



Evaluation of communication competence among Chinese pre-service teachers: A model construction based on influencing factors



Jie Ma¹



Worasorn Netthip^a



Chatupol

Yongsorn^{s+}

^{1,2,a}Faculty of Education, Srinakharinwirot University, 114 Sukhumvit 23, Watthana District, Bangkok 10110, Thailand.

¹Email: jie.ma@g.swu.ac.th

²Email: worasorn@g.swu.ac.th

^sEmail: chatupol@g.swu.ac.th



(+ Corresponding author)

ABSTRACT

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This study investigates the development of communication competence among Chinese pre-service teachers by constructing an evaluation model grounded in influencing factors. A total of 600 undergraduate students from universities in Chongqing participated in the study. Data analysis involved exploratory and confirmatory factor analyses, path analysis, correlation analysis, ANOVA, and t-tests. The results revealed three significant predictors: curriculum system, student activities, and interpersonal relationships, each demonstrating a positive impact on communication competence. A structural model was developed that integrates these influencing factors with four core competence elements: information understanding, expression regulation, emotional resonance, and conflict resolution, offering a comprehensive and quantifiable assessment framework. Additionally, the study observed a progressive improvement in communication competence across grade levels, while gender and urban-rural differences diminished over time. These findings underscore the role of higher education in promoting equitable skill development. The proposed model contributes theoretically by expanding current research on communication competence and offers practical value for evaluating and enhancing teacher education programs. This study introduces an evaluation model that integrates institutional factors and core communication competencies, providing a quantifiable framework for assessing pre-service teachers' communication skills. It contributes to higher education research by supporting policy design, instructional improvement, and equitable talent development in teacher education within the Chinese context.

Contribution/Originality: This research is novel in the sense that it develops a validated and quantifiable assessment paradigm that integrates institutional directing variables with fundamental communication proficiency factors. It transcends self-report measures by correlating curriculum, activities, and relationships within a unified framework focused on pre-service teacher education.

1. INTRODUCTION

In 2017, China implemented the Accreditation Standards for Teacher Education Programs in Regular Higher Education Institutions, issued by the (Ministry of Education of the People's Republic of China, 2017). These standards outlined assessment criteria for "communication competence" for majors in preschool, primary, and secondary education. In 2018, the Ministry of Education issued the National Standards for Teaching Quality in Undergraduate Majors (Wu, 2018), covering 92 disciplinary categories and 587 majors across 56,000 programs. These standards

include objectives such as "sound interpersonal communication and social interaction skills," reflecting an emphasis on communication competence for pre-service teachers.

China's basic education sector has set clear expectations for cultivating communication skills. The Moral Education Curriculum Standards for Compulsory Education (2011 Edition) (Ministry of Education of the People's Republic of China, 2011) state that students should "consider others' perspectives, develop empathy, show respect, offer help, and treat people kindly" in interactions. Similarly, the Chinese Language Curriculum Standards for Compulsory Education (2011 Edition) (Ministry of Education of the People's Republic of China, 2011) emphasizes developing students' "basic oral communication skills, including listening, expression, interaction, and the ability to engage in polite interpersonal and social communication."

Scholars have emphasized the importance of communication competence. Kang et al. (2020) from Beijing Normal University identified it as a core capability for 21st-century talent, comprising empathy, active listening, and effective expression. Matviyevskaya, Tavstukha, Galustyan, Ignatov, and Miroshnikova (2019) found a correlation between communication competence and academic achievement. Wagner (2010) linked it to career success, while Adler and Proctor II (2015) and Xu, Yang, MacLeod, and Zhu (2019) demonstrated that communication skills contribute to positive interpersonal relationships.

According to the 2024 China Undergraduate Employment Report by MyCOS Institute, communication competence is among the top three skills in 80 of 94 major occupations in China, or 85%. The Future of Jobs Report 2025 by the World Economic Forum ranks "empathy and active listening" key communication elements as the seventh most important future employment skill (World Economic Forum, 2025).

The role of communication competence in personal development and society is increasingly important. For pre-service teachers, strong communication competence influences academic performance, professional development, career success, and social integration (Anderson, McClintock, Himawan, Song, & Patterson, 2016; McEwan & Guerrero, 2010; Schöttke, Flückiger, Goldberg, Eversmann, & Lange, 2017). It impacts teaching effectiveness, organizational management, and home-school collaboration in their future practice. Thus, effectively evaluating pre-service teachers' communication competence is essential for assessing teacher training outcomes in higher education.

During teacher education accreditation, institutions must submit evidence showing how they develop pre-service teachers' communication skills. Current research views communication competence primarily as a psychological trait or linguistic skill, studied mainly in medicine or psychology. Most assessments use subjective self-reports and lack quantifiable indicators for higher education training. Digital evaluation tools that include institutional involvement in competency development remain scarce.

Based on Kirkpatrick's Four-Level Evaluation Model (Kirkpatrick & Kirkpatrick, 2006), this study combines influencing factors with communication competence elements to create an assessment model. The study proposes a structural evaluation model that integrates "influencing factors + competence elements," featuring defined components and quantifiable metrics. It combines institutional training assessments and pre-service teachers' self-evaluations for measuring communication competence.

The proposed model fills a critical gap in Chinese higher education talent development frameworks by providing a robust tool for evaluating communication competence. It expands communication competence research while offering practical guidance for institutions seeking to assess and enhance this skill among future educators.

This study aims to: (1) identify the key influencing factors that affect communication competence among Chinese pre-service teachers; (2) construct a structural evaluation model that combines these factors with core communication competence elements; and (3) assess the applicability and validity of the model using empirical data from teacher education institutions.

2. LITERATURE REVIEW

2.1. *The Conceptual Evolution of Communication Competence*

The Chinese term "*Goutong*" first appeared in Zuo Zhuan, meaning waterway connection and later information transmission. The English word "communication" derives from Latin *communis*, meaning "to share." Communication studies originated in ancient Greece with rhetoric, later encompassing verbal and non-verbal behaviors.

Hynes (2012) introduced communication competence as the ability to use language appropriately in context knowing what, when, where, how, and with whom to communicate. Four major theoretical perspectives emerged from subsequent research.

1. Trait Theory: Communication competence is a stable personality trait. Dao and Thu (2020) emphasized that individuals select appropriate behaviors to achieve communication goals.
2. Situational Theory: Communication competence varies by context. Gowtham, Sanjay, Shandilya, and Sountharajan (2021) found that strategies effective in one setting may be ineffective in another.
3. Process Theory: Zlatić, Bjekić, Marinković, and Bojović (2014) advocated a process-oriented approach, considering contextual shifts and cultural factors for mutual communication satisfaction.
4. Performance-Based Theory: Kang et al. (2020) proposed a framework defining communication competence through components like knowledge, skills, and attitudes.

