**THE IMPACT OF CLASS CLIMATE ON COLLEGE STUDENTS'
INDIVIDUAL LEARNING EFFECTIVENESS IN XI'AN CITY: A STUDY
WITH LEARNING MOTIVATION AS THE MEDIATOR**

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# The Impact of Class Climate on College Students' Individual Learning Effectiveness in Xi'an City: A Study with Learning Motivation as the Mediator

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## Abstract

This study investigated the interplay between the class climate, learning motivation, and learning effectiveness among college students in Xi'an, China. The participants of this study were college students in Xi'an, and the data were collected through the convenience sampling method. Out of the 560 distributed questionnaires, 541 valid responses were collected. The collected data were analyzed through item analysis, confirmatory factor analysis, and reliability analysis. The results revealed that there was no significant difference in class climate, learning motivation, and learning effectiveness regarding gender, while grade level demonstrated significant differences in these dimensions. In addition, in the linear regression analysis, class climate, learning motivation, and learning effectiveness all showed significant positive correlations in that class climate and learning motivation had a significant positive impact on learning effectiveness. Within the mediator model including class climate, learning motivation, and learning effectiveness, it was observed that learning motivation exerted a partial mediating effect on the relationship between class climate and learning effectiveness.

*Keywords:* class climate; learning motivation; learning effectiveness; mediating effect

## Introduction

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The learning effectiveness of college students refers to the achievements obtained after a period of study in college, including various aspects such as learning performance, learning achievements, and learning progress. It is a representation of mastery of academic content and a measure of the improvement of skills, emotions, cognition, and other abilities (Wang, 2015). Factors influencing college students' learning effectiveness have been a crucial concern among educators (Zhao, 2017; Sun *et al.*, 2012). While intelligence factors have been well-researched, non-intelligence factors have received less attention (Gandhi & Dass, 2019). In 2 Yagan (2021) study, while class climate was regarded as external condition, learning motivation was considered as an internal factor based on the philosophical theory of the interaction between internal and external factors. Thapa *et al.* (2013) found that changes in external conditions can lead to psychological changes, emphasizing the significance of class climate in impacting on learning motivation and, thus, affecting an individual's achievement.

The purpose of this study is to investigate the relationships between learning motivation, class climate, and the learning effectiveness of college students, and to examine the mediating role of learning motivation. By exploring to what extent class climate as an external factor influences learning effectiveness through impacting on students' learning motivation, this study aims to provide deeper insights in fostering and sustaining high levels of learning motivation and enhancing college students' learning effectiveness.

# Literature Review

## Research on Class Climate

*Definition of Class Climate*: Researchers have different views on the concept of class climate. Yet, general consensus on the concept of class climate involves whether individuals can develop a perception of expected outcomes or beliefs about the environment (Scherer & Nilsen, 2016; Schneider & Reichers, 2010). This study adopts a more socio-psychological perspective towards this concept. This perspective requires individuals to have a consistent sense of foreknowledge and identity for the collective environment (Schneider & Reichers, 2010). Through an invisible binding force, class climate affects the psychology and behaviors of the group members.

*Theoretical Research on Class Climate*: Class climate, from a socio-psychological perspective, is a kind of socio-psychological environment where teaching activities are performed. As it is intangible and is a type of soft environment, it is also called psychological climate or emotional climate (Rudasill *et al.*, 2018). Social

psychologists consider class climate as a stable and dominant emotional state in class interactions between teachers and students (Fan & Williams, 2018; Wang *et al.*, 2020).

*Measurement of Class Climate*: The present study utilized the "College Class Psychological Climate Rating Scale" developed by Arslan & Duru (2017) which consists of 35 items under five dimensions including collaboration, cohesion, learning atmosphere, culture and development, and class cadres. This scale was adopted in the current study to measure the class climate because it interprets the definition of class climate comprehensively, and it is suitable for surveying college students.

