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THE RELATIONSHIP BETWEEN PARENTING STYLES AND SOCIAL ADAPTABILITY OF PRESCHOOL CHILDREN IN CHINA

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Abstract: Background: The importance of family education has risen, yet issues persist. China's "Law on Family Education" clarifies its responsibilities. Parents' parenting styles deeply influence children's social adaptability and growth. This study in Xinxiang explores the relationship between parenting styles and preschoolers' social adaptability, aiming to provide guidance for optimal parenting and children's healthy development. Methods: This cross-sectional study was conducted from March to April 2023 in Xinxiang City, China. Using multi-stage random sampling, a total of 1,058 parents and teachers of preschool children from eight kindergartens in Xinxiang were surveyed through questionnaires, with 995 valid responses collected. The research tools included a general demographic questionnaire, a social adaptability questionnaire, and a parenting style questionnaire. Statistical analysis was performed using SPSS 26.0, including independent sample t-tests, one-way analysis of variance (ANOVA), and multiple regression analysis. Results: The study found significant differences in social adaptability of preschool children based on gender, age, only child, household monthly income, and Paternaleducation level (t=-4.50, P=0.000; F=5.32, P=0.002; F=2.10, P=0.036; F=5.88, P=0.01; F=6.05, P=0.002). Among parenting styles, "rejection" and "preference" were negatively correlated with children's social adaptability (r=-0.098, P<0.0; r=-0.065, P<0.05), while "emotional warmth" and "overprotection" were positively correlated with children's social adaptability(r=0.108, P<0.01; r=0.126, P<0.01). Factors including gender, age, Paternaleducation level, household monthly income, only child, rejection, and overprotection had statistically significant effects on the social adaptability of preschool children(B=4.098, P=0.000; B=2.932, P=0.003; B=3.063, P=0.002; B=-2.522, P=0.012; B=-3.878, P=0.000; B=3.485, P=0.001). Conclusion: Parenting styles significantly affect preschool children's social adaptability. Parents should be mindful of gender differences, actively encouraging boys and fostering their social and self-management skills. Only-child families need to strengthen training in self-care and social interaction, providing more social opportunities. Rejection-style parenting should be avoided, while emotional support should be given more frequently. Low-income and low-education families should seek external resources to optimize the environment for children's growth.
Keywords: Preschool children; Parenting styles; Social adaptability; Emotional warmth; Overprotection

1 INTRODUCTION

With the development of society, the importance of family education has become increasingly prominent, but issues such as the absence and irregularity of family education remain in reality, adversely affecting the growth of minors. The "Law on the Promotion of Family Education of the People's Republic of China," which was officially implemented in 2022, clarifies the responsibilities, content, and methods of family education, emphasizing its importance and necessity. As key participants in their children's education, parents not only directly influence their children's psychological development but also have a profound impact on their personal growth and social adaptability.

Social adaptation refers to the extent to which an individual adjusts their physiological and psychological states to achieve the developmental goals expected by society [1]. Social adaptability is the ability of an individual, based on their age and social-cultural conditions, to independently handle daily life and assume social responsibilities [2]. It includes aspects such as self-care, labor skills, language development, and social responsibility, serving as a critical indicator for evaluating an individual's social integration and functional performance. In early childhood, social adaptation refers to a child's ability to adapt to both the natural and social environments in which they live, specifically including the ability to solve everyday problems independently [3]. At the preschool stage, this adaptive capacity manifests in skills and strategies for independently handling daily issues, which is an essential part of their growth and development. When preschool children transition from the family environment to kindergarten—a micro-society—they face many new challenges, such as learning to interact effectively with others, adapting to a new group setting, and reducing problematic behaviors, all of which directly reflect their social adaptability.

Parenting style refers to the attitudes and approaches parents adopt in interactions with their children. These attitudes and approaches create an emotional atmosphere that affects a child's development and are characterized by cross-situational consistency and relative stability [4]. Baumrind proposed two typical parenting styles—authoritative and authoritarian—based on the emotional support and control levels provided by parents [6]. Authoritative parents generally show positive responsiveness and moderate control, often exhibiting much care and support. Authoritarian

parents often impose demands that are nearly harsh or unreasonable, considering children's developmental characteristics, characterized by high levels of control and demanding absolute obedience. Harmonious and democratic parenting helps develop children's abilities and enhances their social adaptability [5]. Authoritarian parenting tends to result in anxiety, depression, selfishness, and a lack of self-control and responsibility in children, posing potential threats to their psychological development and social adaptation [7-9]. In contrast, parenting styles characterized by trust, encouragement, and emotional warmth not only strengthen parent-child interactions but also foster children's prosocial emotions and self-confidence, laying a solid foundation for their future development [8-12]. Conversely, parents' undesirable habits and emotional problems hinder children's development and may increase the risk of abuse, posing serious threats to their physical and mental health [13-14]. Furthermore, a good parent-child relationship serves as a catalyst for the comprehensive development of children, promoting the development of language, cognition, Exercise. and psychosocial skills, and providing more learning opportunities and quality responsive care [15].

This study aims to explore the relationship between parenting styles and the social adaptability of preschool children, revealing the impact of different parenting styles on children's social adaptability. We hope that through this research, we can provide scientific family education guidance and practical suggestions for parents and educators to help them optimize parenting styles, improve children's social adaptability, and thus provide strong support for their healthy growth and holistic development.

2 SUBJECTS AND METHODS

2.1 Study Subjects

The study adopted a multi-stage random sampling method to select the subjects, dividing Xinxiang City, China, into urban and suburban areas. In March-April 2023, four kindergartens were selected from each of these areas, resulting in a survey involving 1,058 parents and teachers of preschool children from eight kindergartens. All children were required to be between the ages of 3-6, with exclusions made for those not meeting the age requirements or those with serious diseases and mental disorders. The parents of the children were informed and agreed to participate in the survey.

2.2 Research Tools

2.2.1 General demographic questionnaire

A self-compiled survey was used to collect data on preschool children's age, gender, only-child status, parents' educational level, household monthly income, and parental occupation.

2.2.2 Social adaptability scale

The "Social Adaptability Behavior Rating Scale for Children Aged 3-7" [16] was jointly developed by the Children's Growth and Development Research Center of Hangzhou University and the Psychology Department of Hangzhou University, with verified good reliability and validity [5]. The scale consists of 104 items divided into six subscales: Self-Care (SH) (items 1-26), Motor (L) (items 27-40), Work (O) (items 41-45), Interaction (C) (items 56-72), Socialization (S) (items 73-88), and Self-Management (SD) (items 89-104). The scale is completed by preschool teachers, with higher scores indicating stronger social adaptability in preschool children. Validity tests showed a KMO value of $0.879 > 0.5$, a Bartlett's test of sphericity value of 2574.505, and $P < 0.01$, with a Cronbach's alpha coefficient of 0.853.

2.2.3 Parenting style questionnaire

The Parenting Style Scale (Egna Minnen Betraffande Uppfostran - Parents, EMBU-P) was developed by C. Perris and colleagues at the Department of Psychiatry, Umea University, Sweden, in 1980, mainly to evaluate parental attitudes and behaviors. Its reliability and validity have been verified by scholars domestically and internationally [17-18]. The scale consists of 52 questions covering four dimensions: Rejection (items 1-13), Emotional Warmth (items 14-30), Overprotection (items 31-49), and Preference (items 50-52). The scoring is based on a four-point scale: 1 (Never), 2 (Occasionally), 3 (Often), and 4 (Always). The Overall score for each dimension is the sum of its item scores, with higher scores indicating a stronger corresponding parenting style. Validity tests showed a KMO value of $0.836 > 0.5$, a Bartlett's test of sphericity value of 2358.444, and $P < 0.01$, with a Cronbach's alpha coefficient of 0.731.

2.3 Statistical Methods

Statistical analysis was performed using SPSS software (version 26.0). Quantitative data following a normal distribution were expressed as mean ± standard deviation (SD). Categorical data were reported as frequencies or percentages. Independent sample t-tests were used to assess differences in social adaptability scores between children of different genders and only-child status; one-way analysis of variance (ANOVA) was used to compare social adaptability scores among preschool children under different conditions of age, parental occupation, education level, and household monthly income; multiple regression analysis was conducted to explore the relationship between parenting styles and children's social adaptability. All statistical analyses were two-tailed, with a significance level of $\alpha = 0.05$.

3 RESULTS

3.1 Basic Information of Study Subjects

A total of 1,058 questionnaires were distributed in this study, with 63 invalid questionnaires excluded, resulting in 995 valid questionnaires and an effective response rate of 94.05%. Among them, there were 562 boys (56.5%) and 433 girls (43.5%). Only children accounted for 584 (58.7%), while non-only children accounted for 411 (41.3%). In terms of age, 65 children (6.5%) were aged 3-4 years, 901 (90.6%) were aged 4-5 years, and 29 (2.9%) were aged 5-6 years.

3.2 Overall Status of Social Adaptability in Preschool Children

3.2.1 Descriptive statistics of social adaptability in preschool children

As shown in Table 1, the overall level of social adaptability in preschool children was not prominent (M = 0.69, SD = 0.13). Among the six dimensions of social adaptability, the average scores of Self-Care and Motor dimensions (M = 0.76, SD = 0.15; M = 0.76, SD = 0.12) were the highest, indicating relatively high levels of self-care and motor skills. These were followed by the Interaction dimension (M = 0.72, SD = 0.18) and Socialization dimension (M = 0.69, SD = 0.13), indicating a moderate level of peer interaction skills and ability to grasp social norms. The average scores for Work and Self-Management dimensions (M = 0.56, SD = 0.19; M = 0.58, SD = 0.19) were the lowest, indicating slower development in task completion and self-management skills in preschool children (Table 1).

Table 1 Descriptive Statistics for Social Adaptation of Preschool Children

Variable	M	SD
Self-care	0.76	0.15
Exercise	0.76	0.12
Homework	0.56	0.19
Socialization	0.69	0.13
Interaction	0.72	0.18
Self-management	0.58	0.19
Overall score	0.69	0.13

3.2.2 Analysis of differences in social adaptability among preschool children with different demographic characteristics

As shown in Table 2, significant differences were found between boys and girls in self-care, social skills, interaction skills, self-management, and Overall score with statistical significance (t = -6.93, P = 0.000; t = -3.76, P = 0.000; t = -4.45, P = 0.000; t = -2.53, P = 0.012; F = -4.50, P = 0.000). This suggests that, within the same age group, girls may exhibit more advanced or mature abilities in these aspects.

As preschool children grow older, their scores in self-care, academic performance, interaction skills, self-management, and Overall score show an upward trend, with these differences being statistically significant (F = 4.07, P = 0.017; F = 3.41, P = 0.033; F = 3.06, P = 0.047; F = 7.00, P = 0.001; F = 5.32, P = 0.005). This reflects the continuous development of children's abilities and skills as they age.

In terms of Overall scores for life self-care ability, self-management ability, and social adaptability, only children exhibit weaker performance compared to non-only children, with statistically significant differences (t=2.95, P=0.003; t=3.47, P=0.000; t=2.10, P=0.036). This indicates that the social adaptability of only children is relatively poorer.

Table 2 Analysis of Differences in Social Adaptability Among Preschool Children with Various Demographic Characteristics

Variable	N (%)	Self-care	Exercise	Homework	Socialization	Interaction	Self-management	Overall score
Gender								
Male	562 (56.5)	0.73 ± 0.16	0.76 ± 0.12	0.56 ± 0.19	0.67 ± 0.13	0.70 ± 0.19	0.57 ± 0.19	0.67 ± 0..13
Female	433 (43.5)	0.80 ± 0.14	0.77 ± 0.12	0.56 ± 0.20	0.70 ± 0.12	0.75 ± 0.16	0.60 ± 0.18	0.71 ± 0.12
t		-6.93	-1.21	-0.45	-3.76	-4.45	-2.53	-4.50
P		0.000	0.226	0.655	0.000	0.000	0.012	0.000
Age (years)								
3-	65(6.5)	0.75 ± 0.17	0.76 ± 0.12	0.55 ± 0.21	0.67 ± 0.17	0.71 ± 0.19	0.51 ± 0.21	0.67 ± 0.14
4-	901(90.6)	0.76 ± 0.15	0.76 ± 0.12	0.56 ± 0.19	0.69 ± 0.12	0.72 ± 0.18	0.58 ± 0.19	0.69 ± 0.12
5-6	29(2.9)	0.84 ± 0.11	0.81 ± 0.11	0.65 ± 0.17	0.72 ± 0.15	0.80 ± 0.18	0.67 ± 0.16	0.76 ± 0.11
F		4.07	2.01	3.41	1.61	3.06	7.00	5.32
P		0.017	0.134	0.033	0.201	0.047	0.001	0.005

Only Child								
NO	411 (41.3)	0.78 ± 0.16	0.77 ± 0.13	0.57 ± 0.21	0.69 ± 0.14	0.72 ± 0.20	0.60 ± 0.20	0.70 ± 0.14
YES	584 (58.7)	0.75 ± 0.15	0.75 ± 0.11	0.56 ± 0.18	0.68 ± 0.11	0.72 ± 0.17	0.56 ± 0.18	0.68 ± 0.11
t		2.95	1.91	0.62	0.59	-0.11	3.47	2.10
P		0.003	0.057	0.535	0.556	0.914	0.000	0.036

3.3 Analysis of Differences in Social Adaptability Among Preschool Children with Different Family Backgrounds

As shown in Table 3, household monthly income is an important factor affecting children's ability development. As household monthly income increases, children's scores in motor skills, academic performance, social skills, and interaction skills also show an upward trend, with these differences being statistically significant (F = 3.73, P = 0.011; F = 3.63, P = 0.013; F = 7.82, P = 0.000; F = 7.75, P = 0.000). This may imply that children from high-income families have access to more resources and opportunities, thereby contributing to their development in these aspects.

Parental educational level also has a significant impact on children's ability development. As parental educational level increases, children's scores in social skills and interaction skills also increase, with the differences being statistically significant (Mother: F = 8.50, P = 0.000; F = 7.64, P = 0.000; Father: F = 16.45, P = 0.000; F = 12.51, P = 0.000). In particular, fathers' educational level has a significant effect on children's motor skills and academic performance (F = 3.47, P = 0.031; F = 3.92, P = 0.020). This suggests that parental educational level, especially fathers' educational level, plays an important role in the development of children's motor skills and academic performance.

However, it is noteworthy that parental occupation does not have a significant impact on children's social skills (P > 0.05). This may be because children's social skills are influenced by multiple factors, including family environment, parent-child relationships, school education, etc., and parental occupation is just one of these factors.

In summary, differences exist between boys and girls in multiple aspects, and children's ability development is influenced by factors such as age, household income, and parental educational level. Parental occupation has a relatively minor impact on children's social skills. This information helps us better understand the patterns and influencing factors of children's ability development, thereby providing them with better education and support.

Table 3 Analysis of Differences in Social Adaptability Among Preschool Children from Various Family Backgrounds

Variable	N (%)	Self-care	Exercise	Homework	Socialization	Interaction	Self-management	Overall score
Monthly Family Income (RMB)								
＜5000	94 (9.5)	0.76 ± 0.17	0.75 ± 0.13	0.53 ± 0.211	0.65 ± 0.15	0.68 ± 0.22	0.58 ± 0.22	0.67 ± 0.14
5000-	443 (44.5)	0.75 ± 0.16	0.75 ± 0.12	0.55 ± 0.19	0.67 ± 0.12	0.70 ± 0.18	0.56 ± 0.20	0.67 ± 0.13
15000-	271 (27.2)	0.77 ± 0.15	0.77 ± 0.12	0.58 ± 0.18	0.70 ± 0.12	0.74 ± 0.17	0.59 ± 0.18	0.70 ± 0.12
≥25000	187 (18.8)	0.78 ± 0.15	0.78 ± 0.12	0.58 ± 0.20	0.71 ± 0.13	0.76 ± 0.16	0.60 ± 0.17	0.71 ± 0.12
F		1.53	3.73	3.63	7.82	7.75	2.53	5.88
P		0.205	0.011	0.013	0.000	0.000	0.056	0.001
Maternal Education Level								
High School or Below	315 (31.7)	0.76 ± 0.16	0.75 ± 0.13	0.54 ± 0.19	0.66 ± 0.14	0.69 ± 0.20	0.59 ± 0.19	0.67 ± 0.13
Diploma	458 (46.0)	0.76 ± 0.15	0.77 ± 0.12	0.57 ± 0.20	0.70 ± 0.13	0.73 ± 0.17	0.58 ± 0.19	0.69 ± 0.13
Bachelor's Degree or Above	222 (22.3)	0.77 ± 0.14	0.77 ± 0.12	0.57 ± 0.17	0.70 ± 0.11	0.75 ± 0.16	0.57 ± 0.18	0.69 ± 0.11
F		0.23	2.69	2.17	8.50	7.64	0.66	2.56
P		0.796	0.068	0.115	0.000	0.000	0.515	0.078
PaternalEducation Leve								
High School or Below	236 (23.7)	0.76 ± 0.16	0.74 ± 0.13	0.53 ± 0.20	0.65 ± 0.14	0.67 ± 0.20	0.56 ± 0.20	0.66 ± 0.13
Diploma	329 (33.1)	0.77 ± 0.15	0.76 ± 0.12	0.57 ± 0.19	0.69 ± 0.13	0.72 ± 0.18	0.59 ± 0.20	0.69 ± 0.13
Bachelor's Degree or Above	430 (43.2)	0.76 ± 0.16	0.77 ± 0.12	0.57 ± 0.19	0.71 ± 0.11	0.75 ± 0.16	0.58 ± 0.18	0.70 ± 0.12
F		0.88	3.47	3.92	16.45	12.51	1.86	6.05
P		0.415	0.031	0.020	0.000	0.000	0.156	0.002
Maternal Occupation								

Worker or Farmer	112 (11.3)	0.76 ± 0.16	0.76 ± 0.12	0.56 ± 0.19	0.70 ± 0.12	0.71 ± 0.18	0.60 ± 0.19	0.69 ± 0.13
Science, Medical, Education	76 (7.6)	0.77 ± 0.15	0.77 ± 0.12	0.58 ± 0.19	0.69 ± 0.12	0.74 ± 0.16	0.60 ± 0.17	0.70 ± 0.12
Self-employed, Business, Enterprise, Government	456 (45.8)	0.76 ± 0.16	0.77 ± 0.12	0.57 ± 0.20	0.69 ± 0.13	0.73 ± 0.18	0.58 ± 0.19	0.69 ± 0.13
Others	351 (35.3)	0.76 ± 0.15	0.75 ± 0.12	0.55 ± 0.18	0.67 ± 0.12	0.71 ± 0.18	0.57 ± 0.19	0.68 ± 0.12
F		0.07	2.05	0.75	1.72	1.25	0.94	1.12
P		0.978	0.105	0.520	0.161	0.292	0.420	0.340
Paternal Occupation								
Worker or Farmer	151 (15.2)	0.76 ± 0.16	0.76 ± 0.12	0.55 ± 0.19	0.68 ± 0.12	0.69 ± 0.19	0.57 ± 0.19	0.68 ± 0.13
Science, Medical, Education	122 (12.3)	0.77 ± 0.14	0.77 ± 0.11	0.60 ± 0.16	0.69 ± 0.11	0.73 ± 0.16	0.60 ± 0.18	0.70 ± 0.13
Self-employed, Business,Enterprise, Government	553 (55.5)	0.76 ± 0.16	0.77 ± 0.12	0.56 ± 0.20	0.69 ± 0.13	0.73 ± 0.18	0.59 ± 0.19	0.69 ± 0.13
Others	169 (17.0)	0.75 ± 0.14	0.75 ± 0.12	0.54 ± 0.18	0.68 ± 0.11	0.72 ± 0.18	0.55 ± 0.19	0.67 ± 0.12
F		0.47	1.33	2.50	0.82	1.96	1.72	1.70
P		0.704	0.264	0.058	0.481	0.118	0.161	0.165

3.4 Correlation Analysis of Parenting Styles and Social Adaptability in Preschool Children

Spearman correlation analysis showed that "Rejection" was negatively correlated with several dimensions of preschool children's social adaptability, including self-care, social skills, communication skills, self-management skills, and overall score ($r = -0.076, -0.109, -0.067, -0.128, -0.098$, $P < 0.05$). In contrast, "Emotional Warmth" was positively correlated with self-care, social skills, communication skills, self-management skills, and overall score ($r = 0.065, 0.092, 0.132, 0.111, 0.108$, $P < 0.05$). Similarly, "overprotection" shows positive correlations with self-care ability, motor skills, social skills, communication skills, self-management ability, and the overall score ($r = 0.074, 0.135, 0.090, 0.1270.095, 0.126$, $P < 0.05$). However, "preference" (or "favoritism") exhibits negative correlations with task competence and the overall score of preschool children's social adaptability ($r = 0.074, 0.065$, $P < 0.05$). (Table 4).

Table 4 Correlation Analysis Between Family Parenting Styles and Social Adaptability of Preschool Children

Parenting Style	Self-care	Exercise	Homework	Socialization	Interaction	Self-management	Overall score
Rejection	-0.076*	-0.050	-0.026	-0.109**	-0.067*	-0.128**	-0.098**
Emotional Warmth	0.065*	0.059	0.048	0.092**	0.132**	0.111**	0.108**
Overprotection	0.074*	0.135**	0.095	0.090**	0.127**	0.095**	0.126**
Favoritism	-0.042	-0.092	-0.074*	-0.069	-0.041	0.015	-0.065*

Note: *P<0.05, **P<0.01

3.5 Multiple Linear Regression Analysis of Parenting Styles and Social Adaptability in Preschool Children

Multiple linear regression was employed to determine the factors influencing preschool children's social adaptability and to predict the social adaptability of preschool children with genders, ages, only-child, parental occupation, household monthly income, and parental educational levels.

The results showed that the independent variables included in the regression model, such as gender, age, only-child, rejection, and overprotection, were statistically significant (B=4.085, P=0.000; B=2.932, P=0.003; B=3.063, P=0.002; B=-2.522, P=0.012; B=-3.878, P=0.000; B=3.485, P=0.001). Rejection and only-child status were found to reduce preschool children's social adaptability, while female gender, higher household monthly income, older age, and overprotection were found to improve preschool children's social adaptability (Table 5).

Table 5 Multiple Linear Regression Analysis Between Total Parenting Style Scores and Different Dimensions of Preschool Children's Social Adaptability

Variable	B	S. E	Beta	t	P
Constant	0.420	0.067		6.268	0.000
Gender	0.032	0.008	0.125	4.085	0.000
Age	0.037	0.013	0.090	2.932	0.003
Maternal Education Level	0.000	0.006	0.001	0.021	0.983
Maternal Occupation	-0.002	0.005	-0.014	-0.393	0.694
PaternalEducation Level	0.010	0.006	0.065	1.774	0.076
PaternalOccupation	-0.004	0.005	-0.029	-0.810	0.418
Monthly Family Income	.014	0.005	0.103	3.063	0.002
Only Child	-0.021	0.008	-0.081	-2.522	0.012
Rejection	-0.005	0.001	-0.136	-3.878	0.000
Emotional Warmth	0.000	0.001	0.021	.547	0.585
Overprotection	0.003	0.001	0.137	3.485	0.001
Favoritism	0.005	0.003	0.059	1.723	0.085

4 DISCUSSION

The study found significant differences in social adaptability among children of different genders and ages, and parenting styles were significantly correlated with the social adaptability of preschool children. Rejection and overprotection could be used to predict the social adaptability of preschool children. This section analyzes the reasons behind these differences in social adaptability among children of different genders and ages, as well as the reasons why rejection and overprotection predict social adaptability.

4.1 Analysis of Basic Characteristics of Preschool Children's Social Adaptability

This study investigated the social adaptability of 995 preschool children aged 3 to 6, focusing on three potential factors affecting their social adaptability: child-specific factors, parental factors, and parenting styles.

The results showed that children's social adaptability was associated with their gender, only-child status, age, family economic status, Paternaleducation and occupation, Maternal education, and parenting style. At the preschool stage, girls performed better than boys in socialization, communication, self-management, and overall performance. This finding is consistent with related domestic and international research [19-20]. This may be due to inherent physiological differences between boys and girls, their different perceptions of society, or differences in how parents treat boys and girls, with parents often showing more patience and understanding towards girls. Kwak H et al.'s study indicated that [21], although girls scored higher in learning adaptability during college, boys scored higher in future adaptability, environmental adaptability, and interpersonal adaptability. This suggests that more attention should be paid to girls' communication with the outside world during their growth. In terms of self-care and self-management, non-only children scored higher than only children, possibly because parents tend to intervene more in the lives of only children. This further emphasizes that parents in only-child families need to focus on fostering self-care skills in their children.

Moreover, as preschool children grow older, their scores in self-care, academic performance, interaction skills, and self-management show an upward trend; the higher the parents' educational level, the stronger the children's social and interaction skills. This may be because highly educated parents place greater emphasis on communication and interaction with their children, providing them with more social opportunities and resources, thus contributing to the development of their social skills. The higher the family income, the better the preschool children's motor skills, academic performance, social skills, and interaction skills, possibly because high-income families can provide better educational resources and growth environments, such as quality kindergartens, diverse extracurricular activities, and social venues, which contribute to their overall development. These findings are consistent with the studies of He Hongling and Kimangale A et al. [22-23].

4.2 Analysis of the Relationship Between Parenting Styles and Social Adaptability of Preschool Children

The study results indicate that when parents tend to adopt a rejection-oriented parenting style, their preschool children exhibit lower scores in self-care, social skills, interaction, self-management, and overall development. Conversely, if parents show more emotional warmth towards preschool children, these children show improved scores in these areas. This conclusion is consistent with the findings of Dong Yan et al. in 2019, who discovered that positive parenting styles promote infants' adaptive behaviors [10]. Hasan S found that the social adaptability of primary school students is positively correlated with perceived emotional warmth, and negatively correlated with rejection or punishment [24]; Xie

Qingbin and colleagues pointed out that authoritative maternal parenting styles contribute to the social adaptation of 4-year-old children [25].

These findings emphasize the importance of support, praise, understanding, and respect from parents during their children's growth. Even when children make mistakes, parents should use patient guidance rather than scolding or corporal punishment, as the traditional belief of "spare the rod, spoil the child" is not conducive to healthy growth. Jiali S et al. emphasized the significant role of parenting style in developing students' socio-emotional abilities [26], highlighting that the effects of paternal and maternal parenting styles on students' socio-emotional abilities and related outcomes are independent and cannot completely substitute for each other. Compared to the traditional "strict father, kind mother" parenting style, the combined effect of the "kind father, kind mother" style is more beneficial for the development of students' socio-emotional skills.

According to the regression results, rejection and only-child status reduce the social adaptability of preschool children, while being female, having a higher household income, and being older improve social adaptability. This is consistent with the findings of Gao Jie et al. [27]. Unexpectedly, this study found that higher overprotection scores were associated with better scores in self-care, motor skills, social skills, interaction, self-management, and overall development. This finding contradicts the results of previous studies by Tinghu K et al. [26-29]. The specific reasons behind this need further in-depth investigation. This finding suggests that overprotection may have certain positive effects on some aspects of children's development, but its potential mechanisms and long-term effects on children's development need cautious evaluation.

4.3 Suggestions

Based on the above findings, the following countermeasures and suggestions are proposed:

First, parents should pay attention to the impact of gender differences on children's social adaptability. Particularly for boys, a more positive and encouraging parenting style should be adopted to improve their social skills and self-management abilities. For only children, parents should focus on cultivating their self-care abilities and providing more opportunities for independent living to enhance their social adaptability.

Second, parents should avoid using a rejection-based parenting style and instead demonstrate more emotional warmth and support to promote children's social adaptation. In daily life, parents should give children enough attention and encouragement and avoid severe methods such as corporal punishment to build a positive parent-child relationship. In addition, family income and educational levels are also important factors affecting children's social adaptability. Low-income and less-educated families should actively seek external resources and support, such as participating in parenting education courses and utilizing community resources, to provide a better educational environment and growth conditions for their children.

Lastly, all sectors of society should strengthen guidance and support for family education. The government and educational departments can conduct family education campaigns to promote scientific parenting concepts and methods, helping parents establish correct educational views. At the same time, kindergartens and schools should strengthen communication and cooperation with families, jointly focusing on the development of children's social adaptability and providing strong support for their healthy growth.

5 CONCLUSION

Based on 995 valid samples, this study explored the relationship between parenting styles and social adaptability in Chinese preschool children. The findings indicate that gender, age, household monthly income, and parental education level all significantly influence children's social adaptability. In terms of parenting styles, rejection-based parenting had a negative impact on children's social adaptability, while emotionally warm parenting had a positive effect. Although overprotective parenting also showed a certain positive impact, its underlying mechanisms and long-term effects on children's development require further investigation.

COMPETING INTERESTS

The authors have no relevant financial or non-financial interests to disclose.

DATA AVAILABILITY STATEMENT

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author.

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AUTHOR CONTRIBUTIONS

YD, HL, YM and SW conceived the study. YW,YM, SH, YT and HL analyzed the data. YW,wrote the manuscript. SW revised and refined the manuscript. YD,YW, HL and SW contributed to the collection of data. YD and SW was responsible for the integrity of the work as a whole. All authors critically reviewed various drafts of the manuscript and approved the final version.

ETHICS STATEMENT

Our study did not involve animal or human clinical trials and was not unethical. In accordance with the ethical principles outlined in the Declaration of Helsinki, all participants provided informed consent before participating in the study. The anonymity and confidentiality of the participant guaranteed, and participation was completely voluntary. Participants volunteered to take part in the interview. Prior to participating in the interview, they were informed of the purpose of the study and were told that "submission of records" was considered informed consent. Participants could withdraw at any time during the participation process. Written informed consent was obtained from the individual(s) for the publication of any potentially identifiable images or data included in this article.

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BRIEF INTRODUCTION OF CHINESE CALLIGRAPHY

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Abstract: This article introduces seven forms of script in Chinese calligraphy, aiming to provide basic information to people interested in Chinese calligraphy or Chinese culture.This article delves into the fascinating world of Chinese calligraphy by introducing seven distinct forms of script. Each form has its own unique characteristics, historical background, and artistic value. From the ancient and elegant seal script (Zhuanshu) to the fluid and dynamic cursive script (Caoshu), and from the structured regular script (Kaishu) to the free-flowing running script (Xingshu), each style reflects different periods of Chinese history and the cultural ethos of its time. The article also touches on the tools and techniques used in calligraphy, such as the traditional Four Treasures of the Study—brush, ink, paper, and inkstone. By providing detailed descriptions and examples of these scripts, the article aims to offer a comprehensive overview for those who are interested in Chinese calligraphy or Chinese culture. Whether you are a beginner looking to understand the basics or an enthusiast eager to deepen your knowledge, this article serves as a valuable resource to explore the beauty and complexity of Chinese calligraphy.
Keywords: Chinese calligraphy; Oracle bone script; Bronze script; Seal script; Clerical script; Regular script; Running script; Cursive script

1 THE ROLE CALLIGRAPHY PLAYS IN CHINESE CULTURE

Chinese calligraphy is an integral part in Chinese culture. Its status in Chinese culture is mainly reflected in the following aspects:

(1) Calligraphy is an Important Recorder of Chinese History

In calligraphy lies the evidence of Chinese history. For example, through the study of oracle bone calligraphy, we can learn about the politics, economy, sacrificial activities and warfare of the Shang Dynasty (about 1600 BC---1046 BC)[1-3].

(2) Calligraphy is an Important Carrier of Chinese Culture

Ancient Chinese historical books and classics were mostly recorded and passed down through calligraphy. The preservation and dissemination of classic works such as *Records of the Grand Historian* were inseparable from calligraphy in ancient times[4-6].

(3) Calligraphy is a Mirror of Chinese Philosophical Thoughts

Chinese philosophical thoughts can be reflected in its calligraphic works. For example, Confucianism emphasizes harmony and order, which are manifested in the requirement of the writing of regular script. Another case in point is : Taoism worships nature, and the cursive script, with its free, lively, flowing brushwork, perfectly embodies the Taoist idea of pursuing naturalness and non-action[7-8].

(4) Calligraphy has a Profound Impact on Chinese Aesthetics

Chinese calligraphy is primarily expressed through lines. This pursuit of line perfection has led Chinese people to pay great attention to the fluidity and rhythm of lines in their aesthetics. Also, the sense of rhythm in calligraphy lines influences Chinese aesthetics, especially in architectural decoration and sculpture[9-11].

There are spatial relationships between characters and lines in calligraphy works. This concept of spatial balance and the interplay between solid and void has inspired Chinese painters in their painting compositions.

Chinese calligraphy emphasizes harmony with nature. This admiration for natural beauty makes Chinese people more inclined to appreciate natural and unpretentious beauty.

2 BRIEF INTRODUCTION OF CHINESE CALLIGRAPHY

Generally speaking, there are 7 main forms of character writing in Chinese calligraphy, as introduced respectively in the following.