2.2. *Components of Communication Competence*

Scholars have developed structural models of communication competence with two to seven components:

1. Two-Factor Models: Jensen and Trenholm (1992) divided communication competence into surface-level behaviors and deep-level knowledge, identifying five sub-skills: comprehension, role enactment, self-awareness, goal orientation, and information management. The Partnership for 21st Century Skills defined it through understanding and expression, including goal clarity, listening, reading, organization, and audience awareness.
2. Three-Factor Models: Zhang (2003) proposed a triadic structure of communication skills, cognition, and disposition, incorporating contextual variables for assessment validity. Du, Gao, and Ba (2011) refined these items. Kang et al. (2020) conceptualized communication competence as empathy, listening, and expression, integrating linguistic and cognitive dimensions.
3. Four-Factor Models: Bower, Cavanagh, Moloney, and Dao (2011) identified grammatical, sociolinguistic, strategic, and discourse competence. Huang and Lin (2018) ICCI scale includes listening, relaxation, empathy, and expression.
4. Five-Factor Models: Arif and Chatra (2020) developed a five-factor model comprising empathy, belonging, social relaxation, behavioral flexibility, and interaction. UNESCO's Social and Emotional Learning framework (since 2002) defines five competencies: self-awareness, self-management, social awareness, interpersonal skills, and responsible decision-making linked to communication and emotional regulation.
5. Seven-Factor Models: Wise, Lovett, Swarm, and Nazar (2024) validated the 7E-CRF for medical communication, comprising seven dimensions: initiating discussion, building rapport, gathering information, understanding patient perspective, sharing information, reaching agreement, and providing closure—assessing medical students' communication skills.

2.3. *Influencing Factors of Communication Competence*

Communication competence develops through a systemic process. Research identifies four main factors: personal traits, training environment, situational variables, and institutional support.

1. Personal Traits: Empathy is foundational for teacher-student interaction and conflict resolution, influenced by personality and training (Allemand, Steiger, & Fend, 2015). Listening skills affect classroom communication

quality and perceptions of fairness (Brown, Yu, & Etherington, 2020). Traits like openness and self-esteem impact communication behavior and stress adaptability (McEwan & Guerrero, 2010; Otsuka, Uono, Yoshimura, Zhao, & Toichi, 2017).

2. **Training Environment:** Effective training environments use evidence-based teaching methods and practice opportunities. Research supports shifting from lectures (Kang et al., 2020) to role-playing and collaborative learning, which develop communication skills (Agbatogun, 2014; Zepeda, Hlutkowsky, Partika, & Nokes-Malach, 2019). Courses should integrate knowledge and skills to train students for communication across settings. Assessment systems support skill improvement (Frye & Hemmer, 2012; Zepeda et al., 2019).

Language instruction and etiquette training are recommended (Qin & Chen, 2024) along with communication modules in coursework (Lei & Yuan, 2015). Social internships, leadership, and community service provide authentic contexts for developing conflict mediation skills (McEwan & Guerrero, 2010). Dormitory life and class activities improve communication effectiveness (Wang & Yue, 2023). Institutions should integrate practice resources and multicultural environments to develop students' communication competence (McEwan & Guerrero, 2010). Peer and teacher-student networks facilitate access to social resources (Schöttke et al., 2017).

3. **Situational Variables:** Professional contexts require pre-service teachers to adapt communication strategies in teaching settings (Anderson et al., 2016; Zepeda et al., 2019). Cultural backgrounds shape communication norms. In China, collectivism and hierarchical relationships influence communication competence (Öz, Demirezen, & Pourfeiz, 2015; Pantiuk, Pantiuk, Voloshanska, & Burkovska, 2017).
4. **Institutional Support:** Effective communication competence development requires policy-level support. Evaluation systems should be aligned with teacher certification and professional development frameworks. Formative and diversified feedback mechanisms can motivate internal growth and support personalized strategy development (Frye & Hemmer, 2012; Hakan & Seval, 2011).

2.4. Theoretical Evolution of Evaluation Models

Assessment plays a central role in educational systems. Over time, various theoretical models have emerged:

The Kirkpatrick Four-Level Model (Kirkpatrick & Kirkpatrick, 2006) evaluates training through reaction, learning, behavior, and results levels in education and professional development.

The CIPP Model (Stufflebeam, 2000) assesses programs via context, input, process, and product dimensions, integrating environment, resources, monitoring, and outcomes.

Communication competence evaluation models span multiple disciplines:

Management research examines political skills in team coordination (Liu, Wang, & Cao, 2011).

In medicine, communication impacts care quality and patient recovery through doctor-patient interactions and team collaboration (MacDonald, 2017; Nicholls, Sweet, & Hyett, 2014; Wright, Banas, Bessarabova, & Bernard, 2010).

Sociological studies show intercultural communication competence enhances team performance and academic outcomes (Matveev & Nelson, 2004; Moulita, 2019; Sitompul, Syahputra, & Fauzi, 2019; Wright et al., 2013).

In education, communication competence affects learning and teaching quality, with teachers' interpersonal skills influencing classroom climate (Lagur, Makur, & Ramda, 2018; Lukman, Wahyudin, Suryadi, Dasari, & Prabawanto, 2022; Susilawati & Rustika, 2019; Ulfah, 2018).

2.5. Student Evaluation in Higher Education

Student evaluation is essential in higher education, assessing learning outcomes and developmental capacities. Traditional evaluation has focused on academic performance through examinations and assignments. Recently, competency-based assessment has gained prominence, with institutions emphasizing internships and project-based tasks to evaluate practical skills (Sun, 2015). Liu (2006) and Wang (2007) advocated for a diversified evaluation system

balancing academic ability with holistic qualities. Huang, Johnson, and Han (2013) viewed student quality as reflecting university quality, emphasizing both cognitive and affective development.

Internationally, evaluation systems enhance educational quality and equity. Countries have integrated academic achievement with learning engagement indicators to create comprehensive evaluation models (Zhang & Sun, 2013). Process-oriented approaches such as situational simulations and behavioral observations are used (Anderson et al., 2016; Lievens, 2013; McEwan & Guerrero, 2010; Schöttke et al., 2017) alongside multifaceted assessments including self-reports, peer evaluations, and expert reviews. Studies show discrepancies between self-perceptions and external evaluations (Brown et al., 2020; Dickson, Engelberg, Back, Ford, & Curtis, 2012), necessitating cross-evaluation from multiple stakeholders. AI-based technologies now provide efficient approaches for assessing student competence (Lievens, 2013; Suen, Hung, & Lin, 2020).

Communication competence plays a significant role in society and has been studied across management, medicine, engineering, education, and culture. China's education policies require communication skills development, but implementation remains limited. Teacher education programs must emphasize systems for cultivating and evaluating communication competence. Research exists on communication competence definition, components, evaluation criteria, and influencing factors related to curriculum and interaction. However, few studies have integrated influencing factors with communication competence elements, and no research has established an evaluation model for communication competence training outcomes in pre-service teacher education.

3. METHOD

3.1. Research Objectives

This study aims to identify factors influencing Chinese pre-service teachers' communication competence and to construct an evaluation model based on these factors.

3.2. Data Collection and Sample

This study examines factors influencing communication competence among pre-service teachers in Chongqing, China. As a young municipality in Southwest China, Chongqing shows growth potential in economic development and policy support, while its higher education remains moderately developed. Economic growth has increased demand for higher education support, and the Municipal Education Department has strengthened evaluation policies. Since 2024, the city has implemented competency-based assessments for pre-service teachers, including communication competence indicators. Pre-service teachers were selected from six teacher education institutions in Chongqing: Chongqing Normal University, Southwest University, Chongqing University of Education, Chongqing Three Gorges University, Chongqing Technology and Business University, and Chongqing University of Arts and Sciences. These institutions represent a mix of comprehensive and teacher-focused universities with varying resource endowments and enrollment scales.