### Research on Learning Effectiveness

*Definition of Learning Effectiveness*: Learning effectiveness reflects students' achievements following an educational process. It covers students' academic performance, learning achievements, and progress in various aspects including conceptual knowledge, basic ability, scientific skills, experimental skills, cognitive style, scientific attitude, and problem-solving ability (Allen *et al.*, 2016). For university students, learning effectiveness indicates their proficiency in mastering academic content.

*Theoretical Research on Learning Effectiveness*: According to Neel & Fuligni (2013) attribution theory, attributing success to external factors makes students take chances and become less motivated to learn while attributing success to internal factors make students feel proud and enhance their learning motivation. In addition, attributing success to controllable factors leads students to work harder, to strive more aggressively, and to be more motivated, whereas attributing success to factors beyond their control make students lose their motivation. Based on the attribution theory, in the present study, attribution of learning effectiveness is analyzed not only concerning behaviors but also cognition, especially thinking, emotion, and interpersonal relationships.

*Measurement of Learning Effectiveness*: This study employed the "College Student Learning Effectiveness Questionnaire" developed by Badri *et al.* (2014), which consists of 6 items under three dimensions as professional competence, research proficiency, and employability. In the current study, the learning effectiveness of 256 college students was analyzed through this questionnaire, which demonstrated good reliability and validity in exploring the learning effectiveness of college students.

### Research on Learning Motivation

*Definition of Learning Motivation*: Learning motivation, a crucial aspect of motivation in the learning domain, indirectly influences and stimulates the learning process as a non-intellectual influencing factor (Rehman *et al.*, 2014). It refers to

the psychological inclination that triggers and sustains learning activities in the process of learning. In fact, learning motivation manifests in various forms like desires and ideals as prominent expressions, which can determine the direction and ultimate results of learning (Hery *et al.*, 2016). The current study holds that learning motivation is closely related to learning effectiveness in that learning motivation originates from different mental activities, and, in turn, positive mental activities provide continuous energy for learning motivation.

*Theoretical Research on Learning Motivation*: Bandura (2014) believes that the evaluation of self-efficacy can affect an individual's choice of action, the degree of his/her effort, and the duration of his/her actions. Following Bandura's self-efficacy theory, this study recognizes that self-efficacy judgments influence students' choices, degree of effort, and duration of actions. In line with this, upon encountering challenges or failures in the process of learning, students can have enough courage and willingness to face and overcome the challenges if they receive encouragement, support, and feedback from others.

*Measurement of Learning Motivation*: The learning motivation scale employed in this study was developed by Tsai (2019). It comprises 34 items under four dimensions including curiosity, pursuit of ability, altruistic orientation, and reputation acquisition.

# Methodology

*Research Hypotheses*

Based on the literature review, summary of related studies, and the purpose of the current study, the following research hypotheses were proposed:

H1. Different backgrounds of college students have various effects on class climate, their learning motivation, and their learning effectiveness;

H2. Class climate has a significant positive impact on the learning effectiveness of college students;

H3. Class climate has a significant positive impact on the learning motivation of college students;

H4. Learning motivation has a significant positive impact on the learning effectiveness of college students;

H5. Class climate influences the learning effectiveness of college students with learning motivation serving as a mediating factor.

*Participants*

The participants of this study were college students from three universities in Xi'an, China. To ensure the representativeness of the sample and improve the accuracy of the research, the convenient sampling method was adopted. Following

28 Alrayah (2018) suggestion that the number of respondents should be 3-5 times higher than the number of questionnaire items, the researchers involved 170 university students as the preliminary samples to test the reliability and validity of the questionnaire as the questionnaire in this study had 35 items. Having obtained reliable results as a result of piloting process, the researchers recruited 510 college students in the formal study. In this phase, the number of respondents was nearly 7 times higher than the total number of items (Gorsuch, 1983).

## Research Instruments

Based on the scope of the study, the survey questionnaire was divided into four parts. The first part included basic information of the respondents, the second part was the class climate scale, the third part was the learning motivation scale, and the fourth part was the learning effectiveness scale.

