Journal of Learning Spaces
Volume 6, Number 3. 2017

ISSN 21586195

An Investigation of University Students' Classroom Seating Choices

Li Xi
Beijing Normal University

Zhang Yuan
Beijing Normal University

Bai YunQui
Beijing Normal University

Feng-Kuang Chiang
Shanghai Normal University

The classroom is crucial for students, and seating position within the classroom can affect students' performance. This study conducted a survey to investigate the relationship between seating zones and academic performance among 174 university students in Beijing. The results revealed differences in student performance in terms of seating position in small- and medium-sized traditional classrooms. However, the results did not indicate a similar hierarchy of student performance in terms of seating zones in larger traditional classrooms, horseshoe classrooms, collaboration classrooms, and computer classrooms. Additionally, the results revealed that most students considered the layout of a classroom to affect their performance.

Introduction

School facilities are essential educational resources and therefore have substantial educational effects. The classroom is a crucial space for students to obtain knowledge. Classroom capacity and resources are limited, which thus limits the activities of teachers and learners. Therefore, classroom layout is crucial to student learning.

Researchers (Badia-Martin, 2006; Curwin & Mendler, 1988; Downer et al., 2007) have revealed that classrooms have a major effect on students. The arrangement of seats in the classroom is an essential component of the teaching environment and has a major effect on the allocation of educational resources and educational opportunities. In recent years, educators have been promoting various types of learning environments. Preferences for the type of classroom seating and the selection of classroom seating reflect students' learning styles, learning motivation, learning attitudes, and learning behavioral tendencies. These factors have substantial effects on students' academic performance and degree of classroom participation. Therefore, researchers should pay more attention to the arrangement of classroom seats.

Since Comenius first proposed the classroom system, education has developed rapidly. Currently, various schools and other educational (including higher educational) institutions have different classroom designs. For example, the Lewis & Clark Law School (Carney-Morris & Murphy, 2016) has a lecture room, a U-shaped classroom, and a small meeting room. Most of the classrooms in education and advisory institutes have mobile desks and chairs. The Academy of Arts and Sciences has more classroom types, ranging from large auditoriums to smaller seminar rooms. Williams College also has many classroom types, including Socrates classrooms, seminar classrooms, meeting rooms, lecture halls of different sizes, computer teaching labs, and science laboratories and so on. Z Yang et al. (2013) examined the effects of classroom attributes on student satisfaction and performance by using three classroom types: distance education network classrooms, auditorium classrooms, and discussion classrooms. Duan et al. (2015) conducted empirical research on college students' seating preferences; they differentiated classrooms by seedling type, combination type, tandem type, horseshoe type, and other types and then allowed students to choose their preferences.

Studies on the relationship between classrooms and student performance have mainly examined the relationship between student performance and classroom type and that between student performance and classroom seating zones.

Most studies on the relationship between classroom type and student performance have examined the effects of different classrooms on students' academic performance, motivation, participation, communication, and other aspects. Richards (2006) discovered that the location of a student's classroom seat can affect his or her performance. Atherton (2005) revealed that active learners are more effectively motivated through circular or cluster-seating arrangements than in row-and-column classrooms. Steinzor (1950) and Gump (1987) have hypothesized that students seated around tables distributed within a classroom can

Feng-Kuang Chiang, Shanghai Normal University, is the corresponding author: fkchiang@shnu.edu.cn

establish face-to-face contact more easily than those in row-and-column seating.

Research on the relationship between classroom seating zones and student performance have mainly examined the effects of seating zones on students' attitudes, communication with teachers, participation, and motivation. Some studies have recommended new seating arrangements, with students sitting in the front row and center of the classroom exhibiting higher participation rates and being perceived to be more diligent students. Furthermore, higher participation rates appear to be correlated with increased class enjoyment, feelings of inclusion, and stronger motivation. Moore and Glynn (1984) reported that the location of students in classrooms typically determines the number of interactions they have with teachers, with greater interaction eventually improving students' learning. Zomorodian et al. (2012) demonstrated that seat selection has a mutually reinforcing influence on students' seat allocation and performance. Students in the front row of a classroom may be more active and interactive with the lecturer than other students. Shernoff et al. (2017) found that seating position in large lecture halls influences student participation, attention, classroom learning experience, and curriculum performance. The results indicated that students sitting in the back of the classroom reported a lower degree of participation, attention, and classroom experience, compared with those sitting in the middle or front of the class. Those who always sat at the back of the classroom also received lower grades.

