Empirical Analysis of the Relationship among Class Psychological Environment, Academic Buoyancy and Academic Achievement under the Background of Large-scale Data

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Abstract
With the rapidly development of the Internet and Educational Information Technology, big data analyze was also widely used in education. Actually, the duration of study in class increases with the development of various purchase service on campus. Based on the group dynamics theory and the internal and external dynamic model of motivation elasticity, this paper utilized whole sampling rules,collected and processed big data, investigated the influence of class psychological environment on academic buoyancy through a survey of 627 students in grade 2 of two public middle schools in the same area. In this study, data processing and analysis softwareSPSS26.0 and Model 4, Model 7 in the macro program PROCESS were used to analyze the collected data. Data analysis results were found that the higher academic achievement was attributed to the better psychological environment. Academic buoyancy promote academic achievement positively. The indirect effect of class psychological environment on academic achievement was moderated by school types, and the indirect effect was stronger for boarding schools.

Keywords: *Large-scale data; Class psychological environment; Academic buoyancy; Academic achievement; Statistics analysis*

1. INTRODUCTION

In recent years, the heavy work burden combines with the overlap of commuting time and school time, picking up students on time becomes more and more difficult for parents, which results in a disorder of after-school management. The teaching quality in counselling institutions is uneven to alleviate such situation. Therefore, in service teachers have to implement after-class tutoring and solve other practical problems. In accordance with the guiding opinions of the General Office of the State Council on Government Purchasing Services from Social Forces, local education departments have continuously developed and improved the after-school purchasing services in a diversified and flexible way combined with the actual local conditions. Compared with the previous eight-hour school time, the number of hours students spend in school increased year by year. This was especially obvious for students in boarding schools with a single and fixed physical environment. Classroom almost became only place for boarding students to study, live and socialize. The class atmosphere to a great extent, affects students' learning autonomy and enthusiasm, academic achievement, as well as the whole life path in the future. In this study, we comprehensively considered the influence and mechanism of class psychological environment and academic buoyancy on academic achievement, and provided theoretical basis and empirical support for the improvement of students' academic achievement.

The term psychological environment was first proposed by Lewin, who believed that the relationship between people and environment could be expressed by behavior, and the change of people and environment would also lead to corresponding behavioral changes [2]. Psychological environment mainly refers to the relatively dominant and stable overall psychological state in the class, such as class cohesion, collective sense of honor, class identity, teacher-student relationship, peer relationship, learning atmosphere and so on. It was

a huge power with educational significance that develops invisibly in education and teaching [8]. Class psychological environment refers to the whole living environment that affects the psychological activities of teachers and students in a class. Therefore, some researchers divided the psychological environment of class into three levels: individual inner psychological environment, inner psychological environment of class and external psychological environment of class. Among them, the inner psychological environment refers to the mental environment that affects most members of a class [12]. Compared with other influencing factors, the inner psychological environment often has more direct and diverse influence on the class members. Therefore, class psychological environment, as a kind of micro ecosystem, makes the students and education workers feel of its own class and classroom atmosphere. Comprehensive studies on class psychological environment showed that there were few students facing academic difficulties and psychological problems in classes with better psychological environment [7]. Among various factors that affected the psychological environment of the class, the harmonious relationship between teachers and students, and the maintenance of discipline and order had a significant impact on students' academic achievement [11]. The psychological environment of the class might predict the academic achievement of students [1]. Therefore, class psychological environment was positively correlated with academic achievement (H1).

Academic buoyancy, as an important ability for students to overcome setbacks such as poor academic performance, competitive pressure, and difficult tasks in both academic tasks and school activities, acts as an important predictor of academic success. Academic buoyancy was a trait related to an individual's ability to deal with the adversity [3]. With high academic buoyancy, the consciousness of independent learning would also be improved [9]. Similarly, students with higher academic buoyancy have more autonomous learning consciousness and engage in learning activities better [4]. The improvement of academic buoyancy could help students control learning difficulties, enhance their will to face learning setbacks, and relieve the negative emotions brought by examination tension. Therefore, high academic buoyancy had positive effect on the improvement of academic achievement.

Pitzer and Skinner [6] proposed the internal and external dynamic model of motivation elasticity, they argued that healthy and stable environmental factors (such as teacher-student relationship, parent-child relationship and peer relationship) could satisfy the basic psychological needs of individuals, thus relieve individual emotional ups and downs and increase students' motivation elasticity. Active learning consciousness, adaptive internal state that could self-regulate and balance various environments, individual

temperament and personality characteristics, harmonious teacher-student relationship, as well as friendly peer friendship could all promote the generation of academic buoyancy [13]. Therefore, this study hypothesizes that academic buoyancy plays a mediating role in the relationship between class psychological environment and academic achievement (H2).