Using stratified random sampling across all academic years (Cochran, 1977; Lohr, 2021), 600 students were selected: 197 male (32.83%) and 403 female (67.17%) students, with 242 urban (40.33%) and 358 rural (59.67%) students.

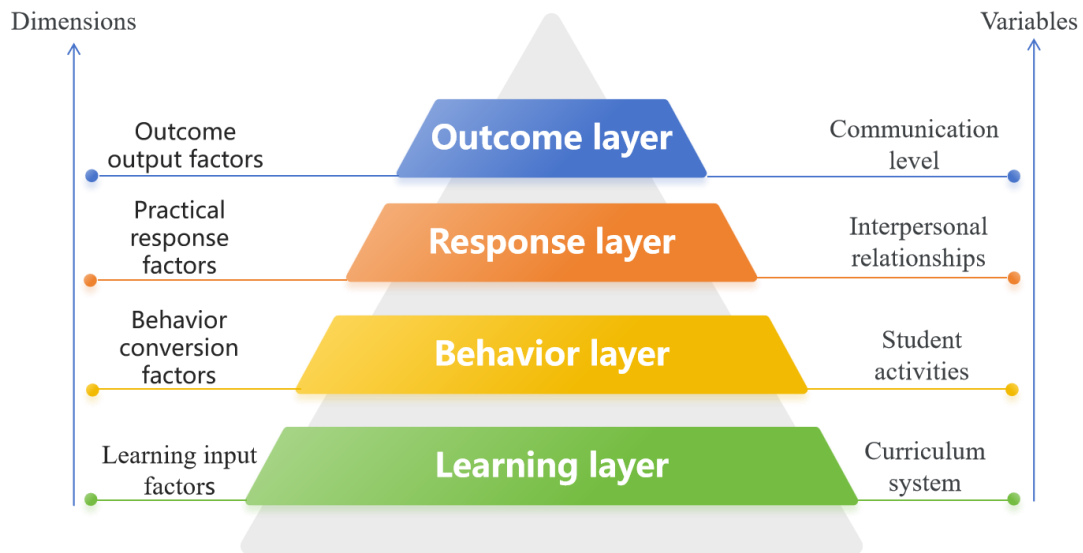
Data collection involved obtaining institutional authorization, distributing online questionnaires through university administrative staff, and informing participants about response confidentiality to ensure reliability.

3.3. Variables

The Kirkpatrick model of training evaluation includes learning, behavior, reaction, and results dimensions, suggesting that training and satisfaction impact individual outcomes. Kang et al. (2020) emphasized classrooms as primary spaces for developing communication competence. Lei and Yuan (2015) highlighted MIT's integration of communication courses within professional curricula through situational learning and multimodal frameworks.

Research shows Chinese pre-service teachers often lack group activity experience, necessitating enhanced student and teacher interactions to improve communication skills (Qin & Chen, 2024; Wang & Yue, 2023).

Based on the Kirkpatrick model, this study examines pre-service teachers' communication competence development through four dimensions: learning input, behavioral transformation, practice response, and outcome output, operationalized as curriculum system, student activities, interpersonal relationships, and communication level (see Figure 1).



Kirkpatrick's four-level assessment model

Figure 1. Theoretical framework of variable composition.

Based on critical ratio, item-total correlation, internal consistency, and communality indicators, 13 scale items were selected for exploratory factor analysis (EFA). Using varimax rotation, four factors with eigenvalues > 1 were extracted ($KMO=0.874$, Bartlett's $p<.001$). The cumulative variance explained was 75.133%, with item communalities ranging from 0.6 to 0.9 (Tables 1,2), indicating strong item-factor associations.

Confirmatory factor analysis showed AVE values >0.50 and CR values >0.70 for all factors, demonstrating good convergent validity (Table 3). The AVE square roots for the curriculum system (.784), student activities (.820), interpersonal relationships (.750), and communication level (.804) exceeded inter-factor correlations, confirming strong discriminant validity (Table 4).

3.3.1. Tables: Factor Analysis Results

Table 1. Variance explained.

Factor No.	Eigenvalue	Pre-rotation variance %	Pre-rotation cumulative %	Initial eigenvalue	Initial variance %	Initial cumulative %	Rotated eigenvalue	Rotated variance %	Rotated cumulative %
1	6.053	46.558	46.558	6.053	46.558	46.558	3.049	23.456	23.456
2	1.629	12.527	59.085	1.629	12.527	59.085	2.821	21.701	45.158
3	1.382	10.630	69.715	1.382	10.630	69.715	2.490	19.154	64.312
4	0.704	5.418	75.133	0.704	5.418	75.133	1.407	10.821	75.133
5	0.589	4.533	79.666	-	-	-	-	-	-
6	0.533	4.100	83.766	-	-	-	-	-	-
7	0.499	3.838	87.604	-	-	-	-	-	-
8	0.409	3.144	90.748	-	-	-	-	-	-
9	0.371	2.851	93.599	-	-	-	-	-	-
10	0.301	2.315	95.914	-	-	-	-	-	-
11	0.197	1.512	97.426	-	-	-	-	-	-
12	0.180	1.387	98.814	-	-	-	-	-	-
13	0.154	1.186	100.000	-	-	-	-	-	-

Table 2. Rotated factor loadings.

Item	Factor 1	Factor 2	Factor 3	Factor 4	Communality
Course quantity		0.786			0.675
Course quality		0.769			0.685
Teaching method		0.857			0.882
Assessment method		0.725			0.673
Participation frequency			0.838		0.868
Activity awards			0.890		0.818
Student organizations			0.785		0.776
Peer relationships	0.806				0.718
Teacher-student relationships	0.745				0.633
Communication method	0.739				0.629
Relationship satisfaction	0.838				0.815
Communication effectiveness				0.700	0.790
Future expectations				0.758	0.807

Table 3. Convergent Validity: AVE and CR Values.

Factor	AVE	CR
Curriculum System	0.615	0.861
Student Activities	0.672	0.858
Interpersonal Relationships	0.562	0.836
Communication Competence	0.646	0.784

Table 4. Discriminant validity: Pearson correlations and AVE square roots.

Constructs	Curriculum system	Student activities	Interpersonal relationships	Communication competence
Curriculum system	0.784			
Student activities	0.399	0.820		
Interpersonal relationships	0.446	0.465	0.750	
Communication competence	0.537	0.562	0.594	0.804

Curriculum System. The first classroom is crucial for pre-service teachers' learning in universities, focusing on curriculum design, teaching methods, communication training, and teaching effectiveness. EFA identified four items: course quantity, course quality, teaching methods, and assessment methods. Representative items include: "Group cooperative learning enhances students' communication competence" and "Course assessments consider students' communication competence." These were measured using a five-point Likert scale. Reliability analysis showed a Cronbach's alpha of .848 for this dimension.

Student Activities. The second classroom is crucial for pre-service teachers' participation, reflecting enthusiasm for activities that enhance communication, achievements, and involvement in major student organizations. EFA identified three items: participation frequency, activity awards, and organization involvement. Items include: "My participation frequency in communication activities is high" and "Higher awards in communication activities strengthen my competence." These were measured on a five-point Likert scale. Reliability analysis showed a Cronbach's alpha of .866.

Interpersonal relationships. Pre-service teachers' interpersonal relationships in universities involve peer and teacher-student interactions. EFA extracted four items: peer relationships, teacher-student relationships, communication style, and relationship satisfaction. Key items include: "A positive teacher-student relationship improves communication competence" and "Nonverbal communication helps understand intentions." These items used a five-point Likert scale, with Cronbach's alpha of .851.