Moreover, student seat selection and personal motivation are highly correlated. Motivated students tend to sit in the middle of the classroom, whereas weak students tend to sit in the back of the classroom. Weinstein (1979) pointed that sitting in a front-center seat facilitated achievement, positive attitudes about the course, and participation.

Armstrong (2007) found out that those in the front received higher grades than those in the back, suggesting that more motivated and engaged students chose seat nearer to the lecturer. He also thought the possible relationship between seat location and test scores was mainly due to the motivation of the students who sat in the front of the class rather than their seat position.

Few empirical studies on the relationship between classrooms and student performance have been conducted in China. Only a single relevant study examined the traditional classroom arrangement. From the perspective of pedagogy, a study investigated the learning attitudes of primary and secondary school students (Song, 1999). In addition, a study examined the relationship between student seating and learning motivation and that between student seating and classroom interaction in row-and-column classrooms (Xiao & Chen, 2011). The study indicated that students sitting in the middle of the front row exhibited significantly higher learning motivation and goals than those in other positions, and the same students also interacted with teachers more frequently than those in other positions. Another study investigated whether the choice of seating by students in row-and-column classrooms influences learning performance and attitude. The study indicated that seating positions in the back and sides were not conducive to student learning or to a positive learning attitude.

Research on the relationship between classrooms and student performance is more mature in foreign countries than in China, for which we must account for its special cultural background. Ahmad and Majid (2010) argued that culture has a strong influence on students' classroom performance and that cultural factors must be considered in classroom arrangements. Research on the relationship between classrooms and student performance in China remains inadequate. Although research on the effects of seating arrangements on student learning and teaching in China has been conducted, these studies have remained at the theoretical level. Few empirical studies on classroom seating arrangements have been conducted. In addition, most relevant studies have focused on primary and secondary schools, but very few related studies have examined university classrooms. Studies have also focused on seating zones within a specific classroom type rather than considering the various classroom types. Row-and-column seating is the most common arrangement in China, and row-and-column classrooms have a wide range of student numbers. A single school might have 30, 60, 100, or 300 students in each classroom. Determining the effect of different class sizes on student performance is imperative, but this effect has not been considered by previous studies.

The main purpose of this study was to determine the effect of students' choices regarding classroom types and seating zones by examining academic performance, classroom types, and seating preferences among various academic majors and grade levels at a university in Beijing. In this paper, we also reveal the reasons for student's classroom-related choices and the factors in the classroom that students believe are crucial. Our analysis and processing of the data revealed the relationship of students' academic performance with classroom type and classroom seating zones. We also attempted to determine the causes of these relationships.

This study raised the following questions：

1) What is the relationship between seating preference in various types of classrooms and students' academic performance?

2) What is the status quo of students' preferences for various types of classrooms and their preferences for various factors in the classroom?

Research Design

Participants and Methods

In undertaking this study, we randomly distributed and collected 177 questionnaires. Among them, 174 (98.3%) questionnaires were valid. Participants included 54 male and 120 female students, whom we randomly selected from the university in Beijing. The students varied in education levels, with 74 being graduate students and 100 being undergraduates. The students also varied in their majors. The distribution of the student sample majoring in the humanities, science and engineering, social sciences, and education was 43, 60, 34, and 37, respectively.

The study's main tool was the questionnaire survey, through which we attempted to examine the relationship between various types of classrooms and students' academic performance, as well as the relationship between students' classroom seating positions and their academic performance. In addition, we obtained the general demographic data of the student respondents, including age, grade, and gender, through the questionnaire. The statistical processing of the data was implemented using SPSS 20.0.

This study raises the following questions:

1) What is the relationship between the seating preference of different types of classrooms and students' academic performance?

2) What is the status quo for students' preferences for different types of classrooms and the preferences of different factors in the classroom?

Research Tools

We prepared the questionnaire in the following stages:

Stage I: Preprogrammed questionnaire. A review of many prior studies clarified the relationships among classroom seating arrangements, student achievement, and student motivation. We categorized classroom types and sizes. With reference to the literature, we categorized the different classroom types (Ankney, 1974; Atherton, 2005; Bonus & Riordan, 1998; Weinstein, 1992). However, in accordance with the actual school classrooms of the university in Beijing, we further divided the row-and-column classrooms into different classroom sizes. We then examined student preferences for different classroom types (Bickers, 2016; Zheng Y, 2013).