Class Climate Scale for College Students: The class climate survey questionnaire used in this study was based on Arslan & Duru (2017) "College Class Psychological Climate Rating Scale". The scale consisted of 35 items, covering five dimensions: collaboration, cohesion, learning atmosphere, culture and development, and class cadres. It adopted the 5-point Likert scoring method, and all items were coded positively. A higher score indicated a better perceived class climate. The overall $\alpha$ coefficient of the scale was 0.875, indicating high reliability. The reliability coefficients for the five dimensions - collaboration, cohesion, learning atmosphere, culture and development, and class cadres - were 0.811, 0.805, 0.929, 0.769, 0.817, and 0.896, respectively, demonstrating good reliability of the scale.

*Learning Motivation Scale for College Students*: The learning motivation scale used in this study was developed by Tsai (2019). The scale comprised 34 items scored on a 5-point Likert scoring method as "completely disagree", "somewhat disagree", "uncertain", "somewhat agree", and "completely agree". It was divided into four dimensions including curiosity, ability pursuit, altruistic orientation, and reputation acquisition. The overall $\alpha$ coefficient of the scale was 0.953, and the Kaiser-Meyer-Olkin (KMO) measure was 0.948.

*Learning Effectiveness Scale for College Students*: This study utilized the "College Student Learning Effectiveness Questionnaire", which was self-compiled by Badri *et al.* (2014). The questionnaire included six items scored on a 5-point Likert scale, representing "completely disagree", "somewhat disagree", "uncertain", "somewhat agree", and "completely agree". The $\alpha$ coefficient of the scale was 0.868, and the KMO was 0.885.

## Results and Discussion

*Items Analysis, Exploratory Factor Analysis, and Reliability Analysis of the Class Climate Scale*

*Item Analysis of the Preliminary Questionnaire*: Item analysis aimed to test whether the questionnaire items had distinguishing power. In item analysis, it is assumed that each item has the same magnitude, and the quality of the questionnaire item is determined based on whether it has distinguishing power (Ahmad *et al.*, 2019). Based on the total scores, the samples were divided into high (27%) and low (27%) groups. An independent sample t-test was conducted on the mean to test for significant differences (Batistič & der Laken, 2019), and the cutoff value of 3.0 was preferred (Etikan *et al.*, 2016). The class climate scale had 35 items. In the homogeneity test, the correlation between the items and the total score after calibration was between 0.667 and 0.829 except for the unqualified items, and the items with a correlation coefficient exceeding 0.4 indicated a moderate correlation (Saiphoo & Vahedi, 2019). After excluding the unqualified items, it was seen that the factor loadings were all above 0.50. After removing extreme values, the critical ratio (CR) values were between -15.360 and -9.515, reaching the statistical significance ($p < 0.001$). Overall, 14 items were removed, and 21 items were retained.

*Exploratory Factor Analysis and Reliability Analysis*: The overall Cronbach's α coefficient of the scale was 0.968, indicating that the scale had good internal consistency among the items. More specifically, the Cronbach's α coefficient of "collaboration", "culture and development", "cohesion", "learning" and "class cadres" were 0.912, 0.896, 0.915, 0.856 and 0.852 respectively. The proportion of the variance explained was 75.454%, and the factor loadings were all higher than the value of 0.45. According to the reliability analysis criteria mentioned earlier, it can be claimed that the results obtained through the class climate scale in this survey are reliable and valid.

*Confirmatory Factor Analysis of the Formal Questionnaire*: The class climate scale underwent confirmatory factor analysis through the AMOS software. The CR values for the five dimensions - collaboration, culture and development, cohesion, learning, and class cadres - were 0.908, 0.885, 0.919, 0.858, and 0.838, respectively. According to Fornell and Larcker (1981), the CR value should be above 0.6. The CR values of the four dimensions of the scale were all greater than 0.6, indicating good composite reliability. Additionally, the convergence validity of the scale was measured using the average variance extracted (AVE). Slater, Hult, and Olson (2007) suggested that the AVE value should be 0.4 or above. The AVE values for the five dimensions in this study were 0.665, 0.659, 0.654, 0.669, and 0.634, respectively (Table 3.3). On the other hand, the overall fit indices of the scale usually include the Chi-square value, the GFI, the RMR, the RMSEA, the AGFI, the NFI and the CFI. In this study, the p-value of the class climate scale

reached significant levels, and the RMR was 0.035, the RMSEA was 0.058, the AGFI was 0.895, the NFI was 0.947, the CFI was 0.965, and the GFI was 0.918, meeting the recommended standards (Bagozzi & Yi, 1988) (Table 1).

