

A study on environmental climate and communicative competence among university students in Shandong Province, China

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Abstract: This study examines the relationship between environmental climate and communicative competence among university students in Shandong Province, China. A quantitative research design was adopted to investigate how students' perceptions of the university environment influence their communication abilities. Data were collected through a structured questionnaire administered to 625 undergraduate students from several universities in Shandong Province. Statistical analyses, including reliability and validity tests, confirmatory factor analysis, correlation analysis, and regression analysis, were conducted to examine the relationships between variables. The results reveal that environmental climate has a significant positive effect on students' communicative competence ($\beta = .570, p < .001$). Students perceiving their university environment as supportive, inclusive, and interactive tend to demonstrate stronger communication abilities. The findings indicate that a positive campus climate plays an important role in fostering students' interpersonal development in higher education. Universities should focus on creating supportive learning environments, encouraging collaborative learning, and promoting academic and social interaction to enhance students' communicative competence.

Keywords: *Campus climate, Communicative competence, Environmental climate, Higher Education, University students.*

1. Introduction

Globalization and the internationalization of higher education have increased the importance of interpersonal communication abilities among university students. In contemporary academic environments, students are expected to collaborate with others, exchange ideas, and participate in various forms of social interaction. Communication competence, therefore, becomes an essential ability that supports students' academic learning and social adaptation. OECD [1] and UNESCO [2]. Greenberg [3] noted that recent studies have increasingly highlighted the role of social and emotional learning in students' interpersonal development. Educational environments that promote emotional awareness, cooperation, and mutual respect can enhance students' communication abilities and encourage active participation in learning activities.

Previous research has highlighted the importance of communication skills in facilitating interpersonal relationships and effective information exchange. For university students, these abilities are closely connected to academic cooperation, social interaction, and future professional development [4, 5]. Within higher education settings, the campus environment represents an important context for students' development. Universities create learning environments through institutional structures, teaching practices, social interactions, and campus culture. These factors collectively influence students' academic engagement and behavioral development [6, 7].

A positive campus environment can strengthen students' sense of belonging and encourage participation in academic and social activities. Interaction with peers and teachers provides opportunities for discussion, collaboration, and communication practice [8, 9]. Students who learn in

supportive environments often feel more comfortable expressing their opinions and participating in collaborative learning activities [10]. Recent studies have further emphasized the importance of campus climate and social interaction in shaping students' interpersonal competence in higher education environments. These studies suggest that supportive academic environments can significantly influence students' communication development and social engagement [11, 12].

Despite increasing attention to communication competence, many existing studies focus on classroom teaching strategies or individual skills. Research examining how the broader university environment influences students' communication development remains limited. This study addresses this gap by exploring the relationship between environmental climate and communicative competence among university students in Shandong Province.

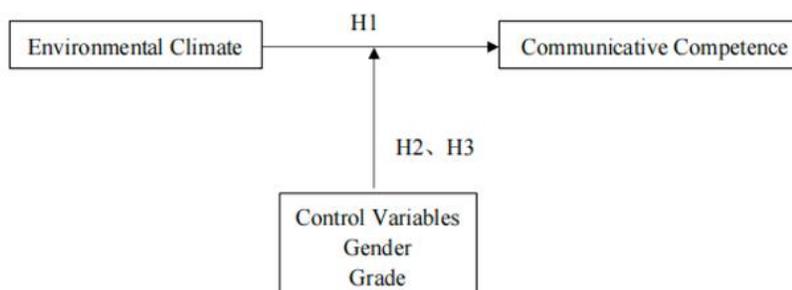


Figure 1.
Research Framework Diagram.
Note: This figure illustrates the relationships between the variables in this study.
Source: Compiled from this study.

2. Literature Review and Hypothesis Development

2.1. Social Emotion Learning Theory Model

Social-emotional learning (SEL) emphasizes the development of abilities related to self-awareness, emotional regulation, interpersonal relationships, and responsible decision-making. These competencies are considered essential components of students' holistic development [13].