2.1 Oracle Bone Script

Oracle Bone Script is the earliest known systematic writing in China. It was mainly inscribed on turtle shells and animal bones, thus acquiring the name “Oracle Bone Script.” It was used for divination and sacrificial activities during the late Shang Dynasty (around 16th century BC to 11th century BC) and the early Western Zhou Dynasty (around 11th century BC to 8th century BC). Its brushwork already has variations in thickness, speed and rhythm. Its structure is spontaneous according to the number of strokes, spatial limitations, overall layout of the text, and the engraver’s immediate

inspiration. Due to engraving, this type of writing is sharp and strong in style, as shown in Figure 1:

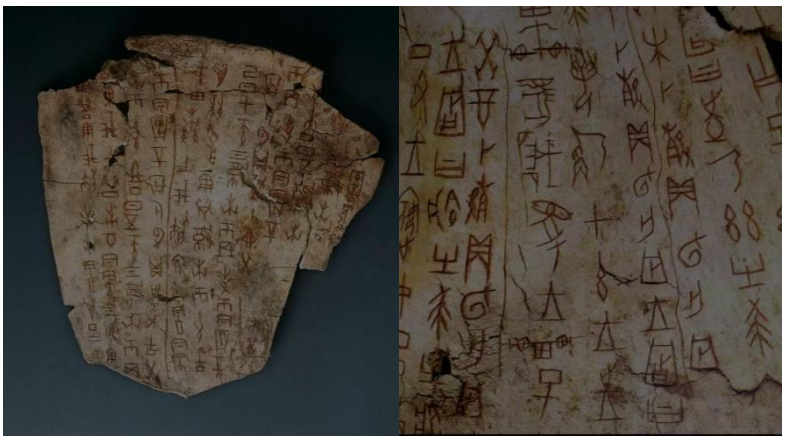

Figure 1 Oracle Bone Script

2.2 Bronze Script

Bronze Script is carved mainly on Chinese ritual bronze vessels, such as bells and tripodal cauldrons. It was primarily popular during the late Shang Dynasty to the Western Zhou period and continued to be in use during the Eastern Zhou period (around 8th century BC to 3rd century BC). These inscriptions often recorded significant incidents, such as praise accorded to ancestors, historical events and sacrifices. Bronze Script is diverse in style, with some being grotesque and solemn, some bold and unrestrained, and some simple and plain. Generally speaking, they are more standard, regular and orderly than Oracle Bone Script, as shown in Figure 2:

Figure 2 Bronze Script

2.3 Seal Script

Seal Script was primarily popular during the Qin Dynasty (221 BC --- 207BC) and continued to be in use during the Western Han Dynasty (202 BC --- 9 AD).

The writing speed of seal script is relatively slow, because its strokes are required to be smooth and regular and the writer needs to carefully control the movement of the brush tip. This slow-writing feature makes seal script pay more attention to the quality of the strokes and the stability of the structure during the writing process.

The strokes of seal script are relatively uniform in thickness and have no sharp corners at the turns but rather a rounded shape. When writing seal script, the brush tip always runs in the middle of the stroke, giving the lines a three-dimensional feel. Moreover, the start of seal script is usually made by reversing the brush, and the end is often made by returning the brush, rendering seal script reserved and restrained in style. The smoothness of the lines is an important feature that distinguishes seal script from other calligraphic styles such as clerical script (which has wave-like strokes) and regular script (which has rich variations in stroke forms), as can be seen in Figure 3:

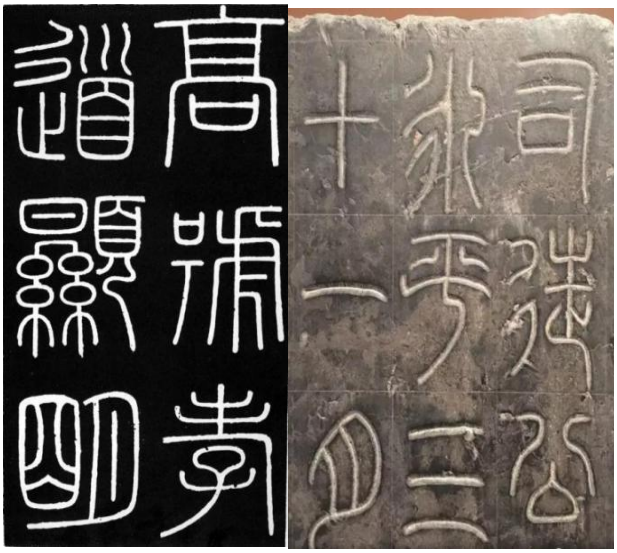

Figure 3 Seal Script

Seal Script reflects the early Chinese aesthetic concepts. Its smooth and regular style reflects the ancient people's pursuit of harmony and balance. In ancient times, Seal Script was often used in solemn occasions such as ancestral temple sacrifices and inscriptions on monuments, which also gave Seal Script a solemn and dignified aesthetic quality.

2.4 Clerical Script

Clerical script was the main official script during the Eastern Han Dynasty (25 AD--- 220 AD) and played a pivotal role in the development of Chinese calligraphy. It evolved from Seal Script and laid the foundation for the emergence of Regular Script.

There is a clear variation in the thickness of Clerical Script strokes. Generally, horizontal strokes are thinner, while vertical strokes are thicker, which makes Clerical Script appear wider and flatter compared with the narrower-taller structure of Seal Script.

The phrase “Silkworm Head and Wild Goose Tail”, which is an imaginary description of Clerical Script, vividly captures the characteristics of some strokes in Clerical Script. The “Silkworm Head” refers to the round shape at the beginning of some stroke, while the “Wild Goose Tail” depicts the extended form at the end of some stroke, resembling the tail of a wild goose.

Clerical Script possesses the aesthetic characteristics of being ancient and elegant, with its stroke shapes and character structures imbued with a strong ancient atmosphere. Because of the use of wave-like strokes, Clerical Script also has a lively and energetic element within its ancientness. Figure 4 is an example of Clerical Script.

Figure 4 Clerical Script

2.5 Regular Script

Regular script, also known as formal script or true script, means good examples for standard writing. It is said to emerge

in the Eastern Han Dynasty (25 AD --- 220 AD), develop rapidly during the Wei and Jin periods (220 AD --- 420 AD) and become popular in the Tang Dynasty (618 AD--- 907 AD).

Regular script is simpler in form, fewer in the number of strokes and straight in line, and its shape is generally square or nearly square. In regular script, the center of gravity of each character is positioned in its center, rendering it a sense of stability and balance.

Without the connected strokes found in running script or the simplified strokes in cursive script, the strokes in regular script are clearly distinguishable. Both beginners and ordinary readers can easily recognize the strokes and structure of each character. This standardization has led to its widespread use in daily writing, book printing, official documents, etc.

In regular script, there are various ways to start and end strokes, with the most common being hidden tip and exposed tip. Hidden tip means starting with a reverse stroke, making the stroke appear reserved and restrained. Exposed tip means the brush tip directly touches the paper, with the tip exposed at the beginning or end of the stroke, giving the stroke a sharp look.

Regular script requires clear square turns at the corners, where the brush tip must clearly change direction to form a distinct angle. It also emphasizes the variation of pressure to show the thickness changes of the strokes, thus giving the characters a sense of rhythm. Two examples of Regular Script are shown in Figure 5.

Figure 5 Regular Script

2.6 Running Script

Running Script originated in the Eastern Han Dynasty (25 AD --- 220 AD), with its purpose to simplify the writing of Regular Script to make writing more convenient, and reached maturation in the Eastern Jin Dynasty (317 AD --- 420 AD).

Running script simplifies writing by omitting strokes and merging lines, and increases the connection between strokes to make writing more convenient. Its structure , though based on regular script, is simplified and different.

Combining the neatness of regular script with the liveliness of cursive script, running script possesses a unique artistic charm that is neither too rigid nor too unrestrained. Besides, due to its faster writing speed, the connection and variation between the running script strokes are more natural, which can better express the calligrapher's emotions and personality and reflect the calligrapher's creative intentions. Being both practical and artistic, running script has always been loved widely by calligraphers and calligraphy enthusiasts. Figure 6 is an example of Running Script.

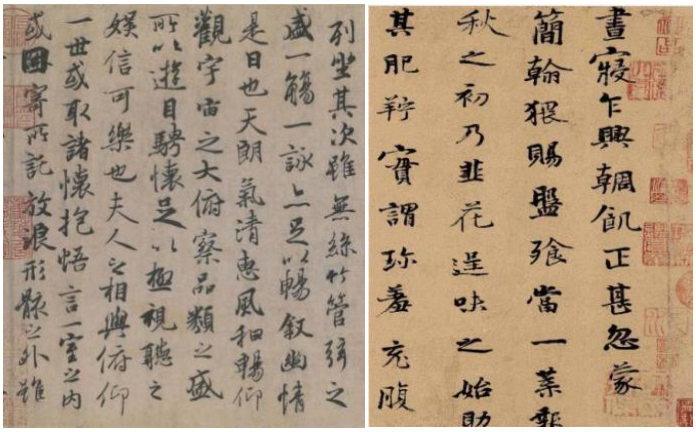

Figure 6 Running Script

2.7 Cursive Script

Cursive script originated in the early Han Dynasty and evolved from the clerical script. The emergence of cursive script predates that of regular script and running script.
Contrary to most people's literal understanding of "cursive" script, cursive script is no hasty or careless way of writing, but rather a writing style with a strict system of cursive symbols. Understanding this system of symbols is crucial for the correct reading of cursive script. For readers who are not familiar with the system, or when encountering cursive works not following strictly with the system, it is very difficult to identify the content of the cursive script.
Cursive script, with its continuous lines and free structure, is one of the most expressive forms of calligraphy for conveying the writer's emotions. The writer can express different feelings through the weight of the strokes, the speed of writing, and the looseness or tightness of the structure, etc. Figure 7 is an example of cursive script.

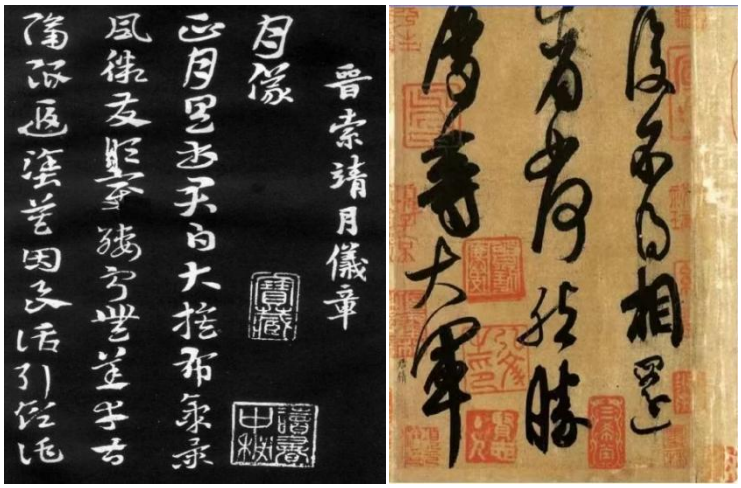

Figure 7 Cursive Script

3 CONCLUSION

For people interested in Chinese culture, calligraphy is one effective way to gain insight of it. However, the taste of apple lies in tasting it. No matter how much you know about Chinese calligraphy in theory, you have to try your hand at it to truly appreciate its significance in Chinese culture and its subtle beauty as an art.
This article hopefully will bring people closer Chinese calligraphy. For people who are really intrigued by it, I encourage you to try practicing Chinese calligraphy, the benefits of which, I promise, will go way beyond your imagination.

COMPETING INTERESTS

The authors have no relevant financial or non-financial interests to disclose.

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REFORM OF DATA SCIENCE PRACTICE SYSTEM EMPOWERED BY DIGITAL INTELLIGENCE TECHNOLOGY

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Abstract: This study introduces CDIO education concepts into Reform of Data Science Practice System, starting from several aspects such as course conceive and design, course implementation cases, and course operation experience, discusses in detail the three major components of the course, namely, Data Structures, Operating System, Software Engineering, have achieved initial success at present, finally summarizes the CDIO teaching practice. This study has carried out a series of practical explorations by adopting methods such as the project task-driven approach, situational teaching method, and role-playing teaching. Construct a brand-new teaching model, integrate project design and competency cultivation into the curriculum system, interrelate knowledge points through projects, and fully embody the overall cultivation philosophy of knowledge-ability-quality.
Keywords: Data science practice system; CDIO; Teaching practice; Digital intelligence technology

1 INTRODUCTION

By reviewing relevant literature at home and abroad, representative achievements in data science teaching reform include the BOPPPS teaching model (Bridge-in, Learning Objective, Pre-assessment, Participatory Learning, Post-assessment, and Summary), the Flipped Classroom, and the exploration of integrating curriculum ideology and politics elements into data science teaching practices.

The current education systems for emerging majors such as data science and big data technology, big data management and application still exhibit phenomena of knowledge-based orientation, disconnection between teaching content and social needs, and decontextualized teaching methods, which cannot meet the requirements for cultivating new-quality talents adapted to the development of new-quality productivity. Traditional knowledge-based design does not conform to students' cognitive laws for engineering problems, thereby affecting the development of engineering capabilities. Blindly copying the experience and approaches of computer science and technology or statistics, and project-based apprenticeship design lack knowledge correlation and deep understanding.

To thoroughly study and implement the spirit of the 2024 Key Points for Improving National Digital Literacy and Skills, and to promote high-quality education development, there is an urgent need for a more reasonable teaching philosophy to improve current teaching methods and construct a brand-new teaching model. This model integrates project design and competency cultivation into the curriculum system, connects knowledge points through projects, cultivates personal and interpersonal skills, as well as the ability to build products, processes, and systems, and forms an integrated curriculum teaching method that fully embodies the overall cultivation philosophy of knowledge-ability-quality. Based on this, the research team proposes such topic as Reform of Data Science Practice System.

2 LITERATURE REVIEW

The prior relevant studies can be summarized in the following aspects:

In terms of discipline construction and talent cultivation, Xueli Wang et al. integrated the CDIO engineering education model into the computer teaching [1], conducted questionnaire survey between the traditional education model and the reformed education model, found that the CDIO engineering education model has a significant advantage. Gongwen Xu et al. introduced CDIO and OBE concept [2], adopted this educational model in the construction of E-Commerce majors to cultivate students' practical and innovative abilities.

In terms of curriculum reform and practice, Xu Guan et al. have taken Artificial Intelligence (AI) course of Liaoning In-stitute of Science and Engineering as an example [3], following the concept of CDIO engineering education and five learning methods (problem-based learning, project-based learning, case-based learning, do-it-yourself learning, and experience-based learning). Dong Yuxia has launched a teaching reform of CDIO engineering education model for Java course teaching, cultivating innovative and applied talents with good professional skills and professional literacy [4]. Cai Yang enables students to learn Java programming course in an active [5], practical and comprehensive way, CDIO engineering education teaching effect of the model was verified by data statistics, the survey questionnaire results show that students who use the new method perform better. Haiyi Jin used a variety of course assessment meth-ods based on OBE-CDIO teaching design of Network Planning and Design course [6], took a chapter of WLAN design as an example, focused on engineering practices and related design points.

Other teaching reform methods, Cesare Aloisi believes that using artificial intelligence and machine learning to assist in high-risk assessment of exams is effective [7], including grading, quality assurance, and paper generation. Using gamified courses as the treatment group and non-gamified courses as the control group, Raquel Blanco et al.

investigated whether gamified usage techniques help improve the participation and performance of software testing students, found that gamified courses have a positive impact on students' participation and academic performance [8].
In the fields of management and business, George Rosier promoted online survey of case method course on the Case Centre at Cranfield, UK, the participants were scholars of business schools in Aus-tralia and Singapore [9], these findings of case method teaching have beneficial effect for business education practice. Aron Truss et al. contributed to blended learning pedagogy in business school circumstances [10], adopted semi-structured interview methods before and after COVID-19, suggested implications for business and management education.
This study introduces the CDIO education concept into the teaching of the reform of the data science practice system. Starting from several aspects such as course concept and design, course implementation cases, and course operation experience, the author discusses in detail the three major components of the course, namely, data structure, operating system, and software engineering.

3 CONCEIVE AND DESIGN

3.1 Data Structure

As the core part of this course, data structure has both abstract theoretical segments and practical segments emphasizing algorithm programming. The logical structure, physical (storage) structure and operational operation of commonly used data structures are taken as the main teaching contents, this study integrates the training of CDIO thinking ability into the course teaching, uses questions to stimulate students' learning enthusiasm, and designs each segment well, let the students feel that the knowledge is useful, interesting and effective, as shown in Table 1.

Table 1 Some of the Questions to Import the Data Structure

Main Content	Questiopns Raised	Corresponding Knowledge Point
Algorithm	What is a good algorithm? How to measure the efficiency of algorithms as high or low?	The time complexity and spatial complexity of the algorithm.
Linear List	How to establish a student grade transcript and how to operate it?	Storage and basic operations of linear tables.
Stack	Nested calls to functions.	Basic operation of stack.
Queue	Ho to design a simulation plan for queuing to buy tickets? Input output buffer?	Basic operations of queues.
Tree and Binary Tree	How to establish and search for a family tree? What is the list of textbooks we use? Mining the relationship between full binary trees and binaries?	Basic concepts of trees and binary trees, traversal of binary tree.
Graph	What is the matter of the "Seven Bridges of Gothenburg"? Graph theory model and algorithm for course scheduling in universities?	Basic concepts of graphs. Minimum spanning tree, directed acyclic graph and their applications.

The new teaching mode integrates the CDIO concept into the data structure teaching, adopts the questioning teaching method, introduces the designed questions into the teaching, and allows students to actively think about the solution of the problem by asking questions. Based on the expected learning results, reverse design of teaching content and use of questions to stimulate students' learning enthusiasm are shown in the following table.

3.2 Operating System

At first, interact with students regarding the operating system of mobile phones, and then step into the operating system of computers, which is the second part of Reform of Data Science Practice System. As an important branch of computer related majors, this section involves a wide range of aspects, abstract processes, complex content, and strong theoretical significance, making it difficult to truly understand and master, therefore, this part is the "most difficult to teach" for teachers and the "most difficult to learn" for students. This study integrates the cultivation of CDIO thinking ability into the teaching process of this part, arouses students' enthusiasm for learning, and changes the situation that students are "unable to learn" and "unwilling to learn", has good teaching effect.
The import settings for some operating system issues are as follows:
No matter how much memory is installed on 32-bit system, it can only use 4GB. Is that true?
No way... So I bought 16GB memory module for nothing?
Interact with students and encourage them to calculate 2^{32}=?

4 IMPLEMENT

4.1 Classic P/V Operations, Status of Processes (Operating System)

Adopting situational teaching methods, designing learning contexts is used to improve teaching effectiveness, this teaching method has a certain degree of operability, highlighting students' learning by doing and doing while learning. In "learning by doing", emphasis is placed on hands-on learning, requiring students to understand and comprehend the

process of doing, and then acquire corresponding skills. In "doing by learning", students need to first master some targeted skills systematic theoretical knowledge.
The state of the “process” is the key and difficult part of the operating system. We integrate abstract, obscure theoretical knowledge into pre-created story scenarios to avoid teacher centered and lecture based cramming, which is also one of the key points that trigger CDIO.
The story scenario presents the fundamental knowledge intuitively and vividly in our vision, making students realize that abstract operating system knowledge supports specific life points. Next, we will discuss and sort out the knowledge points behind the story, this teaching mode is more effective than simple textual explanations, and it also makes students aware of the significance branch of “Software Technology Fundamentals”, namely, operating system, the seemingly dull theory is actually full of fun, which has led to more interaction in the classroom. Besides, it has also stimulated students' interest and enthusiasm for learning.

4.2 Small Design Oriented (Data Structure)

If there are six competition events, it is stipulated that each contestant can participate in up to three events, with five registering to participate in the competition. Require students to apply knowledge of data structure to design a schedule for track and field competitions, so as to complete the competition in the shortest possible time.
During the implementation process, guide students to set different competition items as vertex sets in graph theory algorithms, and edge sets as “connecting an edge between items that cannot be competed at the same time”, has made this non-numerical arithmetic issue easy to be solved.

5 OPERATE (SOFTWARE ENGINEERING)

Taking the third part of Reform of Data Science Practice System as an example, namely, software engineering, this practical segment corresponds to the Conceive practice (C) and Design practice (D) in the CDIO engineering education model. Conceptual practice (C) requires students to familiarize themselves with CDIO, software engineering concepts, and the entire software project development process by consulting relevant materials in the experimental guide book, in addition, Design practice (D) requires students to complete requirement analysis and system design for software systems.
Through this practical session, it is expected that students will be proficient in programming languages and database design. We have chosen a development framework based on MFC, using MySQL for the database, MFC interacts with data, and we have chosen ODBC (Students are also required to try DAO development methods):
(1) Database Design (MySQL).
(2) Creating an ODBC Data Source Link (ODBC).
(3) MFC Development (Visual Studio 2019 development environment).
For the hands-on practice section, we explain the experimental purpose, content, and related knowledge points in advance, students can prepare the hands-on code in advance, based on this, we can have a targeted approach in class.
For some students with poor understanding and weak foundation, the teacher provides reference programs and code, and the core statements are presented in the form of filling in the blanks, so that computer practice will not become mere formality, and each student will also master relevant knowledge to varying degrees for comprehensive application. By contrast, some optional questions are also assigned and additional points are set, providing opportunities for students with strong hands-on and comprehension abilities to integrate. For the latter, the teacher guided students to explore similar search algorithms for the data structure part (Binary Search), how to define intervals? For example, if we give an interval of 0-10, we now request to search for 11. Obviously, 11 is not within the given interval. If we execute the Binary Search algorithm step by step, it will waste memory and re-sources, therefore, we will implement it in two steps:
Step 1: Determine whether the number to be queried is within this interval, and if it is not, we will directly provide feedback to the operator, otherwise, we will search.
Step 2: If the number to be searched is within the given interval, perform a Binary Search.
In this CDIO teaching practice exploration, the students gave me feedback one by one on the difficulties they encountered, at last, a total of 12 students packaged their designed algorithms and software running results, then sent them via email. The achievement of CDIO engineering education is that students can actively analyze and solve problems, and apply what they have learned.

6 CONCLUSION

We cultivate computer application talents, in terms of the teaching content of this curriculum, teachers should not only comprehensively consider the key and difficult points of each part, students’ acceptance ability, and the connection of subsequent courses, but also design more scenarios, small projects, and cases that are closely related to students' learning, living environment, and the forefront of society to associate with various learning objectives, therefore, summarize the teaching practice of CDIO as follows.
(1) Digging Questions from Classics. In terms of teaching settings, the starting point should be to activate students' enthusiasm and learning interest, using situational cases as carriers, combining theoretical overview with algorithm design to solve practical problems, allowing students to walk into the curriculum with questions, gradually grasp the teaching content, and ultimately apply what they have learned. Identify research projects related to teaching content,

bring more and up-dated practical application materials and achievements back to the classroom, through the display and application of these materials and achievements, enhance students' practical abilities to solve practical problems and carry out software development.

(2) Assessment from Multi-perspectives. First, in static search (sequential search, binary search, block search), a related question is given, and students who design additional algorithms have corresponding added value points. Second, in dynamic search, the algorithm implementation of binary sorting tree (mandatory) requires each student to design, and the difficulty coefficient of this experimental practice class is relatively high. Third, the sorting algorithm in the data structure section re-quires students to focus on designing the implementation of bubble sorting algorithm.

(3) Multi-channel Platform. By utilizing multimedia teaching tools, computer simulation technology, and practical programming software, profound and abstract concepts and principles are presented in vivid images and flash animations, demon-strating step-by-step program command lines of algorithms, etc., allowing students to have a more intuitive understanding, familiarity, and mastery of the corresponding content. For instance, for several typical operating systems, students can study the development of Windows, UNIX, and Linux operating systems voluntarily and accept them through classroom communication. In addition, for the key and difficult parts such as data structure and algorithms, a combination of flash animation and blackboard writing is adopted to master the algorithm program, and the stability, usage scenarios, time complexity, spatial complexity, etc. of several sorting algorithms are compared in the form of charts. After class, it is assisted by task driven to consolidate and strengthen these contents, and multiple teaching methods are used in a cross and comprehensive manner, which is beneficial for improving students' ability to comprehend the teaching contents.

COMPETING INTERESTS

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REFORM AND RESEARCH OF THE COURSE "COMMUNICATION SURVEY AND DESIGN AND PRELIMINARY BUDGET" BASED ON THE INTEGRATION OF INDUSTRY AND EDUCATION AND THE BACKGROUND OF JOB COURSE COMPETITION AND CERTIFICATION

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Abstract: Under the guidance of high-quality development, courses should be able to achieve a successful combination of "industry education integration" and "job course competition certification" in talent cultivation and student employment. As a core course of modern mobile communication technology, "Communication Survey and Design and Preliminary Budget" is an important means to cultivate students' vocational abilities and employment directions, ditly involving multiple positions such as consulting design, construction project management, and settlement audit. Based on the integration of industry and education and the certification of job courses, the course design is guided by modular teaching and practical work processes. The teaching content is closely integrated with the actual production of enterprises, and the theory is guided by practicality and vocational skills. By adopting information-based teaching methods and integrating with the 1+X certification and vocational college skills competitions, we aim to strengthen the cultivation of practical abilities, develop students' professional knowledge and vocational skills, and enable them to initially possess the qualification standards for engineering service positions, thereby laying a solid foundation for their employment.
Keywords: Integration of industry and education; Post course competition certificate; Modular design; Practicality; Vocational skills

1 INTRODUCTION

Communication Survey and Design and Preliminary Budget "is a core course for modern mobile communication technology majors, aiming to cultivate students' skills in design drawing and preliminary budget preparation. It is an important knowledge and skill that must be mastered in the employment direction of communication engineering services. Based on the job requirements of multiple positions such as communication consulting design, construction project management, and settlement audit, and referring to the qualification standards of various positions in the engineering service industry chain, the curriculum design and teaching content will be reformed with a focus on modular teaching and actual communication engineering workflow. In collaboration with enterprise technical personnel, we design teaching content that closely integrates with the actual production of the enterprise. Theory is guided by "practicality" and "vocational skills", and information technology teaching methods are used to connect with 1+X certification and vocational college skill competitions. We strengthen the cultivation of practical abilities, construct high-quality course content, cultivate students' professional knowledge and vocational skills, and lay a solid foundation for their employment[1].

2 CURRENT STATUS OF CURRICULUM DEVELOPMENT AT HOME AND ABROAD

The vigorous development of 5G new infrastructure construction has brought about a significant increase in the demand for engineering and technical talents. To this end, various universities have launched similar courses, such as Shijiazhuang Information Engineering College and Changzhou Information Vocational and Technical College. The teaching content of similar courses is partly focused on the understanding of engineering drawing, basic knowledge of engineering drawing, benchmark measurement, and instrument measurement, while some are too broad, not detailed enough, and not in-depth enough[2]. Most courses combine topics such as circuits and pipelines into one course, resulting in content that is too broad but lacks depth. The most important thing is the failure to grasp the spirit of policy documents such as the "Action Plan for Improving the Quality and Quality of Vocational Education" (2020-2023) and the "Implementation Plan for National Vocational Education Reform" (20 articles on vocational education), and the lack of integration between industry and education. For example, most course content lacks practical cases from enterprises, and the budget allocation quota used lags behind too long. Failed to timely connect with the 1+X certification and skills competition, and achieved course updates by promoting teaching and improvement through competition.
Domestic equipment manufacturers responsible for foreign communication engineering generally outsource to domestic design institutes or self manage the entire network deployment, requiring personnel to have planning,design, and engineering cost control capabilities. Therefore, based on the comprehensive investigation and implementation of the

communication engineering industry chain and similar courses at home and abroad, combined with our school's modern mobile communication technology curriculum system, it is necessary and feasible to carry out the course design and teaching content reform of "Communication Survey and Design and Preliminary Budget" through information technology means.

3 RESEARCH ROUTE AND COURSE DESIGN

3.1 Research Routes and Methods

The curriculum reform first and foremost lies in accurately grasping the inherent logical relationship between the integration of industry and education and the comprehensive education model of on-the-job course competition and certification. Through various methods such as data collection, on-site research, and comparative analysis, we have accurately identified the inherent needs of talent cultivation and the dual nature of schools and enterprises, and depicted the technical roadmap for communication survey and design and preliminary budget reform as shown in Figure 1.

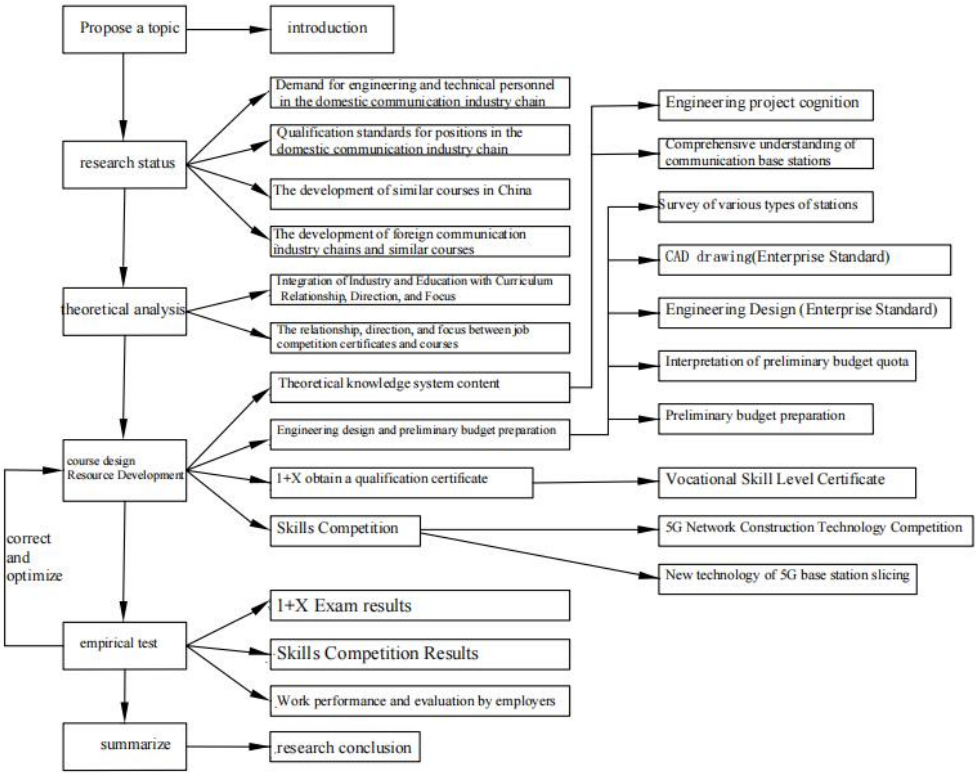


Figure 1 Technical Roadmap

Under the guidance of the technical line, the detailed methods and specific contents adopted for each stage are as follows:

(1) Data collection

Refer to online materials, focus on analyzing the current research status at home and abroad, and the implementation of similar projects in other universities, determine research objectives, content, and key technologies, and lay the foundation for high-quality project development.

(2) On site research method

Visit enterprises, gather needs and obtain enterprise resources, send project members out for learning and training, and deepen "industry education cooperation". Through in-depth research and analysis, the relationship, direction, and focus of the integration of industry and education, as well as the competition and certification of on-the-job courses, with this course.

(3) Comparative analysis method

Comparative analysis of students' classroom performance, understanding of professional knowledge, mastery of professional skills, and course evaluation results before and after the implementation of curriculum reform and resource development

(4) Experimental verification method

Verify the achievements of the reform through the work performance of interns and graduates, evaluations from employers, content and results of vocational skills competitions;

(5) Summary and Amendment Method

Based on course evaluation and practical results, improve and revise project research methods to ensure the scientific and reliable nature of research results. Through project research, achieve the successful integration of curriculum with "industry education integration" and "on-the-job course competition certification".

3.2 Course Teaching Design

The course of "Communication Survey and Design and Preliminary Budget" is designed based on job knowledge and overall ability requirements. Scientific design includes 7 projects: basic knowledge of engineering projects, communication base station survey, communication base station design, engineering cost and preliminary budget, preparation of preliminary budget examples, publication, review and disclosure, and certification integration, as shown in Figure 2.

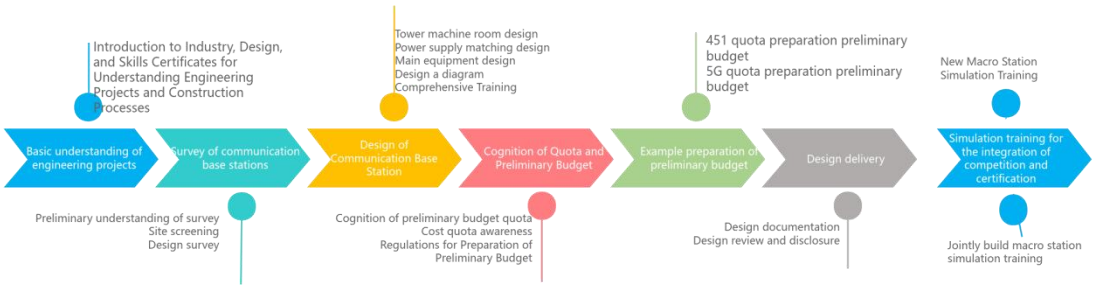


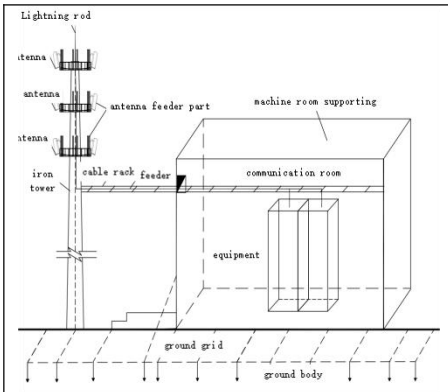
Figure 2 Course Design

According to the course module shown in Figure 2, the teaching plan for the "Communication Base Station Design" module is designed as shown in Table 1. A total of 6 lectures and 12 class hours were arranged, including on-site teaching and practical internships for tower and mast design, power supply matching design, and main equipment design, which were then reflected through drawings. Finally, design practical teaching for the comprehensive training of newly built stations and co located stations, demonstrating the combined effect of theory and practice[3].

Table 1 Teaching Plan for Communication Base Station Design Module

Teaching arrangement	Chapter and Content Summary	Time Allocation		
		lecture	experiment and practice	on-the-spot teaching
1	Design of tower and mast machine room		1	1
2	Power supply matching design		1	1
3	Design of base station main equipment		1	1
4	Design a diagram	1	1	
5	New Station Comprehensive Training		2	
6	Comprehensive Training of Co located Stations		2	

The course introduces industry standards, job responsibilities, enterprise plans, and construction documents to construct project carriers, as shown in Figure 2. Driven by tasks, the integrated design content of "teaching, learning, and doing" fully and clearly reflects the full service process of designers in the construction of communication base station projects, encouraging students to bravely shoulder multiple responsibilities and master necessary skills and certificates. Simultaneously emphasizing the closed-loop assessment of enterprise inspection and competition certification integration, in order to better enhance students' professional abilities, see Figure 3.