*Table 1. The analysis of the model-fit indices of the class climate scale*

| Scale | Fit Indices | Recommended Value | Model fit | Goodness of fit |
|---|---|---|---|---|
| Class climate | χ2/df | <5.000 | 2.794 | Acceptable |
| | RMR | <.080 | .035 | Acceptable |
| | GFI | >.900 | .918 | Acceptable |
| | AGFI | >.900 | .895 | Acceptable |
| | NFI | >.900 | .947 | Acceptable |
| | IFI | >.900 | .965 | Acceptable |
| | CFI | >.900 | .965 | Acceptable |
| | RMSEA | <.080 | .058 | Acceptable |

*Data source: self-collated.*

## Item Analysis, Exploratory Factor Analysis, and Reliability Analysis of the Achievement Motivation Scale

*Item Analysis of the Preliminary Questionnaire*: The CR values of each item in each dimension of learning motivation, excluding the disqualified items, ranged from -10.853 to -14.535, all surpassing the criterion of 3.00. The correlation between corrected item scores and the total score, excluding the disqualified items, ranges from 0.749 to 0.842, all exceeding the criterion of 0.400 and having a significant level. After removing the disqualified items, Cronbach's α values ranged from 0.803 to 0.966, which were below the criterion of 0.985. The commonality of all items, excluding the disqualified items, ranged from 0.599 to 0.733, all surpassing the standard of 0.2. The factor loading of each item, excluding the disqualified items, ranged from 0.774 to 0.856, all exceeding the standard of 0.5. In light of these results, it can be expressed that the scale had good discriminant validity. The decision values for each item, excluding the disqualified ones, were all above 3.0, with p-values reaching significance, and it demonstrated good discriminant validity. Batistič & der Laken (2019) suggested that if there are more than three items below the standards, they can be removed from the scale. In this study, as three indicators of disqualified items did not meet the standards, they were removed, leaving 21 items in the scale.

*Exploratory Factor Analysis and Reliability Analysis*: The overall Cronbach's α coefficient of the Learning Motivation Scale was 0.976. The reliability analysis showed that the Cronbach's α coefficients for the dimensions of curiosity, pursuit

of competence, altruistic orientation, and reputation acquisition were 0.931, 0.915, 0.914, and 0.904, respectively. The proportion of variance explained was 73.768%, with factor loadings all exceeding 0.45. This result indicates that the structural validity of the observed data for the scale was high. Based on the reliability analysis criteria mentioned earlier, it is evident that the scale used in this survey was robust and met the reliability requirements.

*Confirmatory Factor Analysis of the Formal Questionnaire*: The researchers performed confirmatory factor analysis on the Learning Motivation Scale using the AMOS. The CR values for the four dimensions of curiosity, pursuit of competence, altruistic orientation, and reputation acquisition were 0.921, 0.921, 0.904, and 0.880, respectively. All four CR values were above 0.6, indicating good composite reliability. The AVE values for the four dimensions of the scale were 0.660, 0.662, 0.653, and 0.648, all exceeding the value of 0.4. The results revealed that the scale had significant p-value, with the RMR = 0.031, the RMSEA = 0.067, the AGFI = 0.877, the NFI = 0.937, the CFI = 0.955, and the GFI = 0.902. Overall, it demonstrates that model fits the data. (Table 2).