Previous studies mostly explored and analyzed students' gender and age as moderators. Compared with the students in the non-stay schools, the activities of the students in the boarding schools were more single and lasting, and they were affected by the family environment and social environment and receive less psychological support from parents and elders. As the main environment for boarding students' life and learning activities, class psychological environment intervene the process and psychological changes of students' learning activities, and systematically affected the effect of learning activities. As an important place for students to study and live for a long time, the length of the class had a crucial impact on students' perception of the depth of the class psychological environment and the level of academic buoyancy. Therefore, in this study, according to the different types of schools where students live, schools were divided into accommodation and walking schools, And more in-depth research and exploration was put forward the hypothesis that school types might play a moderating role between class psychological environment and academic buoyancy (H3).

In summary, this study based on the large-scale data analysis, proposed a moderated mediation model (Fig.1) based on the theory of group dynamics and the internal and external dynamic model of motivational resilience to explore the mechanism of class psychological environment on academic achievement. This study assumed that academic buoyancy played a mediating role between class psychological environment and academic achievement, and the first half of the mediating role of school types adjustment.
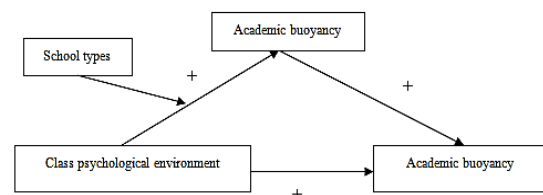

Figure 1: the hypothetical model of the relationship between class psychological environment and academic achievement

2.SUBJECTS AND METHODS

2.1. Examinee

This study adopted the cluster sampling method to select 700 sophomores from two public junior high schools (one boarding school and one walking school) in the same region for a paper questionnaire survey. 73 invalid questionnaires were excluded and 627 valid questionnaires were obtained. According to the descriptive statistical analysis, there were 315 boys and 312 girls; 309 Han students and 318 ethnic minority students; 332 boarding students and 295 walking students; the average age was 15.25 years old (SD = 0.45).

2.2. Tools

2.2.1. Class Psychological Environment Questionnaire

Using class psychological environment questionnaire [14] to measure the class psychological environment, a total of 40 items, included introspection experience, learning atmosphere, cohesion, conflict, psychological support. The higher the score of Likert 5 points (1 means ' never so ', 5 means ' always so '), the better the class psychological environment. By SPSS26.0 reliable analysis, the reliability of the total scale and each dimension scale were 0.96, 0.86, 0.89, 0.83, 0.91 and 0.84, respectively.

2.2.2. Academic buoyancy table

Academic buoyancy was measured using the Academic Buoyancy Scale (ABS) [5]. The above questions were assessed by students themselves and scored at 7 points. The internal consistency reliability coefficient α of the scale is 0.81. The higher the total score was, the higher the level of students' academic buoyancy was.

2.2.3. Academic achievement

At the end of the final examination of the unified proposition in the city, contacted the head teachers of each class to obtain students' achievements in the three main subjects of Chinese, mathematics and English as indicators to measure students' academic achievements.

3.RESULTS AND DATA ANALYSIS

3.1. Common method deviation test

This study adopted self-reported data, and the common method bias should be minimized. By Harman single factor test, the common method deviation was tested. The analysis results showed that the eigenvalues of six factors were greater than 1, and the interpretation rate of the first factor was 34.98 %, which was less than the critical value of 40 %, indicating that the common method deviation was not obvious.

3.1.1. Descriptive statistics and correlation analysis

Descriptive statistics and correlation analysis using SPSS 26.0. Data results were shown in Table 1. Class psychological environment positively predicted academic achievement ($r = 0.21$, $p < 0.01$). The sub-dimensions of the class psychological environment were significantly positively correlated with academic buoyancy, and the class psychological environment was significantly positively correlated with academic buoyancy ($r = 0.46$, $p < 0.01$). Academic buoyancy was significantly positively correlated with academic achievement ($r = 0.22$, $p < 0.01$). The correlation model between variables was consistent with the hypothetical model, which supported subsequent research and analysis.