Budget Table for Construction and Installation Engineering Quantity

Construction Project Name: Wireless Master Equipment Project in the 2.6 GHz Band in the XXX Region
Single project name: Installation project of base station equipment
Construction Unit Name: XXX Company Form Number: TSW-3A

Number	Quota Number	Project Name	Unit Quantity	Num	Unit quota value (working days)		Total value (working days)	
					technician	General worker	technician	General worker
一	II	III	IV	V	VI	VI	VIII	IX
一	T5G2-047	Install power converter/distribution uni	tower	1.00	0.80	0.00	0.80	0.00
2	T5G1-054	Tie soft fiber optic cables (below 15m)	Rice strips	2.00	0.29	0.00	0.58	0.00

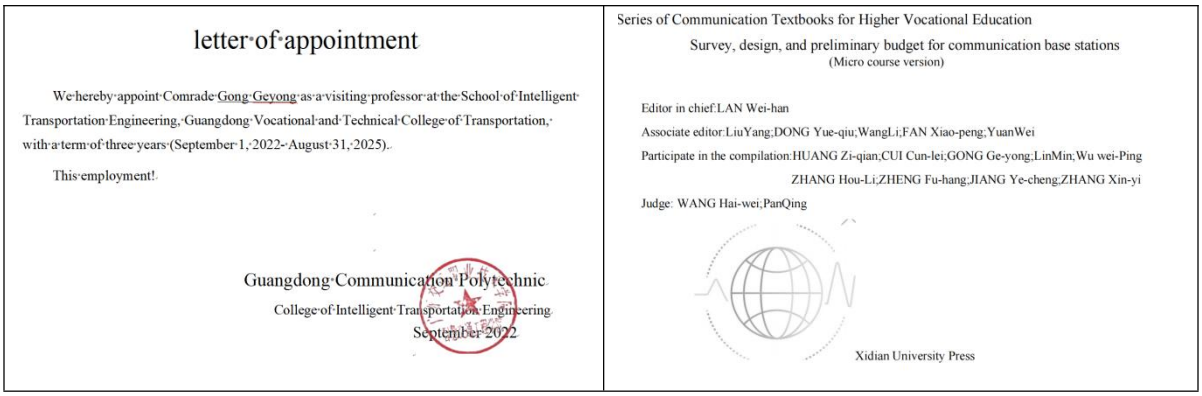
Figure 3 Case Study of Enterprise Positions

Each project sets different task quantities based on the production needs of the enterprise and the teaching difficulties, and the content is equipped with text, pictures, videos, engineering cases, or practical training tasks to highlight practical skills. Teaching emphasizes gradual and closed-loop assessment, and improves students' comprehensive abilities through enterprise testing and competition certification integration.
The above course projects have established online courses for Xueyin and are open to students and society for free. The course design includes teacher-student interaction and course evaluation, which helps to understand students' needs and answer their questions in a timely manner. The course website is: https://www.xueyinonline.com/detail/244644252

4 THE EFFECT OF CURRICULUM REFORM

4.1 Integration of Industry and Education

Since the implementation of the reform research on the course of "Communication Survey and Design and Preliminary Budget", the school and enterprise have closely cooperated and deeply cultivated the field of communication engineering design. Based on the external practice base jointly established by our school's Modern Mobile Communication Technology major and Zhongtongfu Consulting Design and Research Institute Co., Ltd.[4], we have hired senior technical talents from enterprises as guest professors to jointly develop courses and publish textbooks, as shown in Figure 4. By promoting efficient innovation in the education and industry chains, we aim to achieve deep cooperation in the integration of industry and education[5].


letter of appointment

We hereby appoint Comrade Gong Geyong as a visiting professor at the School of Intelligent Transportation Engineering, Guangdong Vocational and Technical College of Transportation, with a term of three years (September 1, 2022- August 31, 2025).

This employment!

Guangdong Communication Polytechnic
College of Intelligent Transportation Engineering
September 2022

Series of Communication Textbooks for Higher Vocational Education

Survey, design, and preliminary budget for communication base stations
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Figure 4 Achievements of Industry Education Integration

4.2 Post Course Competition Certificate

Through teaching reform research, simulation training content of 1+X certification and skills competitions is integrated into the curriculum, encouraging students to obtain relevant industry certificates and actively participate in skills competitions in school[6,7], enhancing their professional competence and improving their employability. Since the curriculum reform, the pass rate of+X certification has increased from 76% to 94%, and the participation base has become larger and wider. The results of the skills competition have also significantly improved, breaking through the BRICS Vocational Skills Competition and winning the second prize in the international finals, as shown in Figure 5. The award-winning contestants and students who have obtained relevant certificates have significantly improved their skills, and the company has provided feedback that these students have strong practical abilities and high professional ethics.

Figure 5 Gold Brick Competition Award Certificate

5 CONCLUSION

Based on the job requirements of the communication industry chain at home and abroad, the development of relevant courses at home and abroad, and the current situation of the mobile communication major in our university, this article conducts research on the reform of "Communication Survey, Design and Preliminary Budget". Through comprehensive and in-depth analysis, propose reform measures based on the integration of industry and education and the certification of job courses. Practice has proven that under this approach, educational reform has achieved the expected goals and improved students' comprehensive qualities. Next, we will incorporate the career trajectory of graduates as a key research focus[8], in order to obtain more valuable long-term benefits and improvement methods.

COMPETING INTERESTS

The authors have no relevant financial or non-financial interests to disclose.

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Based on the background of "industry education integration" and "job course competition certificate", the reform and research of the course "Communication Survey and Design and Preliminary Budget", ZC-B-07-01KY-23154.

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EDUCATION INFLATION IN STUDY TOURS

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Abstract: With the in-depth promotion of the concept of quality education, study tours in my country have developed rapidly, but in practice, the phenomenon of "education inflation" has emerged: the cost of study tours has continued to rise, while the value of education has not increased accordingly, and even problems such as form outweighing content, overpackaging and exaggerated publicity have emerged. This paper first explains the concepts of study tours and education inflation and the relationship between the two, and analyzes its performance characteristics in terms of inflated costs, blind comparisons, uneven quality, and utilitarian evaluation; then analyzes the causes such as market supply and demand imbalance, institutional profit-seeking, and government performance-driven; then through current situation analysis and effect evaluation, it reveals the multiple impacts of education inflation on the quality of study tour education, students' knowledge and practical ability, and educational equity; finally, from the three levels of policy, school and society, comprehensive countermeasures such as building access standards, strengthening supervision, optimizing curriculum design, teacher training and home-school cooperation are proposed. Research shows that only through multi-party collaboration and systematic governance can the vicious cycle of "education inflation" and market expansion in study tours be broken, and study tours can be promoted to return to the essence of education and achieve healthy, balanced and sustainable development.
Keywords: Study tour; Education inflation; Cost-value imbalance; Curriculum design; Education equity; Comprehensive quality training

1 INTRODUCTION

With the continuous advancement of educational reform in China, the concept of quality education has gained widespread acceptance. Study travel, as an educational approach integrating learning, practice, and travel, has emerged accordingly. In 2016, the Ministry of Education and 10 other departments issued the "Implementation Opinions on Promoting Study Travel for Primary and Secondary School Students," explicitly stating that study travel should be incorporated into the teaching plans of primary and secondary schools to promote its healthy and rapid development. Since then, study travel has rapidly gained popularity nationwide, becoming an innovative form of education that bridges school-based and extracurricular learning, widely embraced by schools, parents, and students. From the school perspective, study travel enriches the curriculum system, providing students with opportunities to step outside the campus, connect with nature, and understand society, thereby fostering students' comprehensive qualities and innovative capabilities. Parents also hope that through study travel, children can learn through practice, broaden their horizons, and enhance their competitiveness. For students, study travel is full of novelty and appeal, stimulating their learning interest and desire for exploration. However, behind the vigorous development of study travel, several issues have gradually surfaced. Among them, the phenomenon of "educational inflation" deserves particular attention. In the economic field, inflation refers to an excessive issuance of currency beyond actual demand, leading to currency devaluation and persistent price increases. In the field of education, "educational inflation" can be understood as a situation where, despite continuous increases in educational resource inputs, educational outcomes fail to achieve corresponding and effective improvement, or even experience quality decline and a focus on form over substance. In study travel, this "educational inflation" manifests as continuously rising costs without matching educational value, raising widespread concerns across society. This study aims to conduct an in-depth analysis of the specific manifestations, causes, and impacts of "educational inflation" in study travel. Based on this analysis, targeted solutions will be proposed to promote the healthy and sustainable development of study travel. In terms of theoretical significance, current research on study travel mainly focuses on its educational value, curriculum design, and implementation models, with relatively little attention paid to the issue of "educational inflation." This study will fill this gap, enriching and refining the theoretical framework of study travel and providing new perspectives and insights for future research. In terms of practical significance, by examining the issue of "educational inflation" in study travel, this research can help schools, parents, and study travel institutions better recognize the existing shortcomings in current practices. It will guide them in rationally planning and organizing study activities to enhance the quality and effectiveness of study travel. Simultaneously, it will assist relevant government departments in strengthening market supervision, standardizing market order, safeguarding students' legitimate rights and interests, and steering the study travel industry toward a more professional, standardized, and healthy direction. Abroad, some developed countries (e.g., outdoor education in the United States, educational visits in the United Kingdom) have a long history of conducting study travel, with relatively in-depth research. Some scholars have noted the positive effects of study travel on promoting students' cognitive development and social skills. However, research on issues analogous to "educational inflation" remains scarce. Some studies indicate that with the commercialization of study travel, problems such as

misalignment between activity content and educational goals, and inflated prices may arise, though systematic theories and findings have yet to be established. Domestically, with the rise of study travel in recent years, related research has gradually increased. Many scholars have explored the connotations, characteristics, and educational functions of study travel, emphasizing its importance in cultivating students' core competencies. However, research on "educational inflation" in study travel is still nascent. Some educators and researchers have begun to recognize phenomena such as formalism, high costs with low quality, but most remain at the stage of describing phenomena and raising problems, lacking in-depth causal analysis and effective solution strategies. Overall, current research on "educational inflation" in study travel, both domestically and internationally, remains in its infancy. Further in-depth exploration is necessary to provide more scientific and effective theoretical support and practical guidance for addressing this issue.

2 MECHANISM ANALYSIS OF STUDY TOURS INDUCING EDUCATIONAL INFLATION

2.1 Core Elements of Study Tours

Study tours are an off-campus educational activity that combines research-based learning with travel experiences. Guided by the concept of quality-oriented education, they emphasize students' practice and exploration in authentic contexts. The "Opinions on Promoting Study Tours for Primary and Secondary School Students" point out that study tours are off-campus educational activities, organized and arranged in a planned manner by education departments and schools, conducted through collective travel and centralized accommodation, combining research-based learning with travel experiences. They represent an innovative form connecting in-school education and out-of-school education, are an important part of educational teaching, and serve as an effective means of comprehensive practical education. In essence, study tours are not simple tourism activities but a learning process with clear educational purposes. They break the spatial constraints of traditional classroom teaching, allowing students to leave the campus, enter nature, society, and historical and cultural sites, and carry out research-based learning during travel to acquire knowledge, cultivate abilities, and enhance quality[1].

Study tours can broaden students' knowledge across multiple fields such as natural sciences, human history, and social life. For example, during a study tour to a science museum, students can directly learn about advanced scientific technologies and principles, stimulating their interest in science and desire to explore; during a study tour to historical and cultural relics, students can personally experience the vicissitudes of history and gain a deep understanding of historical events and cultural traditions. At the same time, students can develop various practical skills during study tours, such as observation skills, research and investigation skills, teamwork skills, and communication and expression skills. Through study tours, students learn to apply scientific methods for research-based learning. They need to independently determine research topics, design research plans, collect and analyze data, and draw research conclusions. In this process, students gradually master the general methods and steps of scientific research and cultivate the ability to think independently and solve problems. For example, in an ecological environment study tour, students can be divided into groups to investigate the local ecological environment, use methods such as measurement, sampling, and data analysis to understand the current status and issues of the ecological environment, and propose corresponding protection recommendations. Study tours help cultivate students' sense of social responsibility, spirit of teamwork, and patriotic feelings. During collective travel, students need to cooperate and help each other to complete various tasks, thereby enhancing their sense of teamwork and collective honor. At the same time, as students learn about the magnificent mountains and rivers of their country, its long history, and splendid culture, they will be inspired with love for their country, enhancing national pride and confidence. Moreover, study tours allow students to get close to nature and understand society, cultivating respect for nature and care for society in their attitudes and values.

iiMedia Consulting data show that the market size of the study tour industry was 90.9 billion yuan in 2022, 146.9 billion yuan in 2023—a year-on-year increase of 61.6%—and reached 300 billion yuan in 2024 (see Figure 1). According to questionnaire surveys, over 90% of families participate in at least one study tour each year, and one-third of families arrange 2–3 study tour activities annually, including projects organized by schools and those organized by social institutions; among these families, nearly 70% spend more than 1,000 yuan per trip on study tours for their children, and one-quarter of families spend over 5,000 yuan per trip.

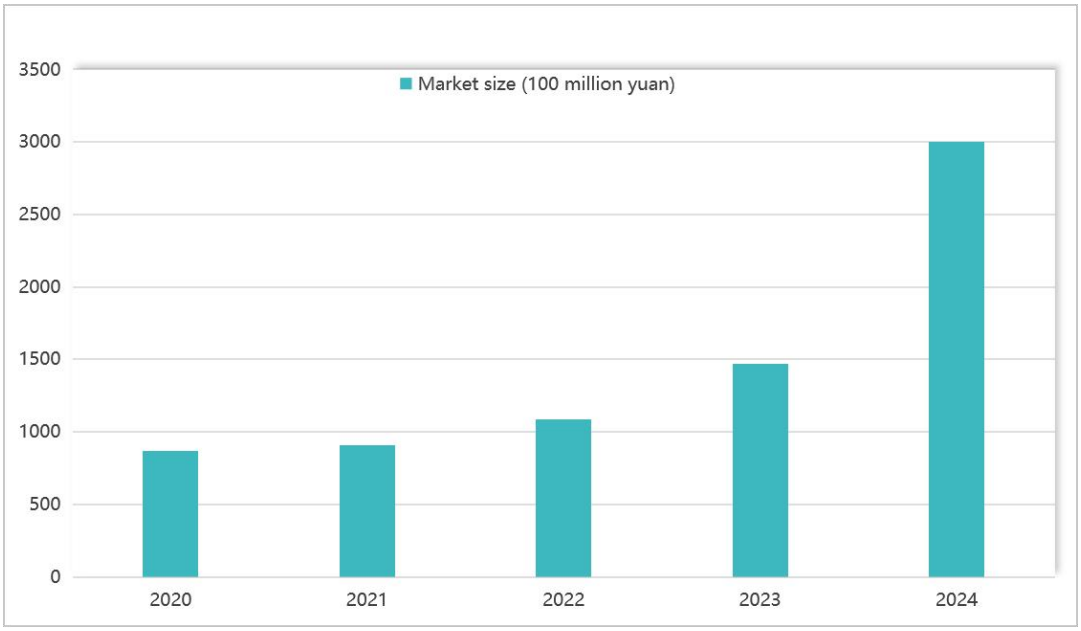

Figure 1 Changes in Market Size of Study Tours from 2020 to 2024

Study tours are typically organized and arranged uniformly by schools or educational institutions. Schools, based on the teaching plan and students' actual circumstances, formulate study tour schemes and select appropriate destinations and activities. In the organizational process, schools assign teachers to lead the group, ensuring both the safety of students and the effectiveness of learning. At the same time, schools also cooperate with travel agencies and study tour bases to jointly carry out study tour activities. In addition, some families independently organize parent–child study tours, allowing children to learn and experience under the accompaniment of their parents. The content of study tour activities is rich and diverse, covering multiple fields such as natural sciences, human history, and social life. Common types of study tour activities include natural ecology study, history and culture study, technological innovation study, and Red Education study. For example, natural ecology study activities can involve taking students to nature reserves, botanical gardens, or zoos to observe the growth habits of plants and animals and to understand the balance and protection of ecosystems; history and culture study activities can involve organizing students to visit museums, ancient architecture, and historical sites to experience the charm of history and culture; technological innovation study activities can lead students to science museums, research institutes, and high-tech enterprises to learn about the cutting-edge developments in technology and to experience the achievements of technological innovation; Red Education study activities can arrange for students to visit revolutionary memorial halls, martyrs' cemeteries, and revolutionary bases to commemorate the revolutionary martyrs and to inherit Red genes.

In study tours, the teaching methods employed mainly include experiential teaching, inquiry-based teaching, and project-based learning. Experiential teaching allows students to participate in various activities firsthand, acquiring knowledge and skills through personal experience. For example, in agricultural study activities, students can personally engage in farm work, experience the processes of planting and breeding, and understand the basic knowledge and skills of agricultural production. Inquiry-based teaching guides students to independently raise questions and solve problems, cultivating their inquiry abilities and innovative thinking. For instance, in geological study activities, teachers can guide students to observe the characteristics of rocks, raise questions about the formation and evolution of rocks, and then let students investigate and seek answers through literature review and fieldwork. Project-based learning allows students to use projects as a vehicle, completing project tasks through teamwork and thereby cultivating their collaborative abilities and comprehensive practical skills. For example, in urban planning study activities, students can be divided into groups to carry out urban planning projects, researching and designing aspects such as functional layout, transportation planning, and environmental protection, ultimately producing an urban planning proposal[2].

Quality-oriented education emphasizes the cultivation of students' holistic development, including moral character, scientific and cultural literacy, physical and mental health, and artistic aesthetic quality. As a comprehensive educational activity, study tours can organically integrate multiple educational elements, providing students with a platform for all-round development. Through study tours, students not only acquire knowledge and skills but also cultivate attitudes, values, and enhance overall quality. For example, during study tours, students must adhere to social ethics and protect the environment, which helps cultivate their moral character; as students learn knowledge in natural sciences and history and culture, they can improve their scientific and cultural literacy; students can also engage in outdoor activities to exercise their bodies and strengthen their physical fitness, contributing to the development of physical and mental health; meanwhile, in appreciating natural landscapes and works of art, students can cultivate their artistic aesthetic quality. School-based education is primarily classroom teaching, focusing on the transmission of knowledge and theoretical learning; off-campus education, on the other hand, places greater emphasis on practical experience and social participation. Following the logic of "what kind of person to cultivate,""how to cultivate people," and "how to guarantee the quality of cultivation," a talent cultivation framework for study tours has been

constructed(Figure 2). In general, this cultivation framework can be described as: to achieve the goal of training study tour professionals who understand education, are skilled in tourism, and are capable of practice, multiple certificate requirements—such as teacher qualification certificates and professional skill certificates—are set as graduation requirements; a "dual-track" cultivation path is constructed in which universities and enterprises jointly train talent; and a "four-in-one" guarantee mechanism is established, in which the government, universities, enterprises, and industry associations collaborate.

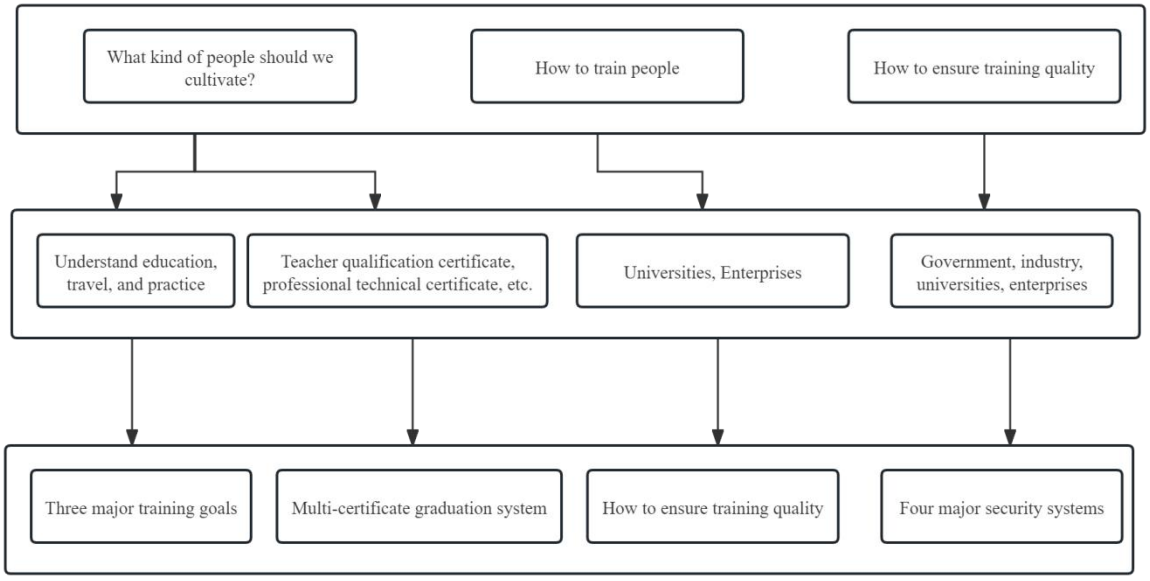

Figure 2 Framework of the Talent Training System for Study Tours

Study tours organically combine school-based education and out-of-school education, making up for the shortcomings of practical teaching in schools. Through study tours, students can apply the knowledge learned in the classroom to real life, deepening their understanding and mastery of that knowledge; at the same time, students in social practice can encounter different people and events, broaden their horizons, gain experience, and improve their social adaptability. For example, in history class, students learn about ancient civilizations, and by going to historical and cultural sites for a study tour, they can personally experience the charm of ancient civilizations and more intuitively understand the development and changes of history. Core competencies are the essential qualities and key abilities that students should possess to meet the needs of lifelong development and social progress. Study tours have unique advantages in cultivating students' core competencies. For instance, study tours can cultivate students' autonomous learning ability and independent thinking ability, allowing students to learn how to learn through independent inquiry and practical experience; they can cultivate students' innovative spirit and practical ability, enabling students to be brave in innovating and dare to practice when facing real problems; they can cultivate students' sense of social responsibility and teamwork spirit, allowing students in group activities to learn to care for others, serve society, and cooperate with others. In short, study tours are an important way to cultivate students' core competencies and have significant importance for students' future development.

2.2 Educational Inflation: Concept Analysis, Characteristic Manifestations, and Quality Concerns

2.2.1 Definition of educational inflation

Educational inflation is a concept widely discussed in the fields of educational economics and sociology, analogous to inflation in the economic domain. In economics, inflation refers to a situation where the money supply exceeds the actual demand in the economy, leading to currency devaluation and a sustained, general rise in prices. Similarly, educational inflation can be understood as a phenomenon in which the number and prevalence of educational certificates, credentials, or degrees continue to increase, yet the actual level of knowledge, skills, and abilities they represent does not improve correspondingly; in other words, the "value" of each unit of educational credential or certificate is devalued in both the market and social perception. Essentially, educational inflation reflects an imbalance between educational supply and labor market demand. As society increasingly emphasizes education and educational scale expands continuously, more and more individuals attain higher-level credentials and degrees. However, the labor market's capacity to absorb highly educated talent is limited; when the supply of highly educated individuals exceeds market demand, the advantages that once accompanied high credentials and degrees gradually diminish, much like purchasing power declines when currency is devalued, and the "gold content" of degrees and diplomas also weakens[3].

2.2.2 Characteristic manifestations of educational inflation in the educational field

Under the backdrop of educational inflation, the overall academic attainment level of society shows a clear upward trend. Taking higher education as an example, in the past, bachelor's degree holders may have been relatively scarce

talent resources, but now the number of master's and even doctoral graduates is continuously increasing. Many positions that originally required only a college diploma or bachelor's degree now begin to demand master's or higher degrees. This general elevation of academic requirements is not entirely based on actual job requirements for higher levels of knowledge and skills, but is to some extent influenced by educational expansion and the pressure of employment competition.

As the population of highly educated individuals grows, the value of credentials becomes diluted. On one hand, the returns and opportunities that the same credential can obtain in the job market are no longer as pronounced as before, for example in terms of salary levels and prospects for career advancement. On the other hand, in pursuit of higher credentials, some schools and institutions may lower admission standards and graduation requirements, leading to a phenomenon of degree "watered down." Some students, although they obtain the corresponding credentials and degrees, cannot actually master the knowledge and skills required by the market, further aggravating the degree of educational inflation.

Educational inflation triggers intense educational competition. In order to gain an advantage in the job market, students and parents must invest more time and effort into education. From kindergarten onwards, there is competition to enter high-quality elementary schools; in primary and secondary education, students face pressure to advance and must participate in various extracurricular tutoring and training; in higher education, competition for postgraduate and doctoral admissions grows increasingly fierce. Such excessive competition not only increases the burden on students and families but may also lead to psychological issues among students, affecting their mental and physical health as well as their holistic development.

Due to the general elevation of academic attainment and the labor market's overemphasis on highly educated talent, many highly credentialed individuals end up working in positions unrelated to their fields of study or in jobs that do not require high credentials, resulting in reduced occupational match. This not only wastes educational resources but also impacts individuals' career development and sense of achievement. For example, some master's or doctoral graduates work as ordinary clerks or sales staff, where the professional knowledge and skills they acquired cannot be fully utilized, and their personal value is difficult to realize.

2.2.3 Potential impacts of educational inflation on education quality

To meet the demands of educational expansion, some schools may face teacher shortages. In order to fill staffing gaps, schools may lower the standards for hiring teachers, leading to an overall decline in the quality of the teaching workforce. Moreover, due to an increase in student numbers, teachers' teaching loads become heavier, making it difficult for them to give each student sufficient attention and guidance, which in turn affects teaching quality. At the same time, in order to cope with educational competition and improve progression rates, some schools may adopt exam-oriented teaching methods, emphasizing the transmission of knowledge while neglecting the cultivation of students' innovation and practical abilities, which is also detrimental to improving education quality.

Educational inflation causes educational goals to gradually deviate from the original intent of cultivating well-rounded individuals. Under intense competition and employment pressure, schools, parents, and students focus more on credentials and grades while neglecting students' interests, individual development, and the cultivation of their comprehensive qualities. Education becomes a means of pursuing utilitarian gains rather than promoting students' holistic growth and societal progress. This deviation in educational goals not only affects individual students' development but also has adverse effects on society's long-term development.

In an environment of educational inflation, academic misconduct such as fraud and plagiarism occurs frequently. To obtain higher credentials and titles, some teachers and researchers may resort to improper methods to produce research outcomes. Such academic misconduct not only undermines academic integrity and the scholarly ecosystem but also affects improvements in education quality. Additionally, the academic evaluation system often overemphasizes metrics such as the quantity of publications and impact factors, while neglecting the actual value and innovativeness of research achievements, which is also not conducive to fostering a healthy academic atmosphere and promoting academic progress[4].

Educational inflation exacerbates the uneven distribution of educational resources. High-quality educational resources are often concentrated in a few regions and schools; to access these resources, students and parents must pay a higher price. In educational competition, students from wealthier families often gain more educational resources and opportunities, while those from less affluent families may face a scarcity of educational resources. This unequal distribution of educational resources not only leads to unequal educational opportunities but also further widens the gap between rich and poor and entrenches social stratification.

In summary, educational inflation is a complex social phenomenon that manifests multiple characteristics in the educational field and has numerous potential impacts on education quality. Addressing educational inflation requires joint efforts from government, schools, families, and society to adjust education policies, optimize resource allocation, improve education quality, and promote the coordinated development of education and the labor market.

2.3 Relationship between Study Tours and Educational Inflation

2.3.1 Mechanisms by which study tours may induce educational inflation

With the rapid development of the study tour market, parents' emphasis on their children's education and pursuit of quality-oriented education have led to a sharp increase in demand for study tours. However, the current supply in the study tour market is relatively insufficient, and high-quality study tour resources are particularly scarce. There are only

limited study tour institutions with professional qualifications, excellent curriculum design, and strong teaching resources, making it impossible to meet the enormous market demand. In this supply-demand imbalance, study tour institutions often raise prices to obtain greater profits. For example, some popular overseas study tour programs can cost tens of thousands of yuan or more, far exceeding their actual costs. This phenomenon of inflated prices significantly increases family expenditures on study tours, further exacerbating the educational burden and becoming an important manifestation of educational inflation.

In a societal environment of increasingly fierce educational competition, parents generally experience blind following and comparison psychology. When they see other children participating in various study tours, they worry that their own children will fall behind and therefore also sign them up. This blind emulation causes study tours to gradually evolve into an "educational standard," with parents no longer focusing on whether study tours truly suit their children but using them as a means of competing with others. For example, some parents spend large sums to enroll their children in various high-end, luxurious study tour programs simply to enrich their resumes, even though these programs may not significantly benefit the child's actual growth and development. This excessive competition and comparison psychology drive the popularity of the study tour market ever higher, further pushing up educational costs and intensifying educational inflation.

Currently, the study tour market lacks unified regulations and standards, leading to uneven quality of study tour products. To reduce costs, some study tour institutions often simplify curriculum design, reduce teacher investment, and shorten activity durations, causing study tour education quality to suffer a major setback. For example, some study tour programs merely organize students to visit certain attractions, lacking professional explanations and guidance, so students cannot gain substantive knowledge and skill improvements. However, when choosing study tour programs, parents often find it difficult to distinguish quality, relying only on price and promotional materials. In such circumstances, even if parents spend large sums, their children cannot obtain educational returns commensurate with their investment, resulting in a waste of educational resources and further aggravating educational inflation.

2.3.2 Intrinsic links between study tours and educational inflation

One important manifestation of educational inflation is the continuous rise in educational costs and excessive increases in educational investment. As a newly emerging form of education in recent years, study tours have gradually become an important part of family education expenditure. With the booming study tour market, parents' spending on their children's participation in study tour activities keeps rising, yet this investment does not necessarily yield corresponding educational returns. For example, some students participate in multiple study tours but do not show significant improvements in academic performance or comprehensive qualities. Therefore, study tours can to some extent be seen as an external manifestation of educational inflation, reflecting unreasonable resource allocation and low efficiency in the education sector.

The competitive pressure and anxiety generated by educational inflation, in turn, further drive the development of the study tour market. In the context of educational inflation, parents focus more on cultivating their children's comprehensive qualities and extracurricular practical experiences to help them stand out in fierce competition. As a form of education that integrates learning, practice, and experience, study tours precisely meet this demand. Hence, educational inflation continually increases parents' demand for study tours, stimulating the prosperity of the market. However, this prosperity may also lead to market overexpansion and a bubble, further intensifying educational inflation[5].The educational inflation induced by study tours and the impact of educational inflation on the study tour market interact, forming a vicious cycle. On one hand, problems in the study tour market such as inflated prices and uneven quality lead to higher educational costs and reduced educational effectiveness, exacerbating educational inflation. On the other hand, educational inflation drives parents to place greater emphasis on study tours, increasing investments in study tours, which further promotes the development of the study tour market and price increases. This vicious cycle not only increases families' educational burdens but is also detrimental to the reasonable allocation of educational resources and the improvement of education quality. Therefore, effective measures must be taken to break this vicious cycle, promote the healthy development of the study tour market, and ensure fairness and efficiency in education.

3 THE CURRENT SITUATION ANALYSIS OF STUDY TOURS

3.1 The Popularity of Study Tours

The coverage of study tours has gradually expanded from economically developed regions to all regions nationwide. In the eastern coastal areas, such as Beijing, Shanghai, Guangdong, and Zhejiang, study tours are relatively mature in development; both the richness of activities and the professionalism of organization are at the forefront. These regions possess abundant historical and cultural resources, advanced technology enterprises, and high-quality educational resources, providing a solid foundation for conducting study tours. In central regions, study tours are also developing rapidly. Taking Hunan, Hubei, and Henan provinces as examples, local governments and education departments actively promote the popularization of study tours by combining local red culture, historical sites, and natural scenery to develop a series of study courses with regional characteristics. For instance, Shaoshan and Jinggangshan in Hunan Province have become popular destinations for red-themed study tours. Although western regions lag behind in terms of economy and educational resources, they have also been increasing investment in study tours in recent years. Xinjiang, Tibet, and Qinghai, for example, fully utilize their unique natural landscapes and ethnic cultures to attract more and

more students to participate in study activities. At the same time, the central government promotes the development of study tours in western regions through policy support and funding, narrowing the gap with eastern regions. The resources covered by study tours are also becoming increasingly extensive, encompassing history and culture, natural sciences, technological innovation, labor practice, and other fields. In terms of history and culture, museums, memorial halls, and ancient architecture have become important study bases. For example, the Palace Museum receives a large number of study tour groups each year; through professional explanations and interactive experiences, it allows students to gain an in-depth understanding of ancient Chinese history and culture. In the field of natural sciences, study resources include nature reserves, botanical gardens, and zoos. Students can observe the ecological habits of plants and animals there, learn natural science knowledge, and cultivate respect for nature. In terms of technological innovation, science museums and high-tech enterprises have become windows through which students learn about cutting-edge technologies. Students can visit research laboratories, experience achievements in technological innovation, and be inspired to develop interest and love for science and technology. Labor-practice–oriented study activities are also receiving increasing attention. Rural farms, orchards, and livestock farms have become places where students can experience agricultural life and learn labor skills. By participating in labor practice, students not only acquire certain labor skills but also cultivate a spirit of hard work and awareness of teamwork. The state attaches great importance to the position of study tours within the education system and has issued a series of policy documents to promote their development. In 2016, the Ministry of Education and ten other departments issued the "Opinions on Promoting Study Tours for Primary and Secondary School Students," which explicitly proposed integrating study tours into primary and secondary school teaching plans, requiring localities to develop a batch of study-tour courses with outstanding educational effects, and establishing a study-tour working mechanism with standardized management, clear responsibilities, diversified funding, and safety guarantees. Subsequently, local governments have successively issued related implementation rules and supporting policies, providing policy guarantees for the conduct of study tours. Study tours have gradually merged with school curricula, becoming an important component of school education. In curriculum design, schools organically integrate study tours with subjects such as Chinese language, history, geography, and biology and design a series of targeted study-tour courses. For example, in Chinese language courses, students can visit the birthplaces of literary classics to gain a deeper understanding of the connotations and background of the works; in history courses, students can conduct on-site investigations of historical sites to experience the changes and development of history. At the same time, study tours also focus on cultivating students' comprehensive qualities, such as innovation ability, practical ability, and teamwork ability[6]. By participating in study activities, students can learn through practice, improve their problem-solving abilities and self-directed learning skills, and lay a solid foundation for future development. To ensure the quality and effectiveness of study tours, education departments have gradually established a comprehensive evaluation system. The evaluation content includes curriculum design, activity organization, safety assurance, student feedback, and other aspects of study tours. Schools use evaluation results to improve and optimize study-tour activities continuously, thus enhancing the educational quality of study tours. Moreover, evaluation results serve as important reference indicators for assessing the overall quality of school education and teaching, motivating schools to attach greater importance to organizing study tours. In summary, in recent years, study tours have made significant progress in participation scale, coverage, and their position within the education system. With social development and deepening educational reform, study tours are expected to play a greater role in the future, making a larger contribution to cultivating well-rounded, high-quality talent.