Communication Level. This dimension reflects pre-service teachers' self-perception of communication competence. EFA extracted two items: communication effectiveness and future expectations. Items include: "I consider my communication competence strong" and "I believe my communication competence is crucial for my future development." Both items used a five-point Likert scale, with Cronbach's alpha of .779.

3.4. Analytical Strategy

This study employed exploratory factor analysis (EFA) to identify factors with eigenvalues greater than 1, serving as an initial step in constructing the structural model. Confirmatory factor analysis (CFA) was subsequently conducted to evaluate discriminant validity, convergent validity, and to verify the rationality of the identified structure, as well as to assess overall model fit. For analyzing relationships among variables, correlation analysis was used to examine the degree of linear association among measurement items and variables. Path analysis was applied to investigate causal pathways among variables and to test the hypothesized model's validity, focusing on the effects of curriculum system, student activities, and interpersonal relationships on communication competence. All statistical analyses were performed using SPSS 26.0 for descriptive statistics, t-tests, ANOVA, and EFA; and AMOS 26.0 for CFA and path analysis. Reliability and validity were assessed through model fit indices such as Cronbach's alpha, AVE, CR, and discriminant validity, which were reported in Tables 3 and 4. To examine whether demographic factors such as gender, place of origin, and grade level influenced variables, independent t-tests and ANOVA were used depending on the number of groups.

4. RESULTS

4.1. Analysis of Factors Influencing the Development of Communication Competence among Chinese Pre-service Teachers

4.1.1. Path Analysis of the Relationships among Variables

Path analysis showed interpersonal relationships (coefficient=0.335, $z=9.832$, $p<0.01$), student activities (coefficient=0.299, $z=8.998$, $p<0.01$), and curriculum system (coefficient=0.269, $z=8.177$, $p<0.01$) all significantly positively affected communication competence (see Table 5).

Table 5. Path analysis: Effects of variables.

X (Independent variable)	→	Y (Dependent variable)	Unstandardized path coefficient	SE	z (CR value)	p	Standardized path coefficient
Interpersonal relationships	→	Communication competence	0.385	0.039	9.832	0.000	0.335
Student activities	→	Communication competence	0.295	0.033	8.998	0.000	0.299
Curriculum system	→	Communication competence	0.316	0.039	8.177	0.000	0.269

4.1.2. Correlation Analysis of the Relationships Between Measurement Items and Variables

We analyzed correlations (Hauke & Kossowski, 2011) between variables Curriculum System, Student Activities, Interpersonal Relationships, Communication Competence and 11 measurement items: Course Quantity, Course Quality, Teaching Methods, Assessment Methods, Participation Frequency, Awards in Activities, Student Organizations, Peer Relationships, Teacher–Student Relationships, Communication Methods, and Relationship Satisfaction.

Curriculum System showed correlations ranging from 0.783 to 0.933 with teaching-related items and from 0.259 to 0.444 with other items ($p < 0.01$). Student Activities correlated strongly with activity-related items (0.873–0.921) and moderately with others (0.241–0.433) ($p < 0.01$). Interpersonal Relationships correlated highly with relationship items (0.806–0.891) and moderately with others (0.227–0.503) ($p < 0.01$). Communication Competence showed moderate correlations (0.372–0.574) across all items ($p < 0.01$).

These significant positive correlations demonstrate the interactive influence of first classroom, second classroom, and campus cultural environment on university talent cultivation, forming an integrated educational network.

Table 6. Correlation analysis – Relationships between measurement items and variables.

Measurement item	Curriculum system	Student activities	Interpersonal relationships	Communication level
Course quantity	0.783**	0.241**	0.227**	0.372**
Course quality	0.821**	0.323**	0.354**	0.466**
Teaching methods	0.933**	0.418**	0.501**	0.536**
Assessment method	0.777**	0.340**	0.395**	0.406**
Participation frequency	0.444**	0.921**	0.503**	0.573**
Awards in Activities	0.259**	0.896**	0.290**	0.415**
Student organizations	0.400**	0.873**	0.496**	0.550**
Peer relationships	0.305**	0.410**	0.831**	0.474**
Teacher-student relationships	0.378**	0.338**	0.806**	0.469**
Communication methods	0.388**	0.373**	0.811**	0.470**
Relationship satisfaction	0.421**	0.433**	0.891**	0.574**

Note: $p < 0.05$, ** $p < 0.01$.

4.1.3. Independent T-Test and ANOVA: Relationships Between Demographic Factors and Variables

An independent t-test (Ruxton, 2006) showed no significant gender differences in curriculum system and communication level ($p > 0.05$), but revealed differences in student activities and interpersonal relationships ($p < 0.05$). For student activities, males scored lower (3.20) than females (3.36) ($t = -2.508$, $p = 0.012$). For interpersonal relationships, males also scored lower (3.56) than females (3.80) ($t = -3.819$, $p = 0.000$) (see Table 7).

Table 7. t-test – Relationships between gender and independent/dependent variables.

Variables	Gender (Mean $\pm$ SD)		T (P)
	Male	Female	
Curriculum system	3.22 $\pm$ 0.71	3.14 $\pm$ 0.62	1.344
Student activities	3.20 $\pm$ 0.84	3.36 $\pm$ 0.73	-2.508*
Interpersonal relationships	3.56 $\pm$ 0.78	3.80 $\pm$ 0.58	-3.819**
Communication level	3.04 $\pm$ 0.82	3.13 $\pm$ 0.73	-1.282

Note: $p < 0.05$, ** $p < 0.01$. The “***” indicates significant differences tested at 0.01 level.

An independent t-test (Ruxton, 2006) examined differences in the curriculum system, student activities, interpersonal relationships, and communication level based on students' origin. Results showed no significant differences in the curriculum system and interpersonal relationships ($p > 0.05$), but significant differences in student activities ($t = 2.574$, $p = 0.010$) and communication level ($t = 3.187$, $p = 0.002$). Urban students scored higher in both activities (3.41 vs 3.24) and communication (3.22 vs 3.02) compared to rural students (see Table 8).

Table 8. t-test – Relationships between place of origin and independent/dependent variables.

Variables	Place of origin (Mean $\pm$ SD)		T (P)
	Urban	Rural	
Curriculum system	3.22 $\pm$ 0.70	3.13 $\pm$ 0.61	1.689
Student activities	3.41 $\pm$ 0.81	3.24 $\pm$ 0.74	2.574**
Interpersonal relationships	3.75 $\pm$ 0.69	3.70 $\pm$ 0.64	0.887
Communication level	3.22 $\pm$ 0.79	3.02 $\pm$ 0.73	3.187**

Note: $p < 0.05$, ** $p < 0.01$. The “***” indicates significant differences tested at 0.01 level.

An analysis of variance (ANOVA) (Bewick, Cheek, & Ball, 2004) examined differences in curriculum system, student activities, interpersonal relationships, and communication levels across grade levels. Results showed no

significant differences in student activities and interpersonal relationships ($p > 0.05$), but significant differences in the curriculum system and communication levels ($p < 0.05$).

Curriculum system showed a significant difference ($F = 5.484$, $p = 0.001$), with group differences: Freshman > Junior; Senior > Freshman; Senior > Sophomore; Senior > Junior.

