment.

Fourthly, as a kind of mathematical ability, graphic ability can make college students deepen their knowledge of points, lines and surfaces, and cultivate their ability of spatial observation, spatial imagination and spatial thinking. And in many employers, it is necessary to be able to read and make drawings. With the help of map reading ability, it can make college students solve complex problems more easily when they encounter them in the process of employment.

Fifth, for statistical reasoning ability, in many fields, need to apply to the statistical reasoning ability, statistical reasoning ability can make the value of information can be maximized.

2.3 The Importance of Teaching Mathematics in Higher Education for Developing Employability of Students

Cultivating students' entrepreneurial ability and employability in the teaching sessions of mathematics courses in colleges and universities can enhance the degree of fit between students and society. To help students adapt to society as soon as possible, adapt to the workplace, so that students can broaden the space for career development.

Combined with the current situation analysis, the employment situation of students in colleges and universities, the entrepreneurial situation is not optimistic, to carry out employment and entrepreneurship education for students can not only effectively alleviate the pressure on students, but also effectively broaden the social employment space, in order to provide protection for the development of the students themselves at the same time, but also for the overall development of the community to provide an important boost.

To carry out employment and entrepreneurship education for students in the teaching section of mathematics course can not only significantly improve students' mathematical ability, but also cultivate students' interpersonal skills, language expression ability and cooperation ability.

In addition, as one of the key courses in college education, the math course can also play a unique role in employment and entrepreneurship education.

(1) Mathematics courses can effectively cultivate students' mathematical thinking to stimulate students to think independently and cultivate good logical thinking ability, so that students can have a keen insight in entrepreneurship and employment, and not be overwhelmed by the interests.

(2) Mathematics is closely related to students' practical application ability, which can help students solve problems better in entrepreneurship and employment.

(3) Through the teaching of mathematics, students can effectively develop interpersonal skills.

3 Study design

3.1 Research hypotheses

Combining the USEM Employability Model and the three parts of university mathematics teaching: basic theory courses, applied skill development, and professional expansion, this study proposes the following hypotheses.

H1: University mathematics teaching has a significant positive effect on college students' employability.

H2: University mathematics teaching has a significant positive effect on subject comprehension.

H3: There is a significant positive effect of university mathematics teaching on general skills.

H4: There is a significant positive effect of university mathematics teaching on self-efficacy.

H5: There is a significant positive effect of teaching mathematics in university on metacognition.

H6: There is a significant positive effect of demographic variables of college students on teaching mathematics in college

H7: There is a significant positive effect of demographic variables of college students on employability of college students

3.2 Survey program design

The pre-survey was implemented by means of online questionnaire distribution, and a total of 60 copies were collected, of which 25 were male, accounting for 41.67%. There were 35 females, accounting for 58.34%. There are 18 people currently studying in top university colleges and universities, accounting for 30%, and 22 people in general colleges and universities, accounting for 36.67%.

The difference between the scores of the two extreme groups on each question was tested for significance using all the questions in the employability scale as the dependent variable. The results showed that out of 40 questions, the significance of all question items was less than 0.05, indicating that the scores of these question items were significantly different in the two extreme groups and should be retained.

The formal implementation was mainly based on the use of online distribution of questionnaires combined with offline distribution of questionnaires. On the one hand, faculty members working in the academic departments of the institutions concerned were contacted and asked to help forward the questionnaires to the students for completion. On the other hand, the questionnaires were also forwarded to students who knew them and asked them to help forward the questionnaires to students around them to fill in, ensuring the diversity of the sample.

A total of 620 questionnaires were distributed and 614 were recovered, 610 were obtained after validity screening, with an effective recovery rate of 98.39%.

3.3 Sample profile

3.3.1 Project analysis

The difference between the scores of the two extreme groups on each item was tested for significance using all the items on the employability scale as the dependent variable. The results showed that the significance of each question item was less than 0.001, so all the items could be retained.

3.3.2 Reliability tests

The results of the formal questionnaire reliability test (N=610) are shown in Table 1.