3.2 Implementation Models of Study Tours

Theme-based curriculum design is one of the more common models in current study tours. It constructs the entire curriculum system around a specific theme, with themes chosen broadly across fields such as natural sciences, history and culture, and technological innovation. Taking a history and culture theme as an example, the course can be designed as an "Ancient Civilization Exploration Journey." In terms of course content, students are first arranged to visit a local history museum, allowing them to intuitively understand the forms, uses, and stories behind ancient artifacts, thereby cultivating their powers of observation and interest in history and culture. Next, students are organized to conduct on-site investigations of historical relics, such as city walls and ancient architecture; through on-site explanations and hands-on experience, they can feel the charm of ancient architecture and the wisdom of ancient people. Additionally, students can be assigned to carry out history and culture research-based learning, such as having them work in groups to study the political, economic, and cultural characteristics of a certain historical period and to present their findings, thereby cultivating students' self-directed learning abilities and teamwork skills. Project-based curriculum design emphasizes that students learn and apply knowledge through real projects. Typically, a specific project goal is set for the course, and students complete the project through teamwork. For example, in a technological innovation–themed study tour, the course can be designed as an "Intelligent Robot Design and Production Project." At the beginning of the course, teachers introduce students to the basic principles and relevant technical knowledge of intelligent robots. Then, students, working in teams, design and produce intelligent robots according to given tasks and requirements. During project implementation, students must apply the knowledge they have learned to carry out scheme design, material selection, programming, debugging, and other tasks. Finally, each team demonstrates and tests their self-made intelligent robots and shares their experiences and gains from the project process. Through this project-based curriculum design, students not only can learn technological innovation knowledge in depth but also can improve their abilities to solve practical problems and innovate in their thinking. Experience-based curriculum design focuses on

students' personal experiences and feelings. Courses are arranged so that students participate in various practical activities and learn and grow through hands-on experience[7]. Taking a natural sciences theme as an example, the course can be designed as a "Field Ecology Investigation Experience Journey." In this course, students enter nature to carry out activities such as plant identification, animal observation, and ecological environment investigation. Students need to personally collect plant specimens, record animal habits and ecological environment data, and so on. Through these firsthand experiences, students can gain a deeper understanding of natural science knowledge and strengthen their love and sense of protection for nature. Meanwhile, during field investigations, students must face various challenges and difficulties, such as harsh weather conditions and complex terrain, which helps cultivate their perseverance and adaptability. School-led study tour activities are organized and implemented by schools. Schools formulate detailed study-tour plans based on teaching goals and students' actual situations. In the preparatory phase, schools conduct comprehensive preparations, including communicating and coordinating with study-tour bases, arranging transportation and accommodation, and formulating safety plans. Schools also provide safety education and pre-trip training for students, informing them of the purpose, content, and precautions of study tours. During the activities, schools arrange for teachers to accompany students throughout the trip, responsible for learning guidance, daily management, and safety assurance. Teachers guide students to actively participate in various activities and help them solve problems encountered along the way. After the activities, schools organize students to summarize and reflect on their experiences, evaluate the effectiveness of the activities, and integrate study-tour outcomes into students' comprehensive quality evaluation systems. Travel-agency–led study tour activities are organized and implemented by travel agencies. Travel agencies, possessing abundant tourism resources and organizational experience, can provide professional services for students. Upon receiving school commissions, travel agencies design personalized study-tour plans based on schools' needs and students' characteristics. Travel agencies are responsible for arranging transportation, accommodation, catering, attraction tickets, and so on, and for coordinating cooperation with study-tour bases. During the activities, travel agencies arrange tour guides to accompany students throughout the trip; tour guides provide explanations and services to ensure the smooth progress of activities. Meanwhile, travel agencies also establish comprehensive safety assurance mechanisms to safeguard students' personal and property safety. However, this model has shortcomings, such as travel agencies focusing more on tourism service quality while paying less attention to the educational functions of study tours. School–enterprise cooperative study tour activities are conducted through cooperation between schools and enterprises (including study-tour bases, training institutions, and so on). Schools and enterprises leverage their respective strengths to jointly organize and implement study-tour activities. Schools are responsible for organizing and managing students, setting teaching objectives, and reviewing course content. Enterprises provide support by offering venues, equipment, and teaching staff based on their own resources and professional advantages. For example, schools may collaborate with science museums to conduct technology innovation–themed study tours: schools organize students to visit the science museum, while the museum provides professional explanations and experimental equipment to allow students to conduct scientific experiments and inquiry activities. School–enterprise cooperative study tours can fully integrate the resources of both schools and enterprises, achieve complementary advantages, and improve the quality and effectiveness of study tours. Student evaluation is an important component of the study-tour evaluation mechanism. Through student evaluation, it is possible to understand students' satisfaction and gains from study tours. Multiple methods can be used for student evaluation, such as questionnaire surveys, interviews, and self-assessments. Questionnaire surveys can include questions about study-tour course content, activity organization, teacher guidance, and so on, allowing students to select and evaluate. Interviews can involve choosing some students for face-to-face dialogue to learn about their specific experiences and feelings during the study tour. Self-assessment lets students evaluate their own performance during the study tour, including learning attitudes, teamwork abilities, innovation abilities, and other aspects. Through student evaluation, problems and shortcomings in study tours can be identified and provide references for future improvements. Teacher evaluation mainly assesses students' learning performance and growth during study tours. Teachers can evaluate from aspects such as students' learning attitudes, knowledge mastery, practical abilities, and teamwork skills. Teacher evaluation can adopt a combination of formative and summative evaluations. Formative evaluation runs throughout the entire study-tour process; teachers observe students' performance during activities and provide timely feedback and guidance.Summative evaluation happens after the activity ends; teachers assess students' learning outcomes based on assignments, reports, presentations, and other outcomes.Table 1 presents the implementation models of study tours[8].

Table 1 Study Tour Implementation Model

Category	Model	Core Features	Core Value
Curriculum Design	Thematic	Course built around a single theme (history/tech/nature)	Systematic knowledge acquisition, fosters subject interest & inquiry skills
	Project-based	Goal-oriented practical projects (e.g., robot building)	Enhances practical application, problem-solving & innovation
	Experiential	Hands-on activities (field surveys/operations)	Deepens perception, cultivates resilience & adaptability
Organization Model	School-Led	Full-cycle management: planning → execution → evaluation	Precise educational goals, safety compliance, curriculum integration
	Travel Agency-Led	Integrated logistics & resource	Professional operational

		services by agencies	efficiency, reduces school burden
	School-Enterprise Collaboration	Resource synergy: schools + enterprises (bases/institutions)	Complementary advantages, provides professional venues/equipment/instructors
Evaluation Dimension	Student Feedback	Surveys/interviews/self-assessments on learning outcomes & experience	Optimizes course design, improves engagement satisfaction
	Teacher Assessment	Process observation + outcome evaluation of skill growth	Provides precise teaching feedback, refines educational objectives
	Parent Evaluation	Surveys on safety & educational effectiveness recognition	Promotes home-school collaboration, builds trust
	Social Evaluation	Expert/media/public assessments of educational value & social impact	Enhances credibility, guides sustainable development

Teacher evaluation not only provides learning feedback for students but also offers a basis for schools and teachers to improve teaching methods and curriculum design. Parent evaluation allows understanding of parents' views and opinions on study tours. As students' guardians, parents are very concerned about their children's growth and development. Parent evaluation can be conducted through questionnaires and parent meetings. In questionnaires, parents can be asked to evaluate aspects such as the organization, safety assurance, and educational effectiveness of study tours. At parent meetings, schools can introduce the details of study tours to parents and listen to their suggestions and opinions. Through parent evaluation, communication and cooperation between schools and parents can be strengthened, jointly promoting students' growth and development. Social evaluation mainly refers to the extent to which all sectors of society evaluate and recognize study tours. Social evaluation can assess the social influence, educational value, and social benefits of study tours. It can be carried out through media reports, expert assessments, and social feedback. Media reports can publicize the achievements and experiences of study tours, raising their social visibility and influence. Expert assessments can involve inviting education experts, tourism experts, and others to evaluate study tours and offer professional opinions and suggestions. Social feedback can be gathered by collecting opinions and suggestions from all sectors of society to understand societal needs and expectations for study tours. Through social evaluation, external support and supervision can be provided for the development of study tours, promoting their healthy growth.

3.3 Evaluation of Study Tours' Effectiveness

To comprehensively and scientifically assess the educational effects of study tours in practice, it is necessary to construct a reasonable evaluation indicator system, which primarily covers three dimensions: knowledge and skills, affective attitudes, and behavioral habits. By comparing students' scores on subject-related knowledge tests before and after the study tour, one can evaluate the improvement in their mastery of disciplines such as history, geography, and science. For example, after a history-and-culture–themed study tour, students can be tested on their knowledge of historical events and cultural sites, and score changes can be observed. One can examine the practical operational skills students have acquired during the study tour—such as handicraft creation, experimental procedures, and wilderness survival skills—and assess these through students' work displays or practical skill evaluations. Through questionnaires and student interviews, one can understand how students' interest in learning changes before and after the study tour, observing whether they exhibit a stronger desire to explore related subjects or fields. One can evaluate students' performance in team activities—such as communication and collaboration skills and sense of collective responsibility—by assessing the completion of group tasks or conducting peer evaluations within small teams. One can investigate students' awareness of and identification with local culture and traditions by reviewing their reflections or cultural-creative works to understand their cultural comprehension and feelings. One can observe students' self-discipline during the study tour—such as adherence to rules and punctuality—and evaluate this through teacher assessments or self-management records. One can assess students' attention to and actions for environmental protection during the study tour by observing whether they actively participate in environmental activities and develop habits of conserving resources. A detailed questionnaire should be designed and administered to students both before and after the study tour. The questionnaire content should encompass all the aforementioned evaluation indicators; by statistically analyzing the questionnaire results, one can understand the changes in students before and after the study tour. For example, one can include multiple-choice questions and open-ended questions concerning learning interest and teamwork awareness, allowing students to self-evaluate and provide feedback. For the knowledge-and-skills dimension, the testing method is adopted: administer a baseline test before the study tour to ascertain students' initial knowledge level; after the trip, administer an identical test and compare the two sets of scores to evaluate students' knowledge gains. For practical skills, one can use hands-on tests to assess students' level of mastery. During the study tour, teachers should conduct thorough observations of students, recording their performance in each activity segment. Observation content should include students' behavior, learning attitude, and teamwork; through continuous observation and documentation, one can evaluate improvements in students' overall qualities. One should collect students' creative works produced during the study tour—such as diaries, drawings, and handicraft pieces—and analyze their content to understand students' gains in affective attitudes and knowledge-and-skill domains. For example, by analyzing students' study-tour diaries,

one can learn about their feelings and reflections on the travel experience. Through analysis of test scores and practical-skill evaluation results, it is found that most students exhibit significant improvement in subject knowledge and practical skills after participating in study tours. For instance, after a natural-sciences–themed study tour, students typically demonstrate deeper mastery of biology and geography knowledge and enhanced practical operational skills. However, some students show less pronounced improvement, which may be related to factors such as their learning foundation and attitude. According to questionnaire surveys and student interviews, study tours have a positive impact on students' affective attitudes. Most students report increased interest in learning, and their awareness of teamwork and cultural identification is strengthened. For example, during a cultural study tour, students gain a deeper understanding of local history and culture, and their sense of identification with traditional culture noticeably increases. Nevertheless, a few students demonstrate little change in affective attitudes, indicating a need for further attention and guidance. Observational methods and analysis of students' work indicate that some students make progress in self-discipline and environmental awareness; for instance, during the trip, they can consciously follow rules and voluntarily participate in environmental protection activities. However, some students do not show obvious improvement in their behavioral habits, suggesting that future education and teaching should strengthen cultivation in these areas. Study tours integrate classroom knowledge with practical activities, allowing students to learn and apply knowledge in authentic contexts. Through firsthand experience and hands-on practice, students can better understand and master subject knowledge, achieving integrated comprehension. For example, during a history-and-culture study tour, students combine historical knowledge from textbooks with real-world scenes by visiting historical sites and listening to on-site explanations, deepening their understanding and memory of historical events. Study tours provide abundant practical opportunities, encouraging students to explore independently and innovate. In practical activities, students must apply learned knowledge to solve real problems, thereby cultivating innovative thinking and practical abilities. For instance, in a technology-themed study tour, students participate in technological experiments and invention-and-creation activities, which stimulate their innovation consciousness and enhance their hands-on abilities. During study tours, students must collaborate with team members to complete various tasks, learning to care for and respect others and thereby enhancing their sense of social responsibility and teamwork spirit. Through team activities, students can better leverage their own strengths while learning from others, improving communication and collaboration skills and team cohesion. Study tours also take students out of the classroom to get close to nature and relax both body and mind. During the trip, students can exercise to strengthen their physical fitness and relieve academic stress, maintaining positive psychological health. For example, in an outdoor-adventure study tour, students engage in activities such as hiking and mountain climbing, which enhance their physical fitness and cultivate perseverance. In summary, study tours play an important role in improving students' comprehensive qualities. However, in practice, some issues still exist that require further refinement and improvement to enhance the educational effectiveness of study tours and better promote students' holistic development.

4 PHENOMENA OF EDUCATIONAL INFLATION IN STUDY TOURS

4.1 Over-Packaging of Educational Content

4.1.1 Manifestations of over-packaging of educational content

In some study tours, course designs appear rich and diverse, aligning with educational objectives on the surface, but in reality, form outweighs substance. For example, some study tour organizations offer history-and-culture–themed courses, arranging for students to visit museums and attend expert lectures. Superficially, these activities cover both knowledge explanation and field investigation, seemingly allowing students to gain an in-depth understanding of history and culture. However, in practice, museum visits are merely cursory; students do not have enough time to carefully observe exhibits or deeply reflect on related historical knowledge. Expert lectures are superficial, lacking interactive communication with students and unable to address students' specific questions in detail. Such course designs pursue formal completeness while ignoring students' actual learning experience and knowledge absorption, resulting in over-packaged educational content whose actual educational value is greatly diminished.

Study tour organizations often exaggerate the effects and value of educational content in their promotions to attract more students and parents. They claim that their study courses can comprehensively enhance students' overall qualities—such as cultivating innovation ability, teamwork spirit, and practical skills—but find it difficult to fulfill these promises in practice. For example, some promotional materials state that study activities will allow students to participate in high-tech project practice, thereby cultivating their technological innovation ability. However, at the event itself, students only watch a few technology demonstrations and do not truly engage in hands-on project practice. Such exaggeration misleads parents and students into having excessively high expectations of the educational value of study tours, while the actual experience falls far short of promotional claims, resulting in over-packaged educational content[9].

4.1.2 Causes of over-packaging of educational content

As the study tour market continues to develop, competition has grown increasingly fierce. In order to stand out among numerous organizations and attract more participants, some organizations resort to over-packaging educational content. They believe that only by making promotional materials and course designs more flashy and appealing can they gain the attention of more students and parents. This market pressure leads organizations to focus more on packaging educational content than on improving educational quality.

Some study tour organizations have a distorted understanding of educational objectives, placing too much emphasis on form and superficial outcomes while neglecting students' actual learning needs and the essence of education. They assume that as long as they arrange many activities and courses, students will automatically receive a good educational experience during the study tour. However, this one-sided perception means that when designing educational content, they fail to fully consider students' interests and abilities, and do not pay attention to the depth and breadth of the content, thus producing over-packaged educational content.

4.1.3 Negative impacts of over-packaging educational content

Because educational content is over-packaged, its actual value shrinks and students cannot truly learn useful knowledge and skills during the study tour. They may participate in activities that are merely formal without gaining a deep understanding of the educational significance behind them, resulting in greatly diminished learning outcomes. For instance, in some natural-science–themed study activities, although students visit nature reserves and see various plants and animals, the lack of professional explanation and guidance means that they learn little about these organisms' ecological characteristics and scientific knowledge, failing to achieve the intended learning goals.

When parents choose a study tour for their children, they often rely on promotional materials and expectations about educational content. Once they discover that the actual educational effect differs significantly from what was advertised, they lose trust in the organization. This loss of trust not only damages the organization's reputation and word-of-mouth but may also lead parents to question the entire study tour market, hindering the healthy development of the industry.

Over-packaging educational content means that organizations invest large amounts of human, material, and financial resources in course design and promotion without achieving corresponding educational outcomes, resulting in wasted resources. These resources could have been used to improve educational quality, refine teaching methods, and provide students with better learning experiences. Instead, they are squandered on over-packaging, which impedes the reasonable use of educational resources and the sustainable development of education.

4.1.4 Strategies to address over-packaging educational content

Relevant government departments should strengthen regulation of the study tour market by establishing strict industry standards and norms, and by reviewing and supervising organizations' course designs and promotional materials. Institutions that over-package educational content or engage in false advertising should be punished in accordance with the law to standardize market order and protect the legitimate rights and interests of students and parents.

Study tour organizations should enhance their own professional competence, gain a deep understanding of educational objectives and students' learning needs, and focus on the quality and actual effect of educational content. Institutions can improve the professionalism of teachers and staff—ensuring that course design and implementation align with educational principles and students' developmental needs—by inviting educational experts to guide them and conducting internal training sessions.

Parents and students should improve their ability to discern the true value of study tours and not be misled solely by promotional materials. They can consult relevant information, ask other parents and students for opinions, and investigate an organization's reputation and track record in order to evaluate the actual value of educational content. Furthermore, parents and students can actively participate in the design and evaluation of study activities, offering their own suggestions to encourage organizations to continuously improve educational content and service quality.

4.2 Exaggerated Claims of Educational Effect

4.2.1 Forms of exaggerated claims

In the study tour market, exaggerated claims about educational outcomes are quite common. Some study tour organizations, seeking to attract more parents and students, excessively package their educational results in promotional materials and marketing campaigns. For example, certain organizations claim that their study projects can significantly boost students' academic performance. They assert that after just a few days of study activities, students will experience a "qualitative leap" in their mastery and application of major subjects like Chinese, mathematics, and English—even suggesting that test scores can increase by dozens of points. From an educational science perspective, however, improvements in academic performance result from a long-term, systematic process influenced by multiple factors; a short study tour cannot realistically produce such dramatic gains in a few days.

Other organizations emphasize that their programs can cultivate students' innovation and practical abilities. They use exaggerated language such as "making students future innovation leaders" or "comprehensively elevating students' hands-on skills." In reality, cultivating innovation and practical ability requires long-term accumulation and systematic training; a single study tour may only offer a brief experience, falling far short of these lofty claims. Additionally, some organizations advertise that study tours can help shape perfect character and morality, claiming that students will become more disciplined, confident, and responsible—perhaps even abandoning bad habits—during the trip. But character and moral development is a gradual process influenced by family, school, and social environments; while a study tour may have a promotive effect, it cannot achieve the advertised transformation in such a short period.

4.2.2 Reasons for misleading parents and students

When parents and students choose a study tour program, they often lack in-depth knowledge of the study tour market. They principally rely on promotional materials and information provided by organizations, which are typically polished by the institutions themselves. Due to a lack of professional judgment and comparison channels, parents and students find it difficult to verify the truthfulness and reliability of promotional claims and so are easily misled by exaggerations.

In the context of fierce educational competition, parents commonly experience educational anxiety. They hope their children will develop comprehensively and never fall behind. Therefore, when they see advertisements claiming that study tours can yield various remarkable educational results, they may quickly decide to sign up, overlooking rational consideration of those claims.

Currently, regulation of the study tour market still has certain loopholes. There is no effective review or oversight mechanism for organizations' promotional content, allowing some to make wild, exaggerated claims without restraint. Moreover, existing laws and regulations provide insufficient penalties for exaggerated advertising, failing to deter violators effectively.

4.2.3 Harms of exaggerated claims

Parents often pay high fees to enroll their children in so-called "high-quality" study tours. However, because exaggerated promotional claims lead to actual educational effects that do not match expectations, parents' financial investments do not yield the promised returns, and students do not gain the anticipated learning and growth experiences. This damages the economic interests of parents and students and infringes upon their learning rights.

Exaggerated claims disrupt a fair market environment. Study tour organizations that operate with integrity and focus on genuine educational outcomes may lose market share when competing against institutions that engage in sensationalized advertising. This can cause a "bad money drives out good" phenomenon. Over time, the healthy and orderly development of the entire study tour market will be undermined.

As a new educational format, study tours aim to foster students' comprehensive development. Yet exaggerated claims create a stark gap between the promoted benefits and actual outcomes, causing parents and students to question the value of study tours as an educational model. This skepticism can undermine the credibility of the broader educational sector.

4.2.4 Countermeasures

Relevant government departments should establish and improve a regulatory mechanism for the study tour market and intensify review of organizations' promotional content. They should clearly stipulate that promotional language must be truthful, accurate, and objective, and impose severe penalties on institutions that engage in exaggerated advertising to raise the cost of violations.

Schools and community organizations should strengthen educational outreach to parents and students, offering training and informational campaigns to enhance their understanding of study tours and their ability to evaluate promotional claims. Parents and students should learn about the essence and characteristics of study tours, develop a rational perspective on advertisements, and avoid impulsive sign-ups.

Study tour organizations should exercise self-discipline, adopt correct business philosophies, and prioritize genuine improvements in educational outcomes. In their promotional materials, they must adhere to the principle of seeking truth from facts, objectively and accurately describing the content, objectives, and expected effects of study tour programs, and avoid using inflated or false promotional language.

4.3 Economic Interests Driving Negative Impacts

4.3.1 Travel agencies and other organizations sacrificing educational value for profit

Travel agencies, as important organizers of study tour activities, prioritize economic gain as their primary objective. Driven by profit, some travel agencies deviate from educational principles when designing and conducting study tours. In order to reduce costs and increase profits, certain travel agencies compress research and development of course materials and investment in teaching staff. They may hire guides with low fees and without professional educational backgrounds to act as study tour instructors; such guides can only provide simple commentary on tourist attractions and cannot offer students in-depth knowledge expansion or practical guidance. Additionally, in course design, genuine educational segments and learning content are reduced while more commercially oriented visits—such as trips to shopping venues or entertainment facilities unrelated to educational themes—are added. For example, a study tour originally planned around history and culture might allocate large portions of its itinerary for students to shop at local specialty stores, while historical site visits become cursory[10]. This profit-driven arrangement strips study tours of their intended educational value; students cannot gain substantive learning experiences, resulting in wasted educational resources, severely diminished educational effects, and exacerbation of the phenomenon of educational inflation.

4.3.2 Influence of scenic areas and merchants' profit demands on study tour quality

Scenic areas and merchants also play important roles in the study tour market. In pursuit of economic benefit, they often take actions detrimental to study tour educational quality. Scenic areas, seeking increased revenue, may charge excessively high admission and service fees to study tour groups. This significantly raises the cost of study tours; to balance expenses, travel agencies or schools may reduce the number of activity days or the richness of course content. Furthermore, some scenic areas, eager to attract more study tour groups, overdevelop tourism facilities, damaging the original natural and cultural environments and degrading the educational experience.

Merchants, through partnerships with study tour organizations, market various so-called "study-tour souvenirs" or "learning supplies" to students. These products are often overpriced and of uneven quality, providing no real educational value when purchased. Such profit-driven behavior by merchants not only increases the financial burden on students and families but also distracts students from the educational focus of the study tour, undermining the educational effect.

4.3.3 Expansion and profit pressure on educational institutions

As the study tour market booms, many educational institutions have entered the field hoping to seize a share of the profits. To secure a foothold in the competitive market, these institutions continuously expand their scale and offer more study tour programs. To attract more students and parents, some educational institutions engage in excessive marketing, exaggerating the effects and benefits of study tours. The content they advertise often does not match the actual activities, setting parents and students up for unrealistic expectations.

Moreover, to meet the demand for rapid expansion, educational institutions may lower teacher requirements, hiring staff without professional educational backgrounds or study tour experience. They also face enormous profit pressure and may cut corners during study tours, reducing investment in necessary educational resources—for example, shortening course durations or decreasing the number of practical activities. Those actions, driven by economic interest, sacrifice educational quality, creating a marketplace where truly valuable educational resources are diluted and exacerbating the problem of educational inflation.

4.3.4 Local governments' performance and economic considerations

Some local governments, aiming for political achievements and local economic development, actively promote study tour projects. Although the initial intention is positive, problems can arise during implementation. Local governments, in order to attract more study tour groups, may offer policy incentives and financial subsidies to local enterprises and organizations. However, some enterprises and organizations take advantage of these incentives, focusing on quantity rather than quality of study tour products.

Additionally, local governments may require that study tour activities align more closely with local economic industries—for example, by arranging visits to local factories or enterprises—without considering whether these activities truly meet students' learning needs and educational objectives. This performance- and economy-driven promotion approach leads study tours to deviate from their educational essence, resulting in unreasonable allocation of educational resources and further aggravating the phenomenon of educational inflation.

Economic interests driving study tour activities produce multiple negative effects, continuously intensifying educational inflation. Solving these problems requires joint efforts by government, schools, enterprises, and society at large to strengthen regulation, standardize market order, and ensure that study tours return to their educational roots, providing students with genuinely valuable learning experiences.

5 Impact of Educational Inflation on Study Tours

5.1 Impact on Educational Quality

Against the backdrop of educational inflation, society generally associates education with utilitarian goals—such as pursuing higher credentials and obtaining better employment opportunities. This atmosphere has gradually permeated the field of study tours, causing their original educational objectives—focusing on cultivating students' comprehensive qualities, improving practical abilities, and broadening knowledge—to become distorted. When selecting study tour programs, schools and parents tend to pay more attention to whether a program can add weight to students' future college admissions or career development. Some schools choose study projects in collaboration with universities or well-known enterprises, hoping that students might receive recommendation letters or gain internship opportunities at prestigious companies. Parents, likewise, prefer study activities with competitive elements or that award certificates, believing these will give their children an advantage in the admissions race. For example, in certain study tours for high school students, organizers emphasize connections to specific colleges' independent enrollment channels, claiming that students' performance during the activity will be referenced by admissions departments. This situation turns students' primary motivation into seeking recognition from universities rather than focusing on learning and experiencing during the tour. They may deliberately cater to the evaluation criteria in order to obtain high marks, neglecting deep exploration of knowledge and cultivation of personal interests[11].

Educational inflation has driven rapid expansion of the study tour market, resulting in a surge of organizations entering this field. To attract more students and parents in a competitive environment, some organizations pursue short-term gains by offering perfunctory course designs, rendering study tour content overly formulaic. On one hand, many study tour curricula lack systematic structure and professional depth. They merely piece together popular educational concepts without truly considering students' cognitive levels or learning needs. For instance, some "technology study" programs simply arrange visits to a few technology exhibitions, offer a few popular-science lectures, and then let students perform a few simple experiments on their own. While these activities appear diverse, they actually lack depth and coherence, making it difficult for students to acquire valuable knowledge or skills. On the other hand, course content often disconnects from actual educational goals. Some study tour programs focus excessively on outward spectacle and superficial excitement, neglecting to cultivate students' core competencies. For example, in some cultural study tours, organizers arrange for students to participate in various traditional ceremonies—such as wearing Hanfu or tea ceremonies—but fail to provide in-depth explanations of the historical origins and spiritual essence behind these cultural practices. Students merely go through the motions of participating in ceremonies without truly understanding or inheriting the essence of traditional culture.

Educational inflation has caused demand for study tours to surge, while the development of professional instructor teams has lagged behind. This leads to uneven levels of teaching quality within study tours, seriously undermining educational outcomes. Because the market demand for study-tour instructors is high, individuals without professional knowledge or teaching experience have entered the industry. These individuals may have only received brief training

and lack deep understanding of the educational philosophy and methods of study tours, rendering them incapable of providing high-quality instruction. For example, in some natural-science study activities, instructors have limited understanding of the local ecosystem and biodiversity, so they merely recite basic information from texts and cannot answer students' in-depth questions or guide them through scientific inquiry. Additionally, to cut costs, some study-tour organizations hire part-time teachers. These part-time teachers may have other jobs and limited time to devote to study tours, resulting in insufficient attention and guidance for students. The high turnover of part-time teachers also makes it difficult to establish long-term, stable teacher–student relationships and to provide personalized education and training.

Under the influence of educational inflation, evaluation systems for study tours have become single-dimensional, primarily using student grades or certificates as evaluation criteria, while overlooking students' holistic development during the study process. Currently, many study tour programs adopt standardized evaluation methods—such as tests or competition rankings—that focus solely on learning outcomes, neglecting indicators such as students' attitudes, methodologies, and emotional experiences during the tour. For example, in some art-focused study activities, students are evaluated based on their artwork or performance scores, whereas their creative thinking during the process, teamwork spirit, and aesthetic appreciation receive insufficient attention. A single evaluation system can also lead students to adopt a utilitarian learning mindset. They will focus exclusively on content that can be reflected in evaluations to obtain good results, ignoring other aspects of development. This not only contradicts the original educational intent of study tours but also impedes the enhancement of students' comprehensive qualities and personal development. In summary, educational inflation delivers multiple blows to the educational quality of study tours, leading to a deviation from their intended goals and preventing study tours from realizing their true educational value. To improve the educational quality of study tours, all parties must work together to correct utilitarian tendencies, strengthen curriculum and instructor development, and perfect evaluation systems so that study tours can return to their essence of cultivating students' comprehensive qualities.

5.2 Negative Impacts on Student Development

In the context of educational inflation, study tours are gradually becoming utilitarian. Schools and parents often view them as tools to bolster students' résumés, focusing on whether study tours can produce tangible benefits for admissions or academic awards. This utilitarian orientation causes study tours to lose their original purpose of deep knowledge exploration. For example, in some study tours centered on visiting prestigious schools, students merely take cursory tours of campuses, hear brief introductions to school histories, and engage in brief conversations with current students. They do not genuinely explore those schools' academic environments, research achievements, or unique educational philosophies. Such superficial visits prevent students from acquiring systematic, in-depth knowledge; they merely gain a nominal "prestigious-school experience." Similarly, in certain natural-science study tours, students may follow a preset route to visit natural museums or geological parks and quickly view exhibits under the guidance of a teacher or guide, lacking time for independent exploration and deep reflection. They passively absorb information without opportunities to ask questions, conduct experiments, or engage in true exploration, making it difficult for them to genuinely master the relevant scientific knowledge.

Educational inflation leads society to adopt a one-dimensional standard for evaluating students, placing excessive emphasis on knowledge in certain popular subjects and fields. This trend also influences the design and selection of study tours. Schools and parents tend to choose programs related to entrance exams or in-demand majors, ignoring students' interests and holistic development. For example, in STEM (science, technology, engineering, and mathematics) education—because of its high employment prospects and social recognition—many study tour programs revolve around STEM disciplines. Students may participate in programming, robotics, or astronomy activities, while opportunities for humanistic, artistic, or social-science study remain relatively scarce. This narrow focus on certain types of knowledge leads to imbalanced knowledge structures and a lack of ability to understand and integrate different fields. Furthermore, some schools, aiming for guaranteed "results" from study tours, prefer mature, low-risk programs over innovative and challenging ones. As a result, students only encounter conventional and conservative knowledge, making it difficult for them to expand their horizons, cultivate innovative thinking, or develop interdisciplinary learning skills[12].

With intensifying educational inflation, competition within the study tour market grows fierce. Some organizations exaggerate the efficacy of experiential activities in their advertising, but in practice, these activities become mere formalities. For instance, in some agricultural study tours, promotional materials claim that students can participate in the entire process of planting and raising livestock. In reality, students only perform simple tasks—such as watering or fertilizing—on a farm, without truly understanding agricultural production principles and techniques. Such superficial activities fail to help students genuinely acquire practical skills or develop hands-on problem-solving abilities. Likewise, in certain industrial study tours, students might only tour a factory's production line and listen to a brief introduction to production processes without having the opportunity to participate in design or manufacturing. Such cursory visits do not provide students with real industrial production experience and thus do not substantively foster their engineering practice skills or innovative capacity.