Research has demonstrated that social-emotional competencies contribute to students' interpersonal interaction and communication abilities. Students who develop stronger emotional awareness and social understanding are better able to cooperate with others and engage in effective communication [14]. Educational environments that support social-emotional development may therefore enhance students' interpersonal interaction and communication competence [15].

2.2. Environmental Climate

Environmental climate refers to the overall atmosphere within an educational institution, shaped by institutional policies, teaching practices, interpersonal relationships, and support systems. These elements influence students' perceptions of the learning environment as well as their academic and social development [16]. Supportive learning environments encourage students to participate in academic activities and interact with peers and instructors. Positive teacher-student relationships and collaborative learning contexts can promote communication and cooperation in educational settings [17].

Environmental climate also contributes to students' sense of belonging. When students perceive their learning environment as respectful and supportive, they are more willing to share ideas and engage in social interaction. Such experiences provide opportunities for communication practice and social participation, which are important for developing communicative competence [18].

2.3. Communicative Competence

Communicative competence describes an individual's ability to exchange information, express ideas, and build relationships during social interaction. This competence involves linguistic knowledge, communication strategies, and the ability to interpret social contexts appropriately [19].

Scholars have identified several dimensions of communicative competence, including communication knowledge, interaction skills, and strategic communication behavior. Individuals with higher levels of communicative competence tend to communicate more clearly, understand others' perspectives more effectively, and maintain stronger interpersonal relationships [20].

Participation in academic and social activities offers opportunities for students to develop communication skills. Through interaction with peers and teachers, students learn how to interpret communication situations, adjust their communication strategies, and convey ideas effectively [21].

2.4. Relationship Between Environmental Climate and Communicative Competence

Learning environments that promote collaboration and social interaction provide opportunities for students to practice communication skills. Participation in group discussions and collaborative learning activities helps students develop interpersonal communication abilities [22]. Educational settings characterized by trust, cooperation, and mutual respect can also strengthen students' emotional awareness and social understanding. These competencies support effective interpersonal communication [23].

Opportunities for dialogue and interaction within supportive environments enable students to practice communication in authentic situations. Such experiences may strengthen communication confidence and interpersonal interaction skills [11]. Students who perceive their learning environment as supportive and inclusive often participate more actively in discussions and collaborative activities. These experiences contribute to the gradual development of communication competence [3].

The following hypothesis can be made:

H₁: Environmental climate has a significant positive effect on university students' communicative competence.

2.5. The Role of Gender and Grade in Communicative Competence

Demographic characteristics may also influence communication behavior. Gender differences in communication styles have been reported in several studies. Female students often demonstrate stronger empathy and emotional expression, while male students may display more task-oriented communication patterns [24].

Students' academic year may also affect communication experiences. As students progress through university, they gain additional opportunities to participate in academic discussions, collaborative learning, and social interaction [25]. Increased experience in communication activities may contribute to greater communication confidence among students in higher academic years [26].

The following hypothesis can be made:

H₂: Gender differences may influence university students' communicative competence.

H₃: Grade level has a significant effect on university students' communicative competence.

3. Research Methods

3.1. Research Design

A quantitative research approach was used to examine the relationship between environmental climate and communicative competence. Data were collected through a structured questionnaire distributed to university students.

Environmental climate was treated as the independent variable, while communicative competence served as the dependent variable. Reliability and validity tests were conducted to ensure the quality of the measurement instruments before statistical analysis. Gender and academic year were included as control variables because demographic characteristics may influence students' interaction experiences and perceptions of learning environments [27, 28].

3.2. Sample

This study investigated undergraduate students from several universities in Shandong Province, China. Participants were undergraduate students from different academic years to ensure a representative sample of the university student population. A sampling strategy was adopted to select participants for the study. Basic demographic information of the participants, including gender and grade level, was collected to describe the characteristics of the sample. The questionnaire also collected demographic information to describe participants' characteristics. Background variables included gender and grade level.