Table 1: Descriptive statistics and correlation analysis of variables in each dimension (n = 627)

	M	SD	1	2	3
1. class psychological environment	161.25	29.73	1		
2. academic buoyancy	19.96	5.45	.46**	1	
3. academic achievement	310.43	74.46	.21**	.22**	1

Note: * represents $p < 0.05$, ** represents $p < 0.01$, *** represents $p < 0.001$; the same below.

3.1.2. Intermediary model test

Used Model 4 in PROCESS for data analysis after controlled variables such as gender and ethnicity. Data results were shown in Table 2. Class psychological environment could positively predict academic achievement ($\beta = 0.54$, $p < 0.001$). Class psychological environment could also significantly positively predict academic buoyancy ($\beta = 0.46$, $p < 0.001$); when class psychological environment and academic buoyancy predicted academic achievement, the positive predictive effect of academic buoyancy on academic achievement was significant ($\beta = 0.42$, $p < 0.001$), and the positive predictive effect of class psychological environment on academic achievement was still significant ($\beta = 0.34$, $p < 0.01$). The results showed that academic buoyancy played a partial mediating role between class psychological environment and academic achievement. The mediating effect value was 0.20, and the Bootstrap confidence interval of 95 % was [0.09, 0.31], excluding 0, indicated that the mediating effect is significant; the

mediating effect of academic buoyancy accounted for 36.76 % of the total effect value.

Table 2: Regression analysis of mediating effect of academic buoyancy

variable	Model 1			
	Academic buoyancy		Academic achievement	
	β	SE	β	SE
sex	-0.04	0.07	0.51*	0.20
nation	-0.03	0.07	-0.26	0.20
class psychological environment	0.46***	0.03	0.34**	0.11
Academic buoyancy			0.42***	0.11
R²	0.21		0.07	
F	57.98***		13.13***	

3.1.3. The moderating effect test of school types

Used Model 7 in PROCESS for data analysis after controlled variables such as gender and ethnicity. Data results were shown in Table 3. Class psychological environment could positively predict academic buoyancy ($\beta=0.59$, $p<0.001$). However, the interaction between class psychological environment and school types could significantly negatively predict academic buoyancy ($\beta= -0.26$, $p <0.001$), which indicates that school types played a moderating role between class psychological environment and academic buoyancy. In order to understand the moderating effect of school types more intuitively, a simple effect analysis diagram of class psychological environment on academic buoyancy was drawn by using EXCEL (Fig.2). Then, the mediating effect and 95 % confidence interval of academic buoyancy of different types of school between class psychological environment and academic achievement were analyzed (Table 4). The results showed that for residential, the mediating effect of academic buoyancy was 0.25, and the confidence interval didn't include 0, so the mediating effect was significant. For day school, the mediating effect of academic buoyancy was 0.14, and the confidence interval didn't include 0, so the mediating effect was significant. Although the mediating effect of academic buoyancy was obvious in different types of school, but with the different types of school, the mediating effect of academic buoyancy in class psychological environment and academic achievement was also increasing.

Table 3: Regression Analysis of Moderating Effects of School Types

variable	Model 2			
	Academic buoyancy		Academic achievement	
	β	SE	β	SE
sex	-0.04	0.07	0.51*	0.20
nation	-0.03	0.07	-0.26	0.20
class psychological environment	0.59***	0.04	0.34**	0.11
Academic buoyancy			0.42***	0.11
student type	-0.03	0.07		
class psychological environment × school types	-0.26***	0.07		
R²	0.23		0.07	
F	38.39***		13.13***	

Table 4: The mediating effect of academic buoyancy of different types of school

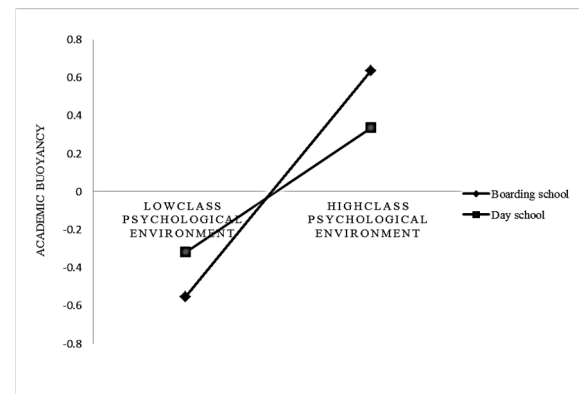| school types	Effect	BootSE	BootLLCI	BootULCI
boarding school	0.25	0.07	0.12	0.40
day school	0.14	0.04	0.06	0.25