Stage II: Expert review phase. We submitted the preprogrammed questionnaires to an expert for review. We then revised the questionnaire in accordance with the results of the expert's assessment. Next, we submitted the revised questionnaire to the expert for another review, and we revised it again in accordance with the expert's second review, to determine the final version of the questionnaire. Thus, we performed several iterations of the questionnaire, and both educational professionals and students tested the validity of survey questions to minimize any bias and misinterpretation. The Cronbach'α reliability analysis of the questionnaire, the reliability is 0.75, indicating the reliability of the questionnaire.

The questionnaire comprised three parts. The first section pertained to basic information about the respondents, including demographic variables such as gender, grade level, major, academic performance rankings, and learning styles. This section consisted of 10 questions.

The second part of the questionnaire pertained to the various classroom types and different seating zones in the classrooms. According to the relevant literature and the actual situation of the school, we classified classrooms into four types: traditional, horseshoe, collaborative, and computer classrooms. The traditional classroom type included row-and-column classrooms. Traditional classrooms are common in China; therefore, we divided the traditional classroom type into four categories according to size, comprising small size (40 people), medium size (40–100 people), large size (100–200 people) and giant size (200 people or higher).

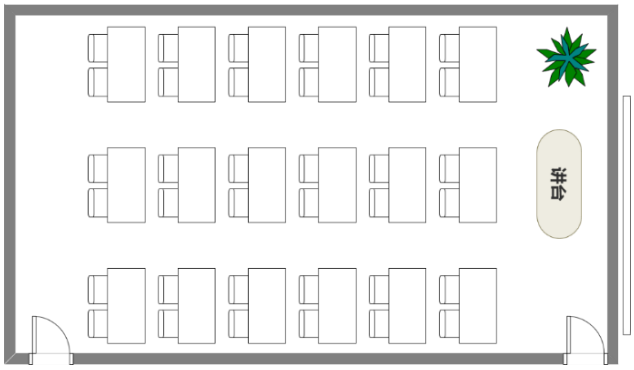

Figure 1. **Traditional small-sized classroom**

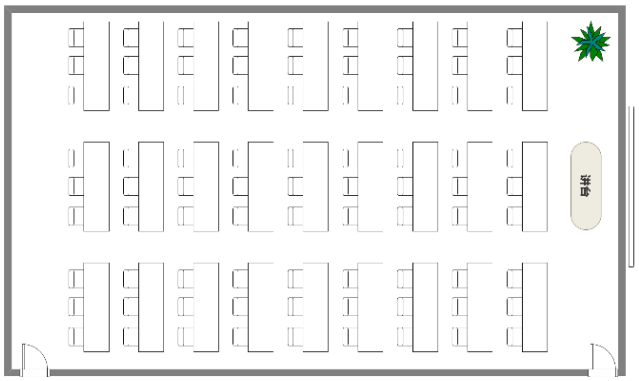

Figure 2. **Traditional medium-sized classroom**

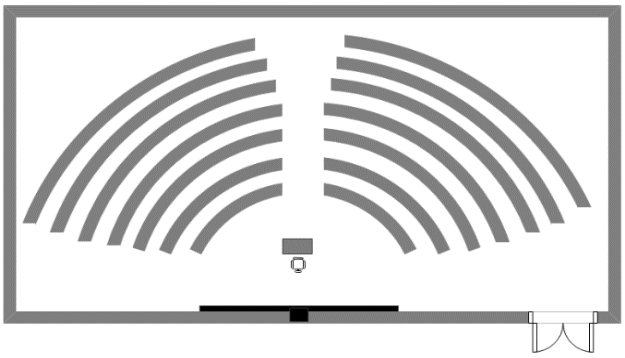

Figure 3. **Horseshoe classroom**

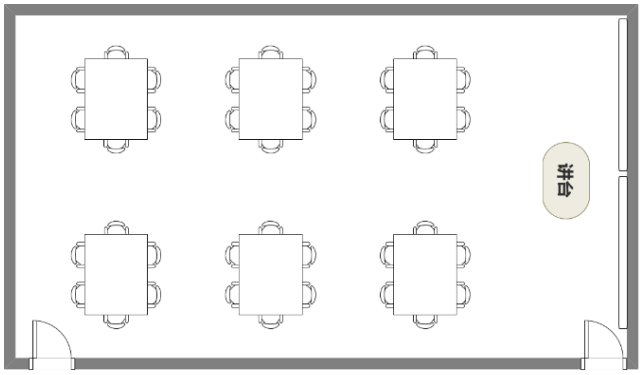

Figure 4. **Collaborative classroom**

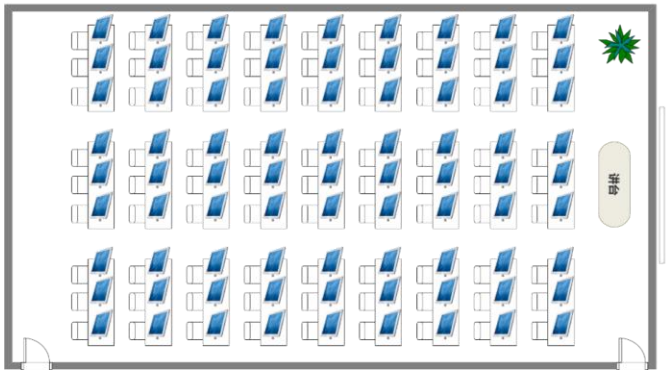

Figure 5. **Computer classroom**

The third part of the questionnaire pertained to student preferences for classroom types and the reasons for these preferences. Finally, we allowed the respondents to draw their ideal classroom distribution.

