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Article

The Impact of Seating Location and Seating Type on Student Performance

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Abstract: While an extensive body of research exists regarding the delivery of course knowledge and material, much less attention has been paid to the performance effect of seating position within a classroom. Research findings are mixed as to whether students in the front row of a classroom outperform students in the back row. Another issue that has not been fully examined in higher education is the effect of environmental factors, specifically seating type, on student performance. This study examines the impact of both factors—seating location and seating type—on overall performance. Data were collected over a 10-year period from 1,138 undergraduate senior business students during their capstone course. The findings suggest that student performance is not significantly altered by seating location or seating type.

Keywords: seating location; seating type; student performance

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1. Introduction

While an extensive body of research exists regarding the delivery of course knowledge and material, much less attention has been paid to the performance effect of seating location within a classroom. Seating assignments can position a student closer to the instructor, making it easier to see and hear the professor. Seating proximity to the instructor can encourage attentive behavior, classroom engagement, and discussion participation. Seating type may also influence the learning environment by providing more comfort, better visibility, or improved movement. This study examines the effects of seating location and seating type on student performance—specifically, whether sitting in the front of the class leads to higher student grades and whether tiered seating positively impacts student outcomes.

The literature regarding the effect of seating location on performance is mixed. For example, Perkins and Weiman [1] found that seating impacts student performance, while Kalinowski and Taper [2] reported no relationship between the two. The research on classroom environmental factors (e.g., seating type) also shows differing results [3–5]. The paragraphs below describe this research in more detail, followed by hypotheses and analysis. This study concludes with a discussion of the results and recommendations for future research.

2. Literature Review

Student seating has been studied from a variety of perspectives. One area of emphasis is seating preference, which focuses on why students choose certain seats and how it affects their performance. Burda and Brooks [6] found that students who sit near the front of the classroom have high achievement motivation and that they tend to feel positive about their ability to perform well in a course. Totusek and Staton-Spicer [7] also found that students who sit toward the front and center of the classroom in "action seats" see themselves as practical and imaginative. According to Pederson *et al*. [8], classmates view front-row students favorably, describing them as leaders and academic achievers. The descriptions associated with students who sit in the back row are not as positive. Back-row students have been labeled as low in self-esteem, disinterested, introverted [9–11], and rebellious [12].

Another factor related to student seating in the classroom is student engagement based on seat location. Students farther away from the instructor tend to disengage without being detected. Because attention spans can be limited and because students are often overloaded and tired [2], the back row of a classroom provides a better opportunity for students to appear attentive when, in fact, they may not be listening. Perkins and Weiman [1] argued that front row seats promote more interaction with the instructor and encourage participation in the class, which leads to higher performance. Sitting closer to the instructor also makes it easier for students to see and hear the instructor. Both Holliman and Anderson [13] and Becker *et al*. [14] found that as the distance from the instructor to the student seat increased, student performance decreased.

According to Vander Schee [15], seat selection had no significant correlation with student GPA; however, students who sat in the front row did outperform others in the class in terms of overall course grade. The average students, those representing the middle third in terms of cumulative GPA, benefited the most from sitting in the front of the classroom. Other research by Benedict and Hoag [16] showed that students who preferred to sit toward the front of the class had a higher chance of getting an A than

students who preferred to sit near the back. In fact, sitting in the back of the classroom increased a student's probability of receiving a D or F by almost 25 percent. Seat selection in the classroom can also affect group interaction. In a study of psychology students by Michelini *et al*. [17], centrality and visibility led to greater group participation in social settings. In other words, students who were positioned in the center and opposite of two other group members communicated more in group discussions. The students reported that it was easier for them to see and speak with everyone in the group.

The effect of randomly assigned seating on student performance is unclear. One study by Kalinowski and Taper [2] found no relationship between random seat assignments and student outcomes. However, other research by Perkins and Weiman [1] reported significantly higher performance levels for students sitting near the front of the room when seats were assigned. In a comparison study of self-selection and assigned seating, Stires [18] found no grade differences between students who chose to sit at the front of the class *versus* students assigned to sit up close. Earlier work by Wulf [19] showed that while students who chose their seats in the front of the classroom outperformed others in the class, randomly assigned seats yielded no significant difference in performance relative to seat location.