The Alpha coefficient of the total scale of employability is 0.974, and the Alpha coefficients of disciplinary comprehension, comprehensive skills, self-efficacy and metacognition are 0.962, 0.973, 0.981, and 0.959, respectively.It can be seen that the Alpha coefficients of both the total scale and the individual sub-scales are greater than 0.9, which indicates that the scales have very high reliability.

And the KMO values of subject comprehension, general skills, self-efficacy and metacognition are all greater than 0.9 with a significance of 0.000. This indicates that there are common factors between the variables, which makes them suitable for factor analysis.

Table 1: Formal questionnaire reliability test results

Categories	Cloning Bach alpha coefficient	Term number	N
Employment scale	0.974	40	610
Disciplinary understanding	0.962	10	610
Comprehensive skill	0.973	10	610
Self-efficacy	0.981	10	610
Metacognition	0.959	10	610

4 Empirical analysis of the impact of university mathematics teaching on employability

4.1 Descriptive statistical analysis

Among the recovered valid questionnaires, descriptive statistics were analyzed based on the basic personal information of the students who were subjected to the study, and the results of the analysis are shown in Table 2.

The results of data analysis in the table reflect the distribution of the data of the 610 research subjects, in which the mean value represents the concentration trend and the standard deviation represents the fluctuation. The results of frequency analysis of each control variable can be found that in terms of gender, the proportion of females reaches 52.62%, which is slightly higher than that of males, which is 47.38%.

In terms of school type, 35.25% of the subjects were from general undergraduate colleges, which accounted for the largest proportion. This was followed by specialized colleges and universities with 30.16%. As for the type of internship organization, Fortune 500 companies accounted for 14.59%.

Table 2: Personal basic information statistics

Variable	Options	Frequency	Percentage	Mean value	Standard deviation
Gender	Man	289	0.4738	1.63	0.43
	Female	321	0.5262		
Biotically	Town	334	0.5475	1.52	0.35
	Countryside	276	0.4525		
School type	"Double class" universities	164	0.2689	1.75	0.71
	General undergraduate	215	0.3525		
	Academy	184	0.3016		
	Other	47	0.0770		
Professional type	Technologists	124	0.2033	3.12	0.80
	The management of the business	162	0.2656		
	Humanities and social sciences	151	0.2475		
	Other	173	0.2836		
Grade	Freshman year	120	0.1967	3.55	1.78
	Sophomore	243	0.3984		
	Junior	174	0.2852		
	Senior year	73	0.1197		
Political appearance	Party member	125	0.2049	1.75	0.67
	League member	221	0.3623		
	Masses	264	0.4328		
The highest level of student cadres	Provincial and municipal	12	0.0197	2.89	1.14
	School level	62	0.1016		
	Court	121	0.1984		
	Class	221	0.3623		
	Other	194	0.3180		
Gpa	Top 10%	56	0.0918	2.57	0.97
	Top 30%	105	0.1721		
	Top 50%	154	0.2525		
	Other	295	0.4836		
Type of intern	The world's top 500 companies	89	0.1459	0.68	1.94
	China's top five hundred companies	235	0.3852		
	Other companies	286	0.4689		

The variables characterizing the demographics of the survey respondents are depicted in Figure 2. They include gender, place of origin, type of school, type of major, grade level, political appearance, highest level of student cadre, and GPA ranking, respectively.

In terms of political appearance, party members, members of the League, and the masses accounted for 0.2049, 0.3623, and 0.4328, respectively.

As for the highest rank of student cadres, it is divided into provincial and municipal level and above, school level, faculty level, class level, and others. The proportion of provincial and municipal level and above is 1.97%.

In terms of GPA ranking, it is divided into top 10%, top 30%, top 50%, and others. The top 10% accounted for 9.18%.