*Table 2. The analysis of the model-fit indices of the learning motivation scale*

| Scale | Fit Indices | Recommended Value | Model fit | Goodness of fit |
|---|---|---|---|---|
| Learning motivation | $\chi^2/df$ | <5.000 | 3.421 | Acceptable |
| | RMR | <.080 | .031 | Acceptable |
| | GFI | >.900 | .902 | Acceptable |
| | AGFI | >.900 | .877 | Acceptable |
| | NFI | >.900 | .937 | Acceptable |
| | IFI | >.900 | .955 | Acceptable |
| | CFI | >.900 | .955 | Acceptable |
| | RMSEA | <.080 | .067 | Acceptable |

*Data source: self-collated.*

## Item Analysis, Exploratory Factor Analysis and Reliability Analysis of the Learning Effectiveness Scale

*Item Analysis of the Preliminary Questionnaire*: The analysis of the questionnaire items revealed that the correlation between the corrected items and the total score ranged from 0.719 to 0.832, all exceeding the criterion of 0.400. After removing the disqualified items, Cronbach's α values ranged from 0.897 to 0.912, slightly below the criterion of 0.920. The communalities of all the items ranged from 0.649 to 0.792, all exceeding the standard of 0.2. The factor loadings of the items ranged from 0.806 to 0.890, all surpassing the threshold of 0.5. These results indicated

that the scale showed good discriminant validity, as also evidenced by the decision values exceeding 3.0 for all items with significant p-values.

*Exploratory Factor Analysis and Reliability Analysis*: The overall Cronbach's α coefficient for the Learning Effectiveness Scale was 0.920. The proportion of variance explained was 71.562%, with factor loadings all exceeding 0.45, which demonstrates a high construct validity of the observed data for the scale. In light of the results, it can be claimed that the scale was robust and the results obtained through this scale were reliable and valid.

*Confirmatory Factor Analysis of the Formal Questionnaire*: The Learning Effectiveness Scale was exposed to confirmatory factor analysis through the AMOS. The CR value for the critical learning effectiveness threshold was 0.915, exceeding 0.6, and it indicates good composite reliability. The AVE value for the four dimensions of the scale was 0.639, surpassing the threshold of 0.4. The scale had a significant p-value, with the RMR = 0.026, the RMSEA = 0.091, the AGFI = 0.934, the NFI = 0.976, the CFI = 0.980, and the GFI = 0.972. These values indicate a good overall fit (Table 3).

*Table 3. The analysis of the model-fit indices of the learning effectiveness scale*

| Scale | Fit Indices | Recommended Value | Model fit | Goodness of fit |
|---|---|---|---|---|
| Learning effectiveness | $\chi^2/df$ | <5.000 | 5.496 | Acceptable |
| | RMR | <.080 | .026 | Acceptable |
| | GFI | >.900 | .972 | Acceptable |
| | AGFI | >.900 | .934 | Acceptable |
| | NFI | >.900 | .976 | Acceptable |
| | IFI | >.900 | .980 | Acceptable |
| | CFI | >.900 | .980 | Acceptable |
| | RMSEA | <.080 | .091 | Acceptable |

*Data source: self-collated.*

## Differential Analysis

Differential analysis between two groups was performed by independent sample t-test ($p < 0.05$). Significant differences between the two groups were observed through the comparison of the means. (Saiphoo & Vahedi, 2019).

*Differential Analysis of Participants with Different Background Variables*: A comparison of male and female students was made using an independent samples t-test. The analysis revealed no significant differences in terms of class climate, learning motivation, and learning effectiveness between male and female students. On the other hand, there was a significant difference regarding the class climate among students from different grades (F = 6.013, p < 0.05). A more detailed comparison showed that senior and junior students had better class climate than freshmen. In addition, in terms of collaboration, seniors and juniors exceeded freshmen, and juniors exceeded sophomores. With respect to cultural development, cohesion, learning, and class cadre aspects, seniors and juniors surpassed freshmen. The overall learning motivation of university students from different grades reached a significant level (F = 4.239, p < 0.05). Further comparison indicated that seniors had higher overall learning motivation than freshmen. Next, in terms of curiosity, seniors and juniors surpassed freshmen, and seniors exceeded sophomores. Regarding pursuit of ability, seniors exceeded freshmen and sophomores and again seniors surpassed freshmen in reputation acquisition. There was a significant difference in learning effectiveness among students from different grades (F = .861, p < 0.05). More specifically, Scheffe's post hoc comparison revealed that the learning effectiveness of seniors was higher than that of freshmen.