After collecting the completed questionnaires, we quantitatively analyzed the results using SPSS 20.0. We examined students' attitudes and classroom type preferences, in addition to examining descriptive statistical variables. We performed an independent-samples t test and variance analysis on the differences in students' grades, learning styles, and demographic backgrounds in various classroom types and seating zones.

Results

Some of the data analysis results are outlined as follows.

(1) Students' preference for classroom types and reasons for these preferences (see Table 1).

The results revealed that 57.2% of students preferred small-sized classrooms, 57.2% preferred medium-sized classrooms, and 33.5% preferred collaborative classrooms. Students did not appear to like giant-sized classrooms, because only 2.9% of students expressed this preference.

As presented in Table 2, among the reasons for students' classroom type preferences, spatial layout, clear view of the blackboard, and communication with teachers accounted for the largest proportion, at 68.2%, 67.6%, and 43.3%, respectively. This indicates that students require more classroom space, educational tool interaction, and teacher–student interaction, as well as other interactive factors. However, fewer students indicated hardware facilities and software facilities as a reason for their classroom preferences, because these items accounted for only 16.8% and 15.6%, respectively, of the sample.

(2) Student views on important factors in the classroom environment (see Table 3).

Among the respondents, 72.7% indicated that spatial density is an influential factor. Additionally, a majority of the students indicated that light, temperature, and classroom size also affect their learning, as these items accounted for 66.3%, 63.4%, and 62.2%, respectively, of the

Table 1: Students' preference for different classroom types

Small-sized classroom	Medium-sized classroom	Large-sized classroom	Giant-sized classroom	Horseshoe classroom	Collaborative classroom	Computer classroom
57.2%	57.2%	18.5%	2.9%	20.2%	33.5%	9.8%

Table 2: Reasons of preference for classroom

Space layout	Temperature and light	Clear blackboard	Hardware facilities	Software facilities	Exchange discussion	Communication with teachers
68.2%	35.8%	67.6%	16.8%	15.6%	39.3%	43.3%

Table 3: Student views on important factors in the classroom environment									
The size of the classroom	Space density	Flexible tables and chairs	Easy access	Temperature	Light	The scenery outside the window	Network status	Software resources	Hardware equipment
62.2%	72.7%	45.3%	44.8%	63.4%	66.3%	23.4%	36.6%	27.7%	32%