Communication level showed a significant difference ($F = 5.679$, $p = 0.001$), with group differences: Senior > Freshman; Senior > Sophomore; Senior > Junior (see Table 9).

Table 9. ANOVA – Differences in independent and dependent variables by grade level.

Variable	Grade (Mean $\pm$ SD)	Grade (Mean $\pm$ SD)	Grade (Mean $\pm$ SD)	Grade (Mean $\pm$ SD)
	Freshman	Sophomore	Junior	Senior
Curriculum system	3.16 $\pm$ 0.59	3.09 $\pm$ 0.62	2.97 $\pm$ 0.64**	3.35 $\pm$ 0.60 **
Student activities	3.28 $\pm$ 0.81	3.27 $\pm$ 0.75	3.30 $\pm$ 0.62	3.32 $\pm$ 0.70
Interpersonal relationships	3.71 $\pm$ 0.67	3.69 $\pm$ 0.66	3.76 $\pm$ 0.57	3.82 $\pm$ 0.55
Communication level	3.02 $\pm$ 0.72	3.08 $\pm$ 0.75	3.09 $\pm$ 0.73**	3.30 $\pm$ 0.68 **

Note: ** $p < 0.01$. The "***" indicates significant differences tested at 0.01 level.

Analysis showed gender differences in communication narrowed with higher grades, while rural students' communication improved beyond urban students' levels. This demonstrates universities' effect in developing communication competence and reversing innate differences (see Table 10, Figure 2, and Figure 3).

Table 10. Comparison of communication levels across grades, gender, and place of origin (Mean $\pm$ SD).

Grade	Male (Mean $\pm$ SD)	Female (Mean $\pm$ SD)	Urban (Mean $\pm$ SD)	Rural (Mean $\pm$ SD)
Freshman	2.91 $\pm$ 0.74	3.07 $\pm$ 0.70	3.20 $\pm$ 0.76	2.91 $\pm$ 0.66
Sophomore	3.19 $\pm$ 0.80	3.00 $\pm$ 0.71	3.19 $\pm$ 0.85	3.01 $\pm$ 0.68
Junior	2.94 $\pm$ 0.89	3.18 $\pm$ 0.61	3.25 $\pm$ 0.69	2.96 $\pm$ 0.75
Senior	3.39 $\pm$ 1.03	3.38 $\pm$ 0.83	3.30 $\pm$ 0.88	3.44 $\pm$ 0.87

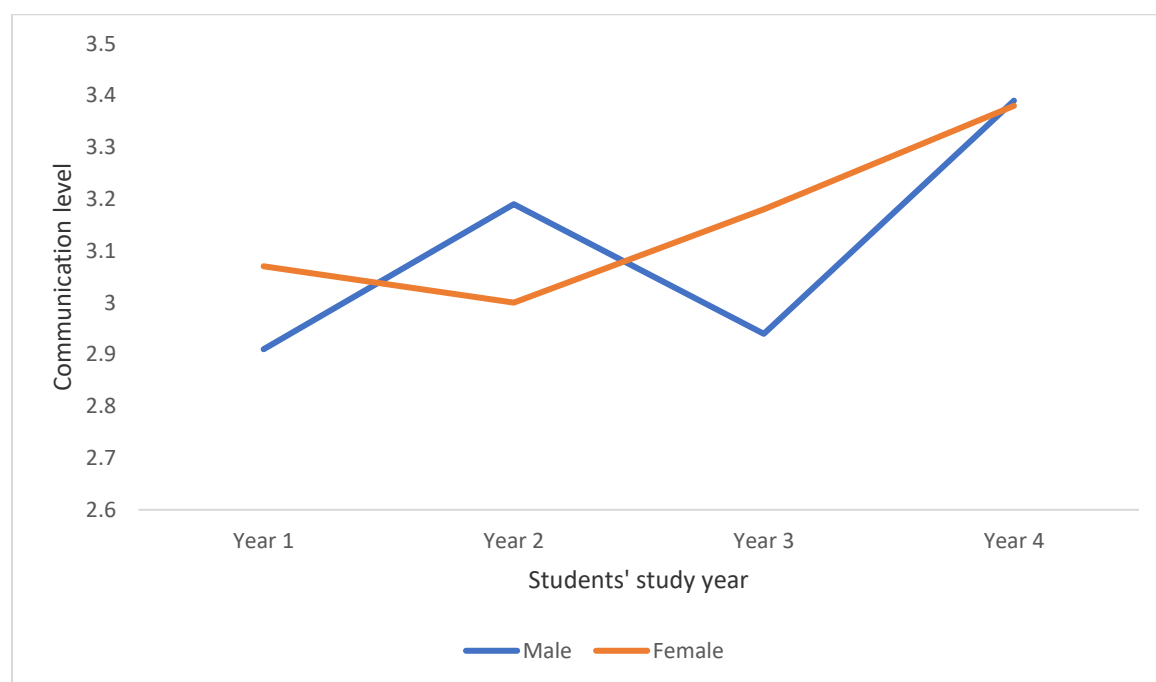


Figure 2. Comparison of communication levels across grades and gender (Mean).

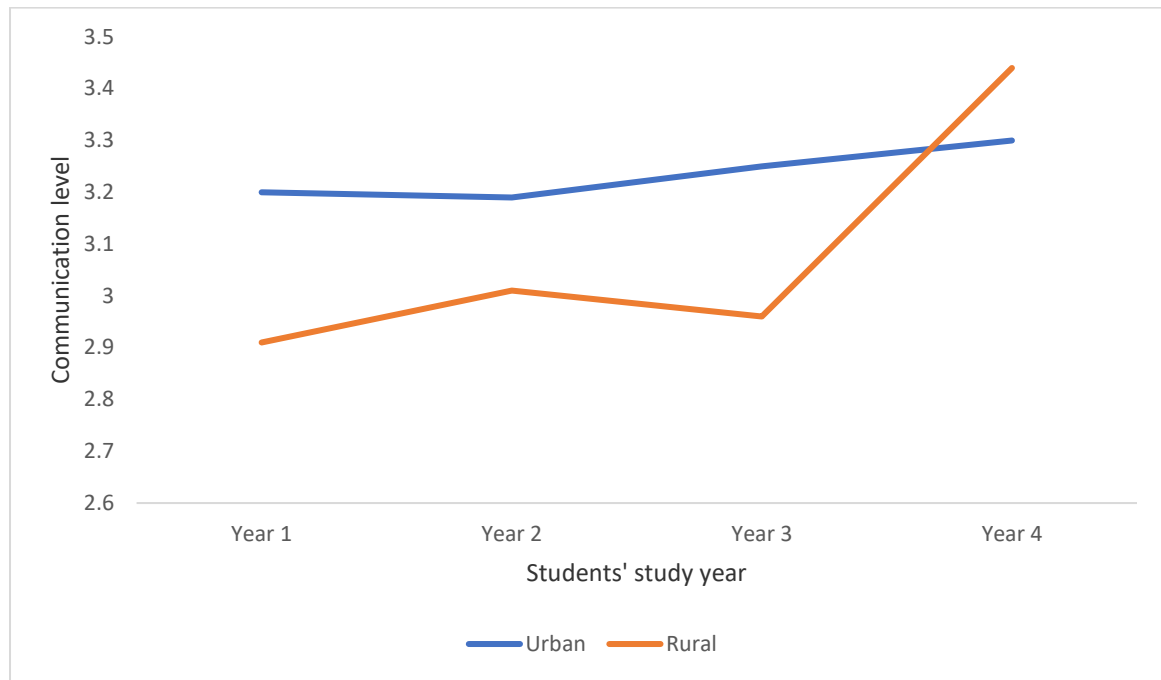


Figure 3. Comparison of communication levels by grade and place of origin (Mean).