Figure 2: Moderating effect of class psychological environment and school types

4.DISCUSSION

4.1. The direct effect of class psychological environment on academic achievement

According to Lewin's theory of group dynamics, the process of association and interaction among

class members could produce human and environment interaction. Different elements played

different roles [14]. In our country, students studied from school and lived in a relatively constant group of teachers and peers. Boarding schools were particularly evident, where students spend most of their day in classes except for double weekends. Due to the single environment and interpersonal communication, students had stronger psychological dependence on class groups, teachers and peers. A good class psychological environment had not only become a powerful force for educating students, but also gradually became a source of influence that could automatically stimulate students to improve academic achievements. Consistent with most previous studies, the results of this study showed that class psychological environment had a significantly positive impact on academic achievement. The better class learning atmosphere students feel, the more psychological support they receive from others, the higher cohesion they had, the better introspective experience they had, the less conflicts they have among their peers, the more harmonious the friendship between teachers and students and their peers, and the higher academic achievement they had. On the contrary, the lower academic achievement. Therefore, good class psychological environment was conducive to the improvement of academic achievement.

4.2. Analysis of the mediating effect of academic buoyancy

Stern believed that human behavior was affected by the interaction between needs and stress. When the class members from the school, family and other external environment pressure was not high, and the inner needs were met, students would be more stable in learning activities. On the contrary, when the class members felt too much external pressure, psychological acquisition was low, there would be low academic achievement, even weariness, escape and other certain degree of extreme behaviour [14]. The results of this study showed that class psychological environment had a positive predictive effect on academic buoyancy, and academic buoyancy was significantly positively correlated with academic achievement, that was, class psychological environment had a positive impact on academic achievement by improving the level of academic buoyancy, and academic buoyancy played a mediating role in the relationship between class psychological environment and academic achievement. H. Kelly's attribution theory attributed human behavior to three different aspects, namely, the actor, the objective stimulus, the environment and relationship of the actor; it was believed that individual behavior was the result of the interaction between individual and external factors [10]. Therefore, the development of students' mental health and the improvement of academic achievement were inseparable from the influence of academic buoyancy and class psychological environment.

4.3. ANALYSIS OF THE MODERATING EFFECT OF SCHOOL TYPES

This study found that boarding school students' academic achievement level was more affected by class psychological environment and academic buoyancy level. Boarding schools' students spent far more time in school than reading schools' students. Students in boarding schools not only studied in classes, but also lived in the fixed physical environment of class group. Therefore, the class atmosphere and interpersonal relationship they feel were relatively constant, the main activities they engage in were more single, and they were more deeply and directly affected by the class psychological environment. Therefore, it was particularly important for educators and students to establish a class group with a positive and healthy psychological environment, so that students could obtain more psychological support and made them emotionally stable to overcome the various setbacks that might be encountered in the learning process. Compared with the students in the non-stay schools, the boarding students received more practical support from teachers and peers, forming a strong sense of class belonging, interpersonal skills and frustration resistance, so their academic achievement level was relatively higher.

4.4. Lack of research and educational implications

There were certain limitations in this study:

The subjects in this study were all in the same region, with single representation and lack of diversity, and their education status couldn't represent the education level of various provinces and cities.

The results showed that class psychological environment was an important factor affecting students' academic achievement, which not only directly affected students' academic achievement, but also damaged academic achievement by reducing students' academic buoyancy level. Therefore, it was necessary to inspire educators, especially teachers in boarding schools, to do a good job of class collective leadership, cultivate positive and powerful student cadres, and guide students to form a good class learning atmosphere, collective public opinion and classroom order. Constantly reflected on their own values and codes of conduct, gave full play to the role of behavior model, improved the class students' inner cohesion. Facing the increasing psychological pressure and psychological problems of students, teachers should pay attention to students' mental health status timely and carefully, guided students to correctly handle interpersonal conflicts and contradictions in class collective life, and did a good job of students' psychological health care. Created a harmonious class psychological environment, improved students' academic buoyancy level, made it better to deal

with academic setbacks and challenges, so as to obtain higher academic achievement.

5.CONCLUSION

This study concluded:

(1) Class psychological environment had a significant positive predictive effect on academic achievement.

(2) Class psychological environment and academic buoyancy were significantly positively correlated.

(3) Academic buoyancy positively predicted academic achievement.

(4) Academic buoyancy played a mediating role in the relationship between class psychological environment and academic achievement.

(5) The indirect effect of class psychological environment on academic achievement was moderated by the type of schools, and the indirect effect was stronger for boarding schools.

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