Previous studies indicate that students at different academic stages may demonstrate differences in their perceptions of the learning environment and levels of social interaction experience [29]. Research has also suggested that students in different academic years may vary in their engagement in learning activities and communication experiences due to differences in academic pressure and participation in university life [12]. Gender and grade were included as background variables in this study. This analysis of sample characteristics provides further insight into the basic situation of the research subjects and lays the foundation for subsequent data analysis.

3.3. Data Collection Procedures

Data were collected through questionnaire surveys. A pilot test was conducted before the formal survey to evaluate the clarity of the questionnaire items and ensure the reliability of the scales. After revising the questionnaire items, the formal survey was conducted among university students in Shandong Province. Participation was voluntary, and respondents were informed that their responses would remain confidential and be used only for academic purposes. The collected questionnaires were screened to identify valid responses before statistical analysis.

3.4. Research Tools

This study used a structured questionnaire as its research tool, which mainly consisted of two parts: the Environmental Climate Scale and the Communicative Competence Scale. All items were measured using a five-point Likert scale, ranging from "1 = strongly disagree" to "5 = strongly agree," to assess respondents' level of agreement with the statements. To ensure the scales had good measurement quality, reliability, and validity, analyses were conducted on each scale, including Cronbach's α reliability test, KMO, Bartlett's test of sphericity, and confirmatory factor analysis (CFA).

The Environmental Climate Scale was used to measure the impact of the university's environmental atmosphere on students' learning and interaction experiences. This study referenced scales from relevant research on campus and learning environments and appropriately revised the items to reflect the actual situation of the university's environmental atmosphere. The scale primarily measures the environmental atmosphere from aspects such as campus support, teacher-student interaction, and the learning environment to reflect students' overall perception of the university's environmental atmosphere. In terms of reliability analysis, the Cronbach's α coefficient of the Environmental Atmosphere Creation Scale was 0.89, indicating good internal consistency. Regarding validity, the KMO value was 0.90, and Bartlett's test of sphericity showed a significant result ($p < 0.001$), indicating data suitability for factor analysis. Confirmatory factor analysis showed that the standardized factor loadings of each item were greater than 0.60, indicating good construct validity.

The Communication Competence Scale is used to measure college students' communication skills in interpersonal interactions. This study referenced mature scales in existing research on communication competence and made appropriate revisions to suit the characteristics of the college student population to improve the scale's applicability. This scale mainly assesses students' communication competence in terms of expression, listening, and interpersonal interaction. In terms of reliability analysis, the Cronbach's α coefficient of the Communication Competence Scale was 0.91, indicating high internal consistency. Regarding validity testing, the KMO value was 0.92, and Bartlett's test of sphericity

showed a significant result ($p < 0.001$), indicating that the data were suitable for factor analysis. Confirmatory factor analysis results showed that the standardized factor loadings of each item were all above 0.60, indicating that the scale has good construct validity and measurement quality.

4. Results

A total of 625 valid samples were collected in this study to ensure the inclusion of two background variables: gender and grade. Table 1 presents the demographic characteristics of the respondents, including gender and grade level. Their specific characteristics are shown in Table 1.

Table 1.
Demographic characteristics of the sample (N = 625).

Demographic variables	Classification	Frequency	Percentage (%)
Gender	Male	358	57.3
	Female	267	42.7
Grade	Freshman	90	14.4
	Sophomore	139	22.2
	Junior year	226	36.2
	Senior year	170	27.2

4.1. Confirmatory Factor Analysis

As can be seen from Table 2, $\chi^2/df = 1.136$, which is smaller than the reference value of 5. GFI = .967, AGFI = .960, NFI = .972, TLI = .996, CFI = .997, RFI = .969, and IFI = .997, all of which are close to or higher than the recommended reference value of .900, indicating that the structural model has a good overall fit. In addition, RMR = .037 and SRMR = .023, both of which are lower than the recommended threshold of .080, indicating that the residual errors of the model are within an acceptable range. Furthermore, PNFI = .872 and PGFI = .801 are both greater than the reference value of .500, suggesting that the model achieves a satisfactory parsimonious fit.