4.2. How to Construct a Communication Competence Evaluation Model Based on Influencing Factors?

The three variables curriculum system, student activities, and interpersonal relationships significantly impact communication levels. How can these factors integrate with communication competence elements to form a quantifiable evaluation model for cultivating communication competence in normal university students?

4.2.1. Structural Model Testing of Influencing Factors and Communication Level

A CFA examined the model fit between influencing factors and communication level. The SRMR was 0.039 (threshold: 0.05), χ^2/df was 2.645 (critical value: 3), and RMSEA was 0.052 (criterion: 0.1). The RMR was 0.027 (standard: 0.05). The GFI (0.964), CFI (0.980), NFI (0.969), NNFI (0.972), TLI (0.972), AGFI (0.942), and IFI (0.980) all exceeded 0.90. These results demonstrate high structural validity and an excellent model fit (see Table 11) (Brown, 2015).

Table 11. Model fit indices.

Common Indices	χ^2	df	p	χ^2/df	GFI	RMSEA	RMR	CFI	NFI	NNFI
Criterion	—	—	>0.05	<3	>0.90	<0.10	<0.05	>0.90	>0.90	>0.90
Value	148.115	56	0.000	2.645	0.964	0.052	0.027	0.98	0.969	0.972
Other Indices	TLI	AGFI	IFI	PGFI	PNFI	PCFI	SRMR	RMSEA 90% CI		
Criterion	>0.90	>0.90	>0.90	>0.50	>0.50	>0.50	<0.10	—		
Value	0.972	0.942	0.98	0.593	0.695	0.704	0.039	0.042–0.063		

The model demonstrates associations between participation frequency and activity awards (0.128), teacher-student relationship and communication methods (0.067), and peer relationship and satisfaction (0.178), as shown in Figure 4. In the model, Curriculum System (CS), Student Activities (SA), Interpersonal Relationships (IR), and Communication Level (CL) are coded as follows:

- CS1–CS4: Course Quantity, Course Quality, Teaching Methods, Assessment Methods
- SA1–SA3: Participation Frequency, Activity Awards, Student Organizations.

- IR1–IR4: Peer Relationship, Teacher–Student Relationship, Communication Methods, Relationship Satisfaction.
- CL1–CL2: Communication Effectiveness, Future Expectations.

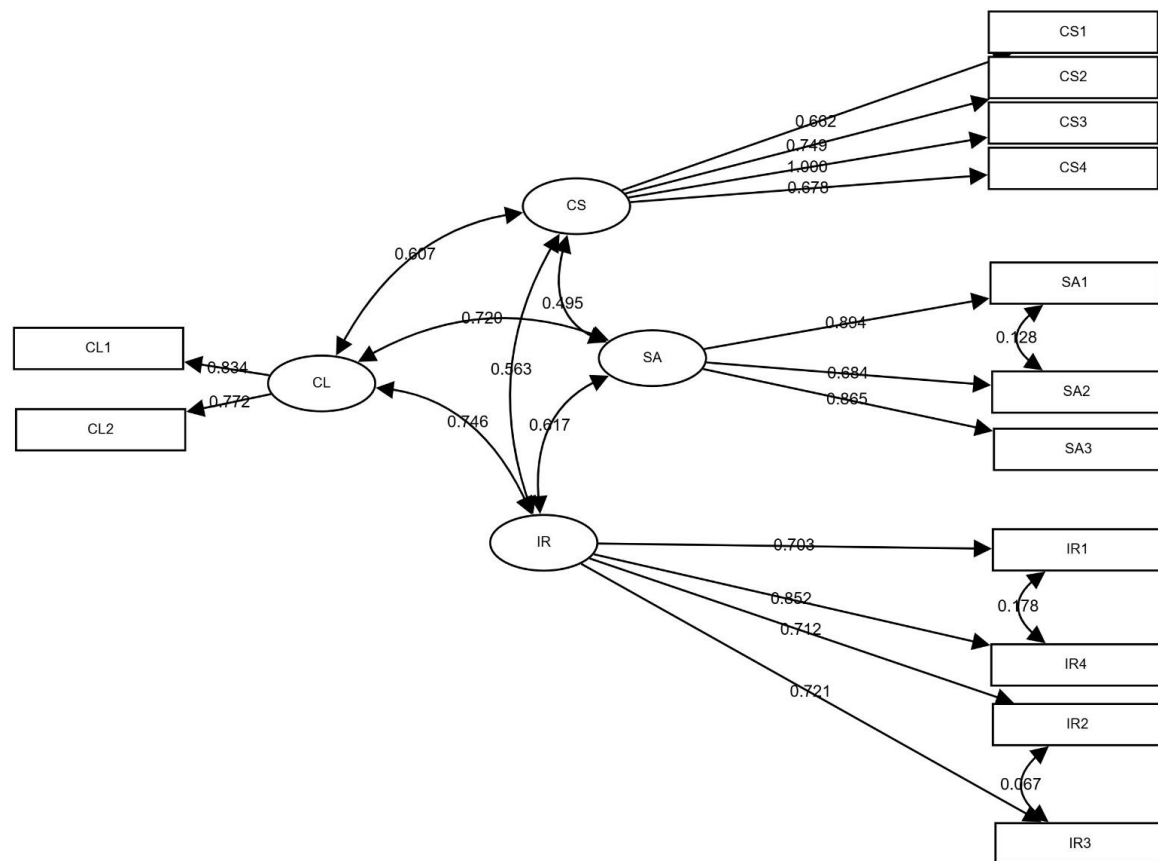


Figure 4. Structural model of influencing factors and communication level.

4.2.2. Elements of Communication Competence

Drawing on research on communication competence by scholars at Beijing Normal University (Kang et al., 2020), communication competence is divided into four dimensions.

- Information Understanding and Evaluation (Observing whether one can receive and interpret conversational information, verify understanding, and assess reliability to avoid assumptions).
- Clear Expression and Regulation (Observing whether one can flexibly use diverse forms of expression and technology tools to convey information logically, while optimizing expression and emotional state).
- Emotional resonance and adaptation (observing whether one can perceive the interlocutor's emotions and culture, respect differences, and adjust communication to establish empathy);
- Conflict Resolution and Strategy (Observing the ability to find win-win solutions during disagreements, maintain interests through negotiation, and maximize collaboration).

This enhances communication competence by demonstrating its problem-solving attributes.

4.2.3. Structure of the Evaluation Model for Cultivating Communication Competence of Chinese Normal University Students Based on Influencing Factors

In higher education, curriculum system measurements (course quantity, quality, teaching methods, and assessment) relate to communication competence cultivation. Student activity measurements (participation, awards, and organizations) relate to fostering communication competence. Interpersonal relationship measurements (peer and

teacher-student relationships, communication methods, satisfaction) reflect students' practical communication competence.

We constructed an evaluation model for Chinese normal university students' communication competence based on influencing factors (Figure 5). The model maintains three independent variables (curriculum system, student activities, interpersonal relationships) and one dependent variable (communication level). The influencing factors integrate with competence elements.