*Correlation Analysis*

Correlation analysis serves as a preliminary way for causal analysis by examining the relationships between pairs of variables (Saiphoo & Vahedi, 2019). After the correlation analysis between variables, subsequent regression analysis can be conducted to explore the causal relationship. The Pearson correlation coefficient is suitable for describing linear relationships between two continuous variables, ranging from -1 to 1. As shown in Table 4, class climate has a significantly positive correlation with learning motivation (r = 0.931, p < 0.001), indicating that higher class climate corresponds to higher learning motivation. In addition, the class climate also has a significantly positive correlation with learning effectiveness (r = 0.878, p < 0.001), suggesting that higher class climate corresponds to higher learning effectiveness. Similarly, learning motivation has a significantly positive correlation with learning effectiveness (r = 0.907, p < 0.001), indicating that higher learning motivation corresponds to higher learning effectiveness.

*Table 4. Summary of the correlations among class climate, learning motivation, and learning effectiveness*

| Factor dimension | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 Collaboration | 1 | | | | | | | | | |
| 2 Cultural and development | .812** | 1 | | | | | | | | |
| 3 Cohesion | .839** | .769** | 1 | | | | | | | |
| 4 Learning | .818** | .810** | .761** | 1 | | | | | | |
| 5 Class cadres | .764** | .730** | .695** | .740** | 1 | | | | | |
| 6 Curiosity | .790** | .851** | .804** | .791** | .693** | 1 | | | | |
| 7 Ability pursuit | .833** | .861** | .778** | .818** | .703** | .312** | 1 | | | |
| 8. Altruistic orientation | .797** | .879** | .795** | .807** | .720** | .840** | .871** | 1 | | |
| 9 Reputation acquisition | .774** | .834** | .766** | .771** | .641** | .829** | .848** | .853** | 1 | |
| 10 Effectiveness | .803** | .856** | .761** | .793** | .707** | .830** | .864** | .874** | .844** | 1 |

*Data source: self-collated.*

*Note:* $^{**}p < 0.01$.

## The mediating effect of learning motivation between class climate and learning effectiveness

In the mediating model of this study, class climate served as the independent variable, learning effectiveness as the dependent variable, and learning motivation as the mediating variable. Multivariate regression analysis was employed to test the mediating effect of learning motivation and verify the hypotheses H2, H3, H4, and H5. Regarding the multicollinearity, the variance inflation factor (VIF) values for all variables were below 10, indicating no multicollinearity among the variables, and, thus, the subsequent analysis was conducted.

As indicated in Table 5, the results of the regression analysis regarding the impact of class climate on learning effectiveness revealed a standardized Beta coefficient of 0.876 with a significance level of $p < 0.001$, demonstrating a significant level. Hence, the H2 is supported, indicating that class climate significantly and positively influences learning effectiveness. This result suggests that a higher level of class climate corresponds to greater learning effectiveness.

*Table 5. The result of the regression analysis of class climate on learning effectiveness*

| | Dependent variable: Learning effectiveness | | | |
|---|---|---|---|---|
| | Standardized Coefficient Beta | t value | *p* | VIF |
| Independent variable | | | | |
| Freshman vs. Senior | .046 | 1.474 | .141 | 2.150 |
| Sophomore vs. Senior | .001 | .045 | .964 | 2.288 |
| Juniors vs. Seniors | .003 | .090 | .928 | 2.079 |
| Class climate | .876*** | 40.506 | .000 | 1.034 |
| F value | 418.647*** | | | |
| $R^2$ | .758 | | | |
| Adjusted $R^2$ | .756 | | | |

*Data source: self-collated.*

*Note: \*\*\* p < 0.001.*

Table 6 displays the results of the regression analysis of class climate on learning motivation. The standardized Beta coefficient was 0.928 (p < 0.001), which shows a significant effect. Therefore, the H3 refers that class atmosphere has a significant positive effect on learning motivation. It means that the better the class climate is, the higher the learning motivation is.