Under educational inflation, schools and parents often arrange study tours for students in an overly meticulous and restrictive manner, neglecting to cultivate students' ability to practice independently. During study tours, students usually follow detailed schedules and safety rules devised by teachers or guides, lacking opportunities for independent choice and decision-making. For example, on a single outdoor-adventure study tour, teachers may create highly specific

itineraries and safety protocols, requiring students to follow the plan exactly and preventing them from exploring or discovering on their own. This excessive protection and intervention deprive students of opportunities to exercise independent thinking and problem-solving. Additionally, some schools and parents, worried about safety during experiential activities, limit the scope and intensity of students' practical engagement. For instance, in certain outdoor-ecology study tours, students can only partake in very simple and safe projects, preventing them from challenging their limits and cultivating resilience and a spirit of daring to try. Such restrictions on students' opportunities for independent practice hamper their comprehensive development of practical skills.

Educational inflation also causes a disconnect between practice and theory in study tours. In some programs, although practical activities are arranged, there is a lack of in-depth teaching and guidance on relevant theoretical knowledge, preventing students from combining experiential knowledge with theoretical understanding. For example, in a chemistry experiment–focused study tour, students perform simple chemistry experiments in a laboratory, but the teacher merely introduces procedural steps and safety precautions without delving into underlying chemical principles. Students mechanically complete the experiments without truly understanding their meaning and value. This separation of practice from theory precludes students from transforming practical experiences into broader knowledge and abilities and prevents cultivation of scientific thinking and innovation skills. Similarly, in some history-and-culture study tours, students visit historical sites and museums, but guides only offer brief introductions to events and figures without leading students to think or analyze problems from a historical perspective. Students merely remember historical facts without genuinely grasping historical development patterns or cultural connotations. Such practice lacking theoretical guidance cannot provide students with deep learning experiences or cultivate their humanistic literacy and comprehensive analytical abilities.

5.3 Challenges to Educational Equity

Educational equity is a fundamental pillar of social justice, with its core in providing every student with equal educational opportunities and resources so that they can fully realize their potential and achieve holistic development. However, educational inflation poses severe challenges to this goal, especially in the context of study tours, where it exacerbates unequal distribution of educational resources and significantly undermines the realization of educational equity. Study tours typically require students to bear various costs—including transportation, accommodation, and activity fees. As educational inflation intensifies, the cost of study tours continues to escalate. On one hand, fierce competition in the education market drives study-tour organizations to invest more in offering attractive programs and services—such as hiring professional instructors, developing specialized courses, and selecting high-end destinations—all of which contribute to rising prices. On the other hand, growing societal interest in and recognition of study tours—and surging demand—also push prices higher. Families with relatively strong financial means can afford costly study tours and choose high-quality, internationally oriented programs for their children, thereby broadening their knowledge and cultivating comprehensive qualities during travel. For example, some families send their children on study tours to prestigious schools abroad, allowing them to experience advanced educational philosophies and campus cultures firsthand and interact with international students—undoubtedly providing more opportunities and advantages for their future development.

However, economically disadvantaged families face study-tour fees as a barrier they simply cannot overcome. They may need to budget even basic living expenses carefully, making it impossible to afford study-tour costs. Consequently, these children lose opportunities to gain practical experience and broaden their horizons through study tours, causing the gap between them and children from better-off families to widen. This economic barrier, which creates unequal opportunities, is the most direct manifestation of educational inflation's negative impact on educational equity.

Under educational inflation, high-quality study-tour resources tend to concentrate in economically developed regions and key schools. Economically advantaged areas usually boast abundant educational resources and stronger financial capabilities, making them attractive to study-tour organizations that offer high-quality programs. Schools in these areas also have more funds and channels to partner with reputable study-tour organizations, providing students with a diverse range of study-tour options. For instance, in first-tier cities, schools can organize study tours to local research institutes, enterprise parks, and cultural venues, exposing students to cutting-edge scientific achievements and cultural and artistic resources. These areas also frequently host international study-tour exchange events, giving students the chance to learn alongside peers from around the world.

In contrast, economically underdeveloped regions suffer from a shortage of educational resources, leaving study-tour development severely constrained. Schools in these areas may lack the funds and connections to offer rich study-tour programs; even if some activities exist, their quality and scale cannot compare to those in developed regions. This concentration of high-quality resources creates increasing disparities in study-tour opportunities between different regions, further exacerbating unequal distribution of educational resources and undermining educational equity.

Current educational evaluation systems, to some extent, reinforce advantages gained through study tours. In an environment of increasingly intense competition for admissions, some schools and admissions institutions begin incorporating students' study-tour experiences into evaluation criteria as a key reference factor. Students from affluent families—who have more opportunities to participate in high-quality study tours—accumulate rich experiences, certificates, and honors during these tours, giving them an edge in evaluations. These students have an easier time gaining recognition and opportunities in admissions and awards, further enhancing their competitiveness. Conversely, students from low-income families, lacking such study-tour experiences, are at a disadvantage in the evaluation system.

They may lose out on opportunities in admissions competition simply because they do not hold related experiences or certificates. This orientation of the evaluation system amplifies disparities caused by educational inflation, working against the realization of educational equity.

Educational inflation presents multiple challenges to educational equity in the realm of study tours. To promote educational fairness, government, schools, and society must work together to adopt effective measures that lower study-tour costs, balance resource distribution, and perfect evaluation systems—so that every student can enjoy fair and high-quality educational opportunities.

6 RESPONSE STRATEGIES AND RECOMMENDATIONS

6.1 Policy-Level Regulation

The government should coordinate education, tourism, and market supervision departments to develop unified and scientifically based admission standards for study tour providers. For study tour organizations, these standards should specify requirements in areas such as instructor qualifications, curriculum design capacity, safety measures, and financial stability. For example, require that study tour instructors hold relevant educational credentials and professional expertise, and establish a clear instructor-to-student ratio. Curricula must match students' cognitive levels and learning objectives at each grade, with explicit educational themes and practical components. For venues hosting study tours, authorities should inspect environmental safety, the richness of educational resources, and the adequacy of facilities. Only organizations and venues that meet these admission standards may operate, raising overall market quality from the outset and preventing low-quality, nominally "study tour" projects that lack real educational content. This will reduce parents' blind investment in supposedly "high-end" study tours and help curb educational inflation.

Price-regulating agencies should enhance oversight of study tour fees. First, require all study tour providers to post itemized pricing that clearly lists included services—transportation, lodging, meals, instruction, admission fees, and so forth—to prevent hidden charges and misleading offers. Second, establish a price-monitoring system that regularly collects and analyzes the cost of various study tour offerings. When a program's price is clearly excessive and not matched by service quality, investigate and intervene. The government can publish recommended price ranges to guide providers toward reasonable pricing. At the same time, encourage healthy competition so that providers naturally offer fair prices, ensuring parents and students can access quality programs without being overcharged, which in turn helps prevent educational inflation driven by inflated costs.

The government should lead in creating a multi-dimensional quality-assurance system for study tours, encompassing educational outcomes, safety protocols, and service quality. The education bureau can assemble expert panels to periodically evaluate curricula, teaching methods, and student feedback to determine whether programs achieve their intended learning goals. Tourism and market-supervision agencies should inspect providers' safety safeguards—vehicle safety, lodging and dining hygiene, emergency procedures—and verify service standards. Providers or programs that fail to meet these evaluations must be ordered to correct deficiencies within a set timeframe; if violations are severe, revoke their operating licenses. By enforcing rigorous quality assessments and supervision, the government elevates overall standards, ensuring parents and students truly benefit, avoiding wasted resources on programs of uneven quality, and preventing educational inflation.

Government publicity offices, in cooperation with the education department, should use multiple channels—official websites, social media, school bulletins—to promote an accurate understanding of study tours. Explain to parents and students that the purpose of study tours is to broaden horizons, build practical skills, and enhance well-rounded competencies—not merely to keep up with peers or impress others. Publicize regulatory policies and oversight measures so families can have confidence in the market. Additionally, share model examples and success stories of high-quality study tours to demonstrate best practices, guiding parents and students toward rational decisions and reducing the tendency to chase expensive, "high-status" programs. This coordinated messaging helps create a social climate that values substance over show, effectively curbing educational inflation.

The government should strengthen planning and support for study tour resources across regions and program types. In economically underdeveloped areas or places with fewer education resources, increase funding to build more bases and facilities—science centers, museums, historical sites—that can host study activities, and improve ancillary infrastructure and services. At the same time, encourage reputable study tour providers to expand into these regions through partnerships, joint programs, or resource sharing. This will raise the quality and variety of offerings in underserved areas. By striving for a balanced distribution of study tour resources, students nationwide will enjoy fair access to quality programs, reducing the pressure on families to spend excessively to secure "elite" experiences and helping to alleviate the effects of educational inflation.

6.2 School-Level Optimization

6.2.1 Thoughtful curriculum design

Schools should design study tour courses that tie directly into their existing subject curricula and respect students' developmental levels. For instance, in history classes, arrange visits to historically significant cities or landmarks so that as students tour ancient sites and museums, they gain deeper insight into historical events and cultural developments, reinforcing their understanding and memory. In science subjects, schedule trips to science centers or research facilities where students can participate in experiments and experience technological innovations firsthand, cultivating their

scientific thinking and hands-on skills. Curricula should go beyond simple lectures and include interactive, experiential elements. For example, organize wilderness survival training, hands-on crafts, and cultural performances, so students learn by doing and reflect on each experience.

Instructional methods should be varied—group work, inquiry-based learning, and project-based tasks can foster collaboration and critical thinking. For example, in an ecological study tour, divide students into teams to observe local ecosystems, collect data, and analyze findings through group discussion. This approach develops teamwork and problem-solving abilities. Study tour courses should build in progression: start with foundational knowledge, then move to deeper inquiry, guiding students to progressively develop skills and understanding. At the same time, ensure continuity from start to finish so students can construct a cohesive framework of knowledge. For example, in a unit on traditional culture, begin with a museum visit to introduce basic concepts and historical context; next, involve students in learning a traditional craft to experience culture firsthand; finally, have students create a cultural project that applies their new knowledge in an innovative way.

6.2.2 Strengthening management systems

Schools should form a dedicated study tour management team that includes administrators, teachers, and counselors, each with explicitly defined responsibilities. School leaders oversee overall planning and decision-making. Teachers handle curriculum delivery and instructional guidance. Counselors manage student welfare, logistics, and safety. The school should conduct regular training sessions for the management team to improve their leadership skills and professional expertise.

When engaging external providers, select organizations with solid reputations and proven experience. Sign detailed partnership agreements that spell out each party's rights, responsibilities, and quality expectations. Throughout the collaboration, school staff should actively participate in curriculum planning and logistical arrangements, ensuring activities align with the school's educational goals and meet students' needs. Implement an ongoing evaluation system for partner providers: regularly assess their service quality, highlight areas for improvement, and require prompt corrective actions if problems arise.

Establish a comprehensive student-management policy covering attendance, behavioral expectations, and a clear system of rewards and consequences. Before any trip, provide extensive safety and behavioral orientation so students understand rules and expectations. During the tour, maintain vigilant supervision of student conduct, promptly address conflicts or issues, and ensure a safe, orderly environment for the entire program.

6.2.3 Enhancing teacher training

Schools should organize regular professional-development workshops on study tour pedagogy—covering curriculum design, teaching strategies, and safety protocols. Invite subject-matter experts and experienced instructors to lead sessions that blend theory, case studies, and hands-on practice, thereby raising teachers' skill levels. Encourage teachers to take an active role in planning and executing study tour activities, fostering a culture of continuous innovation. The school might create a small fund to reward teachers who excel in study tour instruction, motivating them to invest extra effort. Additionally, establish peer-learning forums—workshops, roundtables, or informal meetings—where teachers can share best practices and lessons learned, promoting collective growth in teaching quality.

6.2.4 Ensuring student safety

Develop detailed emergency-response plans that address potential risks—traffic accidents, natural disasters, medical emergencies—and outline clear procedures and responsibilities so that staff can act quickly and effectively when unforeseen events occur. Provide each participant—student and teacher—with adequate insurance coverage, including accident and medical policies. When selecting insurers, carefully compare coverage terms and premium costs to secure appropriate protection. Before departure, conduct thorough safety inspections of all transportation vehicles and activity venues to verify the integrity of equipment and facilities. During the study tour, maintain strict oversight: assign sufficient adult chaperones, equip them with first-aid supplies, and enforce protocols for monitoring student locations and well-being. These measures safeguard students' lives and health at every stage of the experience.

6.2.5 Fostering home–school collaboration

Before the study tour, hold parent information sessions—both in person and via online parent groups—to explain the tour's purpose, itinerary, and learning objectives. Answer questions promptly to alleviate any concerns. Invite parents to contribute to planning and logistical support, for example by volunteering to help with chaperoning or sharing relevant expertise. Engaging parents not only provides extra resources but also strengthens the partnership between families and the school in nurturing student growth.

After the tour concludes, provide families with detailed feedback on student performance and learning gains. Solicit parents' perspectives and suggestions via surveys, informal conversations, or follow-up meetings. Incorporating parental feedback enables the school to refine future curriculum design and management practices, continually improving educational quality.

By implementing these school-level optimizations—careful curriculum design, robust management structures, enhanced teacher training, stringent safety measures, and strong home–school partnerships—schools can significantly elevate the learning value and overall effectiveness of study tours, ensuring students benefit fully from comprehensive developmental experiences.

7. CONCLUSION

This study confirms the existence of a significant phenomenon of "educational inflation" in the field of study travel, primarily manifested in the substitution of superficial sightseeing for in-depth educational practices, the weakening of diverse learning value due to curriculum homogenization, and the deviation of utilitarian evaluation from the original purpose of cultivating core competencies. This phenomenon has exerted profound negative impacts on the educational system: First, the inclination of commercial capital toward popular projects has led to an imbalance in resource allocation, exacerbating the crisis in educational equity; second, passive learning models hinder the development of students' innovative abilities, causing a substantive deviation from the goals of study travel; third, market chaos has triggered a crisis of public trust, undermining the health of the educational ecosystem. Future reforms should focus on three major directions: achieving immersive learning experiences through the integration of AR/VR technologies and AI-powered personalized customization; reconstructing the curriculum system via STEAM interdisciplinary integration; and expanding global perspectives through international collaboration. The fundamental solution lies in establishing a multi-stakeholder collaborative mechanism—at the policy level, national standards and a quality supervision system must be established; educational institutions should deepen curriculum reform and teacher training; and social forces must open resources to participate in ecosystem co-construction. Only by returning to the essence of education can the core value of study travel as a practical education carrier be restored, thereby advancing high-quality educational development.

COMPETING INTERESTS

The authors have no relevant financial or non-financial interests to disclose.

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DEVELOPMENT OF FINANCE AND COMMERCE MAJORS IN GUANGDONG HIGHER VOCATIONAL COLLEGES: SYNERGISTIC DEVELOPMENT OF POLICY, INDUSTRY AND MARKET

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Abstract: This paper takes the finance and commerce majors in Guangdong higher vocational colleges as the research object, and systematically analyzes the synergistic development path of policy drive, industrial demand and market orientation. The study finds that Guangdong Province has constructed a policy-driven vocational education system through key policies such as the "14th Five-Year Plan for Vocational Education", industry-education integration policies, and special fund support policies. Under the background of industrial upgrading, the demand for talents in cross-border e-commerce, logistics, financial technology and other fields continues to grow. Higher vocational colleges have gradually achieved precise docking with market demand through professional optimization, curriculum reform and school-enterprise cooperation. The deep integration of policy, industry and market in Guangdong higher vocational colleges is the key to improving the quality of talent training in finance and commerce majors. In the future, it is necessary to further strengthen the cultivation of digital skills and the expansion of international vision.
Keywords: Higher vocational colleges; Finance and commerce majors; Policy; Industry; Market

1 INTRODUCTION

As an important engine of China's regional economic development, Guangdong Province's regional GDP reached 14,163.381 billion yuan in 2024, an increase of 3.5% over the previous year. From the analysis of industrial structure, the added value of the tertiary industry reached 8,143.131 billion yuan, accounting for 57.5% of the regional GDP, making it the main contribution to economic growth. It is worth noting that the added value of high-tech manufacturing increased by 10.2%, accounting for 32.0% of the added value of industries above designated size, highlighting the remarkable effectiveness of industrial upgrading[1]. Against the backdrop of the in-depth advancement of the Guangdong-Hong Kong-Macao Greater Bay Area national strategy, strategic emerging industries such as modern service industries and digital economy are showing a rapid development trend, prompting the talent demand structure of finance and commerce majors to evolve in the direction of "highly skilled, composite and international". As the main position for training technical and skilled talents, the construction level of finance and commerce majors in higher vocational colleges directly affects the efficiency of regional economic transformation and upgrading and the improvement coefficient of industrial core competitiveness. Based on the three-dimensional analysis framework of policy supply, industrial demand and market feedback, this study systematically explores the development characteristics, existing bottlenecks and optimization strategies of finance and commerce majors in higher vocational colleges in Guangdong Province, so as to provide decision-making basis for the reform and innovation of vocational education in the Guangdong-Hong Kong-Macao Greater Bay Area.

2 POLICY DRIVE: BUILDING A NEW ECOLOGY FOR VOCATIONAL EDUCATION DEVELOPMENT

2.1 Synergistic Promotion of National Strategies and Local Policies

In recent years, the state has successively issued the National Vocational Education Reform Implementation Plan and the Opinions on Promoting the High-quality Development of Modern Vocational Education, which clearly emphasize deepening the integration of industry and education and school-enterprise cooperation, and are committed to improving the education system of combining morality and technology and combining work with study. Guangdong Province has actively responded to the national strategy. According to the Guangdong Province "14th Five-Year" Plan for Vocational Skills Training, Guangdong Province plans to carry out a total of 7 million person-times of various vocational skills training by 2025, and the number of high-skilled talents will reach 5.8 million[2]. Compared with the current number of 4.43 million high-skilled talents in Guangdong Province, this goal shows a significant increase. In 2025, Guangdong Province further issued the Guangdong Province Vocational Skills Training Subsidy (Guidance) Standard Catalogue (2025 Edition), which included 14 digital occupations such as big data and artificial intelligence in the subsidy scope, focusing on supporting the training of digital technology and skilled talents.
In terms of financial support policies, Guangdong Province plans to invest 11.6 billion yuan in special funds during the "14th Five-Year Plan" period to fully support the development of vocational education, and raise the subsidy standard for tuition-free secondary vocational education to 3,500 yuan per student per year[3]. In 2025, Guangdong Province

plans to arrange 460 million yuan in special funds, of which 400 million yuan will be used for higher vocational colleges to "improve their level", focusing on building 300 provincial-level high-level professional groups[4] to strengthen the quality improvement of professional group construction. These policies have strongly supported the vigorous development of finance and commerce majors, providing a solid institutional backing and sufficient financial support.

2.2 Deepening of Industry-Education Integration and School-Enterprise Cooperation

Guangdong Province has promoted the in-depth development of industry-education integration through policy guidance. By the end of 2024, a total of 1,223 industry-education integration enterprises have been successfully put on the record in the province, higher vocational colleges have joined hands to build 146 modern industrial colleges, and more than 4,000 order classes have been opened[5]. For example, a vocational and technical college in Guangdong Province has established the "JD Smart Logistics Supply Chain Industrial College" in cooperation with JD Logistics, carried out the 1+X certificate pilot, and trained intelligent logistics talents; a vocational school in Guangzhou has carried out modern apprenticeship pilots with Guangdong Cosmo Lady, TCL and other enterprises, and jointly built an e-commerce network marketing industrial college.

The implementation of tax preferential policies has further stimulated the enthusiasm of enterprises to participate in industry-education integration. Some enterprises in Guangdong Province have obtained tax relief such as education surcharges as industry-education integration enterprises, effectively reducing the cost of enterprises participating in vocational education. In addition, the Regulations on the Development of Skilled Talents in Guangdong Province (the first in the country) clarifies the interconnection of career development paths between skilled talents and professional and technical talents, and promotes vocational school graduates to enjoy the same treatment as ordinary college graduates in terms of household registration, professional title evaluation, etc.[6], providing institutional guarantee for the development of finance and commerce talents in higher vocational colleges.

3 INDUSTRIAL UPGRADING: GIVING BIRTH TO NEW DEMANDS FOR FINANCE AND COMMERCE MAJORS

3.1 Industrial Structure Optimization and Talent Demand Characteristics

The industrial structure of Guangdong has been continuously optimized. In 2024, the added value of the tertiary industry reached 8.14 trillion yuan, accounting for 57.5% of GDP, among which modern service industries and digital economy have become core development fields. As an emerging business form, cross-border e-commerce achieved import and export volume of 427.34 billion yuan in the first half of 2024, accounting for 10% of the province's total foreign trade volume, and the annual import and export volume of Guangzhou, Shenzhen and Foshan all exceeded 100 billion yuan[7]. Driven by both e-commerce and manufacturing, the market demand for the logistics industry continues to rise. In 2024, the average monthly salary of logistics management graduates reached 5,113 yuan, and the professional counterpart rate was as high as 86.35%.

Fields such as financial technology and digital commerce show the compound characteristics of "technology + business" in terms of talent demand. For example, in the 2025 campus recruitment of China Post, candidates for logistics, finance, e-commerce and other positions are required to master big data analysis, intelligent warehousing and other skills, with a salary range of 8,000 to 12,000 yuan. The intelligentization of the service industry has significantly improved the employment quality of individuals[8]. A vocational college in Guangdong has established a digital finance college in cooperation with Alibaba Cloud and Huawei, and developed courses such as blockchain finance and financial big data analysis to cultivate financial talents adapting to the digital economy.

3.2 Analysis of Talent Demand in Key Industries

3.2.1 Cross-border e-commerce

The scale of cross-border e-commerce in Guangdong ranks first in the country. In 2023, the import and export volume reached 843.3 billion yuan, 74.6 times that of 2015. The development of the industry has given birth to the demand for cross-border e-commerce operation, international logistics, cross-border payment and other positions. A vocational school in Guangzhou has set up a new cross-border e-commerce major, and joined hands with Beijing Zhanchuang Technology to cultivate cross-border e-commerce elites through the mode of "online training + offline special training". A technical college in Guangdong has officially integrated cross-border e-commerce skills training into the curriculum system, and built a training base with SHEIN cross-border e-commerce, so that students can have the opportunity to participate in real project operations.

3.2.2 Modern logistics

The intelligent and digital transformation of Guangdong's logistics industry has accelerated, and the gap of intelligent logistics talents exceeded 200,000 in 2024. The modern logistics management major of a vocational and technical college in Guangdong has cooperated with well-known enterprises such as Suning.com and JD Logistics, introduced advanced training equipment such as intelligent warehousing and UAV distribution, carried out the 1+X certificate pilot, and the graduate employment rate has remained above 98% for many years, the graduate placement rate is as high as 97.28%, and the average monthly income is 3,932.72 yuan. According to the 2023 graduate employment quality annual

report of a vocational college in Guangdong, the employment rate of logistics management majors in the School of Business Administration reached 91.04%, and most of the graduates went to logistics enterprises and supply chain management positions in manufacturing enterprises. In addition, graduates of logistics management major also have the ability to work in many fields such as commercial circulation enterprises, government agencies, educational institutions and consulting management companies.

3.2.3 Digital finance

Digital technology has reshaped the pattern of the financial industry, and technologies such as blockchain and artificial intelligence have been widely used. A vocational college in Guangdong has built an industry-education integration project with the Guangzhou Digital Finance Association, developed digital finance industry standards, applied for 15 software copyrights and invention patents, and promoted the leapfrog upgrading from "technology application" to "ecological empowerment". Graduates of financial services and management majors can be engaged in financial product marketing, investment and financial consulting and other work. According to the latest data, the average monthly salary of graduates of this major in 2024 reached 8,900 yuan.

4 MARKET ORIENTATION: OPTIMIZING PROFESSIONAL CONSTRUCTION AND TALENT TRAINING

4.1 Docking of Professional Settings and Industrial Demand

Higher vocational colleges in Guangdong flexibly respond to industrial needs and dynamically adjust the professional structure. For example, a vocational and technical college in Guangdong has opened 11 finance and commerce majors including modern logistics management, e-commerce, and big data and accounting, covering accounting and finance, e-commerce logistics and other fields in an all-round way, which is highly consistent with the economic development needs of the Guangdong-Hong Kong-Macao Greater Bay Area. A vocational school in Guangzhou has actively included emerging majors such as business data analysis and application and mobile business in the enrollment plan, and its graduates are widely serving in the core data operation positions of e-commerce platforms and Internet enterprises.

The through training mode of secondary and higher vocational education has effectively strengthened the continuity of talent supply. By 2025, the number of three-two segmented degrees provided by a vocational school in Guangzhou will reach 1,700, which is closely connected with 15 higher vocational colleges such as a vocational and technical college in Guangdong Province, unblocking the students' further study path. The 2024 enrollment plan of a vocational and technical college in Guangdong shows that majors such as business English and financial services and management continue to expand enrollment, with tuition fees of 5,250-10,000 yuan/year, meeting the market demand for high-quality financial talents.

4.2 Curriculum Reform and Teaching Innovation

4.2.1 Integration of digital skills into curriculum system

Facing the impact of digital economy on finance and commerce industry, higher vocational colleges actively promote curriculum reform. A technical vocational college in Guangdong has integrated new technologies such as big data and artificial intelligence into finance and commerce courses, developed an "AI + finance" curriculum system, reconstructed the contents of courses such as cost accounting and financial robots, and added digital technology application modules. A vocational and technical college in Guangdong has joined hands with Huawei to introduce the domestic DeepSeek large model, and jointly built an artificial intelligence platform for smart campus, which has strongly promoted the digitization process of teaching scenes.

4.2.2 Practical teaching and industry-education integration

The school-enterprise cooperation in building training bases has become an important carrier of practical teaching. A vocational and technical college in Guangdong is equipped with a series of advanced facilities such as accounting comprehensive training room and financial engineering training base, and has cooperated with Suning.com, Weiyigou and other enterprises to build an on-campus distribution center and entrepreneurship center, so that students can have the opportunity to participate in the operation of real businesses. A vocational school in Guangzhou has cooperated with Guangdong Baodao Glass and Guangdong Huimei Group to establish off-campus internship bases and carry out order-based training, with the student employment rate exceeding 95% for many consecutive years.

4.2.3 Construction of teaching staff and teaching materials

Higher vocational colleges optimize the teaching staff structure through the training of "double-qualified" teachers and the introduction of enterprise experts. A technical vocational college in Guangdong has set up a teaching staff database composed of experts from 90 enterprises such as SF Express, 211 teachers have taken turns to exercise in enterprises, and 130 enterprise experts have undertaken teaching tasks, realizing the role integration of "teachers are engineers and engineers are teachers". In terms of teaching material construction, school-enterprise cooperation has developed characteristic teaching materials such as RPA Development and Application and Digital Intelligence Customer Service, integrating the latest industry technologies and cases into the teaching content.

A vocational and technical college in Guangdong has implemented the "Hundreds of Teachers Entering Thousands of Enterprises" plan. In 2024, a total of 243 professional teachers were sent to work in enterprises such as Tencent Financial Technology and SF Supply Chain, and participated in practical projects such as cross-border e-commerce

digital marketing and intelligent logistics system optimization, so that the teachers' practical teaching ability has been significantly improved. A vocational and technical college in Guangdong has built a "three-stage progressive" training system. Newly recruited teachers need to complete 200 hours of enterprise practice training, intermediate title teachers need to participate in 6 months of industrial practice every three years, and senior title teachers must take the lead in completing more than 2 industry-education integration projects.

The construction of teaching materials highlights the characteristics of "post, course, competition and certificate" integration. Shenzhen Institute of Information Technology, in conjunction with Shenzhen Cross-border E-commerce Association, has developed 12 loose-leaf teaching materials such as Cross-border E-commerce Big Data Analysis and RPA Financial Robot Application, and supporting the construction of a library of 278 real enterprise project cases. The Intelligent Financial Sharing Practice textbook developed by a vocational and technical college in Guangdong in cooperation with Kingdee Software has integrated 18 cutting-edge technologies such as financial robot process automation and electronic invoice blockchain deposit, and has been adopted by 67 vocational colleges across the country.

In order to improve the international applicability of teaching materials, the Teaching Steering Committee for a Certain Professional of Higher Vocational Education in Guangdong Province has taken the lead in formulating the International Curriculum Certification Standard for Cross-border E-commerce Professionals, and jointly developed 6 regional teaching materials such as Business Data Analysis in the Guangdong-Hong Kong-Macao Greater Bay Area (Bilingual Edition) with the Hong Kong Vocational Training Council. A vocational and technical college in Guangdong has even introduced the certification standards of the German Chamber of Industry and Commerce (IHK), and embedded international teaching contents such as EU CE certification and cross-border customs compliance into courses such as International Logistics Management, so that the construction of teaching materials can be in line with international vocational standards.

5 CHALLENGES AND COUNTERMEASURES

5.1 Main Challenges

5.1.1 Uneven Policy Implementation and Resource Allocation

Studies have shown that some higher vocational colleges in Guangdong have problems of insufficient efficiency in policy implementation, specifically manifested in the formalization of the industry-education integration mechanism, the decline of enterprise main body participation momentum, the insufficient depth of the school-enterprise collaborative education mechanism construction, and the low utilization rate of the practical teaching resource platform and other outstanding contradictions. It is worth noting that there is a significant gap in the allocation of vocational education resources in the eastern, western and northern regions of Guangdong. Key indicators such as per student funding, teaching staff construction and training base density form obvious inter-regional resource endowment differences with the Pearl River Delta economic belt. This development gradient difference has seriously restricted the balanced development of the supply system of high-skilled talents in finance and commerce.

5.1.2 Disconnection between curriculum system and industrial demand

In the process of continuously promoting the reform of the curriculum system in higher vocational colleges in Guangdong, some majors still have problems such as lagging curriculum content update and relatively weak practical teaching system. Taking the accounting major as an example, its core curriculum system has not systematically integrated the cutting-edge digital contents such as financial robots (RPA) and blockchain technology. The main reason for this is that the curriculum content has a generational gap with the development of industry technology, resulting in the significant feature that graduates show insufficient job adaptability under the background of digital financial transformation.

5.1.3 Insufficient practical ability of teaching staff

Some professional teachers have the problem of relatively scarce industry practice experience, resulting in difficulty in effectively integrating cutting-edge technological achievements and real business scenarios into the teaching system. Empirical studies have shown that among the teaching staff of finance and commerce majors in higher vocational colleges in Guangdong Province, the proportion of teachers with more than three years of front-line work experience in enterprises is less than 30%. Moreover, the current teacher enterprise practice period is generally short, resulting in teaching content lagging behind industrial development needs, and it is difficult to effectively achieve the dynamic connection between teaching and industry required by industry-education integration.

5.2 Optimization Countermeasures

5.2.1 Strengthening policy implementation and resource coordination

In the process of continuously advancing the reform of the curriculum system in higher vocational colleges in Guangdong, some majors still have problems such as lagging curriculum content updates and a relatively weak practical teaching system. Taking the accounting major as an example, its core curriculum system has not systematically integrated cutting-edge digital contents such as financial robots (RPA) and blockchain technology. The main reason for this is the generational gap between the curriculum content and the development of industry technology, resulting in graduates showing significant characteristics of insufficient job adaptability in the context of digital financial transformation.5.1.3 Insufficient Practical Ability of Teaching Staff

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The government urgently needs to construct a systematic and normalized supervision and evaluation system for vocational education policy implementation, establish a quantitative index-based assessment mechanism for the effectiveness of industry-education integration, and incorporate the breadth, depth, and effectiveness of enterprises' participation in vocational education into the corporate social responsibility credit evaluation system. Meanwhile, implement preferential policies for fiscal transfer payments, focus on strengthening the special fund guarantee for vocational education in the eastern, western, and northern regions of Guangdong, and rely on the "Strong Teachers Project" for precise teacher cultivation and the "Training Base Construction" modern facility upgrading project to systematically improve the balance and development quality of vocational education resource allocation in these regions.

5.2.2 Deepening curriculum reform and industry-education integration

Against the backdrop of the new "Double High" construction, higher vocational colleges should establish a scientific and efficient dynamic curriculum adjustment mechanism, deepen school-enterprise cooperation, and regularly revise talent training programs in conjunction with industry enterprises to ensure that educational content remains consistent with market demand. For example, introduce the "post-course-competition-certificate" integration model, embed vocational skill level certificate training content into the curriculum system, and achieve the docking of curriculum content with professional standards. At the same time, strengthen in-depth cooperation with leading enterprises, jointly build industrial colleges and research centers, and promote the integrated development of "teaching-scientific research-industry".

5.2.3 Improving teachers' practical ability and international vision

Implement a teacher enterprise practice system, clearly requiring professional teachers to complete no less than six months of targeted enterprise practice training within a five-year cycle. Encourage teachers to actively participate in enterprise technology research and development projects and social service work to promote the effective transformation of scientific research achievements into teaching resources. Deepen strategic cooperation with overseas universities and enterprises, systematically introduce international advanced educational concepts and standardized curriculum systems, and strive to cultivate composite finance and commerce professionals with a global vision.

6 CONCLUSIONS AND OUTLOOK

The innovative development of finance and commerce majors in higher vocational colleges in Guangdong presents a three-dimensional collaborative driving mechanism of policy guidance, industrial transformation, and market regulation. From the policy dimension, national strategic planning and regional development outlines constitute the top-level institutional design. The continuous investment guarantee mechanism of provincial fiscal special education funds and industry-education integration policy incentives form a multi-dimensional linkage institutional framework. At the industrial transformation level, the clustered development of modern service industries and the innovative breakthroughs of the digital economy in the Greater Bay Area have given rise to compound talent demands that integrate digital capabilities and industry knowledge. In terms of market regulation, higher vocational colleges have significantly improved talent training quality and market adaptability by establishing a dynamic professional adjustment mechanism, innovating curriculum development models, and deepening school-enterprise collaborative education systems.

The main achievements in the development of finance and commerce majors in higher vocational colleges in Guangdong are reflected in three aspects: policy synergy, industry-education integration, and quality optimization. The policy support system has effectively stimulated the vitality of running schools, and the depth and breadth of industry-education integration have continued to expand. Professional construction is closely aligned with new digital economy formats, and curriculum content has achieved dynamic connection with industry technical standards. The quality of talent training has been widely recognized by employers.