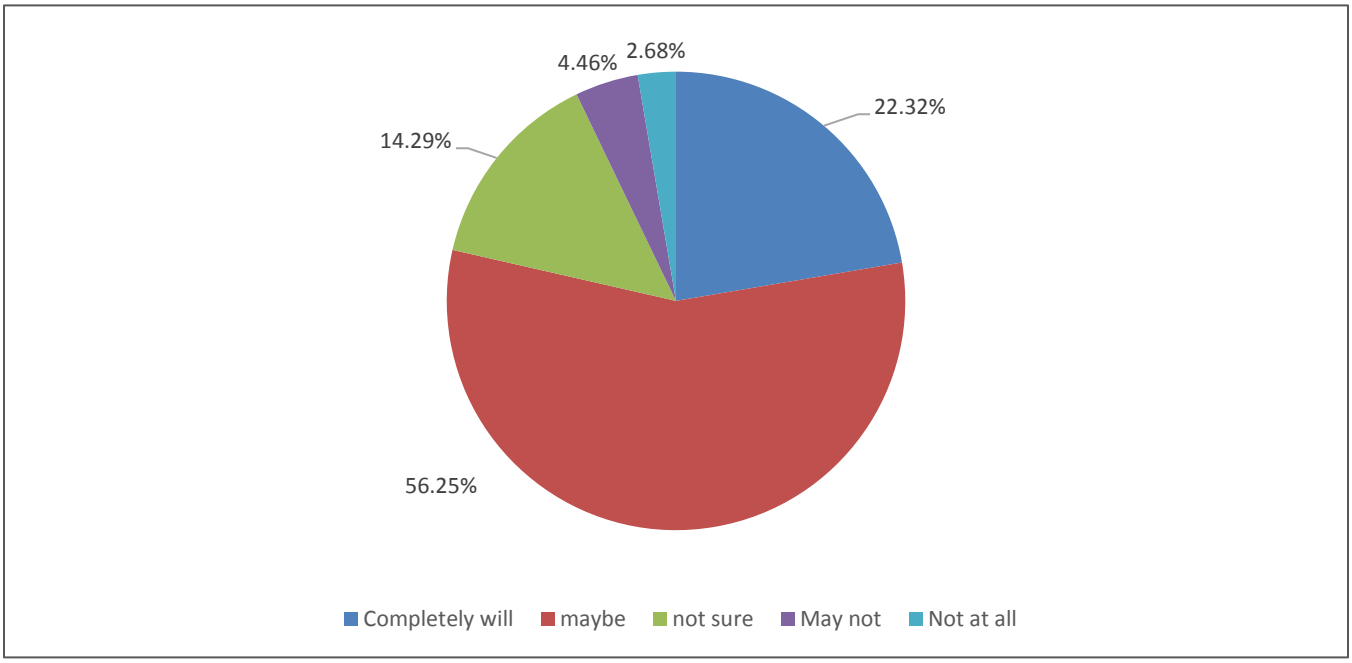

Figure 6. **Student attitudes toward the effect of classroom seating zones**

sample. By contrast, only 23.4% of students perceived that scenery outside the classroom window influences their learning. Similarly, students who perceived that software resources and hardware equipment have relatively low effects on learning only accounted for 27.7% and 32%, respectively, of the sample. This indicates that students focus more on classroom spatial environment factors than on software, computer networks, or other factors.

(3) Student attitudes toward the effects of different seating zones in the classroom (see Figure 6).

Most students (56.25%) believed that sitting in various classroom zones may have a considerable effect on their academic performance. Only 2.68% of students considered that classroom seating zones have no effect on academic performance. These results indicate that most students considered that classroom seating position has a relatively large effect on their academic results.

(4) Differences in seating zones, academic performance, and learning style in small-sized classrooms.

As indicated by Table 4, significant differences in academic performance existed between students seated in the front row and those seated in the middle row ($p < .05$). The middle-row students' academic performance was significantly stronger than that of the front-row students. The academic performance of students in the front row and that of students in the rear row did not exhibit a significant difference. However, the academic performance of middle-row and rear-row students exhibited a significant difference ($p < .001$). Additionally, the academic performance of the middle-row students was stronger than that of the rear-row students. Therefore, the middle-row students' academic performance was significantly superior to that of students seating in both the front row and the rear row, but the difference between those seated in the front row and the rear row was not significant.

As presented in Table 5, significant differences existed in the learning styles of middle-row students and that of back-row students in terms of internal control and external control ($p < .05$). The middle-row students tend to have a more internally controlled learning style, whereas the rear-row students tend to have more externally controlled learning styles.

Table 4: The differences of different seating areas, performance, and learning style in small-sized classrooms

Seat selection of small-sized classroom	Seat selection of small-sized classroom	Mean difference	Standard error	Significance
The front row	The middle row	.56935*	.23968	.019
	The rear row	-.26667	.28220	.347
The middle row	The front row	-.56935*	.23968	.019
	The rear row	-.83602*	.22407	.000
The rear row	The front row	.26667	.28220	.347
	The middle row	.83602*	.22407	.000

Table 5: The relationship between different seating zones and learning styles in classrooms

Learning style	Small-sized classroom seating zone	Small-sized classroom seating zone	Mean difference	Standard error	Significance
Internal control	The middle row	The front row	-.034	.078	.666
		The rear row	-.190*	.081	.021
External control	The rear row	The front row	.157	.097	.108
		The middle row	.190*	.081	.021

Table 6: The difference of different seating zones and academic performance of medium-sized classrooms

Seat selection of medium-sized classroom	Seat selection of medium-sized classroom	Mean difference	Standard error	Significance
The front row	The middle row	.42809	.22969	.065
	The rear row	-.28986	.28575	.313
The middle row	The front row	-.42809	.22969	.065
	The rear row	-.71795*	.23763	.003
The rear row	The front row	.28986	.28575	.313
	The middle row	.71795*	.23763	.003

(5) Effects of seating zones and academic performance in medium-sized classrooms (see Table 6).