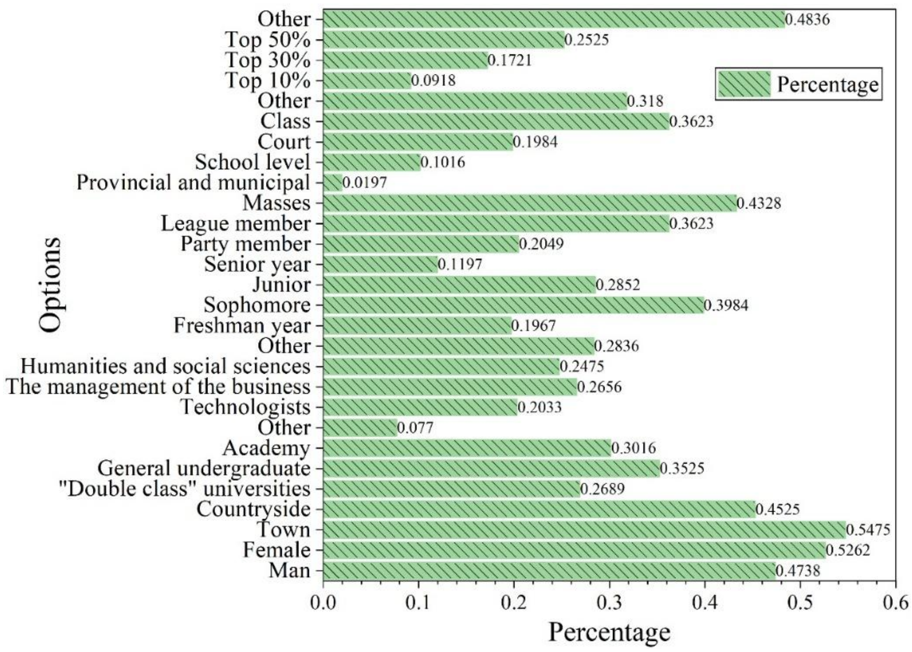

Figure 2: Description of demographic characteristics of the survey object

4.2 Analysis of Variable Differences

4.2.1 Teaching college math in different school types

Differences in college math instruction by school type were analyzed as shown in Table 3. The school types include double first-class colleges and universities, general undergraduate colleges, specialized colleges, and others, which are replaced by 1, 2, 3, and 4 in the table.

As can be seen from the table, the F-values between basic theory courses, applied skills training, and professional extension and different school types are 6.221, 4.327, 5.116, and 6.024, respectively. School type presents significance ($p < 0.05$) for university mathematics teaching in general as well as for basic theory courses, applied skills training, and professional extension.

This is mainly due to the fact that, compared with specialized colleges and general undergraduate colleges, double first-class colleges and universities are able to have richer educational resources and better levels of faculty, teaching facilities and other aspects, and thus are better able to implement college mathematics teaching.

Table 3: The difference analysis of college mathematics teaching learning school type

Type	School type	Sample size	Mean value	Standard deviation	F	Sig	LSD
Basic theory course	1	167	3.75	1.45	6.221	0.003	A>B A>C A>D
	2	254	3.68	1.21			
	3	146	3.64	1.02			
	4	43	3.42	0.98			
Application skills training	1	175	3.74	1.14	4.327	0.001	A>C A>B A>D
	2	245	3.56	1.25			
	3	112	3.65	1.36			
	4	78	3.39	1.21			
Professional extension	1	135	3.86	1.09	5.116	0.001	A>B A>C A>D
	2	248	3.65	0.99			
	3	102	3.54	1.15			
	4	125	3.41	1.36			
College mathematics teaching	1	167	3.78	0.87	6.024	0.000	A>B A>C A>D B>C B>D C>D
	2	215	3.54	0.64			
	3	142	3.36	1.09			
	4	86	3.15	1.62			

4.2.2 Employability of students in different school types

The difference analysis of college students' employment ability on school type is shown in Table 4.