These results indicate that the structural equation model constructed in this study demonstrates a good level of model fit and is suitable for further analysis. Based on this model, the relationship between environmental climate and communicative competence among university students can be effectively examined. The good model fit suggests that the measurement indicators can adequately reflect the latent variables, providing reliable support for subsequent hypothesis testing and relationship analysis between environmental climate and communicative competence.

Table 2.
Measurement model fit indices.

Fit index	Adaptation indicators	Measurements	Remark
χ^2	–	305.644	Fit
χ^2/df	< 5	1.136	Fit
GFI	> 0.900	0.967	Fit
AGFI	> 0.900	0.960	Fit
RMR	< 0.080	0.037	Fit
SRMR	< 0.080	0.023	Fit
NFI	> 0.900	0.972	Fit
TLI	> 0.900	0.996	Fit
CFI	> 0.900	0.997	Fit
RFI	> 0.900	0.969	Fit
IFI	> 0.900	0.997	Fit
PNFI	> 0.500	0.872	Fit
PGFI	> 0.500	0.801	Fit

4.2. Analysis of Environmental Climate and Communicative Competence

It can be seen from Table 3 that $\chi^2/df = 1.136$, which is smaller than the reference value of 5. GFI = .967, AGFI = .960, NFI = .972, TLI = .996, CFI = .997, RFI = .969, and IFI = .997, all of which are close to or greater than the reference value of .900, indicating that the model fits the data well. In addition, RMR = .037 and SRMR = .023, both of which are lower than the reference value of .080, indicating that the residual error of the model is small and within an acceptable range. Furthermore, PNFI = .872 and PGFI = .801, both of which are greater than the reference value of .500, indicating that the model also shows good parsimony fit.

Overall, the results suggest that the structural equation model developed in this study demonstrates a satisfactory level of model fit. This indicates that the model is appropriate for further examining the relationship between environmental climate and communicative competence among university students, and the measurement model is considered acceptable for subsequent structural analysis.

Table 3.

Structural model fit indices.

Fit index	Adaptation indicators	Measurements	Remark
χ^2	–	84.005	Fit
χ^2/df	< 5	0.894	Fit
GFI	> 0.900	0.985	Fit
AGFI	> 0.900	0.979	Fit
RMR	< 0.080	0.026	Fit
SRMR	< 0.080	0.016	Fit
NFI	> 0.900	0.984	Fit
TLI	> 0.900	1.002	Fit
CFI	> 0.900	1.000	Fit
RFI	> 0.900	0.980	Fit
IFI	> 0.900	1.002	Fit
PNFI	> 0.500	0.771	Fit
PGFI	> 0.500	0.681	Fit

4.3. Analysis of Environmental Climate and Communicative Competence

As can be seen from Table 4, $\chi^2/df = 1.136$, which is less than the reference value of 5. GFI = .967, AGFI = .960, NFI = .972, TLI = .996, CFI = .997, RFI = .969, and IFI = .997, all of which reached or were close to the recommended standard of .900, indicating that the overall model fit is good.

In addition, RMR = .037 and SRMR = .023, both lower than the reference value of .080, indicating that the residual error of the model is small and acceptable. Furthermore, PNFI = .872 and PGFI = .801 are both greater than the reference value of .500, indicating that the model also shows good parsimony fit.

The results indicate that the measurement model constructed in this study has a good level of model fit and satisfactory construct validity. Therefore, the model can effectively reflect the relationship between environmental climate and communicative competence among university students, providing a reliable basis for further analysis of the structural relationships between the variables.

Table 4.
Model fit indices of the communicative competence scale.