In response to the new trends in regional economic development, it is recommended to build a systematic development path. The curriculum system needs to improve digital literacy and international competence training modules to form a hierarchical and progressive capability matrix. Industry-education integration should establish a school-enterprise standard conversion mechanism and two-way talent flow channels to enhance the efficiency of technical skill accumulation. International training needs to strengthen docking with international rules and cross-border education cooperation to build an open training system. Through multi-dimensional systematic construction, the strategic support efficiency of professional clusters in serving regional economic transformation and upgrading can be comprehensively improved.

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THE CONSTRUCTION OF SELF-REGULATION PROMOTION STRATEGY AND EFFECT EVALUATION SYSTEM FOR SECONDARY SCHOOL ENGLISH ONLINE TEACHING: BASED ON INTELLIGENT LANGUAGE MODELING

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Abstract: This paper focuses on the application of intelligent language modeling in secondary school English online teaching, aiming to enhance students' learning autonomy, language proficiency and learning effect by constructing self-regulation facilitation strategies and effect evaluation system. Combining the technical advantages of intelligent language models, the study designs application scenarios such as personalized learning path generation, intelligent interaction and real-time feedback, automated assessment and diagnosis, and proposes self-regulation facilitation strategies such as meta-cognitive ability development, motivation maintenance mechanism, and behavior monitoring and intervention. Meanwhile, the study constructs an effect evaluation system containing process evaluation matrix, dynamic evaluation model and evaluation result application to comprehensively assess students' learning effectiveness. Through the empirical analysis of application cases, the effectiveness and feasibility of the intelligent language model in secondary school English online teaching are verified. This paper provides a new theoretical framework and practical path for secondary school English online teaching, which is of great significance for promoting the development of education information and intelligence.
Keywords: Intelligent language modeling; Online teaching; Self-regulation; Quality evaluation

1 INTRODUCTION

With the rapid development of information technology, online education has become an important trend in the global education field. As an important part of it, secondary school English online teaching not only breaks the time and space limitations, but also provides students with richer and more diverse learning resources and learning methods. However, secondary school English online teaching also faces many challenges, such as students' lack of independent learning ability, difficulty in maintaining learning motivation, and difficulty in monitoring learning behavior. These problems constrain the effectiveness and quality of secondary school English online teaching and need to be solved urgently. Intelligent language modeling, as an important branch in the field of artificial intelligence, has powerful natural language processing ability and learning ability, which provides a new solution for secondary school English online teaching[1]. In recent years, the application of intelligent language modeling in the field of education has gradually received widespread attention. By learning a large amount of text data, language models are able to generate coherent and reasonable texts to provide students with personalized learning experiences. In terms of intelligent teaching and personalized tutoring, the language model shows great potential[2-3]. It can generate personalized learning resources and tutoring suggestions based on students' learning needs and interests to help them solve learning problems. At the same time, the language model can also generate teaching resources and tutoring suggestions in real time to provide students with immediate learning support. In secondary school English online teaching, the application of intelligent language modeling is promising[4]. On the one hand, secondary school English, as a language subject, focuses on cultivating students' listening, speaking, reading and writing skills. Intelligent language modeling can help students improve their English speaking skills by simulating real language environments and providing them with rich speaking practice opportunities. On the other hand, secondary school English online teaching needs to pay attention to students' personalized needs. Intelligent language models can generate personalized learning paths and practice questions according to students' learning progress and ability level to meet students' differentiated learning needs[5]. However, although intelligent language modeling has great potential for application in secondary school English online teaching, its practical application still faces many challenges. For example, how to ensure that the content generated by the language model meets the teaching requirements? How to evaluate the impact of language modeling on students' learning outcomes? How to build an effective evaluation system to comprehensively assess students' learning effectiveness? All these issues need to be further researched and explored.

In order to deeply explore the application of intelligent language modeling in secondary school English online teaching, this paper aims to construct a self-regulation facilitation strategy and effect evaluation system. Through the design of application scenarios such as personalized learning path generation, intelligent interaction and real-time feedback, automated assessment and diagnosis, as well as the proposal of self-regulation facilitation strategies such as meta-cognitive ability development, motivation maintenance mechanism, and behavioral monitoring and intervention, this paper expects to provide a new theoretical framework and practical path for secondary school English online

teaching. Meanwhile, by constructing an effect evaluation system that includes a process evaluation matrix, a dynamic evaluation model, and the application of evaluation results, this paper will comprehensively assess the effect of the application of intelligent language modeling in secondary school English online teaching, and provide a useful reference for future educational practice.

2 STATUS OF RESEARCH

2.1 Application of Intelligent Language Modeling in Education

Intelligent language models are increasingly used in education, and their powerful natural language processing and learning capabilities provide strong support for educational innovation. By learning a large amount of text data, language models are able to generate coherent and reasonable texts to provide students with personalized learning experiences. In terms of intelligent teaching and personalized tutoring, language models show great potential. On the one hand, intelligent language models can be used to generate personalized learning resources. For example, the Knewton platform in the United States analyzes student behavior data through machine learning algorithms to generate personalized learning paths for English learners[6]. The platform dynamically adjusts the difficulty of learning content according to the students' learning progress and ability level, from simple scenarios such as "asking for directions at the airport" to complex scenarios such as "academic debates". The Canadian Grammarly tool not only corrects grammatical errors, but also provides vocabulary upgrading suggestions to help students improve their English writing skills[7]. On the other hand, intelligent language models can be used to provide intelligent interaction and real-time feedback. Based on the GPT-4 architecture, the intelligent language modeling virtual teaching assistant introduced in UK universities can understand the complex questions asked by students and provide detailed answers to students by generating comparison tables and attaching links to BBC documentary clips[8]. The Australian Educational Game Platform (AEGP) uses intelligent language modeling to design the "English Adventure Island" task, in which students are required to complete grammar puzzles, pronunciation challenges, and other levels, and the points can be exchanged for virtual medals, thus enhancing learning engagement[9]. In addition, intelligent language modeling can be used for automated assessment and diagnosis. The Singapore Intelligent Language Model Assessment System uses a hybrid BERT-CNN model to semantically analyze writing, not only detecting grammatical errors, but also assessing logical coherence and cultural sensitivity[10]. The American Turnitin tool, on the other hand, combines anti-plagiarism detection and writing guidance functions to provide students with originality scores and sentence optimization suggestions by comparing a massive academic corpus[11].

2.2 Current Situation and Challenges of Teaching English Online in Secondary Schools

Online teaching of English in secondary schools was widely used during the epidemic, but it also revealed many problems. On the one hand, there is the problem of insufficient ability to operate the online teaching platform and teaching ability on the part of teachers. Many teachers, especially veteran teachers, are unfamiliar with the use of online teaching platforms, resulting in lower classroom efficiency. On the other hand, students have problems such as poor self-discipline and difficulty in maintaining learning motivation. Online teaching relies on student autonomy, but secondary school students have weak self-control and are easily distracted or avoid learning. In addition, secondary school English online teaching faces the challenge of limited interaction and fun. The online mode is difficult to provide an authentic language environment, reducing classroom interaction and student engagement. Meanwhile, technological and environmental barriers also affect teaching effectiveness, such as network stability, device compatibility and insufficient home supervision. The Finnish K12 school system uses the Knewton Alta platform, which generates a weekly program that includes "vocabulary building," "grammar focus," "listening training," and a weekly plan that includes "vocabulary building," "grammar focus," "listening training," and so on. After students input their learning objectives, the system includes a weekly plan with "vocabulary building", "grammar intensive" and "listening training", and automatically assigns study periods through a calendar algorithm. The learning analytic system developed by the International University of Applied Sciences in Germany analyzes the reflection logs submitted by students through NLP technology, extracts themes such as "learning disabilities" and "strategy adjustment", and generates structured feedback templates[12]. Claude, a virtual lab assistant in Singapore, uses eye-tracking data to identify learning distractions[13]. A Canadian special education school used Khanmigo role-playing AI to simulate a "supermarket shopping" scenario for students with autism. The students were asked about the price of goods in English, and the AI adjusted the complexity of the conversation according to the fluency of the conversation[14].

2.3 The Potential of Intelligent Language Modeling in Online English Teaching in Secondary Schools

Intelligent language modeling has great potential for application in secondary school English online teaching. On the one hand, intelligent language models can meet students' differentiated needs by dynamically adapting learning resources. For example, the Singapore Intelligent Language Model Evaluation System generates personalized learning paths and practice questions based on students' learning progress and ability levels. On the other hand, the intelligent language model can improve students' speaking skills through intelligent interaction and real-time feedback. The intelligent language modeling virtual teaching assistants introduced in UK universities can understand the complex

questions asked by students and provide detailed answers [15]. In addition, intelligent language models can optimize teaching strategies through automated assessment and diagnosis. The Finnish teacher's dashboard displays a heat map of the class's knowledge mastery in real time, marking weak points such as "present perfect tense", and the system automatically pushes micro-lesson videos and targeted exercises[16]. At the same time, the intelligent language model can also be combined with cross-modal learning support to simulate real language scenarios. The AI learning partner developed in Japan is based on the ZPD theory and adjusts the challenge level according to students' unit test performance[17]. For example, after students complete the basic reading for three consecutive times, the system automatically pushes the Economist Junior article with vocabulary explanations and background knowledge cards.

2.4 Synthesis of Research

Current research has fully verified the technical feasibility of intelligent language models in secondary school English online teaching, and has carried out practical exploration around the directions of personalized learning, intelligent interaction, and automated assessment. However, existing studies still have the following deficiencies. First, there is insufficient attention to ethics and data security. Most studies focus on the realization of technical functions, but lack systematic exploration of ethical issues such as privacy protection of learning data and algorithmic bias. Second, the path of teacher role transformation is missing. Existing programs overemphasize the application of technological tools, and do not fully explain how teachers can transform from "knowledge transmitters" to "collaborative educators of intelligent language models". Second, the depth of mixed reality integration is insufficient. Although "intelligent language modeling + MR" technology shows the potential of immersive learning, most studies still remain in the proof-of-concept stage and lack of large-scale application cases. Finally, the diversity of learners is not enough. There is a lack of customized solutions for special education needs groups (e.g., autistic students, ADHD students).

3 COGNITIVE CHARACTERISTICS AND MODERATING NEEDS OF ONLINE ENGLISH TEACHING IN SECONDARY SCHOOLS

3.1 Cognitive Uniqueness of English Learning in Secondary Schools

English, as a pinyin writing system, is fundamentally different from Chinese in terms of cognitive processing pathways. fMRI studies have shown that the activation intensity of the left temporal lobe of the brain when Chinese students process English is only 63% of that of native speakers, and that conflicting "phoneme-grapheme" mappings lead to delayed response times. Meanwhile, the proportion of culturally specific items in secondary English textbooks is as high as 37%. Table 1 systematically presents the significant deficiencies of the three core competency dimensions of English in traditional online teaching and their corresponding intelligent language modeling solutions.

Table 1 Core Issues in Secondary English Subjects

Capability dimension	Deficiencies in traditional teaching	Intelligent Language Modeling Solutions
Oral communication [18]	Feedback delay > 24 hours	Real-time pronunciation correction (phoneme-level analysis)
Reading comprehension [19]	Text is abstract and difficult to understand	Syntax tree visualization + contextual animation
Cultural awareness [20]	Lack of scenario realism	Dynamic generation of cultural scenarios

As shown in Table 1, in the oral communication dimension, traditional teaching suffers from the timeliness problem of feedback lag of more than 24 hours, while the intelligent language model realizes millisecond pronunciation error correction through real-time phoneme-level analysis techniques (e.g., resonance peak trajectory tracking and minimal pair comparison). In the dimension of reading comprehension, to address students' cognitive overload due to the abstract nature of the text, the intelligent language model drives dynamic syntactic parsing tools to visualize complex sentence structures as interactive syntax tree animations, and generates contextual presentations (e.g., 3D reconstruction of the social scene of Pride and Prejudice) in line with the theme of the text. In the dimension of cultural awareness, traditional teaching is limited by the lack of authenticity of virtual scenes, while the intelligent language model utilizes multimodal generation technology (e.g., combining Stable Diffusion with the CEFR cultural parameter library) to generate on-demand scenario examples with cultural details (e.g., accurately reproducing the rules of china placement in the English afternoon tea etiquette). This solution system accurately addresses the needs of speech coding, cognitive processing and cultural understanding specific to the English language subject, and builds a closed loop of intelligent regulation from language form to cultural connotation.

3.2 Core Pain Points in Teaching English Online in Secondary Schools

A study of 20 secondary schools (n=3,000) revealed that online English language teaching consisted of two main problems. The first was abnormal physiological signals, mainly in the form of HRV (heart rate variability) mean values >97ms (resting baseline 59ms) during speaking practice. The second is the occurrence of student behavioral avoidance characteristics, with nearly half of the students actively turning off the camera to avoid speaking. The details

are shown in Figure 1.

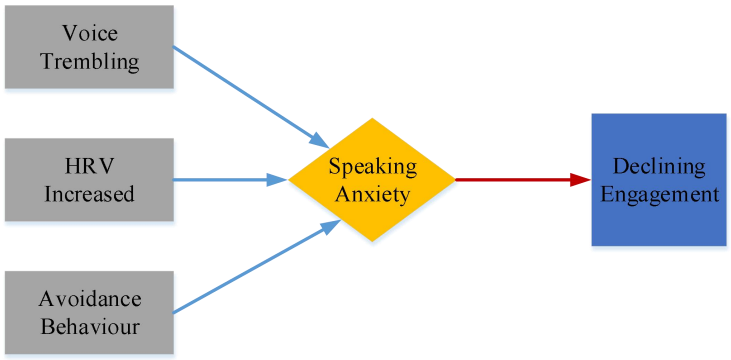

Figure 1 Model of the Characteristics Associated with Anxiety in Secondary School English Speaking

As can be seen from the figure, the core pain points faced by online English teaching are centered on four areas. First, learners' physiological tension due to speaking anxiety often triggers avoidance of on-camera behavior, leading to a cycle of error accumulation and decreased engagement. Second, in writing, influenced by Chinese thinking, there are significant errors in sentence structure transfer and insufficient use of passive voice. Third, the lack of realism in the cultural scene leads to comprehension bias, and the mechanical repetition of virtual interaction lacks depth. Fourthly, the static and single content of teaching can easily lead to cognitive fatigue and attenuation of learning effect. Thus, to solve these pain points, the application of innovative technology is needed.

3.3 Demand Analysis of Intelligent Conditioning for Online Teaching of English in Secondary Schools

According to the technical realization of the comprehensible input hypothesis, the language input needs to satisfy the "i+1" principle, and there are two major defects in traditional secondary school English online teaching, namely, static grading, i.e., the online course materials are preset with fixed difficulties, and also the lagging feedback of learning effects, most teachers cannot realize on-site evaluation, and the manual correction cycle of online teaching assignments takes more than 24 hours. manual correction cycle is more than 24 hours. In addition, according to the sociolect-cultural theory of scene adaptation, secondary school English online teaching will also have bottlenecks in the application of online environments, including insufficient frequency of teacher-student interactions in the online classroom as well as insufficient authenticity of the context, with a high rate of mechanical repetition of the virtual dialogues, which diminishes the authenticity and reliability of the teaching.

Based on the above, the demand for intelligent adjustment of secondary school English online teaching stems from the balance between students' differentiated learning characteristics and dynamic teaching goals, and the precise adaptation of teaching content, pace and evaluation needs to be realized through technical means. The intelligent language model analyzes students' cognitive level, learning style and emotional state through multimodal data collection to build a personalized learning portrait, and then dynamically adjusts the difficulty gradient of teaching resources, such as generating special variations of exercises for grammatical weaknesses and designing low-risk role-playing scenarios for speaking anxieties, and at the same time, relying on natural language processing technology to realize real-time speech error correction and semantic comprehension and feedback, and combining with the big data of learning behavior to predict knowledge breakpoints and pre-set the learning objectives. At the same time, it relies on natural language processing technology to realize real-time speech error correction and semantic understanding feedback, combines with big data on learning behavior to predict knowledge breakpoints and preset compensatory resources, and ultimately forms a closed-loop adjustment mechanism of "assessment-diagnosis-intervention-reassessment" to ensure that teaching strategies are dynamically matched with learners' needs.

4 APPLICATION SCENARIOS AND TECHNOLOGICAL ENABLING OF INTELLIGENT LANGUAGE MODELING IN ONLINE TEACHING OF ENGLISH IN SECONDARY SCHOOLS

Under the background of rapid development of artificial intelligence technology, intelligent language modeling is profoundly changing the mode and ecology of secondary school English online teaching. Compared with traditional classrooms, intelligent language models provide comprehensive support for English teaching from knowledge transfer to competence advancement through the technical advantages of multimodal interaction, personalized adaptation and real-time feedback. In this paper, we focus on the innovative application of intelligent language model in secondary school English online teaching, and discuss how it breaks through the bottleneck of traditional teaching and builds a highly efficient, interactive and personalized learning environment by combining the specific paths of technological empowerment.

4.1 Application Scenario Innovation for Intelligent Language Modeling

The innovation of the application scenario of intelligent language modeling in secondary school English online teaching

is reflected in multiple dimensions: simulating the real language environment through virtual scene generation and role-playing functions, such as situational dialogue training and cultural scene penetration, to enhance the authenticity of language practice. Designing personalized learning paths based on students' ability data, including dynamic difficulty adjustment and error-targeted training, to realize accurate teaching. Use in-depth semantic analysis to assist writing teaching, provide structured feedback and creative writing stimulation, and cultivate critical thinking. Combined with a multidisciplinary knowledge base, it supports interdisciplinary project-based learning, such as theme-based inquiry and cross-cultural debate, to enhance comprehensive literacy. At the same time, the intelligent language model also optimizes the teaching process through data-driven teaching decision-making, human-machine collaborative classroom interaction, multimodal resource integration and generation, and the innovation of the evaluation system and other technology-enabled paths, realizing the dynamic matching of teaching strategies and learners' needs, and bringing about a revolutionary change in secondary school English online teaching. The details are shown in Figure 2

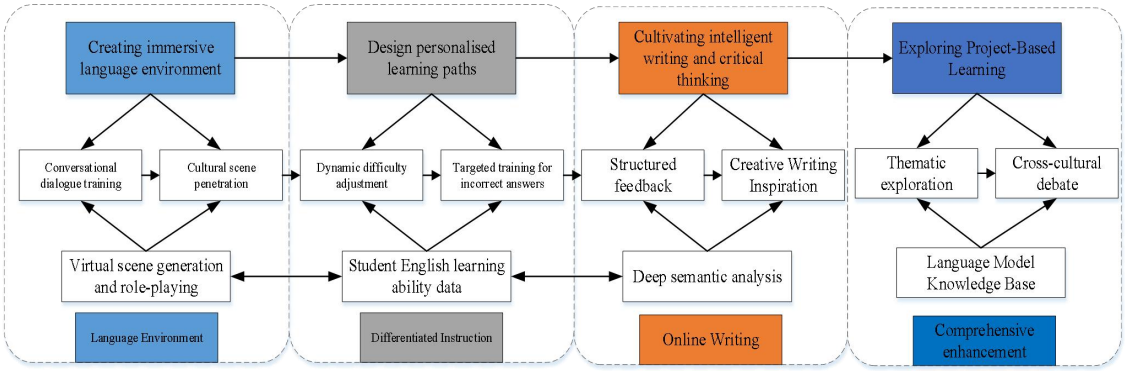

Figure 2 Innovative Architecture for Application Scenarios of Intelligent Language Models

First, build an immersive language environment. The intelligent language model simulates the real secondary school English teaching language environment through virtual scene generation and role-playing functions. Included:
Situational Dialogue Training: Students can engage in dialogues with the virtual tutor of the intelligent language model on topics such as "ordering food in a restaurant" and "asking questions at the airport", and the intelligent language model provides instant feedback based on the students' pronunciation and grammatical errors, and guides the logical expression through multiple rounds of dialogues.
Cultural Scene Infiltration: Combining intelligent language modeling mapping technology to generate cultural scenes (e.g., London streets, American campuses), students are required to describe the content of the pictures in English, and the intelligent language modeling automatically generates the cultural background annotations to enhance cross-cultural understanding.
Second, we design personalized learning paths. Based on students' English learning ability data, the intelligent language model realizes "tiered teaching" and "accurate remediation". Including:
Dynamic Difficulty Adjustment: Intelligent language modeling analyzes students' listening and reading levels, and automatically matches practice materials with appropriate speed and vocabulary. For example, weak students practice the dialogues of "Peppa Pig" and advanced students analyze TED talks.
Error-targeted training: For grammatical weaknesses (e.g., virtual voice), the intelligent language model generates special exercises and reinforces memory through the closed loop of "error reproduction-variation training-consolidation test".
Third, cultivating intelligent writing and critical thinking. Intelligent language modeling aids online writing instruction in secondary English through deep semantic analysis. Included:
Structured feedback: The intelligent language model not only corrects grammatical errors, but also parses the logic of the article and makes suggestions such as "adding transition sentences" and "optimizing argument support".
Creative writing stimulation: Input keywords (e.g. "future city"), the intelligent language model generates a multi-dimensional writing framework, students choose perspectives (technology, environmental protection, society) to start creating, and the intelligent language model provides high-level vocabulary replacement solutions in real time.
Finally, Exploring Project-Based Learning. Combining language modeling with a multidisciplinary knowledge base, Intelligent Language Modeling for Integrated Literacy: Including:
Thematic Inquiry: For example, in the theme of "Global Climate Change", the Intelligent Language Model (ILM) provides English popular science articles, news reports, and audio interviews with experts, and students work in groups to complete a research report, and the ILM evaluates the integration of the information and language accuracy.
Cross-cultural debate: The intelligent language model generates a topic (e.g., "Should we restrict the use of plastics?"), students review the information and debate it in English, and the intelligent language model records the gaps in the argument and generates rebuttal prompts.

4.2 Core Pathways for Technology-Enabled Teaching and Learning

The core path of technology-enabled teaching lies in the optimization of teaching strategies through data-driven

teaching decisions, such as the construction of learning profiles and dynamic adjustment of teaching priorities. Enhance efficiency through human-computer interaction in the classroom, such as intelligent teaching assistants and dual-teacher classroom model. Integrating multimodal resources, such as accessing global corpora and generating customized materials. As well as revolutionizing the evaluation system, such as formative evaluation and multi-dimensional feedback mechanism, so as to comprehensively promote the development of teaching in the direction of intelligence and precision.

Intelligent conditioning technology is systematically reshaping the path of English acquisition, and the core barriers to online English learning in secondary schools form a critical mapping with the intelligent technological solutions, as shown in Figure 2. For the physiological avoidance loop formed by speaking anxiety, a multimodal emotion capture and dynamic pronunciation correction system is used to eliminate the source of anxiety instantly. For the sentence solidification caused by negative native language transfer, the intelligent grammar reconstruction engine and cross-language comparison training are embedded to strengthen English thinking. For the distortion of cultural scenes and mechanical interaction, we build adaptive cultural scene libraries and intelligent language modeling conversational agents to stimulate deep contextual interaction. For the cognitive decay triggered by semantic saturation, develop neural feedback-driven dynamic content flow to continuously activate the language processing brain area (Table 2).

Table 2 Mapping of Barriers to Online Learning and Intelligent Moderation Schemes for English in Secondary Schools

Learning disability	Testing Indicators	Conditioning strategy	Technical realization
phonological confusion	Minimum contrarian error rate > 40%	Demonstration of tongue position dynamics	Lip tracking + 3D pronunciation animation
dyslexia	Lookback > 3 times/sentence	Syntax tree disassembly in real time	Dependency Analysis + Animation Generation
writing migration	Passive voice usage <12%	English-Chinese Structural Comparison Casebook	Parallel corpus search

In terms of data-driven pedagogical decision-making, the intelligent language model optimizes the online teaching strategy of secondary school English through learning behavior analysis, including the construction of learning portraits, and the intelligent language model records data such as students' pronunciation accuracy, reading speed, and writing vocabulary complexity to generate personalized learning reports. In addition, dynamic teaching adjustment is realized, and teachers adjust their teaching focus based on the feedback from the intelligent language model. For example, if the class generally loses points in "comprehension of long and difficult sentences", the intelligent language model will automatically recommend graded practice materials.

In terms of human-computer collaboration in online classroom interaction, the intelligent language model complements the role of the teacher to improve the efficiency of the online teaching classroom, including the realization of intelligent teaching assistants, the intelligent language model is responsible for real-time voice assessment, error analysis and other repetitive tasks, while the teacher focuses on thinking guidance and emotional interaction. At the same time, to explore the dual-teacher classroom model, teachers design interactive links (such as "intelligent language model questions - students rush to answer"), the intelligent language model statistics and answer data and generate a set of wrong questions, to assist in targeted review after class.

In terms of multimodal resource integration and generation, the Intelligent Language Model will break the barriers of secondary school English online teaching resources and realize the intelligent aggregation of teaching materials. Firstly, it can realize access to the global corpus, and the intelligent language model integrates BBC news, academic lectures, film and TV dialogues, etc. Teachers can get the appropriate materials by inputting keywords. Secondly, the online materials can be customized, according to the teaching objectives, the intelligent language model generates simulated dialogues with different accents, supporting exercises and cultural annotations.

5 AN INTELLIGENT ENHANCEMENT FRAMEWORK FOR AUTONOMOUS REGULATORY FACILITATION STRATEGIES FOR TEACHING ENGLISH ONLINE IN SECONDARY SCHOOLS

The intelligent enhancement framework of the self-regulation promotion strategy aims to build a closed-loop system that can dynamically perceive the state of an individual or a system, intelligently analyze the regulation demand, and proactively provide a personalized intervention plan by integrating advanced AI technologies and adaptive mechanisms, so as to realize the capability leap from reactive response to proactive optimization, as shown in Fig. 3.

As shown in Figure 3, the architecture is based on the closed-loop control theory of "perception-decision-execution-optimization", and builds a four-level cascade language learning system. Specifically, it includes:

5.1 Sensory Layer

By integrating heterogeneous data such as voice waveform, eye track, text input, etc., the "perception layer" is the core function of the "multimodal data" module. According to the system architecture diagram, the core function of the "perception layer" is carried out by the "multimodal data" module, which serves as the information input port of the whole intelligent system and is responsible for the real-time collection of heterogeneous data from multiple sources,

such as speech, text, and behaviors, to provide the original observation signals for the decision-making and analysis of the subsequent strategy engine, and constitutes the initial sensing tentacles of the closed-loop regulation system.

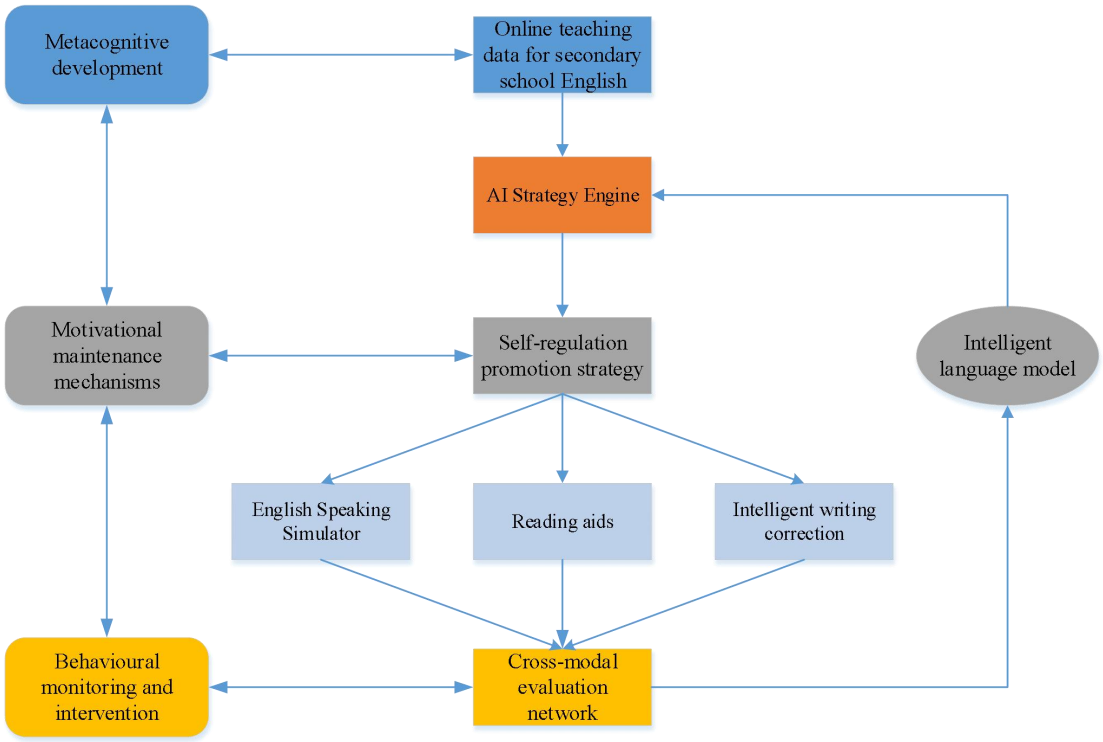

Figure 3 Intelligent Enhancement Framework for Promoting Self-Regulation in Online English Teaching in Secondary Schools

5.2 Decision-Making Level

Real-time diagnosis and strategy generation based on Transformer. Based on the architecture diagram, the function of "Decision Layer" is independently undertaken by "EngGPT Strategy Engine", which acts as the core hub of the closed-loop system, generating executable regulatory strategy commands and driving the downstream tools to work together through real-time parsing of the multimodal input data and matching of the teaching rules, and the dynamic strategy optimization mechanism realizes the autonomy of evolution through the reinforcement of the learning feedback of the evaluation network.

5.3 Executive Level

Subject-oriented tool-set to solve the core problem of listening, reading and writing. According to the architecture shown in the picture, the functions of the "Execution Layer" are fully carried in the "Regulatory Strategy Execution" module, which serves as the conversion hub from the strategy engine to the teaching tools, mapping the abstract instructions generated by EngGPT into specific operational instructions for the three major domains of Speaking, Reading, and Writing, and directly driving the simulators and intelligent tools to implement the pedagogical interventions, which constitutes the operation hub of the closed-loop system that transforms the decisions into the entity's teaching behaviors. It constitutes the operation hub of the closed-loop system that transforms decisions into physical teaching behaviors.

6 CONSTRUCTION OF EVALUATION SYSTEM FOR ONLINE TEACHING EFFECT OF SECONDARY ENGLISH BASED ON INTELLIGENT LANGUAGE MODELING

Intelligent language modeling pushes evaluation from "result-oriented" to "process-enabling". For formative assessment, the Intelligent Language Model records students' participation in the classroom, the number of homework revisions and other process data, generating a dynamic growth curve. A multi-dimensional feedback mechanism is built, combining teacher evaluation, intelligent language model scoring and peer assessment to form a comprehensive evaluation report of "skills + literacy".

6.1 Evaluation System

Process evaluation matrix is a dynamic assessment tool, it is through the construction of multi-dimensional index

system, continuous tracking of key behavioral nodes in the process of learning or task implementation, the trajectory of competence development and the quality of stage results, the formation of horizontal coverage of cognition, skills, attitudes and other elements, vertical through the initial state, the progress of the stage and the achievement of the goal of the three-dimensional evaluation network, so as to provide real-time feedback and guidance for the individual or the team. The details are shown in Table 3.

Table 3 Process Evaluation Matrix

Dimension (math.)	Norm	Technical realization	Typical case
Cognitive Participation	Length of stay at knowledge point, error retry rate	Learning behavior log analysis + heat map visualization	Knewton Platform, USA
Skills Development	Oral fluency, essay complexity	Speech Recognition + LSTM Text Generation Evaluation	Grammarly, Canada
Emotional Attitude	Emotional polarity of classroom interactions	ESAM-LI Sentiment Semantic Analysis Model	Japanese AI Emotion Recognition Tool
Collaborative Capacity	Contribution to group discussions, number of role-plays	Social Network Analysis + Role Assignment Algorithm	Australian Educational Gaming Platform

Dimension 1: Cognitive engagement refers to the active engagement of individuals in cognitive activities, covering multi-level mental processes such as meta-cognitive monitoring, in-depth information processing, critical thinking, and knowledge construction, which is reflected in the continuous exploration of the meaning of the task, the independent discovery of logical associations, and the strategic deployment of cognitive resources, and the essence of which is the cognitive leap from surface perception to meaning generation through the activation of higher-order thinking activities. The essence is to realize the cognitive leap from surface perception to meaning generation by activating higher-order thinking activities, which is often manifested in adaptive learning systems as the dynamic planning of learning paths, the active regulation of cognitive load, and the creative reorganization of knowledge networks.

Dimension 2: Skill development is a dynamic process in which an individual or a system realizes a leap in competence through continuous practice and reflection, and its essence is the in-depth construction of the transformation of knowledge and experience into behavioral efficacy, which not only involves the linear progression from rudimentary to proficient, but also emphasizes the integration of multi-dimensional interactions of cognition, action and emotion in complex situations, and the refined reorganization of the skill modules and the creative migration through the meta-cognitive control, and the eventual formation of expertise in coping with new challenges. The final result is the formation of adaptive expertise to cope with new challenges.

Dimension 3: Affective attitude is the complex of the individual's implicit emotional experience and value orientation in cognitive activities, which is not only the internal driving source of learning motivation but also the implicit regulator of behavioral choices. Through the empowering effect of positive emotions, the belief support of self-efficacy, and the guiding role of values, the bridge of affective connection is constructed between cognitive processing and behavioral execution, so as to make the knowledge construction from the rational-logical layer to the affective domain. The knowledge construction is extended from the rational logic layer to the emotional domain, and the dynamic regulation of learning engagement and the continuous reinforcement of goal orientation are realized through the emotional feedback loop.