There were a slight but nonsignificant ($p < .1$) difference in academic performance between students in middle rows and those in front rows. By contrast, the academic performance of students sitting in middle rows and that of

those sitting in rear rows differed significantly ($p < .05$), indicating that the academic performance of students sitting in middle rows was significantly stronger than that of those sitting in rear rows.

(6) The data indicated no significant relationship between student classroom seating and academic performance in large-sized classrooms, horseshoe classrooms, collaborative classrooms, and computer classrooms.

Conclusion

1) Students typically believe that classroom seating zones affect their academic performance.

The results of the questionnaire indicate that most students believe that classroom seating definitely or probably affects their academic performance, whereas only a minority do not believe that it affects their academic performance. This indicates that most students recognize the influence of classroom seating on their academic performance and believe that classroom seating is among the most crucial factors affecting their performance. The following paragraphs discuss how and why classroom type and classroom seating arrangements influence student achievement.

2) Significant differences in academic performance exist between students in the various seating positions in small-sized classrooms and medium-sized classrooms.

Our analysis of the correlation between seating zones and academic performance in traditional classrooms indicated the following results.

First, in small-sized classrooms and medium-sized classrooms, students seated in middle rows had superior academic performance to those in the front and rear rows. The main reason is that the traditional classroom facilitates the implementation of a teacher-centered teaching mode. In this teaching mode, the teacher is the absolute center of the classroom. Students seated in the front and middle of the classroom are closer to the teacher and podium than other students. Thus, they can often see items more clearly, hear instructions more distinctively, and understand lessons more thoroughly, compared with other students. Students in these seating positions can engage in exchanges with their teacher conveniently and actively participate in classroom activities. According to Atherton (2005), row arrangements within the classroom support a top–down (teacher–student) approach to learning. Students in this seating arrangement are meant to be seen and not heard. They are passive learners.

By contrast, students in the back of the classroom face disadvantages of weaker communication with teachers and less clear vision. In addition, the requirements for their classroom learning are lower than those for students sitting in the front and medium rows, and their enthusiasm therefore is weaker than that of their peers. The results also reveal that in small-sized classrooms, back-row students are likely to have externally controlled learning styles, whereas middle-row students are more likely to have internally controlled learning styles. Those with internal control characteristics are more highly motivated to achieve than those with external controllers (Zhang et al., 2011), and they are more self-disciplined. The relationship between classroom seating and student academic performance is not only a virtuous cycle but also a vicious circle. Students with good grades prefer to sit in the front row, the grades are getting better and better. Students with poor academic performance prefer to sit in the back row, getting worse grades. In other words, students in traditional classrooms are prone to stratification based on seating. Teachers can estimate students' previous scores and enthusiasm for the course according to the students' choice of seating.

Second, our results have some discrepancies with those in previous studies. The results of this study indicate no significant difference between student seating selection and academic performance in large-sized classrooms and giant-sized classrooms. With the expansion of the classroom scale, we learned that courses given in such classrooms are considered "unimportant" or elective courses. These courses are not included in the students' final performance statistics; therefore, the learning results of such courses do not have a substantial effect on the students' performance. Related research (Lee, 2009) revealed that students' learning enthusiasm is generally not as high in large-sized classrooms when compared with small-sized classrooms. Educators should emphasize the teaching content repeatedly and express concern for students' academic performance to achieve effective teaching and improve students' learning enthusiasm.

3) Data reveal no significant difference between students' academic performance and classroom seating choice in collaborative classrooms and computer classrooms.

Our analysis of the correlation between the seating zones and student scores in collaborative classrooms and computer classrooms indicated no significant difference between students' academic performance and classroom seating in such classrooms. The main reason is that in such classrooms, teachers are not regarded as the absolute center. Compared with small-sized traditional classrooms, collaborative classrooms play a more active role in promoting student interaction and collaboration. Computer classrooms facilitate independent learning by students. These classroom types facilitate student collaboration and independent learning; therefore, students are less dependent on teachers and the teaching platform than in traditional

classrooms. In such classrooms, teachers are educational facilitators and mentors rather than lecturers.

4) Teaching models and students' enthusiasm are the main causes of classroom seating stratification.

After considering the correlation analysis of student seating zone and academic performance in various classroom types, we suggest that the teaching model and students' enthusiasm are the main factors that influence academic performance stratification, rather than classroom type or classroom size. Certainly, classroom types and sizes can support different teaching models and can also affect student enthusiasm levels. In other words, the surface causes and underlying causes are interrelated. We discuss the details of this conclusion in the following paragraphs.