In the metacognition dimension, the mean values of students in double first-class colleges and universities, general undergraduate colleges and universities, specialized colleges and universities, and others were 3.89, 3.71, 3.60, and 3.24, respectively, and students in double first-class colleges and universities showed outstanding metacognitive ability for employment. School type showed significance ($p < 0.05$) for college students' employability as a whole as well as for the four dimensions of disciplinary comprehension, general skills, self-efficacy and metacognition.

This is because, compared with specialized colleges and universities, double first-class colleges and universities have richer educational resources in terms of faculty level and teaching facilities, and thus are able to cultivate students in a better and more comprehensive way, which results in higher comprehensive quality and employability of college students accordingly.

Table 4: The difference analysis of the employment ability in the school type

Type	School type	Sample size	Mean value	Standard deviation	F	Sig	LSD
Disciplinary understanding	1	164	3.85	0.65	2.505	0.142	A>B A>C A>D
	2	238	3.76	0.89			
	3	156	3.65	1.23			
	4	52	3.61	0.94			
Comprehensive skill	1	156	3.76	0.95	2.259	0.001	A>C A>B A>D
	2	241	3.68	0.86			
	3	86	3.71	0.87			
	4	127	3.52	0.99			
Self-efficacy	1	165	3.98	0.56	3.648	0.106	A>B A>C A>D
	2	189	3.92	0.67			
	3	194	3.75	0.74			
	4	62	3.64	0.78			
Metacognition	1	210	3.89	0.85	2.036	0.078	A>B A>C A>D
	2	251	3.71	0.94			
	3	104	3.60	1.02			
	4	45	3.24	1.14			
Employment capacity	1	175	3.72	0.98	6.178	0.001	A>B A>C A>D B>C B>D C>D
	2	210	3.45	0.94			
	3	154	3.42	0.91			
	4	71	2.89	0.90			

4.3 Regression Analysis of College Mathematics Instruction and Employability

4.3.1 Correlation analysis

College mathematics instruction consists of three components: basic theory courses, applied skills development, and professional extension.

The USEM employability model divides employability into four dimensions: subject comprehension, comprehensive skills, self-efficacy and metacognition.

Pearson correlation analysis was used to explore the correlation between university mathematics teaching and college students' employability, and the specific analysis results are shown in Figure 3.

The data results reflect a positive correlation between college mathematics teaching and college students' employability (correlation coefficient $r = 0.823$, $p < 0.01$). It indicates that university mathematics teaching implemented in colleges and universities can positively affect the employability of college students, and the better the training of college students by university mathematics teaching, the stronger their employability accordingly. Hypothesis H1 is valid. Improving college math teaching can positively enhance students' employability and strengthen their ability to face employment risks. The figure shows that the basic theory courses, applied skill development, and professional expansion of university mathematics teaching are positively correlated with the four aspects of disciplinary comprehension, comprehensive skills, self-efficacy, and metacognition of the model of employability, respectively; therefore, hypotheses H2, H3, H4, and H5 are valid.