Fit index	Adaptation indicators	Measurements	Remark
χ^2	–	84.005	Fit
χ^2/df	<5	0.894	Fit
GFI	> 0.900	0.985	Fit
AGFI	> 0.900	0.979	Fit
RMR	< 0.080	0.026	Fit
SRMR	< 0.080	0.016	Fit
NFI	> 0.900	0.984	Fit
TLI	> 0.900	1.002	Fit
CFI	> 0.900	1.000	Fit
RFI	> 0.900	0.980	Fit
IFI	> 0.900	1.002	Fit
PNFI	> 0.500	0.771	Fit
PGFI	> 0.500	0.681	Fit

4.4. Correlation Analysis between Variables

As illustrated in Table 5, environmental climate is significantly positively correlated with communicative competence ($r = .570$, $p < .001$). The results indicate that when university students perceive a more positive and supportive environmental climate within the university, their communicative competence tends to be higher. This suggests that a supportive university environment may contribute to the development of students' communication abilities and interpersonal interaction skills. Overall, the correlation analysis shows that environmental climate is positively associated with communicative competence, providing preliminary support for the proposed relationship between the variables and laying the foundation for subsequent structural model analysis.

Table 5.
Correlation between environmental climate and communicative competence.

variables	Environmental Climate	Communicative Competence
Environmental Climate	1	
Communicative Competence	0.570***	1

Note: *** $p < .001$. Especially compiled for this study.

4.5. Analysis of the relationship between Environmental Climate and Communicative Competence

In determining the control variables for examining the relationship between environmental climate and communicative competence, this study considered several demographic variables. Among them, academic year was included as a control variable, while gender and major were not included in the final analysis. This is because previous studies have indicated that students' learning experiences and communication abilities may change gradually as their academic year increases, reflecting differences across stages of study. Controlling for the academic year helps reduce potential confounding effects and allows for a more accurate examination of the relationship between the main variables.

The results of the regression analysis indicate that environmental climate has a significant positive effect on communicative competence among university students ($\beta = .570$, $p < .001$). This suggests that when students perceive a more supportive and positive environmental climate within the university, their communicative competence tends to be higher.

The findings demonstrate that the environmental climate plays an important role in promoting the development of students' communicative competence. A supportive educational environment may facilitate interpersonal interaction, improve communication opportunities, and encourage students to participate more actively in academic and social activities, thereby enhancing their communicative abilities.

Table 6.
Regression analysis predicting communicative competence.

Variables	Communicative Competence	
	β	t
Constant term	0.467	3.205*
Environmental climate	0.570	8.511***
F	88.321***	
R ²	0.389	

Note: *** p < 0.05, ** p < 0.01, **** p < 0.001**

5. Discussion

The findings of this study reveal a clear and significant relationship between environmental climate and communicative competence among university students. Students who perceive their university environment as supportive, interactive, and inclusive tend to demonstrate stronger communication abilities. This result highlights the importance of the university environment as a contextual factor influencing students' interpersonal development. From a theoretical perspective, the results support the view that educational environments play an essential role in shaping students' competence development. Universities represent complex social settings in which students engage in continuous interaction with peers, teachers, and the broader academic community. These interactions create opportunities for students to exchange ideas, express opinions, and participate in collaborative learning activities. Such experiences gradually strengthen students' confidence in communication and contribute to the development of their communicative competence.

The positive relationship identified in this study also aligns with existing literature suggesting that supportive learning environments can enhance students' social participation and interpersonal interaction. When students feel respected, supported, and encouraged to share their views, they become more willing to participate in classroom discussions and teamwork. Frequent participation in these activities allows students to practice communication skills in real situations and develop more effective interpersonal strategies. University environments also influence students' communication development by shaping opportunities for academic and social engagement. Learning environments that promote cooperation, dialogue, and mutual respect encourage students to interact with others and actively engage in learning activities. Participation in such environments may enhance students' communication confidence and strengthen their ability to express ideas and understand different perspectives.

The results of this study also suggest that communication competence should not be viewed solely as an individual ability. Instead, it can be influenced by the broader learning environment in which students study and interact. A positive environmental climate can provide the conditions necessary for students to develop communication skills through experience, interaction, and participation. These findings provide practical insights for universities seeking to enhance students' competence development. Educational institutions that focus on building supportive learning environments may create more opportunities for communication practice and interpersonal interaction. Such environments can contribute not only to students' academic success but also to their personal and social development.