First, a clear stratification exists in small-sized classrooms and medium-sized classrooms of the traditional type. However, large-sized classrooms and giant-sized classrooms exhibit no stratification. Teachers in most of these classrooms carry out the lecture teaching model. Students consider courses given in large-sized classrooms to be unimportant, and they are generally less active in such classrooms. Students in small- and medium-sized classrooms exhibit stronger learning enthusiasm than those in larger classrooms. This could explain the effect of student enthusiasm on classroom stratification. Furthermore, James et al. (1978) have revealed considerable differences in student performance according to seating in compulsory courses, but they have reported no considerable difference in elective courses.

Second, small- and medium-sized classrooms of the traditional type exhibit stratification, whereas small- and medium-sized collaborative classrooms and computer classrooms are not stratified. The traditional classroom type effectively supports the lecture teaching models, while" in the collaborative and computer classroom types, teachers are guides and facilitators of learning rather than the center of the classroom. Collaborative classrooms more effectively support collaborative learning, and computer classrooms support independent learning. This could explain the influence of teaching models on classroom stratification.

Third, the horseshoe-type classroom is a special case that requires further discussion. Our results indicate no significant difference between student seating position and academic performance in the horseshoe classroom. The horseshoe is a modified version of the traditional classroom, containing approximately 100 students, in which the seating is not a row-and-column arrangement but rather a fan-shaped arrangement. However, in contrast to cooperative classrooms, seats in horseshoe classrooms are fixed; therefore, group discussion is not convenient. If we only observe the size and type of a classroom, we cannot infer whether it is stratified. However, if we observe the teaching model and the level of student enthusiasm in the class, inferring whether the classroom exhibits stratification is difficult.

This suggests that the lecture teaching model is prone to the stratification phenomenon, whereas other teaching models are not prone to stratification. Furthermore, classrooms in which students exhibit large differences in learning enthusiasm are prone to stratification, but if no such differences in learning enthusiasm exist, stratification is less likely.

5) Students prefer traditional classrooms over collaborative classrooms and computer classrooms.

The results reveal that students prefer small- and medium-sized traditional classrooms over collaborative classrooms and computer classrooms. The traditional classroom is called traditional because it has been used as a base to develop many other classroom types. New classroom types are often considered to have new teaching functions that did not exist in the traditional classroom and are also considered to be an improvement on the traditional classroom. However, most students like the traditional classroom, which thus has a strong vitality. In terms of concentration, Wheldall (1987) revealed that students in traditional classrooms tend to be more attentive than those in "round table" classrooms. Thus, we cannot simply take a view that traditional classrooms must be superior or inferior to other classroom types. Classrooms types and seating arrangements have their own advantages and weaknesses. We must understand the characteristics of different classroom types and also consider the features of the course subject, the teaching content, and the characteristics of both students and teachers. Thus, we can choose classroom types and teaching methods flexibly.

6) Application of information technology in education requires improvement.

The survey results indicate that students believed that important factors in the classroom include spatial density, light, classroom size, and other spatial layout and physical environment factors. However, network conditions, hardware and software resources, and other information technology were less highly ranked in order of importance. Students' classroom preferences are due to physical environment factors such as spatial layout, blackboard view, and PPT. Hardware, software, and other information technology facilities are not within the scope of students' consideration.

The results also reveal that students were not satisfied with the status quo use of information technology in the classroom. However, information technology has had a revolutionary effect on education ("National Medium and Long Term Education Reform and Development Plan Outline (2010–2020)," 2010). Relevant international research

has continued in the fields of integration of information technology and curriculum, deep integration of information technology and education, and intelligent classroom education application. These studies are examining how information technology can achieve the optimization of educational achievement, from theoretical and practical aspects. Clearly, we must attempt to increase the role of information technology in education. Much work remains to make students thoroughly appreciate the importance of information technology.

Study Limitation

Further empirical research is required on the stratification of student academic performance in the classroom. The following questions can provide the direction for future research: Should classroom stratification exist or not? Does a lack of stratification engender more favorable learning effects than those engendered by stratification? How can we improve the performance of students with weaker performance in stratified classrooms? In cases in which student performance is not stratified, how can we improve overall student learning?

References

Ahmad, B. E., & Majid, F. A. (2010). Self-directed learning and culture: a study on Malay adult learners. *Procedia - Social and Behavioral Sciences*, *7*(1), 254-263.

Ankney, R. F. (1974). Effects of classroom spatial arrangement on student behavior. Unpublished dissertation, The Ohio State University, Columbus, Ohio.