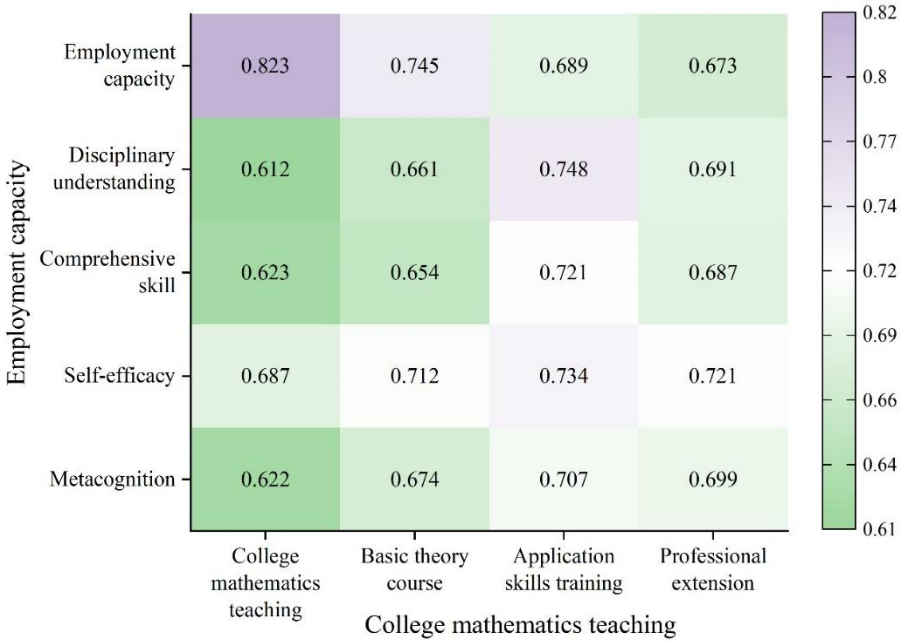

Figure 3: Correlation analysis

4.3.2 Overall regression analysis

This part of the study involves two models using SPSS 22.0 to conduct a stratified regression analysis of two variables, namely, university mathematics teaching and university students' employability.

The Logistic model is as follows:

Consider the University Mathematics Teaching and Student Employability Profile dataset, where the response variable Y takes only two values 0 or 1. Logistic regression models the probability that Y belongs to a class, rather than modeling the response variable Y directly. Logistic regression models the probability of belonging to a class rather than modeling the response variable directly. Given X, this can be written as $p(X) = P(Y = 0 | X)$ ($p(X)$ takes values between 0 and 1).

Fitting a binary response variable coded 0,1 with a straight line, it is in principle always possible to find some value of X that makes the prediction of $p(X) < 0$, and some other value of $p(X) > 1$ for X (unless the range of X is bounded), and in order to avoid this type of problem, it is necessary to find a function that models for $p(X)$ so that for any value of X the output of this function is between 0 and 1. In logistic regression, the logistic function is used:

$$p(X) = \frac{e^{\beta_0 + \beta_1 X}}{1 + e^{\beta_0 + \beta_1 X}} \tag{1}$$

The resulting Logistic function produces a S-shaped curve and always yields a reasonable value for the output of the function, no matter what value X takes.

By organizing Eq. (1), this can be obtained:

$$\frac{p(X)}{1 - p(X)} = e^{\beta_0 + \beta_1 X} \tag{2}$$

The value of $p(X)/[1-p(X)]$ is called the incidence ratio and takes values from 0 to ∞.

Taking logarithms on both sides of equation (2) simultaneously gives:

$$\ln\left[\frac{p(X)}{1-p(X)}\right]=\beta_0+\beta_1 X \tag{3}$$

The left side of Eq. (3) is called the logarithmic incidence ratio or fractional logarithm, whereby the logistic regression model can be viewed as a linear model about X under the fractional logarithmic transformation.

Estimation of coefficients by maximum likelihood method. The basic idea of fitting a logistic regression model by the maximum likelihood method is to find estimates of β_0, β_1 such that the predicted probabilities, $\hat{p}(x_i)$, obtained through equation (1), are as close as possible to the actual observations. This basic idea can be expressed as a likelihood function of a mathematical equation:

$$L(\beta_0,\beta_1)=\prod_{i:y_i=1} p(x_i)\prod_{i:y_i=0}(1-p(x_i)) \tag{4}$$

The coefficients $\hat{\beta}_0, \hat{\beta}_1$ estimated in equation (4) maximize the value of the likelihood function.

The results of the regression analysis of college mathematics teaching overall on college students' employability are specifically shown in Table 5, where *p < 0.05 and **p < 0.01.

The regression analysis of control variables on college students' employability was conducted in Model 1, in which the control variables included gender, place of origin, school type, major type, grade level, political appearance, the highest level of student cadre, and GPA ranking (hereinafter collectively referred to as demographic characteristic variables), and the dependent variable was college students' employability. The value of R^2 in Model 1 is 0.335, indicating that the demographic characteristic variables can explain 33.5% of the variation in college students' employability, and the F-test of the model indicates that the model passes the F-test (F = 15.201, p < 0.05). Therefore hypotheses H6/H7 are valid.