Overall, the literature reveals a weak inverse relationship between student performance and distance from the instructor. This study adds to this literature by (1) providing a sample across an entire decade and (2) randomly assigning seats where distance is not as much of a factor as is "front *versus* back" row location. To determine the effect of assigned seating on student performance, Hypothesis 1 is proposed.

> *Hypothesis 1: When seating is randomly assigned, students who sit in the front row of a classroom outperform students who sit in other rows of the classroom.*

Some research studies in higher education have focused on the impact of classroom environmental factors (e.g., seating type) on the learning process rather than seating location [5,20]. In their study, Hill and Epps [5] found that student satisfaction was higher in "upgraded classrooms" with comfortable chairs, tiered seating, and appropriate lighting than in standard classrooms. Students felt like they learned more and that their professors were more organized in upgraded classrooms. Even though students preferred the enhanced learning environment, the authors found that classroom upgrades did not improve their performance.

This finding is inconsistent with the majority of research at the secondary education level. In a review of educational studies, Fisher [3] concluded that improved building conditions lead to improved student performance. The author identified individual factors, such as air quality, lighting, and temperature, which have been linked to student behavior and outcomes. Design issues such as classroom arrangement and circulation have also been found to affect student performance. Tanner [21] noted that classroom spaces arranged to promote freedom of movement were related to higher test scores. Another study by Uline *et al*. [22] examined the effect of facility conditions on the overall learning climate for a large, metropolitan high school. The findings showed that physical conditions of the school played a role in shaping student behavior and performance. For example, furniture was described as a major learning deterrent by students who did not like the physical restrictions of a chair-desk combination. Students preferred to have more modern chairs and tables in order to move about and work in groups if needed.

In order to examine the effect of classroom environment on student performance, this study focuses on one specific factor—tiered seating. Hypothesis 2 is shown below.

Hypothesis 2: Students who sit in tiered seats in a classroom outperform students who sit in non-tiered seating.

3. Research Design

Data was collected from a large West Coast State University (WCSU) and a small Southern State University (SSU). Undergraduate business students taking a capstone course in their final semester of study were used as a sample. All students were taught by the same instructor. The sample was collected during the ten year period from 2003 to 2012. The classrooms used in the study consisted of tiered and non-tiered multiple row seating arrangements. For the purposes of this study, all front rows were coded "front" while the remaining rows were coded "other". For tiered and non-tiered seating, different configurations existed. For example, a straight tiered classroom had three or more rows at elevated heights in the middle of the room, while a tiered classroom with side seats had the same setup in the middle plus two rows on each side wall. Non-tiered classrooms had three configurations—individual chairs lined in rows, long tables with movable chairs, and long connected tables with stationary chairs. Data related to tiered seating classrooms was only collected from the West Coast State University.

Data was collected from 1138 undergraduate students. A total of 65 students were excluded from the study for one of three reasons: (1) they withdrew from the course and thus did not earn a final grade; (2) they sat in an oddly configured single row u-shaped classroom which did not lend itself to row classification; or (3) they sat in seats to the side of the instructor—seats added for additional classroom capacity. Another 84 students were excluded from the analysis of the second hypothesis, as the data collected from the small Southern State School did not include any classrooms with tiered seating. The final sample size for Hypothesis 1 was 1073 students and 989 students for Hypothesis 2. Gender was used as a control variable, as several studies have found that women receive lower grades than their male classmates in general business classes [23]. Student grade was determined by the final percentage grade in the class, which was computed by dividing the total points earned by the total points available and then multiplied by 100.

4. Results and Discussion

4.1. Descriptive Statistics

Table 1 shows the descriptive statistics related to Hypothesis 1. The grand mean for all 1,073 subjects' final grade (%) was 87.0184 with a standard deviation of 9.81060. Examination of the independent variable, seating position, revealed that the total mean for students sitting in the front row was 87.6737 with a standard deviation of 9.0592 (n = 267) while the total mean for those who sat elsewhere was 86.8014. The standard deviation for students who sat someplace other than the first row was slightly higher at 10.0430 (n = 806).

Table 1. Descriptive statistics for hypothesis 1. Respondent's percentage grade—(points earned/total points) × 100.