*Table 6. Summary of the regression analysis of class climate on learning motivation*

| | Dependent variable: learning motivation | | | |
|---|---|---|---|---|
| | Standardized Coefficient Beta | t value | *p* | VIF |
| Independent variable | | | | |
| Freshman vs. Senior | .007 | .293 | .770 | 2.150 |
| Sophomore vs. Senior | -.043 | -1.726 | .085 | 2.288 |
| Juniors vs. Seniors | -.037 | -1.549 | .122 | 2.079 |
| Class climate | .928*** | 55.752 | .000 | 1.034 |
| F value | 798.472*** | | | |
| $R^2$ | .856 | | | |
| Adjusted $R^2$ | .855 | | | |

*Data source: self-collated.*

*Note: \*\*\* p < 0.001.*

As it can be seen in Table 7, the results of the regression analysis of learning motivation and learning effectiveness showed that the standardized Beta coefficient was 0.910 (P < 0.001), which had a significant level. Therefore, the H4 is established that learning motivation has a significant positive impact on learning effectiveness. It indicates that the higher the degree of learning motivation is, the higher the learning effectiveness is.

*Table 7. Summary of the regression analysis of learning motivation on learning effectiveness*

| | Dependent variable: Learning effectiveness | | | |
|---|---|---|---|---|
| | Standardized Coefficient Beta | t value | *p* | VIF |
| Independent variable | | | | |
| Freshman vs. Senior | .033 | 1.254 | .210 | 2.141 |
| Sophomore vs. Senior | .037 | 1.337 | .182 | 2.297 |
| Juniors vs. Seniors | .036 | 1.368 | .172 | 2.081 |
| Class climate | .910*** | 49.766 | .000 | 1.023 |
| F value | 630.872*** | | | |
| $R^2$ | .825 | | | |
| Adjusted $R^2$ | .823 | | | |

*Data source: self-collated.*

*Note: *** p<0.001.*

Baron and Kenny (1986) proposed that the mediating effect should meet the following conditions: A. The independent variable has a significant predictive effect on the dependent variable; B. The independent variable has a significant predictive effect on the intermediate variable; C. When both the independent variable and the mediating variable are put into the regression model at the same time, if the predictive effect of the mediating variable is significant, the predictive effect of the independent variable decreases, and the mediating variable plays a partially mediating role. On the other hand, if the predictive effect of the independent variable disappears, the mediating variable plays a completely mediating role.

In the third model, class climate and learning motivation are taken as independent variables, and learning effectiveness is considered as dependent variable. The results showed that the explanatory variance $R^2$ increased by 0.073, and the standardized regression coefficient β of the effect of class climate on learning effectiveness was 0.211, reaching a significant level (p < 0.001). The standardized regression coefficient β of the effect of learning motivation on learning effectiveness was 0.716, having a significant level (p < 0.001). In addition, the standardized regression coefficient was positive. Thus, in the regression model in which both class climate and learning motivation affected learning effectiveness, both class

climate and learning motivation had a significant positive impact on learning effectiveness. The standardized regression coefficient β of class climate on learning effectiveness decreased from 0.876 to 0.211 and reached a significant level. Therefore, learning motivation played a completely mediating role in the effect of class climate on learning effectiveness. This result is consistent with Model 3 proposed by Baron and Kenny (1986). Thus, the hypothesis H5 of this study was verified (Table 8).