Curriculum system and student activities use objective data from learning records, participation, and awards.

- Interpersonal relationships use subjective self-efficacy assessment data (Table 12).



Figure 5. Evaluation model structure for cultivating communication competence of Chinese Normal University students based on influencing factors.

Table 12. Variables, competence dimensions, and data sources of the communication competence evaluation model.

Variable name	Variable type	Competence dimension	Data source
Curriculum system	Independent variable	Information understanding and evaluation	Related course learning data
		Clear Expression and Regulation	Related course learning data
		Emotional resonance and adaptation	Related course learning data
		Conflict Management and Strategy	Related course learning data
Student activities	Independent variable	Information understanding and evaluation	Participation in related activities; awards in related activities
		Clear Expression and Regulation	Participation in related activities; Awards in related activities
		Emotional Resonance and Adaptation	Participation in related activities; Awards in related activities

Variable name	Variable type	Competence dimension	Data source
		Conflict Management and Strategy	Participation in related activities; Awards in related activities
Interpersonal relationships	Independent variable	Information understanding and evaluation	Self-efficacy assessment
		Clear Expression and Regulation	Self-efficacy assessment
		Emotional Resonance and Adaptation	Self-efficacy assessment
		Conflict Management and Strategy	Self-efficacy assessment
Communication level	Dependent variable	—	—

4.2.4. Mathematical Model for Evaluating the Cultivation of Communication Competence of Chinese Normal University Students Based on Influencing Factors

To evaluate pre-service teachers' communication competence level (CL), communication competence is divided into four dimensions: Information Understanding and Evaluation (UE), Clear Expression and Regulation (ER), Emotional Resonance and Adaptation (RA), and Conflict Handling and Strategy (CH). Let the effect weights of these dimensions on communication competence be θ_{UE} , θ_{ER} , θ_{RA} , θ_{CH} , respectively, subject to the condition.

$$\theta_{UE} + \theta_{ER} + \theta_{RA} + \theta_{CH} = 1, \quad \theta_{\cdot} \geq 0. \quad (1)$$

The evaluation comprises three components: courses related to communication competence (Curriculum System), activities and competitions enhancing communication competence (Student Activities), and communication performance in interpersonal relationships. The curriculum system and student activities use objective evaluation, while interpersonal relationships use self-evaluation. Let the effect weights of the curriculum system, student activities, and interpersonal relationships on communication competence be λ_C , λ_A , λ_R , respectively, subject to the condition.

$$\lambda_C + \lambda_A + \lambda_R = 1 \\ \lambda_{\cdot} \geq 0. \quad (2)$$

4.2.4.1. Evaluation of Students' Communication Competence within the Curriculum System

Let the total professional courses be M . The score of student i in the j -th course is S_{ij} (Zlatić et al., 2014). The weights of the j -th course in four dimensions of communication competence, Information Understanding and Evaluation (UE), Expression and Regulation (ER), Resonance and Adaptation (RA), and Conflict Handling and Strategy (CH) are denoted as α_j^{UE} , α_j^{ER} , α_j^{RA} , α_j^{CH} , respectively, and satisfy the condition:

$$\sum_{j=1}^M \alpha_j^{UE} = \sum_{j=1}^M \alpha_j^{ER} = \sum_{j=1}^M \alpha_j^{RA} = \sum_{j=1}^M \alpha_j^{CH} = 1, \quad \alpha_j \geq 0. \quad (3)$$

Under this curriculum system, the students' evaluation of communication skills in each dimension is:

$$\begin{aligned} UE_i^{(C)} &= \sum_{j=1}^M \alpha_j^{UE} S_{ij}, \\ ER_i^{(C)} &= \sum_{j=1}^M \alpha_j^{ER} S_{ij}, \\ RA_i^{(C)} &= \sum_{j=1}^M \alpha_j^{RA} S_{ij}, \\ CH_i^{(C)} &= \sum_{j=1}^M \alpha_j^{CH} S_{ij}, \\ CL_i^{(C)} &= \theta_{UE} UE_i^{(C)} + \theta_{ER} ER_i^{(C)} + \theta_{RA} RA_i^{(C)} + \theta_{CH} CH_i^{(C)}. \end{aligned} \quad (4)$$

4.2.4.2. Evaluation of Students' Communication Skills in Student Activities

Let the total competitions/activities be, and the student's score in the activity be. The weight on four dimensions of communication skills for teacher-training students (UE, ER, RA, CH) is $\beta_t^{UE}, \beta_t^{ER}, \beta_t^{RA}, \beta_t^{CH}$, respectively, and satisfies.

$$\sum_{t=1}^K \beta_t^{UE} = \sum_{t=1}^K \beta_t^{ER} = \sum_{t=1}^K \beta_t^{RA} = \sum_{t=1}^K \beta_t^{CH} = 1, \beta_t \geq 0. \quad (5)$$

Under student activities, the students' evaluation of communication skills in each dimension is:

$$\begin{aligned} UE_i^{(A)} &= \sum_{t=1}^K \beta_t^{UE} A_{it}, \\ ER_i^{(A)} &= \sum_{t=1}^K \beta_t^{ER} A_{it}, \\ RA_i^{(A)} &= \sum_{t=1}^K \beta_t^{RA} A_{it}, \\ CH_i^{(A)} &= \sum_{t=1}^K \beta_t^{CH} A_{it}, \\ CL_i^{(A)} &= \theta_{UE} UE_i^{(A)} + \theta_{ER} ER_i^{(A)} + \theta_{RA} RA_i^{(A)} + \theta_{CH} CH_i^{(A)}. \end{aligned} \quad (6)$$

4.2.4.3. Evaluation of Students' Communication Skills in Interpersonal Relationships

The assessment of teacher-training students' communication skills is through self-evaluation. Let the student's scores in the four dimensions of communication skills (UE, ER, RA, CH) be $UE_i^{(R)}, ER_i^{(R)}, RA_i^{(R)}, CH_i^{(R)}$, then the student's evaluation of communication skills under interpersonal relationships is:

$$CL_i^{(R)} = \theta_{UE} UE_i^{(R)} + \theta_{ER} ER_i^{(R)} + \theta_{RA} RA_i^{(R)} + \theta_{CH} CH_i^{(R)}. \quad (7)$$

4.2.4.4. Overall Level of Students' Communication Skills

Let the influence weights of the curriculum system, student activities, and interpersonal relationships on communication skills be $\lambda_C, \lambda_A, \lambda_R$, respectively. The student's scores in the four dimensions (UE, ER, RA, CH) and the overall communication skills are.

$$\begin{aligned} UE_i &= \lambda_C UE_i^{(C)} + \lambda_A UE_i^{(A)} + \lambda_R UE_i^{(R)}, \\ ER_i &= \lambda_C ER_i^{(C)} + \lambda_A ER_i^{(A)} + \lambda_R ER_i^{(R)}, \\ RA_i &= \lambda_C RA_i^{(C)} + \lambda_A RA_i^{(A)} + \lambda_R RA_i^{(R)}, \\ CH_i &= \lambda_C CH_i^{(C)} + \lambda_A CH_i^{(A)} + \lambda_R CH_i^{(R)}, \\ CL_i &= \lambda_C CL_i^{(C)} + \lambda_A CL_i^{(A)} + \lambda_R CL_i^{(R)}. \end{aligned} \quad (8)$$