Model 2 is based on model 1 by adding university mathematics teaching to the independent variables, and the dependent variable is still college students' employability. The change of F value showed significance (p < 0.05) after adding university mathematics teaching in addition to the control variables. In addition, the value of R^2 rises from 0.335 to 0.672, indicating that university mathematics teaching can produce 33.7% explanatory strength for university students' employability. Specifically, the value of the regression coefficient of university mathematics teaching is 0.634 and shows significance (t = 30.81, p = 0.000 < 0.01), indicating that university mathematics teaching can have a significant positive impact on the employability of university students. Hypothesis H1 is tested again.

Table 5: Regression analysis

	Model 1				Model 2			
	B	Standard error	t	Sig	B	Standard error	t	Sig
Constant	5.517**	0.334	23.546	0.000	2.564**	0.214	8.229	0.000
Gender	0.118*	0.071	2.117	0.021	0.030	0.036	0.859	0.771
Biotically	-0.103**	0.003	-3.254	0.001	0.025	0.047	0.781	0.426
School type	-0.035	0.022	-0.898	-0.024	0.016	0.019	-0.707	0.603
Professional type	0.001	0.003	0.004	1.118	-0.015	0.034	-0.227	0.817
Grade	0.074**	0.031	4.559	0.000	0.007	0.026	1.558	0.366
Political appearance	-0.023	0.051	-0.441	0.754	0.021	0.041	0.854	0.332
Class of student cadres	-0.225**	0.013	-5.226	0.003	-0.018	0.022	-2.665	0.068
Gpa	-0.254**	0.031	-4.185	0.000	-0.068*	0.033	-3.117	0.001
College mathematics teaching					0.634**	0.009	30.81	0.000
R^2	0.335				0.672			
Adjusted R^2	0.309				0.660			
F value	F=15.201 p=0.000				F=83.041 p=0.000			
ΔR^2	0.335				0.515			
ΔF value	F=15.201 p=0.000				F=320.151 p=0.000			

4.4 Differences

This paper tests the moderating role of different types of colleges and universities between college training, individual inputs and employability.

4.4.1 Dual-tier universities

The moderating effects of double first-class colleges and universities are shown in Table 6. The interaction terms are A Teachers' teaching* double first-class colleges, B Peer interaction input* double first-class colleges, C Internships and training* double first-class colleges, D Extracurricular activities input* double first-class colleges, E Extracurricular learning input* double first-class colleges, F Classroom learning input* double first-class colleges, and G Observations.

The coefficient of classroom learning input and employability of double first-class colleges and universities is 0.223, and the robust standard error is -0.009. Classroom learning input of double first-class colleges and universities has a significant moderating effect on employability. Meanwhile, the coefficient of extracurricular activities and employability is 0.129, with a robust standard error of -0.022, and the observed value is 32.526, which shows that teaching and internships play a more important role in enhancing the employability of college students in double first-class colleges. The reason may be that the training quality of double first-class colleges and universities is better than that of ordinary undergraduate colleges and universities in all aspects, with a good foundation of teachers, perfect internship and training equipment, and more opportunities for internship and training, while ordinary undergraduate colleges and universities have limited results in applied teaching.

Table 6: The regulation of two first-class universities

	Employment capacity	Disciplinary understanding	Comprehensive skill	Self-efficacy	Metacognition
A	0.095* (-0.036)	0.104 (-0.047)	0.091* (-0.039)	0.085* (-0.041)	0.078** (-0.045)
B	0.055 (-0.026)	0.082 (-0.016)	0.121 (-0.022)	0.060 (-0.019)	0.051 (-0.02)
C	0.067** (-0.019)	0.093 (-0.011)	0.078 (-0.015)	0.105 (-0.012)	0.065 (-0.017)
D	0.129 (-0.022)	0.089 (-0.025)	0.067 (-0.018)	0.105 (-0.023)	0.061 (-0.025)
E	0.085 (-0.012)	0.81 (-0.019)	0.061 (-0.023)	0.089 (-0.018)	0.064 (-0.022)
F	0.223 (-0.009)	0.057 (-0.008)	0.052 (-0.006)	0.093 (-0.011)	0.018 (-0.002)
G	32.526	32.526	32.526	32.526	32.526