*Table 8. The analysis of the mediating effect of learning motivation between class climate and Learning effectiveness*

| | Mode 1 | Mode 2 | Mode 3 |
|---|---|---|---|
| | Learning effectiveness (dependent variable) | Learning motivation | Learning effectiveness (dependent variable) |
| | Beta | Beta | Beta |
| Control variable | | | |
| Freshman vs. Senior | .046 | .007 | .041 |
| Sophomore vs. Senior | .001 | -.043 | .032 |
| Juniors vs. Seniors | .003 | -.037 | .029 |
| Independent variable | | | |
| Class climate | .876*** | .928*** | .211*** |
| Mediator variable | | | |
| Learning motivation | | | .716*** |
| F value | 418.647*** | 798.472*** | 526.783*** |
| $\triangle R^2$ | | | .073 |
| $R^2$ | .758 | .856 | .831 |
| DF | 4 | 4 | 5 |

*Data source: self-collated.*

*Note 1: ***p<0.001.*

*Note 2: "Female students" and "senior students" were the reference groups.*

# Conclusion

Regarding gender as a background variable, there were no significant differences among college students from different genders in terms of overall class climate, learning motivation, and learning effectiveness, as well as their various dimensions. With respect to grade level, the study revealed significant differences in overall class climate, learning motivation, and learning effectiveness among students from different grades. This finding aligns closely with the studies conducted by Arslan & Duru (2017), Wang *et al.* (2020), Mao and Chen (2014), and Zhao (2017). Regarding class climate, seniors and juniors surpassed freshmen. This difference is primarily manifested in five dimensions of class climate: collaboration culture and development, cohesion, learning, and class cadres. One of the possible reason behind this finding may be that freshmen just adapt to the university environment and learning methods, while in the third and fourth years, students fully acclimate to the university atmosphere, which contributes to a more favorable class climate. In terms of learning motivation, seniors exhibited higher motivation than freshmen, particularly in the areas of intellectual curiosity, pursuit of abilities, and reputation acquisition. One of the possible rationales of this finding may be that seniors face some challenges such as postgraduate entrance exams and job searches, and, therefore, motivation for learning becomes more evident. In addition, regarding learning effectiveness, seniors surpassed freshmen. This finding can be attributed to the possibility that fourth-year students are in a period of academic achievement, where effectiveness gradually becomes apparent.

The results of this study indicated that class climate significantly influenced the learning effectiveness of college students in Xi'an. This suggests that the better the class climate is, the more students are equipped with the professional foundational knowledge, skills, research abilities, and the enhancement of professional qualities. This finding aligns with the studies conducted by Allen *et al.* (2016) and Neel & Fuligni (2013).

One of the other important results of the study showed that class climate had a significant positive impact on the learning motivation of college students in Xi'an. This finding aligns with the studies of Rudasill *et al.* (2018), Fan & Williams (2018), and Wang *et al.* (2020). The level of class climate among college students can reflect their motivation for better academic development, and, thus, it indicates the degree of their learning motivation. When class climate improves, learning motivation increases accordingly. In other words, a better class climate of college students can significantly and positively influence their learning motivation. Importantly, it was found that class climate had a significant positive impact on the learning effectiveness of college students in Xi'an, which was consistent with the viewpoint proposed by Sun *et al.* (2012). That is, when the level of learning motivation is high among college students, it has a positive impact on learning effectiveness of students. This study also demonstrated that learning motivation had a complete mediating effect between class climate and

learning effectiveness. In other words, class climate can positively influence learning effectiveness through learning motivation.

## Suggestions

The level of class climate affects various aspects of college students' learning effectiveness. Therefore, schools should aim not only to improve students' teaching skills but also to create a positive class climate through fostering collaboration, emphasizing culture and development, enhancing class cohesion, creating a conducive learning environment, and cultivating democratic class cadres. In this way, students' learning effectiveness can be enhanced.

Contemporary college students should attach importance to the cultivation of learning motivation. When they encounter academic problems that they cannot solve on their own, they should actively address the issues and seek solutions. This process can lead them to have, higher academic achievements.

This study can be conducted with different participants, research methods, and research variables. Including more extensive and international participants, diversifying research methods and including both qualitative and quantitative approaches, and exploring additional related variables can lead to more comprehensive and profound research results.

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