Dimension 4: Collaboration ability is the composite ability of multiple subjects to achieve common goals through dynamic role adaptation and cognitive synergy in interactive situations, the essence of which is the transformation process of social capital and knowledge potential, which not only includes the integration of information and task coordination in explicit communication, but also emphasizes the construction of trust and cultural adaptation in implicit tacit understanding, which is reflected in the emergence of collective wisdom in the adaptive system based on intelligent role matching based on situational awareness, dynamic authority configuration based on trust assessment, and collective wisdom based on consensus achievement. Through the complementary collision of heterogeneous perspectives, the networked connection of distributed cognition, and the creative reconciliation of conflict situations, the adaptive system is embodied in the intelligent role matching based on situational awareness, the dynamic configuration of authority based on trust assessment, and the emergence of collective wisdom based on the achievement of consensus.

6.2 Practice Cases and Effectiveness Analysis

The chapter of Practice Cases and Effectiveness Analysis demonstrates the practical application value of the intelligent enhancement framework in complex tasks through the in-depth analysis of typical scenarios in multiple fields, presenting the optimization of personalized learning paths in the field of education, precise diagnosis and treatment assistance in medical scenarios and other differentiated implementation paths, as well as revealing the common law formed in cross-industry practices - through Dynamic adaptation mechanism effectively breaks the rigid constraints of the traditional system, and promotes the qualitative leap of human-computer collaboration while improving the decision-making efficiency, which is not only reflected in the improvement of quantitative indexes, but also in the leap of the user's subjective experience and the construction of the system's sustainable evolution capability, as shown in Table 4.

Table 4 Table of Cases and Effectiveness

Case Name	Implementation modalities	Efficacy
AI-Enabled English Listening and Teaching	A school utilizes an AI speaking assessment system, where students complete 10 minutes of reading practice every day, and the AI scores them in three dimensions: pronunciation, fluency, and intonation, and generates a "Speech Waveform Comparison Chart".	Students' average speaking scores increased and high-frequency error corrections increased.
Smart Writing Workshop	Teachers assign argumentative essay tasks through the AI writing platform, and after students submit their first drafts, the AI provides suggestions for structural optimization, and the teacher selects model essays for classroom dissection.	Students' scores for logical coherence in their essays improved, and their use of advanced vocabulary increased.
Cross-cultural project-based learning	Students work in groups to generate a research report on the Belt and Road theme using AI, integrating data from English-language news, policy documents and expert interviews.	Students' information screening and cross-cultural communication skills are significantly enhanced.

Case 1: AI-Enabled Secondary English Listening and Speaking Teaching builds a multi-dimensional language practice ecology through intelligent speech recognition, adaptive learning path planning and contextualized interaction technologies. The system captures the vocal characteristics of students' pronunciation in real time, analyzes speaking elements such as intonation, legato, stress, etc. in combination with natural language processing technology, generates personalized diagnostic reports and puts forward suggestions for improvement. The virtual dialog engine simulates real communication scenarios, allowing students to engage in role-playing, topic debates and other immersive exercises with AI digital people, and the system dynamically adjusts the difficulty of the dialog based on semantic coherence, logical hierarchy and cultural appropriateness. The intelligent recommendation engine matches listening materials with appropriate difficulty based on learning profiles, such as news broadcasts, film clips or academic lectures, and with adjustable speech rate and key vocabulary visualization and annotation functions, it helps learners gradually adapt to different speech rates and accents. In addition, the AI-driven automated assessment system breaks through the limitations of traditional assessment by comprehensively evaluating students' fluency, accuracy and complexity through multimodal data analysis, and generating visual growth profiles that include speech waveform comparison, high-frequency error clustering, and progress trends, so that the listening and speaking training shifts from mechanical imitation to the construction of precise abilities based on data feedback.

Case 2: The Intelligent Writing Workshop builds a human-computer collaborative writing empowerment system by integrating natural language processing technology and creative writing pedagogy. The semantic analysis engine based on deep learning can analyze the logical chain of text, identify rhetorical weaknesses, and generate style optimization suggestions in real time, while the AI writing tutor supports multiple rounds of interactive outline generation, allowing participants to focus on the topic, develop arguments, and match materials through conversations with virtual editors. Intelligent material library automatically recommends cross-disciplinary cases, golden sentence templates and anti-common sense perspectives according to the writing goal to help break the stereotyped thinking. The multimodal feedback system generates a diagnostic report by synthesizing the dimensions of grammatical accuracy, point of view innovation, reader empathy, etc., and with the style migration function, the text can be converted into different languages such as academic, business, literature, and so on in a single click. The workshop also sets up AI-assisted collaborative writing sessions to cultivate the role cognition and consensus building ability in group creation through the conflict warning and consensus refining functions of the real-time co-editing platform, so that the writing training can evolve from unidimensional skill enhancement to the composite cultivation of cognitive flexibility and digital literacy.

Case 3: Intercultural project-based learning creates real or virtual global issue situations and guides learners to complete knowledge construction and competence advancement through multicultural teamwork. The project design focuses on cross-cultural topics such as sustainable development and cultural heritage preservation, and requires members to integrate local experiences and cross-cultural perspectives to develop solutions. In the process, they need to conduct cross-country field research with the help of virtual reality technology, break through language barriers by using AI translation tools, and realize decentralized collaboration through the blockchain platform, while the teacher, as a cultural broker, guides the students to reflect on cultural biases and decode non-verbal communication symbols, Teachers act as cultural brokers to guide students to reflect on cultural biases, decode non-verbal communication symbols, negotiate cultural value conflicts, and ultimately produce solutions reflecting both cultural sensitivity and innovative value. Through a multi-dimensional assessment system, we comprehensively examine the cultural intelligence, effectiveness of digital collaboration, and the feasibility of the solutions, so as to make the learning process become a symbiotic practice of cultural cognitive restructuring and global competency development.

7 CONCLUSION

This paper discusses in depth the application of intelligent language modeling in secondary school English online teaching, aiming to improve students' independent learning ability, language skills and overall learning effect by constructing self-regulation facilitation strategy and effect evaluation system. The article first analyzes the current situation and challenges of secondary school English online teaching, and points out the great potential of intelligent language models in providing personalized learning experiences. Subsequently, it elaborates on the application

scenarios and technological empowerment of intelligent language models in building immersive language environments, designing personalized learning paths, cultivating intelligent writing and critical thinking, and exploring project-based learning. In order to further optimize the teaching effect, this article proposes an intelligent enhancement framework for autonomously regulating facilitation strategies in secondary school English online teaching, which realizes the leap from passive response to active optimization of the teaching ability through the synergy of the perception layer, the decision-making layer and the execution layer. In addition, the article constructs an evaluation system of secondary school English online teaching effect based on the intelligent language model, including a process evaluation matrix and a multidimensional feedback mechanism, in order to comprehensively assess students' learning progress and teaching effect. The innovations of this article are mainly reflected in the generation of personalized learning paths, the realization of intelligent interaction and real-time feedback, the application of automated assessment and diagnosis, and the innovation of the intelligent enhancement framework and effect evaluation system for self-regulated facilitation strategies. These innovations not only promote the intelligent development of secondary school English online teaching, but also provide a useful reference for the digital transformation of the education field. Looking ahead, this paper proposes the directions of ethical and data security, teacher role transformation, mixed reality integration, learner diversity consideration, and continuous technology optimization and innovation, which provide guidance for the further application and development of the intelligent language model in secondary school English online teaching.

COMPETING INTERESTS

The authors have no relevant financial or non-financial interests to disclose.

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POLICY BARRIERS AND THEIR INFLUENCE ON THE GLOBAL EXPANSION OF EDUCATIONAL INSTITUTIONS

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Abstract: Policy barriers present major challenges to the development of educational services trade, especially amid rising global trade protectionism, which further restricts the overseas operations of educational institutions. This study examines the impact of such barriers on the international expansion of educational institutions, using educational trade data and the Services Trade Restrictiveness Index (STRI) across 55 countries from 2008 to 2017. Following the General Agreement on Trade in Services (GATS), we analyze effects across its four supply modes. Our results show that policy barriers under Mode 3 (commercial presence) strongly inhibit overseas expansion. Notably, the impact differs by income level: in high- and lower-middle-income countries, barriers under Mode 1 (cross-border supply) reduce Mode 3 trade, indicating complementarity between these modes; in contrast, for upper-middle-income countries, Mode 1 barriers encourage Mode 3 trade, revealing a substitutive relationship. These findings suggest that educational institutions adjust their market-entry strategies according to policy restrictiveness, either combining multiple modes or substituting one for another depending on context.
Keywords: Educational services trade; Policy barriers; Cross-border education; International branch campus; Online education

1 INTRODUCTION

With accelerating globalization and deeper integration of international labor markets, cross-border collaboration in education has become a key strategy for national competitiveness. Consequently, trade in educational services is gaining global importance. According to the General Agreement on Trade in Services (GATS), this trade occurs via four modes: (1) cross-border supply (Mode 1), including online education; (2) consumption abroad (Mode 2), where students study overseas—the dominant form; (3) commercial presence (Mode 3), involving foreign institutions establishing local campuses; and (4) movement of natural persons (Mode 4), where educators work abroad under institutional employment.

Mode 2 remains the largest, but Mode 3, driven by foreign direct investment through international branch campuses (IBCs), has grown rapidly [1]. The expansion of IBCs reflects a strategic shift toward physical presence abroad, facilitating local partnerships and overcoming market entry barriers. Since the early 20th century, elite universities from the U.S., Europe, and Australia have expanded into East and Southeast Asia and the Middle East, enhancing both institutional prestige and host countries' educational competitiveness while offering students accessible, cross-cultural opportunities.

However, rising trade protectionism has constrained IBC development. Education trade intersects uniquely with national sovereignty concerns, and only 58 GATS members have liberalized their education sectors [2]. Policy barriers like restrictive visa rules and investment limits increase costs and operational challenges for foreign institutions.

Most research on transnational education focuses on micro-level factors—operational models, management, risk [3]—and key determinants like campus origin, location, strategy, and regulatory engagement [4]. Yet, macro-level analysis of Mode 3 policy barriers and their impact on branch campus growth remains scarce, a critical gap amid rising anti-globalization and protectionism.

While Mode 3 barriers clearly limit foreign direct investment, their effects on other modes—especially the relationship between Modes 1 and 3—are unclear. Classical trade theory suggests substitution between trade and FDI [5], implying Modes 1 and 3 may substitute. However, empirical evidence shows sector-specific variation, with some services displaying complementarity and others substitution. Unlike Mode 2 (low barriers) or Mode 4 (often tied to Mode 3), the interaction between Modes 1 and 3 remains unresolved.

Understanding this interaction is crucial. A substitutive relationship would let institutions bypass restrictions by switching modes, undermining regulation; complementarity would amplify the negative impact of barriers across both modes. This distinction matters greatly for policymakers shaping education trade and for institutions planning internationalization in an era of rising protectionism. Addressing this question is key to improving regulatory frameworks and ensuring fair access to global education markets.

2 LITERATURE REVIEW

2.1 Policy Barriers under Mode 1 of Educational Services Trade

Mode 1, encompassing online education, correspondence courses, and educational software, has rapidly expanded with digital technology. Despite its ability to overcome geographic limits, online education is often seen as a supplement rather than a full substitute for face-to-face instruction [6-7].

However, several policy barriers constrain Mode 1 development. First, many countries impose explicit restrictions to protect domestic providers, limiting foreign market access. For example, China has yet to liberalize Mode 1 education under WTO commitments, though regional initiatives like the Shanghai Free Trade Zone show tentative openness [8]. Second, the lack of a unified international framework complicates cross-border accreditation and quality assurance, increasing compliance costs [9]. Third, technical and regulatory challenges—including internet firewalls, content filtering, and infrastructure disparities—limit global resource accessibility and program effectiveness [10]. Fourth, data governance regulations such as the EU's GDPR restrict cross-border data flows, raising compliance burdens [11-12]. Lastly, institutional resistance to digital learning slows policy innovation [13-14].

2.2 Policy Barriers under Mode 3 of Educational Services Trade

Mode 3 involves foreign commercial presence, primarily through branch campuses, which support goals like revenue diversification, brand building, and internationalization [15-17]. Yet, their growth is restricted by host-country FDI regulations concerning market access, ownership, location, and digital infrastructure use [18-19].

Diverse national regulations also challenge foreign campuses in faculty management, academic quality assurance, and compliance with financial and administrative rules [20]. For instance, India's regulatory inconsistencies and cultural frictions have hindered progress despite formal openness [21]. Political instability and economic volatility further disrupt operations via abrupt policy changes and financial uncertainty [22]. Institutions must also navigate local intellectual property and data protection laws, adding operational complexity [23].

2.3 Complementarity or Substitution between Modes 1 and 3

A key debate is whether Modes 1 and 3 complement or substitute each other. Some studies argue for complementarity, where FDI (Mode 3) reinforces cross-border services (Mode 1). Evidence from finance and education sectors supports this [24-27]. For example, Benz and Jaax find that Mode 3 restrictions reduce trade in Modes 1 and 4 [28], indicating complementarity.

Conversely, other research highlights substitution: tighter restrictions on one mode push trade to the other. Riker and Barbe et al. show that higher Mode 1 barriers lead providers to shift toward Mode 3 [29-30]. EU sector studies also confirm this substitution effect [31]. Thus, the Mode 1–3 relationship likely varies by sector, strategy, and regulatory context.

2.4 Research Gaps and Hypotheses

Current literature mainly focuses on institutional or sector-specific factors, lacking macro-level analysis of how policy barriers affect trade across modes, especially amid rising protectionism. It remains unclear whether restrictions in one mode impact others within educational services.

This study tests the following hypotheses:

H1: Policy barriers under Mode 3 inhibit educational service trade via Mode 3.

H2: Policy barriers under Modes 1 and 4 also negatively affect Mode 3 trade.

H3: There is a complementary relationship between Modes 1 and 3 in educational service trade.

2.5 Econometric Model Specification

To validate the impact of policy barriers on the development of educational institutions in overseas markets, an econometric model is constructed as follows:

$$IMP\_M3_{it} = \alpha + \beta STRI_{it} + Z'_{it}\gamma + \varphi_i + \varphi_t + \varepsilon_{it} \quad (1)$$

$$IMP\_M3_{it} = \alpha + \beta_1 STRI\_M1_{it} + \beta_2 STRI\_M3_{it} + Z'_{it}\gamma + \varphi_i + \varphi_t + \varepsilon_{it} \quad (2)$$

In this study, the total imports under Mode 3 of educational services of a country are used as the dependent variable, representing the flow of educational service trade formed by foreign educational institutions establishing branches in that country. The model constructs independent variables from the indices of policy barriers both overall and specific to different supply modes, and the empirical analysis is conducted using control variables and fixed effects. The explained variable IMP_M3_{it} represents the trade volume of educational services under Mode 3, with subscripts i and t denoting the country and year, respectively. The core explanatory variables $STRI$ represent the indices of service trade policy barriers; lower index values indicate fewer policy restrictions in a country's service sector and a higher degree of policy openness. The indices for restrictions under Mode 1 and Mode 3 are denoted $STRI\_M1_{it}$ and $STRI\_M3_{it}$ respectively. If the coefficient β is significantly negative, it indicates that policy barriers have a negative impact on the trade of educational services under Mode 3, suggesting that restrictive service trade policies affect the expansion of educational institutions in foreign markets. Z stands for control variables, including the size of the economy, economic growth prospects, total population, and social stability. Country and year fixed effects are denoted φ_i and φ_t

respectively; ε_{it} represents the random disturbance term. Additionally, to reduce heteroscedasticity, control variables are logarithmically transformed, except for dummy variables.

2.6 Core Indicator Measurement

Dependent Variable: Trade Volume of Educational Services (Mode 3). The core dependent variable in this study is the trade volume of educational services under Mode 3, which captures the extent of cross-border educational activities involving the commercial presence of foreign institutions. This variable is proxied by the import value of educational services under Mode 3 for a given country-year, reflecting the host country's receipt of educational services through foreign subsidiaries and campuses. Data are obtained from the WTO's Trade in Services by Mode of Supply (TiSMoS) database, covering the period from 2008 to 2017, which reports trade values disaggregated by all four modes of services trade.

Key Explanatory Variable: Policy Barrier Restrictiveness Index. The Policy Barrier Restrictiveness Index serves as the key explanatory variable, capturing the overall regulatory restrictiveness of a country's services trade environment. Data are derived from the Services Trade Restrictiveness Index (STRI) compiled by the WTO and OECD, which quantifies trade policy barriers for 23 service sectors across 75 countries. Each policy measure is scored on a scale from 0 (fully open) to 100 (completely restricted).

While the STRI does not report sector-specific scores for educational services, the overall level of restrictiveness is interpreted as a proxy for a country's general openness to service trade. The STRI provides disaggregated restrictiveness scores for Modes 1, 3, and 4, but excludes Mode 2, given that most countries impose minimal restrictions on consumption abroad. Due to data availability, STRI scores are used for 2008 and 2016, and the study period is accordingly divided into two intervals. The TiSMoS and STRI datasets are merged for 55 countries with high-quality data for analysis.

2.7 Control Variables

To isolate the effect of policy barriers, the model incorporates a set of control variables reflecting economic and sociodemographic characteristics that may influence educational service imports under Mode 3:

Economic Size (GDP): Measured as the natural logarithm of a country's Gross Domestic Product (in constant USD), this variable captures the scale of economic activity. A larger economic size typically correlates with higher demand for advanced educational services, including from foreign providers [32].

(2) Economic Growth Prospects (GDPgr): Represented by the annual GDP growth rate, this variable reflects a country's economic momentum. Stronger growth may boost household income expectations and investment in education, although in some contexts, improved domestic opportunities may reduce the incentive for seeking foreign educational services [32].

Population Size (Pop): This variable, expressed as the natural logarithm of total population, reflects the potential market size for educational services. All else being equal, a larger population suggests greater aggregate demand for education.

Social Stability (Pea): Measured by the Global Peace Index (compiled by The Economist Intelligence Unit), this composite indicator includes the prevalence of violence, internal conflict, and organized crime. Higher levels of peace and stability are conducive to attracting foreign educational institutions and promoting Mode 3 trade flows [33].

Data for GDP, GDP growth, and population are sourced from the World Bank World Development Indicators.

2.8 Descriptive Analysis

The time frame for this study spans from 2008 to 2017, during which data from various sources were harmonized, covering 55 countries with a total of 550 observations. Table 1 presents the descriptive statistics for the key variables.

Table 1 Descriptive Statistics of Main Variables

Variable	Variable description	Obs.	Mean	S.d.	Min	Max
$lnIMP\_M3_{it}$	Import value of education service in mode 3	550	1.979	3.352	-4.605	8.028
$lnSTRI_{it}$	Index of service trade barriers	550	3.931	0.158	3.512	4.403
$lnSTRI\_M1_{it}$	Trade barrier index in Mode 1	550	4.061	0.227	3.176	4.407
$lnSTRI\_M3_{it}$	Trade barrier index in Mode 3	550	3.883	0.182	3.245	4.458
$lnSTRI\_M4_{it}$	Trade barrier index in Mode 4	550	4.088	0.273	3.219	4.605
$lnGDP_{it}$	Gross Domestic Product	550	26.655	1.393	24.245	30.571
$GDPgr_{it}$	GDP growth rate	550	2.813	3.563	-15.136	24.370
$lnPop_{it}$	Total population	550	17.310	1.444	14.790	21.057
Pea_{it}	Peace Index	550	1.943	0.474	1.179	3.280

Note: The unit of IMP_m3_{it} is millions of dollars, the unit of Pop_{it} is 10,000, and the unit of $STRI_{it}$, $STRI\_M1_{it}$, $STRI\_M3_{it}$ $STRI\_M4_{it}$ and Pea_{it} is 1.

Figure 1 displays the distribution of the STRI across 55 countries. More than half of these countries have services sector STRI scores concentrated between 40-45 and 45-50, with 17 and 10 countries respectively, totaling 27 countries. This indicates that the majority of these countries have a moderate level of openness in their services sectors. Among these 55 countries, only Ecuador has an STRI score below 35, representing the highest degree of openness in its services sector, while Indonesia and the Philippines have the highest level of restrictions on their services sectors, exceeding 65 points.

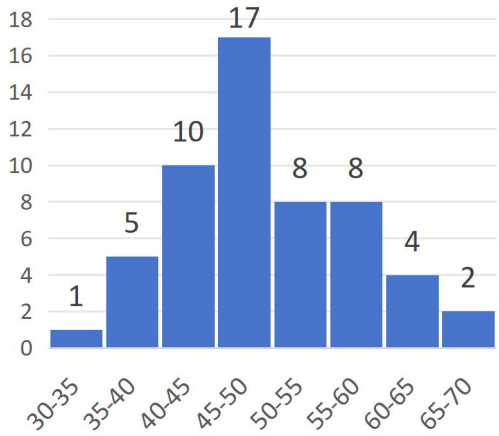

Figure 1 Distribution of the STRI Index

The World Bank classifies these countries into three groups based on their income levels: 28 high-income countries, 15 upper-middle-income countries, and 12 lower-middle-income countries. As shown in Figure 2, overall, there is a positive correlation between the level of income and the degree of openness in the services sector. Wealthier countries generally have a comparative advantage in many areas of service trade, thus exhibiting a more open attitude towards service trade. In contrast, lower-income countries, concerned about the impact of foreign enterprises on their domestic services industries, maintain a more cautious stance toward opening their service sectors. When broken down by the three different modes of service supply, Mode 3, which involves foreign direct investment in services, faces the fewest restrictions, indicating that most countries are relatively more receptive to foreign direct investment. In comparison, countries are more cautious regarding services trade involving digital delivery in Mode 1 and movement of persons in Mode 4.

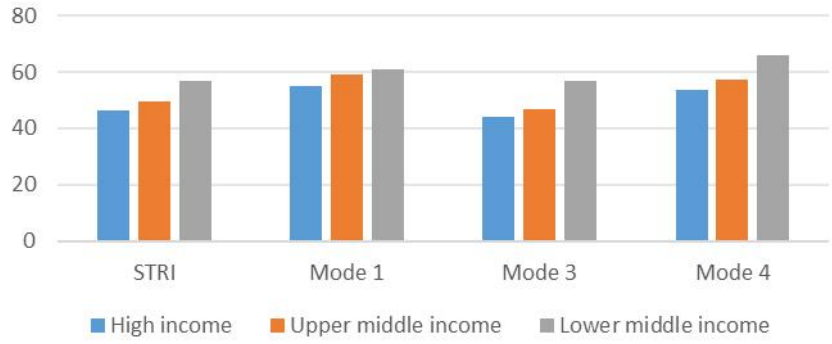

Figure 2 Comparison of STRI Indexes among Different Income Countries

3 EMPIRICAL RESULTS AND ANALYSIS

3.1 Benchmark Regression Analysis

This paper conducts an econometric analysis based on data from 2008 to 2017. Table 2 reports the baseline regression results regarding the impact of service trade barriers on the flow of educational services trade.

Table 2 Benchmark Regression Results

	lnIMP_M3				
Variables	(1)	(2)	(3)	(4)	(5)
lnSTRI	-2.1114***				
	(-5.8777)				
lnSTRI_M1		-1.0390***			-0.5796*
		(-3.7465)			(-1.7442)

lnSTRI_M3			-1.5500***		-1.1134**
			(-4.1495)		(-2.4796)
lnSTRI_M4				-0.5928***	
				(-4.1101)	
lnGDPpc	3.0623***	3.2701***	3.1740***	3.0639***	3.1914***
	(13.1206)	(13.9436)	(13.4646)	(12.7166)	(13.5545)
GDPgr	-0.0141**	-0.0134**	-0.0123*	-0.0096	-0.0138**
	(-2.2779)	(-2.1148)	(-1.9627)	(-1.5336)	(-2.1888)
lnpop	3.6339***	4.2095***	3.8566***	4.3496***	3.8714***
	(7.4925)	(8.8147)	(7.7881)	(9.2364)	(7.8331)
Pea	0.9725***	0.9358***	0.9934***	0.7677***	0.9923***
	(5.6386)	(5.3223)	(5.6203)	(4.3397)	(5.6255)
N	550	550	550	550	550
adj. R^2	0.509	0.489	0.492	0.492	0.494

Note: t statistics in parentheses * p < 0.1, ** p < 0.05, *** p < 0.01

Column (1) of Table 2 presents the baseline regression results. The coefficient of the core explanatory variable—the policy barrier restrictiveness index—is significantly negative at the 1% significance level, indicating that lower policy restrictiveness is associated with higher openness to educational services trade. This finding supports the notion that policy barriers in the service sector impede countries from receiving foreign educational services, particularly under Mode 3, which involves the commercial presence of foreign institutions.

To further explore the heterogeneity across different modes of delivery, Columns (2) through (4) of Table 2 report the effects of policy barriers under Modes 1 (cross-border supply), 3 (commercial presence), and 4 (presence of natural persons), respectively. All coefficients are significantly negative at the 1% level, suggesting that policy barriers across these three modes restrict the international operations of educational institutions. Among them, the restrictive effect under Mode 3 is the strongest, followed by Mode 1, while Mode 4 exhibits the weakest effect. These results indicate that while educational institutions are primarily affected by barriers related to commercial establishment (Mode 3), restrictions on remote teaching (Mode 1) and personnel mobility (Mode 4) also exert non-negligible inhibitory effects.

Column (5) introduces an interaction term between the Mode 1 and Mode 3 policy indices to examine their combined impact. The results indicate that barriers under both modes jointly inhibit the international engagement of educational institutions. This suggests that the relationship between these two modes is complementary rather than substitutive. In other words, institutions do not merely choose between delivering services via physical presence (Mode 3) or cross-border virtual means (Mode 1); instead, they tend to adopt multi-modal strategies to serve foreign markets effectively.

Collectively, these findings validate the core proposition of this study: Policy barriers under Mode 3 significantly reduce the cross-border activities of educational institutions; Barriers under Modes 1 and 4 also inhibit the flow of educational services delivered through commercial presence; There exists a complementary relationship between Modes 1 and 3, highlighting the integrated nature of international educational service provision.

3.2 Robustness Check : System GMM Estimation

The baseline regression employs a static panel model. To account for potential dynamic effects, a first-order lag of the dependent variable is introduced into the baseline regression model. The dynamic panel model is specified as follows:

$$IMP\_M3_{it} = \alpha_0 + \alpha_1 IMP\_M3_{i,t-1} + \beta STRI_{it} + Z'_{it}\gamma + \varphi_i + \varphi_t + \varepsilon_{it} \quad (3)$$

$$IMP\_M3_{it} = \alpha + \alpha_1 IMP\_M3_{i,t-1} + \beta_1 STRI\_M1_{it} + \beta_2 STRI\_M3_{it} + Z'_{it}\gamma + \varphi_i + \varphi_t + \varepsilon_{it} \quad (4)$$

The term $IMP\_M3_{i,t-1}$ represents the first-order lag of trade in educational services under Mode 3. To address the issue of endogeneity, we employ the Generalized Method of Moments (GMM) to estimate equations (12) and (13). GMM constructs equations based on moment conditions, without requiring assumptions about the distribution of variables or knowledge of the distribution of random disturbances, effectively solving endogeneity problems. We utilize the System GMM (SYS-GMM) model to examine the relationship between trade barriers and foreign investment in educational services. The estimation results are presented in Table 3.

To ensure the reliability of the System GMM results, we conduct the Arellano-Bond test for serial correlation and the Sargan test for instrument validity. The AR(2) test shows no evidence of second-order serial correlation (p > 0.1), and the Sargan test confirms the validity of the instruments (p > 0.1). These results indicate that the model satisfies key identification assumptions and that the GMM estimates are consistent.

The System GMM results confirm the baseline findings: overall service trade barriers, as well as barriers under Modes 1, 3, and 4, significantly hinder the establishment of overseas educational branches. Additionally, the complementary relationship between Mode 1 and Mode 3 is supported, reinforcing Hypotheses 1, 2, and 3.

Table 3 SYS-GMM Regression Results

	lnIMP_M3				
Variables	(1)	(2)	(3)	(4)	(5)

$L1.lnIMP\_M3$	0.8730***	0.8826***	0.7108 ***	0.4409***	0.7806***
	(134.79)	(42.87)	(60.15)	(23.08)	(76.89)
$lnSTRI$	-0.1444***				
	(-5.71)				
$lnSTRI\_M1$		-0.0656*			-0.4218**
		(-1.88)			(-2.86)
$lnSTRI\_M3$			-0.6541***		-0.1003**
			(-8.52)		(-2.64)
$lnSTRI\_M4$				-0.7735 ***	
				(-22.73)	
Controls	Yes	Yes	Yes	Yes	Yes
AR（1）	0.0052	0.0052	0.0052	0.0051	0.0052
AR（2）	0.1431	0.1713	0.1389	0.1324	0.1306
Sargan Test	1	1	1	1	0.8119
N	495	495	495	495	495

Note. t statistics in parentheses * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

3.3 Heterogeneity Analysis by Income Group

The World Bank classifies countries into four income groups: high, upper-middle, lower-middle, and low income. Based on data availability, this study includes 55 countries across three groups—28 high-income, 15 upper-middle-income, and 12 lower-middle-income countries—excluding low-income countries due to missing data. Grouped regression results reveal heterogeneous effects of policy barriers across income levels.

In high-income countries, all policy barrier coefficients are negative and significant, indicating that restrictions under Modes 1, 3, and 4 hinder foreign educational institutions' operations. Moreover, the interaction between Modes 1 and 3 also shows a negative effect, suggesting complementarity rather than substitution—institutions rely on multiple modes simultaneously rather than switching between them in response to rising barriers (Table 4).

Table 4 Regression Results for High-Income Group

	$lnIMP\_M3$				
Variables	(1)	(2)	(3)	(4)	(5)
$lnSTRI$	-2.7831***				
	(-6.3037)				
$lnSTRI\_M1$		-1.7457***			-1.2724***
		(-5.4934)			(-3.1222)
$lnSTRI\_M3$			-2.3603***		-1.1404*
			(-4.8256)		(-1.8410)
$lnSTRI\_M4$				-0.9586***	
				(-3.9575)	
Controls	Yes	Yes	Yes	Yes	Yes
N	280	280	280	280	280
adj. R^2	0.355	0.333	0.316	0.296	0.340

Note: t statistics in parentheses * p < 0.1, ** p < 0.05, *** p < 0.01

For upper-middle-income countries, the overall policy barrier coefficient is positive, driven by a significantly positive coefficient for Mode 1, while the coefficients for Modes 3 and 4 are negative. This indicates that while barriers to direct investment and personnel mobility hinder foreign educational institutions, restrictions on online education (Mode 1) are associated with increased foreign institutional activity. This paradox may reflect strategic adaptation, whereby foreign institutions respond to online delivery restrictions by establishing a physical presence via direct investment, thereby bypassing Mode 1 limitations (Table 5).

Table 5 Regression Results for Upper Middle Income Group

	lnIMP_M3				
Variables	(1)	(2)	(3)	(4)	(5)
$lnSTRI$	1.8619*				
	(1.7029)				

lnSTRI_M1		2.9966***			3.5326***
		(3.6879)			(3.1856)
lnSTRI_M3			-1.9679*		-0.9654
			(-1.9107)		(-0.7119)
lnSTRI_M4				-0.1491	
				(-0.5397)	
Controls	Yes	Yes	Yes	Yes	Yes
	(6.0992)	(5.8229)	(6.0315)	(5.9979)	(5.7286)
N	150	150	150	150	150
adj. R2	0.571	0.603	0.573	0.562	0.601

Note: t statistics in parentheses * p < 0.1, ** p < 0.05, *** p < 0.01

For lower-middle-income countries, the regression results mirror those of high-income countries, with overall and mode-specific policy barriers generally inhibiting foreign educational institutions. However, the effect of Mode 1 barriers is not statistically significant, though potentially negative, suggesting a possible complementary relationship with Mode 3. Notably, social stability plays a more prominent role in this group, with a stable environment significantly enhancing the attractiveness of these countries for foreign educational investment and operations (Table 6).

Table 6 Regression Results for Lower Middle Income Group

	lnIMP_M3				
Variables	(1)	(2)	(3)	(4)	(5)
lnSTRI	-3.1663***				
	(-4.3043)				
lnSTRI_M1		-0.8216			-0.5638
		(-1.1128)			(-0.8076)
lnSTRI_M3			-2.3126***		-2.2654***
			(-3.8843)		(-3.7804)
lnSTRI_M4				-0.6705**	
				(-2.3026)	
Controls	Yes	Yes	Yes	Yes	Yes
N	120	120	120	120	120
adj. R^2	0.806	0.774	0.800	0.782	0.800

Note: t statistics in parentheses * p < 0.1, ** p < 0.05, *** p < 0.01

Based on the group regression results by income level, Figure 3 is constructed with the horizontal axis representing the STRI under Mode 1 and the vertical axis representing Mode 3 educational service trade flows. For high-income and lower-middle-income countries, the regression lines slope downward, indicating that higher Mode 1 barriers suppress Mode 3 trade flows—suggesting a complementary relationship. In contrast, for upper-middle-income countries, the regression line slopes upward, implying that increased Mode 1 barriers correspond to greater Mode 3 trade flows, indicating a substitutive relationship between the two modes.