6. Practical Implications

The results of this study provide practical implications for higher education institutions. Universities should actively cultivate supportive campus climates that encourage dialogue, cooperation, and student participation. Learning environments emphasizing collaborative learning and interpersonal interaction can create opportunities for students to practice communication skills and develop interpersonal competence.

7. Recommendations

The findings of this study suggest several practical implications for universities seeking to improve students' communicative competence through the development of positive environmental climates.

Universities may benefit from placing greater emphasis on creating supportive and inclusive campus environments. A positive environmental climate can encourage students to participate in academic discussions and social interactions. Universities can strengthen this atmosphere by promoting respectful communication, cooperation, and interaction within classrooms and across campus communities.

Teaching practices also play an important role in shaping communication opportunities for students. Courses that incorporate collaborative learning activities can provide students with valuable communication experiences. Group discussions, project-based learning, and cooperative assignments create situations in which students exchange ideas and practice interpersonal communication skills. These learning experiences help students become more confident in expressing their views and engaging in academic dialogue. Universities can also expand opportunities for communication through extracurricular programs and campus activities. Academic seminars, cultural exchange programs, and student organizations provide additional contexts where students can interact with others and develop communication competence outside the classroom. Participation in such activities may strengthen students' ability to communicate effectively in diverse social situations.

Another important strategy involves creating platforms that support student participation in academic communities. Activities such as research forums, academic competitions, and interdisciplinary projects encourage students to share knowledge and collaborate with others. These activities allow students to practice communication skills while engaging in meaningful academic experiences. By continuously improving campus environments and encouraging student participation, universities can create conditions that support the development of communication competence and enhance students' overall educational experiences.

8. Conclusion

This study examined the relationship between environmental climate and communicative competence among university students in Shandong Province, China. The results indicate that the environmental climate has a significant positive effect on students' communicative competence.

Students who perceive their university environment as supportive, inclusive, and interactive tend to demonstrate stronger communication abilities. Participation in collaborative learning activities and social interaction within the university environment may contribute to the development of communication skills.

The findings highlight the importance of the university environment as a context for students' interpersonal development. A positive campus climate encourages communication, collaboration, and participation in academic activities. Through these experiences, students can strengthen their communicative competence and improve their ability to interact with others.

The results of this study provide useful insights for universities seeking to improve campus environments and support students' competence development. Creating supportive learning environments may play an important role in enhancing students' communication abilities and preparing them for future academic and professional interactions.

9. Limitations and Future Directions

Although this study provides valuable insights into the relationship between environmental climate and communicative competence, several limitations should be acknowledged. The research sample was limited to university students in Shandong Province. Educational environments and student experiences may vary across different regions and institutions. Future research could expand the sample to include universities from multiple regions to obtain more comprehensive findings and improve the generalizability of the results.

The study employed a cross-sectional research design, which limits the ability to examine causal relationships between environmental climate and communicative competence. Longitudinal research designs may provide deeper insights into how communication competence develops over time within different learning environments. Another limitation relates to the use of self-report questionnaires.

Although questionnaires are widely used in educational research, responses may be influenced by subjective perceptions. Future studies could incorporate additional data sources such as teacher evaluations, peer assessments, or behavioral observations to obtain a more comprehensive understanding of communication development.

Future research may also explore additional factors influencing students' communication competence. Variables such as teaching styles, peer networks, and participation in extracurricular activities may contribute to students' communication development. Investigating these factors could provide further insights into how universities can support students' interpersonal competence.

Institutional Review Board Statement:

This study involved human participants and was conducted in accordance with academic ethical standards. Participation in the survey was voluntary and anonymous. All respondents were informed about the purpose of the research and provided consent before completing the questionnaire.

Transparency:

The authors confirm that the manuscript is an honest, accurate, and transparent account of the study; that no vital features of the study have been omitted; and that any discrepancies from the study as planned have been explained. This study followed all ethical practices during writing.

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