In summary, the overall model for evaluating communication skills can be expressed as.

$$\begin{aligned} CL_i &= \theta_{UE} (\lambda_C \sum_{j=1}^M \alpha_j^{UE} S_{ij} + \lambda_A \sum_{t=1}^K \beta_t^{UE} A_{it} + \lambda_R UE_i^{(R)}) + \theta_{ER} (\lambda_C \sum_{j=1}^M \alpha_j^{ER} S_{ij} + \lambda_A \sum_{t=1}^K \beta_t^{ER} A_{it} + \lambda_R ER_i^{(R)}) \\ &+ \theta_{RA} (\lambda_C \sum_{j=1}^M \alpha_j^{RA} S_{ij} + \lambda_A \sum_{t=1}^K \beta_t^{RA} A_{it} + \lambda_R RA_i^{(R)}) + \theta_{CH} (\lambda_C \sum_{j=1}^M \alpha_j^{CH} S_{ij} + \lambda_A \sum_{t=1}^K \beta_t^{CH} A_{it} + \lambda_R CH_i^{(R)}). \end{aligned} \quad (9)$$

5. DISCUSSION AND CONCLUSION

5.1. Curriculum, Student Activities, and Interpersonal Relationships Significantly Influence the Improvement of Chinese Teacher-Training Students' Communication Skills

The results show curriculum, student activities, and interpersonal relationships as key factors affecting communication skills development in teacher-training students. Data indicate that curriculum system items (course quantity, quality, teaching methods, and assessment) positively correlate with communication levels, with teaching methods showing the highest correlation. This suggests that a quality curriculum with interactive and collaborative teaching methods enhances students' language expression abilities.

Student activities measurements (participation frequency, awards, and organization experience) positively correlate with communication skills, with participation frequency showing the highest correlation. Rich extracurricular activities and involvement in student organizations drive skill development (Astin, 1999), increasing real-life communication opportunities and exercising abilities in authentic contexts.

Interpersonal relationship items (peer relationships, teacher-student relationships, communication style, and satisfaction) positively correlate with communication levels, with relationship satisfaction showing the highest correlation. Good peer and teacher-student interactions establish trust networks and provide authentic communication contexts. High relationship satisfaction enhances interaction quality, promoting communication skill development. Tinto (2017) noted that positive interpersonal interactions enhance students' academic engagement.

5.2. The "Influencing Factors + Skill Elements" Model for Communication Ability Evaluation Has Practical Value

Based on Kirkpatrick's model (Kirkpatrick & Kirkpatrick, 2006), we combined three factors curriculum, student activities, and interpersonal relationships with four communication skill elements (information comprehension, clear expression, emotional resonance, and conflict management) to construct an evaluation model for communication ability. The model covers learning input, behavior transformation, practical response, and outcome output.

Confirmatory factor analysis of 600 students across six teacher-training institutions in Chongqing showed an excellent model fit. Path coefficients from all independent variables to the dependent variable were significantly positive. Curriculum, activities, and interpersonal relationships demonstrated stable positive effects on communication skills across different grades and samples.

The study revealed positive correlations between curriculum, student activities, and interpersonal relationships, indicating synergistic effects. Professional courses and activities support the communication skill elements, while the "dual-classroom" approach enhances interpersonal harmony. These multiple factors collectively improve communication skills among teacher-training students.

5.3. Communication Skill Development Shows a Grade-Level Progression Trend

The study found that teacher-training students' communication skills improve significantly with grade progression. Senior students scored higher in "curriculum system" and overall "communication level," following the order: fourth year > third year > second year > first year. After four years of training and campus life, students showed substantial development in knowledge, skills, and communication.

Students' hometown and gender differences decrease as grades progress: regional differences in activities and communication diminish, and gender gaps in interpersonal relationships reduce. Higher education effectively narrows innate disparities through coursework, social interaction, and cultural adaptation (Pascarella & Terenzini, 2005).

In higher grades, correlations between curriculum, student activities, interpersonal relationships, and communication levels strengthen, indicating progressive skill development with increased structural robustness.

The study shows curriculum, activities, and interpersonal relationships positively affect students' communication skills, forming a support framework for improvement. The "Influencing Factors + Skill Elements" model demonstrates theoretical innovation and practical value, enriching communication skills evaluation in higher

education. The findings highlight grade-level effects and educational equity, as communication skills increase while gender and regional differences decrease.

6. POLICY RECOMMENDATIONS AND FUTURE RESEARCH

Based on the findings, we propose the following policy recommendations:

1. Build a collaborative ecosystem for communication skill development in higher education.

Communication skills constitute a vital component of the comprehensive competence of teacher-training students and are already incorporated into professional accreditation standards in China. It is imperative for universities to integrate curriculum instruction, extracurricular activities, and student affairs management to facilitate the deep integration of primary and secondary educational environments. This approach aims to establish a holistic, continuous, and collaborative ecosystem for the development of communication skills.

2. Strengthen competency-oriented instructional design and curriculum reform.

Universities should undertake a comprehensive review and optimization of their existing curricula, with a focus on communication skill objectives, content integration, pedagogical approaches, and assessment strategies across professional, general education, and practical courses. The inclusion of specialized modules such as expression training, intercultural communication, educational communication, instructional design, educational psychology, and social etiquette can significantly enhance students' competencies in information expression, emotional regulation, and conflict management within complex educational contexts.

3. Enhance the second classroom construction and create a positive communication environment.

To enhance the practical application of communication skills, it is recommended to design extracurricular projects such as debate competitions, speech contests, instructional design and creation, educational internships, social surveys, rural teaching initiatives, and online classroom activities. Additionally, organizing cross-cultural communication workshops and peer support activities can significantly bolster interpersonal guidance. The establishment of a "Second Classroom Skill Growth Portfolio" is advised to facilitate the continuous tracking of activity records, process evaluations, and skill development outcomes. Furthermore, the development of high-quality student organizations should be prioritized, alongside encouraging participation in structured student unions and professional associations.

4. Improve teachers' communication instruction ability and exert positive guidance.

The relationships between teachers and students, though subtle, play a significant role in student development. It is imperative for universities to enhance the training and support provided to full-time faculty, counselors, and class advisors in communication skills. This can be achieved through workshops, teaching design competitions, and class observations. Such initiatives will augment faculty awareness and proficiency in incorporating communication skill development into classroom instruction, while also enhancing the communication capabilities of counselors and advisors in student management, emotional interaction, and problem guidance, thereby maximizing the positive influence of teachers.

Moreover, the sample for this study was predominantly drawn from teacher-training institutions in Chongqing. To improve the generalizability of the model, future research should consider expanding the sample scope. Additionally, subsequent studies could implement dynamic monitoring of communication skill development from enrollment to graduation, identifying critical turning points and changes in factors. This approach would provide precise references for talent development, early warning interventions, and educational reform. Furthermore, future research could integrate this model with university curricula and student activities to create comprehensive digital profiles of students' competencies, align professional education with industry demands, and develop intelligent assessment technologies for dynamically matching student abilities to job requirements, thereby supporting precise career services.

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Transparency: The authors state that the manuscript is honest, truthful, and transparent, that no key aspects of the investigation have been omitted, and that any differences from the study as planned have been clarified. This study followed all writing ethics.

Competing Interests: The authors declare that they have no competing interests.

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