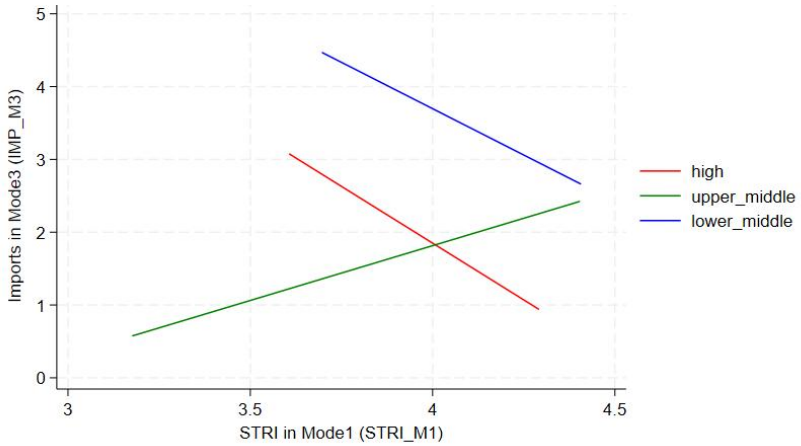

Figure 3 Regression coefficients for different income groups

4 CONCLUSION AND DISCUSSION

This study demonstrates that policy barriers under Mode 3 significantly hinder the establishment and operation of overseas educational campuses. Restrictions under Modes 1 and 4 also negatively affect Mode 3 trade, indicating that foreign institutions face constraints not only from direct investment regulations but also from limits on online communication and personnel mobility. Empirically, Modes 1 and 3 tend to be complementary, suggesting that online education supplements rather than substitutes traditional in-person education in international markets.

The impact of policy barriers varies by national income level. In high-income and lower-middle-income countries, barriers across all modes suppress Mode 3 activities, with stronger effects observed in high-income nations. Conversely, upper-middle-income countries display a distinct pattern: while Mode 3 barriers restrict foreign presence, Mode 1 barriers appear to encourage Mode 3 trade, implying a substitutive relationship where institutions shift between modes to navigate regulatory environments.

This heterogeneity reflects differing stages in global service trade development. High-income countries, with service sector advantages, generally promote liberalized trade. Developing countries maintain higher barriers to protect domestic industries. Upper-middle-income countries—such as Malaysia, Qatar, and the UAE—balance protectionism with efforts to attract quality foreign educational resources via direct investment, despite restricting online education. Institutions respond by leveraging Mode 3 to bypass online service barriers.

Policy implications are clear: reducing Mode 3 barriers can attract more foreign direct investment in education. In high-income and lower-middle-income countries, easing restrictions in one mode benefits others due to complementarity; for example, facilitating cross-border communication (Mode 1) supports overseas campus operations (Mode 3). In upper-middle-income countries, however, reducing Mode 1 barriers may boost online trade but reduce physical campus investment, reflecting a trade-off between modes.

For educational institutions, lowered investment barriers ease global expansion. In upper-middle-income countries, restrictions on online education incentivize establishing branch campuses. In contrast, in countries where Modes 1 and 3 complement each other, barriers in any mode amplify operational difficulties.

For students, increased trade protectionism risks reducing overseas campus availability and study options. In high- and lower-middle-income countries, barriers across modes limit both online and offline opportunities, making traditional study abroad (Mode 2) more dominant. In upper-middle-income countries, constraints in one mode may be offset by opportunities in another.

This study advances the literature on service trade modes by focusing on educational services but is limited by data availability up to 2017. Future research could update the analysis with recent data and extend to other service sectors to further validate these findings.

COMPETING INTERESTS

The authors have no relevant financial or non-financial interests to disclose.

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PROMOTING DEEP LEARNING: SMART CLASSROOM TEACHING STRATEGIES

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Abstract: In the new era, artificial intelligence (AI) technology is effectively empowering the development of higher vocational education. Within this context, smart classrooms, evolved from the iteration and upgrading of multimedia classrooms, have become an essential and routine teaching environment in higher vocational institutions. Utilizing smart classrooms to promote deep learning among vocational students has emerged as a crucial approach for enhancing talent development quality in the future. This paper constructs a new model for smart classroom teaching in higher vocational education, which effectively standardizes the implementation of smart classroom teaching activities. Furthermore, the implementation requirements of this model are elaborated. This model demonstrates significant potential in effectively promoting deep learning among students.
Keywords: Smart classroom; Deep learning; Teaching strategy

1 INTRODUCTION

Currently, a prevalent phenomenon in classrooms of higher vocational institutions is that teachers merely impart knowledge and skills to students through direct instruction, while students engage in rote learning and passive reception. In such classroom environments, student participation rates are significantly low, and their understanding of knowledge remains at the surface learning stage. Literature analysis of existing research indicates that the instructional design for pre-class and in-class phases has a crucial impact on the effectiveness of smart classrooms. However, research specifically integrating smart classrooms with deep learning is relatively scarce. Nevertheless, the consistent annual increase in related studies demonstrates that this field holds substantial research value and potential. Therefore, it becomes particularly important to study smart classroom teaching strategies that promote deep learning, as this addresses the key questions of how to enhance the teaching effectiveness of specialized courses in higher vocational institutions, guide students in achieving knowledge transfer [1], deepen their learning orientation to attain the outcomes associated with deep learning [2], and ultimately improve students' core competencies.

2 DEEP LEARNING-ORIENTED THREE-DIMENSIONAL TEACHING OBJECTIVES

American educational psychologist Benjamin Bloom categorized educational objectives into three domains: cognitive, affective, and psychomotor. The cognitive domain pertains to intellectual development, encompassing objectives related to imparting knowledge to students and training their cognitive abilities such as comprehension, reasoning, and judgment. The affective domain refers to objectives aimed at shaping students' dispositions, cultivating their sentiments, and fostering emotional attitudes. The psychomotor domain involves objectives concerning the development of students' technical skills [3].

Aligned with China's educational context, teaching objectives can be categorized into three dimensions: Knowledge and Skills, Process and Methods, and Emotional Attitudes and Values. Specifically:

The Knowledge and Skills dimension includes fundamental subject knowledge, as well as basic abilities such as acquiring, collecting, processing, and utilizing information.

The Process and Methods dimension emphasizes students' positive experience during the learning process and the mastery and internalization of scientific methods. It requires teachers to pay attention to students' individual differences and, based on their physical and mental development patterns, guide them to proactively explore learning methods.

The Emotional Attitudes and Values dimension entails teachers creating opportunities for students to participate in activities, allowing them to gradually perceive, experience, and internalize values over time [4].

Clearly defined teaching objectives serve as a beacon guiding teachers in conducting instructional activities and are also one of the standards for evaluating teaching effectiveness.

Currently, in most smart classroom teaching practices, teachers across the pre-class, in-class, and post-class phases tend to overemphasize the Knowledge and Skills objectives, focusing on cultivating students' basic abilities. The objectives related to Process and Methods and Emotional Attitudes and Values are frequently neglected, which is detrimental to the development of students' core competencies [5].

Therefore, within the smart classroom teaching model designed to promote deep learning, it is imperative to transform classrooms focused on singular objectives into those embracing multiple objectives. The three-dimensional objectives

must be integrated and implemented throughout the actual teaching process. This approach must not only promote students' continuous construction and refinement of their knowledge frameworks but also guide students to develop effective learning habits and explore suitable learning methods during the learning process. Furthermore, it must guide students in establishing sound value systems, maintaining an optimistic outlook on life, a pragmatic scientific attitude, and a tolerant attitude towards others.

3 PROMOTING DEEP LEARNING: CURRICULUM DESIGN AND IMPLEMENTATION

To better facilitate students' deep learning of knowledge, teachers should base their instruction on learning objectives, thoroughly analyze the course content, and provide students with more structured and hierarchical knowledge centered around the core concepts of the discipline. Through this knowledge, students will find it easier to construct an overall framework of the subject's knowledge. As their learning progresses and with effective guidance from teachers, the content within this framework will become increasingly rich, and their knowledge system will gradually become more comprehensive. This process will cultivate students' higher-order thinking skills. Moreover, a solid grasp of the core knowledge in the discipline will help students categorize and summarize the fragmented knowledge they acquire later, integrating it under existing relevant conceptual frameworks. This will promote the understanding, integration, and consolidation of both new and prior knowledge.

For specialized course instructors, making course knowledge more structured and hierarchical is not an easy task. It requires teachers to accurately grasp the key content of the course and be able to present the logical relationships between pieces of knowledge to students through certain methods. Existing research indicates that disciplinary mind maps play a significant role in helping students construct knowledge and achieve the internalization of disciplinary thinking. Compared to traditional mind maps, disciplinary mind maps place greater emphasis on structured thinking, focusing on the logical relationships between concepts. The process of creating disciplinary mind maps can also serve as a training ground for students' logical thinking skills [6]. Therefore, specialized course instructors can fully leverage disciplinary mind maps as a teaching and thinking tool during the instructional process. By using diagrammatic representations primarily based on hierarchical structures, they can achieve a structured representation of disciplinary teaching content. This also necessitates specialized course instructors accurately grasping the key knowledge of the course and clarifying the logical relationships between various pieces of knowledge. In the process of practical application, teachers should also pay attention to guiding students to understand the knowledge concepts and logical relationships within the disciplinary mind maps, thereby promoting students' deep understanding of the learned content.

4 TEACHING ACTIVITIES TO PROMOTE DEEP LEARNING

Under the goals of deep learning, smart classroom teaching activities not only include in-class group cooperative inquiry learning but also encompass students' independent learning activities before class and teachers' individualized guidance activities after class. Regarding the independent learning activities before class, it is both a learning method and a teaching approach, and is an essential component for students to achieve deep learning. Students in vocational colleges often have weaker self-directed learning abilities, making it even more necessary for teaching activities to stimulate and maintain their learning motivation. This requires teachers to have a very clear understanding of each student and guide them to take responsibility for their own learning [7]. Before class, teachers mainly use teaching platforms to monitor students' learning progress. If they rely solely on monitoring by the teacher to urge students to study before class, the effectiveness of students' independent learning will certainly not be good, and it may even lead to negative feelings towards the teacher and the subject. Only by transforming students' external learning motivation into internal motivation, allowing them to explore learning methods on their own, reflect on and regulate their own learning process, can their core competencies be effectively improved, and the achievement of the three-dimensional teaching objectives be promoted. This poses a challenge to teachers' teaching philosophy and teaching abilities.

The traditional teaching philosophy holds that teachers only need to impart the key knowledge for course exams to students, and then students can simply pass the exam standards by rote memorization in the days leading up to the exam, which might be the most convenient learning method for them[8]. This philosophy is deeply flawed. Although some specialized courses are highly theoretical, and students can pass the exams in a short time through last-minute rote memorization, thereby earning credits, during this process, students do not engage in much thinking or understanding of the actual content, remaining stuck in surface-level learning, and the effectiveness of specialized course education cannot be realized[9]. Therefore, specialized course teachers should, based on an understanding of their students, integrate students' interests into teaching activities before, during, and after class, while also setting highly contextualized questions to maintain students' long-term learning enthusiasm and stimulate their internal motivation for in-depth learning [10]. The teaching model for a smart classroom that promotes deep learning is shown in Figure 1 below.

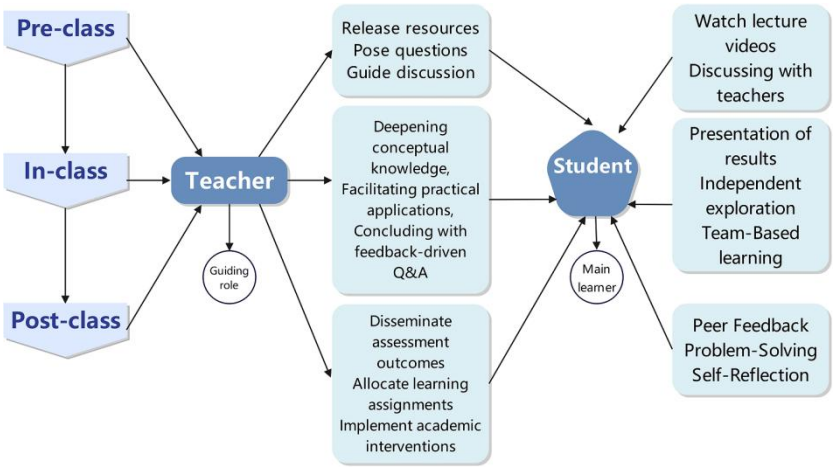

Figure 1 The Teaching Model for a Smart Classroom

5 DIVERSE TEACHING EVALUATION BASED ON DEEP LEARNING OBJECTIVES

Teaching evaluation is an important indicator for students to understand their own learning situation and for teachers to identify issues in their teaching. For students, it is only through teaching evaluation that they can recognize their specific performance during the learning process, understand their strengths and weaknesses, and thereby engage in more targeted learning and improvement. For teachers, teaching evaluation helps identify areas in their teaching that require optimization and gain a deeper understanding of each student's learning abilities and characteristics, which in turn provides scientific guidance for future teaching work. Therefore, the evaluation system for smart classrooms based on deep learning objectives has two requirements: first, clear evaluation criteria must be established so that students understand the standards they should meet in their learning, thereby striving harder to reach the goals and promoting the occurrence of deep learning; second, appropriate evaluation strategies must be selected to make scientific and objective judgments about the effectiveness of students' deep learning, enhance their sense of self-efficacy, and continuously improve their level of learning engagement. This study adopts a combination of summative and formative evaluation to assess students' overall performance, paying attention to both the students' performance during the learning process and not neglecting their learning outcomes. This approach provides a more scientific evaluation of the effectiveness of students' deep learning. Summative evaluation is primarily based on the completion of students' post-class extension tasks and their final assessments, while formative evaluation is mainly based on self-assessment, peer assessment, and teacher feedback during the pre-class, in-class, and post-class learning processes. Diverse evaluation subjects allow students to receive feedback on their learning from different perspectives, enabling them to view their learning process more objectively and reasonably, and consequently make adjustments to their learning methods and goals.

6 CONCLUSIONS

Constructing a smart classroom teaching model for higher vocational education that promotes deep learning is beneficial for students to achieve it. Through the statistical analysis of questionnaire data and the analysis of interview results, it can be observed that students who implement the smart classroom model exhibit greater learning engagement during the learning process, can better master the core knowledge of professional courses, and are able to apply critical thinking to analyze problems in group cooperative learning. They can also communicate effectively with other group members and collaborate to solve problems together. Their independent learning abilities have also improved; they not only learn the knowledge conveyed by teachers but, more importantly, have learned how to learn, enabling them to maintain their learning enthusiasm for extended periods. Therefore, compared to traditional classrooms, smart classroom teaching is more conducive to achieving students' deep learning and promoting the development of their comprehensive abilities.

COMPETING INTERESTS

The authors have no relevant financial or non-financial interests to disclose.

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TALENT DEVELOPMENT IN CHINA-ASEAN POLICE EDUCATION COLLABORATION

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Abstract: This paper examines the challenges associated with talent cultivation within the context of China-ASEAN police education cooperation. Through a comprehensive analysis of the existing issues in the direction of talent development in cooperative education—such as ambiguous goal positioning, inadequacies in the curriculum framework, insufficient practical components, and a scarcity of international faculty—the study draws upon the successes of Sino-foreign cooperative education in the engineering sector. It integrates the unique characteristics of crime dynamics in the ASEAN region with the requisite police skills and professional attributes to propose optimization strategies. These strategies include the precise delineation of training objectives, the restructuring of the curriculum framework, the enhancement of the practical teaching system, and the establishment of an international faculty team. The overarching goal is to elevate the quality of cooperative education in China-ASEAN police training, to cultivate high-caliber law enforcement professionals who meet the actual demands of regional policing, to foster deeper collaboration in law enforcement between the involved parties, and to contribute to the maintenance of regional security and stability.
Keywords: China - ASEAN; Police education cooperation; Talent cultivation; Collaborative education; Regional policing

1 INTRODUCTION

Transnational criminal activities have exhibited new characteristics, including heightened organization, sophistication, and concealment, thereby presenting significant threats to regional security and stability [1]. The geographical proximity and cultural ties between China and the Association of Southeast Asian Nations (ASEAN) region have facilitated increasingly frequent economic exchanges and personnel interactions [2]. Concurrently, issues related to transnational crime have become more pronounced, encompassing areas such as transnational drug trafficking, cybercrime, and human trafficking. In light of these challenges, it is imperative for China and ASEAN to enhance cooperation in police vocational education to develop high-quality law enforcement personnel [3]. This collaborative effort is essential for both parties to effectively address the challenges posed by transnational crime and to maintain regional security.

The collaboration in police education between China and the Association of Southeast Asian Nations (ASEAN) has experienced significant evolution over the past two decades, transitioning from a model of unilateral assistance to a framework of multilateral cooperation. The "China-ASEAN Law Enforcement Training Course" (CALET) project, initiated in 2004, initially concentrated on providing training in criminal investigation technologies to countries such as Cambodia and Laos, thereby establishing a foundation for capacity-building cooperation [4]. By 2016, the inaugural Police College Presidents Forum introduced the concept of "promoting the establishment of a China-ASEAN Law Enforcement Academy," marking a substantial advancement in cooperation by shifting the focus from skills training to degree-level education [5]. The subsequent forum in 2017 established the guiding principle of "joint consultation, joint construction, and shared benefits," which facilitated the development of a three-tier cooperation framework. This framework encompasses short-term training addressing 14 specialized topics, including drug control and counter-terrorism, resulting in the training of 264 law enforcement personnel from 26 countries; degree education offering an all-English master's program in law enforcement, aimed at enrolling key law enforcement officials from ASEAN nations; and platform development that utilizes the college presidents' forum to coordinate course recognition and faculty exchanges. This evolution signifies a profound transformation in the rationale for cooperation, transitioning from a China-centric capacity output model to one characterized by multilateral collaborative innovation, and from a focus on traditional security issues to a comprehensive approach to the governance of non-traditional security challenges.

The expansion of the "Belt and Road" initiative has generated new developmental opportunities for collaboration in police vocational education between China and the ASEAN [6]. By enhancing cooperation in the field of police education, it is feasible to develop a substantial number of high-quality law enforcement personnel who possess a thorough understanding of the legal systems, law enforcement processes, and cultural contexts pertinent to both parties [7]. This advancement is anticipated to significantly deepen law enforcement collaboration between China and the member states of ASEAN. However, existing challenges related to the direction of talent cultivation within cooperative educational practices considerably impede the effectiveness of such initiatives and the quality of training for law enforcement personnel. Therefore, conducting comprehensive research on the issues surrounding talent cultivation in the context of China-ASEAN police education cooperation, as well as exploring practical optimization strategies, holds considerable theoretical and practical significance.

2 ANALYSIS OF CURRENT ISSUES

2.1 Ambiguity in the Positioning of Talent Targets

A significant challenge in the ongoing collaboration between China and the Association of Southeast Asian Nations (ASEAN) in the realm of police vocational education is the inadequate precision and depth in comprehending the regional law enforcement requirements. This deficiency has resulted in a notable disconnect between the objectives of talent training and the actual demands of the field. The underlying cause of this issue is the absence of comprehensive, detailed, and in-depth research regarding the current law enforcement conditions in both China and ASEAN member states when establishing talent training goals. Furthermore, there has been a lack of systematic organization and analysis of the specific needs across various domains, including border management, transnational crime prevention, and cybersecurity maintenance.

In the context of combating transnational crime, the phenomenon has become increasingly diverse and complex due to the intensification of economic globalization. This complexity encompasses various forms of transnational crime, including drug trafficking, human trafficking, and telecommunications fraud. Countries adopt distinct strategies and methodologies to address these issues, influenced by variations in legal systems, law enforcement environments, and cultural contexts. However, current objectives for talent training often inadequately account for these differences, lacking the necessary specificity and personalization. Furthermore, there is a notable deficiency in the understanding of the evolving trends in regional law enforcement cooperation. The "Belt and Road" initiative has facilitated deeper collaboration between China and ASEAN countries, leading to the emergence of new areas and projects that continuously reshape the demand for law enforcement personnel. If these changes are not monitored and comprehended in a timely manner, it becomes challenging to establish talent training objectives that align with contemporary needs. This lack of clarity in target positioning results in law enforcement personnel being inadequately prepared to meet the actual demands of their roles, particularly in terms of knowledge structure and capabilities. Consequently, they may feel overwhelmed when confronted with complex and dynamic law enforcement tasks, hindering their ability to perform effectively. This situation significantly undermines the quality and efficacy of vocational education cooperation in law enforcement between China and ASEAN countries.

2.2 Deficiencies in the Curriculum System

Currently, the curriculum design in the cooperative training process does not adequately consider the characteristics of the ASEAN region and the emerging trends in international law enforcement development. This oversight represents a significant issue within the curriculum framework of China-ASEAN police vocational education cooperation. In terms of course content selection, there is limited coverage of the unique legal systems, cultural traditions, social customs, and law enforcement models of ASEAN countries. As a result, students often possess an insufficient and incomplete understanding of the ASEAN region. For instance, the legal systems of ASEAN countries incorporate various elements, including civil law, common law, and local traditional legal customs, which contribute to their diversity. There are notable differences in specific legal provisions, judicial procedures, and law enforcement methods among these countries. However, the existing curriculum may only offer a superficial introduction to general legal knowledge without thoroughly analyzing the distinctive features of the legal systems in ASEAN countries. This lack of depth makes it challenging for students to fully comprehend the legal knowledge necessary for effective law enforcement work in the ASEAN region. Reason: The revised text improves clarity, enhances vocabulary, and corrects grammatical errors while maintaining the original meaning.

Moreover, with the rapid advancement of technology and the continuous evolution of the international landscape, the field of international law enforcement is also undergoing significant development and transformation. This includes the widespread application of big data and artificial intelligence in law enforcement operations, as well as the emergence of new criminal issues such as cybersecurity and terrorism. However, the curriculum system has not kept pace with these changes, lacking the integration of cutting-edge knowledge and technology relevant to international law enforcement. Emerging technologies and concepts, such as crime prediction analysis and intelligent security systems, are insufficiently represented in the curriculum, leading to a disconnect between the knowledge students acquire and the actual demands of law enforcement work. Furthermore, there is a notable absence of specialized courses focused on transnational law enforcement cooperation, including topics such as collaborative transnational crime investigations and international law enforcement negotiations. The lack of these courses means that students do not possess the necessary knowledge and skills to effectively participate in transnational law enforcement efforts.

2.3 Weaknesses in Practical Components

The shortcomings of practical teaching components represent a pressing issue that must be addressed in the cooperation between China and ASEAN regarding police vocational education. The number of practical teaching bases is inadequate, and their quality is inconsistent, which hampers the ability to meet students' practical training needs. Notably, there is a significant shortage of overseas practical teaching bases that are aligned with the China-ASEAN police vocational education collaboration, leading to a lack of opportunities for students to engage in practical training within authentic ASEAN law enforcement environments.

In the current practical teaching facilities, some equipment is outdated and unable to effectively simulate the complex and evolving scenarios encountered in modern law enforcement. In practical training involving simulated crime scene investigations, the overly simplistic scenarios fail to accurately represent the intricacies of real-life situations, hindering students' ability to receive adequate training. Furthermore, the collaboration between practical teaching facilities and educational institutions is insufficient, lacking effective communication and coordination mechanisms. The facilities have not fully engaged in the planning and guidance of the school's practical training, resulting in a disconnect between the practical teaching content and the school's educational objectives and requirements. Students have limited opportunities for hands-on experience during their studies, with practical content often restricted to basic foundational tasks, such as document organization and community patrols, which do not adequately prepare them for core law enforcement duties. In the context of combating transnational crime, students encounter difficulties in participating in

critical aspects such as case investigations, inquiries, and collaboration with law enforcement agencies from other countries, which impedes their ability to significantly enhance their practical skills.
Due to the inadequate integration of theory and practice, students often take a considerable amount of time to adjust to real-world law enforcement work after graduation. When confronted with complex issues, their lack of practical experience and problem-solving skills hinders their ability to perform tasks efficiently and effectively, significantly affecting the overall quality and efficiency of law enforcement operations.

2.4 Shortage of Internationally Diverse Faculty

In terms of faculty, the limited level of internationalization significantly restricts the development of cooperation in police vocational education between China and ASEAN. Most educators lack experience in studying, working, or engaging in exchanges abroad, resulting in a limited understanding of the latest advancements, innovative concepts, and technologies in international law enforcement. Consequently, they struggle to impart cutting-edge knowledge and skills to students during instruction. When discussing cases of international law enforcement cooperation, teachers often rely solely on theoretical knowledge from textbooks due to their lack of practical experience, which hinders their ability to vividly and concretely convey the details and key aspects of practical operations to students.
Additionally, the number of teachers proficient in using foreign languages for professional instruction is limited, which hinders the ability to meet the demands of bilingual education. In certain specialized courses, language barriers impede students' comprehension of the material presented by instructors, adversely affecting learning outcomes. The shortage of teachers with experience in transnational law enforcement results in a lack of authenticity and vividness in the explanations of transnational law enforcement practices. Consequently, educators are unable to integrate their personal experiences and real-life cases from transnational law enforcement into their teaching, making it challenging for students to develop a deep understanding of the complexities and challenges associated with this field. Furthermore, the low level of internationalization among the faculty complicates efforts to attract and recruit distinguished law enforcement experts and scholars from ASEAN countries for teaching and exchange programs, thereby further constraining the international development of cooperative education.

3 CURRENT ACHIEVEMENTS WITHIN COOPERATIVE EDUCATION

The existing cooperative education experience has significant implications for the collaboration between China and ASEAN in police vocational education. In terms of target positioning, it should closely align with the actual needs of regional law enforcement cooperation between China and ASEAN. This involves clearly defining the goal of cultivating high-quality law enforcement professionals who possess an international perspective, familiarity with the legal systems and law enforcement models of both parties, and the ability to effectively respond to transnational crime.
In terms of curriculum design, it is essential to draw on international course design experiences while incorporating the unique legal frameworks, cultures, and law enforcement systems of ASEAN countries. Courses such as the application of laws in transnational crime, the interplay of culture and society in the ASEAN region, and case analyses of international law enforcement cooperation can be offered to broaden students' international perspectives and deepen their understanding of the ASEAN context. Simultaneously, it is important to pay attention to cutting-edge developments in international law enforcement, ensuring that course content is regularly updated to include the application of emerging technologies, such as big data and artificial intelligence, in law enforcement practices. In terms of practical teaching, strengthening cooperation with police forces from ASEAN countries and relevant international organizations is crucial for establishing stable overseas practical teaching bases. More opportunities should be provided for students to engage in transnational law enforcement cooperation practices, such as joint investigations of transnational crimes and international law enforcement exchange activities. Through these practical experiences, students can develop their skills in real international law enforcement environments, enhancing their overall competencies and laying a solid foundation for future involvement in transnational law enforcement work. Reason: The revisions improve clarity, enhance vocabulary, and ensure grammatical accuracy while maintaining the original meaning of the text.

4 OPTIMIZING COLLABORATIVE EDUCATION STRATEGIES

4.1 Precise Positioning of Training Objectives

Conducting comprehensive research on police work in China and ASEAN countries is essential for accurately defining talent training objectives. It is important to organize professional teams to explore frontline units, such as border management departments, criminal investigation agencies, and cybersecurity divisions across various countries, in order to understand the practical challenges and needs they encounter in their daily operations. Engage in discussions with senior management and frontline law enforcement personnel from different nations to gather their insights and recommendations regarding police talent training. By conducting an in-depth analysis of the research data, we can accurately identify the specific requirements of regional police practices, including the need for effective cross-border personnel and goods supervision in border management, as well as the demand for innovative crime investigation technologies and methodologies to combat transnational crime.
Integrating the dynamic trends in regional police cooperation is essential for ensuring that talent training objectives are forward-looking. It is important to pay attention to the new dynamics in cooperation between China and ASEAN countries in areas such as trade, culture, and energy during the promotion of the "Belt and Road" initiative, as well as the resulting changes in police demand. With the rapid growth of cross-border e-commerce, the need for police work related to online transaction supervision and the prevention of online fraud is increasing [8]. Talent training objectives should be adjusted promptly to adapt to these changes. The goal should be to cultivate versatile professionals with an

international perspective who are well-versed in ASEAN police work. This requires them to possess not only solid professional knowledge and skills in policing but also a deep understanding of the political, economic, cultural, and social aspects of ASEAN countries, enabling them to respond flexibly to various complex situations in transnational police cooperation.

4.2 Restructuring the Curriculum System

Developing targeted and distinctive courses is a crucial aspect of restructuring the curriculum system. Offer international policing courses that systematically introduce the theories, principles, mechanisms, and practical cases of international police cooperation, enabling students to comprehend the operational models and developmental trends of international police collaboration. Establish courses on ASEAN legal culture to conduct an in-depth analysis of the legal systems, cultural traditions, and practical applications of law in social life across ASEAN countries, equipping students with the legal knowledge necessary for police work in the region. Introduce courses on responding to cross-border crime, focusing on prevalent types of transnational crimes such as drug smuggling, human trafficking, and telecom fraud, while teaching specialized investigation, combat, and prevention techniques.

Emphasize the importance of updating and optimizing course content to ensure its relevance and practicality. Establish a systematic approach for regularly updating course materials by collecting the latest research findings, practical case studies, and changes in policies and regulations within the field of international policing. Integrate this information into course instruction in a timely manner. Focus on the application of emerging technologies, such as big data, artificial intelligence, and blockchain, in police work. Introduce relevant courses or enhance existing ones to equip students with the skills necessary to utilize new technologies in addressing policing challenges. Strengthen the organic integration and connection between different courses to break down disciplinary barriers, thereby avoiding redundancy and disconnection in course content. Incorporate ASEAN legal knowledge into criminal investigation courses, enabling students to develop investigative skills while understanding how to operate within the legal framework.

4.3 Strengthening the Practical Teaching System

Establishing stable and high-quality transnational practical bases is essential for enhancing the practical teaching system. It is important to actively engage in communication and negotiations with police forces, law enforcement agencies, and relevant international organizations in ASEAN countries to sign cooperation agreements and establish long-term, stable partnerships. When selecting practical bases, it is crucial to thoroughly consider the regional crime characteristics, the nature of police work, and the level of cooperation with Chinese law enforcement. A practical base should be established in Thailand, focusing on practical training in combating transnational drug crime, while another base should be set up in Malaysia, concentrating on responses to cybercrime and financial crime.

Conducting various joint law enforcement drills is an effective method for enhancing students' practical skills. Collaborating with police forces from ASEAN countries to plan and organize these drills can simulate real transnational crime scenarios, such as cross-border drug trafficking and human trafficking. Students should be assigned different roles during the drills, allowing them to engage in various stages of investigation, arrest, and interrogation. This participation will help them develop teamwork, emergency response, and transnational law enforcement collaboration skills. Through these exercises, students can gain a deeper understanding of the law enforcement processes and operational methods employed by police in different countries, thereby improving their practical capabilities in transnational police cooperation.

Strengthen the guidance and assessment of practical teaching to ensure the quality and effectiveness of practical education. Select instructors with extensive practical experience and professional expertise to lead practical teaching sessions, while monitoring students' practical processes and providing timely guidance and support. Establish a comprehensive and systematic practical teaching assessment framework that evaluates students from multiple dimensions, including practical performance, task completion, teamwork skills, and innovative thinking. This approach will enable a thorough and objective assessment of students' practical abilities and overall quality. Based on the assessment results, promptly adjust and refine practical teaching content and methods to continuously enhance the quality of practical education.

4.4 Building an International Faculty Team

Introducing foreign experts with extensive international policing experience is a crucial step toward enhancing the internationalization of the faculty team. It is essential to develop preferential policies that attract distinguished police experts, scholars, and frontline law enforcement personnel from ASEAN countries to teach or engage in academic exchange activities at the institution. Providing foreign experts with a conducive working environment and favorable living conditions—including comfortable accommodation, convenient transportation arrangements, and competitive salary packages—is vital. Additionally, we should encourage foreign experts to participate in course design, teaching reform, and research projects, integrating their practical experience and international perspectives into both teaching and research endeavors.

Sending teachers to police academies and law enforcement agencies in ASEAN countries for further study is an effective strategy for cultivating a locally internationalized faculty. Regularly selecting outstanding educators to participate in overseas training programs enables them to acquire in-depth knowledge of the policing education systems, teaching methodologies, and practical experiences of ASEAN nations. During their studies, teachers can engage in local police teaching and research activities, collaborating and exchanging ideas with local experts and scholars. This experience broadens their international perspectives and enhances their professional competence and teaching effectiveness. Upon returning to China, teachers should share the knowledge and experiences they have gained with their colleagues, thereby promoting the international development of the entire teaching team.

Strengthen international exchanges and cooperation among educators to promote knowledge sharing and the exchange of experiences. Encourage teachers to participate in international policing academic conferences, seminars, and other exchange activities, showcasing the achievements and experiences of Chinese policing education on the global stage while learning from and incorporating advanced concepts and technologies from other countries. Support teachers in conducting collaborative research projects with peers from ASEAN countries to jointly address challenges in the field of transnational policing, thereby enhancing their international influence and academic standing. By establishing international exchange and cooperation platforms, such as the International Police Education Alliance, provide educators with increased opportunities for collaboration and exchange, thereby promoting the internationalization of the faculty team.

5 CONCLUSION

This paper presents a systematic investigation into the cultivation of talent within the framework of China-ASEAN police education cooperation. It thoroughly examines the challenges associated with talent development in cooperative educational initiatives. The study leverages relevant achievements and aligns them with the specific needs of regional policing to propose a series of optimization strategies. By precisely defining training objectives, restructuring the curriculum, enhancing the practical teaching framework, and establishing an international faculty team, the aim is to elevate the quality of cooperative police education between China and ASEAN. This initiative seeks to produce a greater number of high-quality law enforcement professionals who are equipped to meet the actual demands of regional policing. Such advancements are anticipated to provide robust support for enhanced law enforcement collaboration between the two parties and hold significant implications for maintaining security and stability in the China-ASEAN region. Nonetheless, it is important to recognize that talent cultivation is a long-term and intricate process. Future endeavors must remain focused on achieving practical outcomes, necessitating ongoing adjustments and improvements to training strategies in response to actual conditions, thereby ensuring adaptability to the dynamic international policing landscape and the evolving needs of regional law enforcement.

COMPETING INTERESTS

The authors have no relevant financial or non-financial interests to disclose.

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