Armstrong, N. & Chang, S. (2007). Location, location, location: does seat location affect performance in large classes?. *Journal of College Science Teaching*, *37*(2), 20-29.

Atherton, J. S. (2005). Teaching in learning: Physical layout. Retrieved December 20, 2007, from: http://www.learningandteaching.info/teaching/layout.htm

Badia-Martin, M. (2006). Disruptive behavior in schools. *Educational Journal*, *92*, 33– 35.

Beckers, R., Voordt, T. V. D., & Dewulf, G. (2016). Learning space preferences of higher education students. *Building & Environment*, *104*, 243-252.

Bonus, M. & Riordan, L. (1998). Increasing student on-task behavior through the use of specific seating arrangements. *Attention*, 43.

Carney-Morris, M., & Murphy, T. (2016). Teaching, Learning, and Classroom Design. *ACM on Siguccs Conference (pp.15-18).* ACM.

Curwin, R. L., & Mendler, A. N. (1988). Packaged discipline programs: let the buyer beware. *Educational Leadership*, 46(2), 68-71.

Downer, J. T., & Rimm, S. E. (2007). How do classroom conditions and children's risk for school problems contribute to children's behavioral engagement in learning?. *School Psychology Review*, 36(3), 413-432.

Duan, Baojun. (2015). College students classroom space shape preference empirical research. *Modern education science (Higher education research), 0 (4);* 69-72.

Gump, P.V. (1987). School and classroom environments. In D. Stokols & I. Altman (Eds.), *Handbook of environmental psychology (pp. 691–732).* New York: Wiley.

Guo, Yang. (2015). Study on the Influence of Different Seat Arrangements on College Students' Oral Participation in College English Classes. *Chongqing University*.

Lee, J. J. (2009). Size matters: an exploratory comparison of small- and large-class university lecture introductions. *English for Specific Purposes*, *28*(1), 42-57.

McCorskey, J. C. & McVetta, R. W. (1978). Classroom seating arrangements: instructional communication theory versus student preferences. *Communication Education*, *27*(2), 15.

Ministry of Education. Outline of National Medium and Long - term Education Reform and Development Plan (2010-2020) [EB / OL]. [2010-07-29].

Moore, D. W. (1984). Variation in question rate as a function of position in the classroom. *Educational Psychology*, *4*(3), 233-248.

Qiuqian, S. & Peijun, D. (1999). Investigation and study of classroom and student seat learning. *Education Science (4)*, 45-49.

Richards, J. (2006). Setting the stage for student engagement. *Kappa Delta Pi Record*, *42*(2), 92-94.

Shao-Bei, X. & Qulin, C. (2011). Junior high school students' seat arrangement and motivation in learning, the interaction between classroom teachers and students. *Journal of Hainan Normal University (Social Science Edition),* 24 (1), 159-162

Shernoff, D. J., Sannella, A. J., Schorr, R. Y., Sanchez-Wall, L., Ruzek, E. A., & Sinha, S., et al. (2017). Separate worlds: the influence of seating location on student engagement, classroom experience, and performance in the large university lecture hall. *Journal of Environmental Psychology*, *49*, 55-64.

Steinzor, B. (1950). The spatial factor in face to face discussion groups. *Journal of Abnormal & Social Psychology*, *45*(3), 552.

Stokols & I. Altman (Eds.), Handbook of environmental psychology (pp. 691–732). New York: Wiley.Yang, Z., Becerik-Gerber, B., & Mino, L. (2013). A study on student perceptions of higher education classrooms: impact of classroom attributes on student satisfaction and performance. *Building & Environment, 70(15),* 171-188.

Weinstein, C. S. (1992). Designing the instructional environment: focus on seating. *Classroom Research*, 7.

Wheldall, K. (1987). The behaviourist in the classroom. *Allen & Unwin in Association with Positive Products*. Routledge.

Yang, Z., Becerik-Gerber, B., & Mino, L. (2013). A study on student perceptions of higher education classrooms: impact of classroom attributes on student satisfaction and performance. *Building & Environment, 70* (15), 171-188.

Zhang, Z. X., Zhang, W. M., & Liu, M. F. (2011). Teaching Design: Principles and Applications. *Higher Education Press.*

Zomorodian, K., Parva, M., Ahrari, I., Tavana, S., Hemyari, C., & Pakshir, K., et al. (2012). The effect of seating preferences of the medical students on educational achievement. *Medical Education Online, 17(1),* 10.3402/meo.v17i0.10448.