4.4.2 General undergraduate colleges

The moderating effect of general undergraduate institutions is shown in Figure 4. A, B, C, D, E, and F in the figure are the interaction terms of teacher teaching, peer interaction input, internship and training, extracurricular activity input, extracurricular learning input, and classroom learning input with general undergraduate colleges and universities, respectively. The interaction terms were brought in to analyze the effect of each moderator on the employability of students in general undergraduate institutions.

Extracurricular activity input, extracurricular learning input, and classroom learning input in general undergraduate colleges have a greater impact on students' self-efficacy, with coefficients of 0.074, 0.082, and 0.074, respectively.

The moderating coefficients of extracurricular activity input, extracurricular learning input, and classroom learning input on students' self-efficacy in double first-class colleges and universities are 0.105, 0.089, and 0.093, respectively.

Compared with the double first-class colleges and universities, the moderating coefficients of general undergraduate colleges and universities are lower. It indicates that double first-class colleges and universities have a better moderating effect on college students' employability.

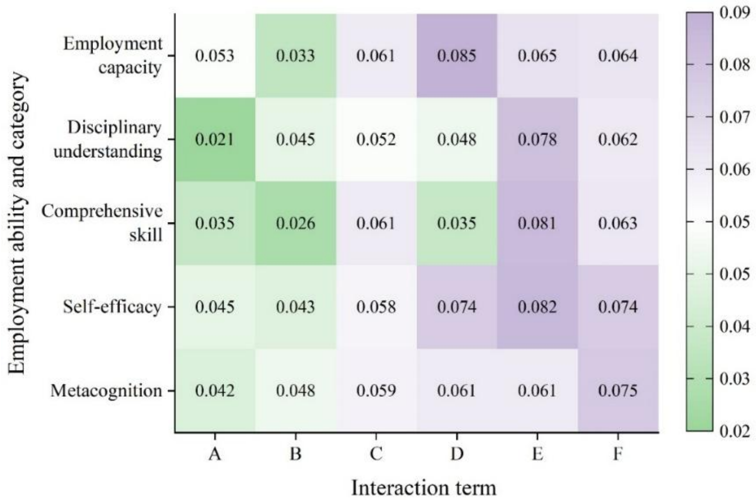

Figure 4: The regulation of ordinary undergraduate institutions

5 Conclusion

This paper divides university mathematics teaching and employability separately and puts forward the hypothesis of the relationship between university mathematics teaching and employability. Combined with the questionnaire data, the empirical analysis is conducted to test the effect of improved university mathematics teaching on employability. The mean values of university mathematics teaching in double first-class colleges and universities, general undergraduate colleges and universities, specialized colleges and universities, and others are 3.78, 3.54, 3.36, 3.15, respectively, and the mathematics teaching in double first-class colleges and universities is the best. In the employability variable, the comprehensive skills of students in specialized colleges are higher than those in general undergraduate colleges. The rankings of comprehensive skills were 3.76 for double first-class colleges, 3.71 for specialized colleges, 3.68 for general undergraduate colleges, and 3.52 for others.Disciplinary comprehension, comprehensive skills, self-efficacy, and metacognition were ahead of other types of colleges and universities in double first-class colleges and universities. The correlation coefficient between university mathematics teaching and college students' employability is 0.823, $p < 0.01$, and there is a positive correlation between university mathematics teaching and college students' employability. From the regression analysis of university mathematics teaching overall on college students' employability R^2 value increased from 0.335 to 0.672, indicating that university mathematics teaching can produce 33.7% of the explanatory strength of college students' employability. That is, university mathematics teaching improvement can positively promote students' employability.

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