Room Type	School *	Gender	IV-Front								
			Front row only			All other student seats/rows			Total		
			Mean	*n*	Std. Deviation	Mean	*n*	Std. Deviation	Mean	*n*	Std. Deviation
Tiered	WCSU	Female	87.1262	53	10.49329	89.2807	134	8.89384	88.6701	187	9.39638
		Male	90.7610	52	5.93123	85.8919	121	14.47216	87.3554	173	12.71092
		Total	88.9263	105	8.69715	87.6727	255	11.96842	88.0383	360	11.11691
	Total	Female	87.1262	53	10.49329	89.2807	134	8.89384	88.6701	187	9.39638
		Male	90.7610	52	5.93123	85.8919	121	14.47216	87.3554	173	12.71092
		Total	88.9263	105	8.69715	87.6727	255	11.96842	88.0383	360	11.11691
Flat	WCSU	Female	88.3302	61	6.92019	87.6742	237	7.41985	87.8085	298	7.31379
		Male	85.8485	73	11.72220	85.6284	258	10.34690	85.6770	331	10.64727
		Total	86.9782	134	9.87574	86.6079	495	9.11285	86.6868	629	9.27377
	SSU	Female	86.8294	18	5.25204	85.8252	33	6.04224	86.1796	51	5.74274
		Male	85.3600	10	5.02751	82.7052	23	9.50959	83.5097	33	8.41523
		Total	86.3046	28	5.12904	84.5437	56	7.73389	85.1307	84	6.99215
	Total	Female	87.9882	79	6.57654	87.4482	270	7.28090	87.5704	349	7.12199
		Male	85.7896	83	11.11092	85.3892	281	10.29631	85.4805	364	10.47328
		Total	86.8618	162	9.22201	86.3981	551	8.99776	86.5035	713	9.04476
Total	WCSU	Female	87.7704	114	8.74421	88.2544	371	8.00912	88.1407	485	8.18114
		Male	87.8921	125	10.00828	85.7125	379	11.80226	86.2531	504	11.41308
		Total	87.8341	239	9.40712	86.9699	750	10.17853	87.1788	989	9.99976
	SSU	Female	86.8294	18	5.25204	85.8252	33	6.04224	86.1796	51	5.74274
		Male	85.3600	10	5.02751	82.7052	23	9.50959	83.5097	33	8.41523
		Total	86.3046	28	5.12904	84.5437	56	7.73389	85.1307	84	6.99215
	Total	Female	87.6421	132	8.34505	88.0560	404	7.88899	87.9541	536	7.99778
		Male	87.7045	135	9.73813	85.5405	402	11.69420	86.0845	537	11.26505
		Total	87.6737	267	9.05921	86.8014	806	10.04306	87.0184	1,073	9.81060

***** WCSU = (Large) West Coast State University; SSU = (Small) Southern State University.

Further examination of the means for subgroups of students based on gender, school, and room type indicated variation among the different subgroups. For example, means varied from 85.360 (n = 10) to as high as 90.7610 (n = 52) for students who sat in the front row, and from 82.7052 (n = 23) to 89.2807 (n = 134) for those who sat elsewhere. The results also show that the total mean for females of 87.9541 (n = 536) was higher than the 86.0845 total mean for males (n = 537), which is interesting, as it is contrary to findings previously established in the literature [23]. Surprisingly, the standard deviation was also lower among females (7.99778) when compared to their male counterparts (11.26505), indicating

that females performed at a more consistent level. These findings suggest that it may be time to reexamine the relationship between gender and business school performance, as what was true in earlier studies may no longer be the case.

Analysis of the descriptive statistics by school indicates that students at the large West Coast State University performed better, earning a mean score of 87.1788 (n = 989) with a standard deviation of 9.99976. On the other hand, students attending the small Southern State University earned on average a final grade percentage of 85.1307 (n = 84). Finally, the descriptive statistics support the contention that room type may be related to student performance. Students who sat in tiered classrooms earned an average a final grade (%) of 88.0383 with a standard deviation of 11.1169 (n = 360), while those who sat in flat classrooms and had less direct eye contact with the instructor earned a final grade (%) that averaged 86.5035 with a standard deviation of 9.04476 (n = 713).

While not definitive, the descriptive statistics results suggest that in addition to seating location, gender, school, and room type may be related to the dependent variable. However, sample sizes in some subgroups were small which means that differences between compared groups may simply be artifacts of the sample size. Thus, prior to running a regression analysis to test the first hypothesis, several independent t-tests were performed for the purpose of justifying the inclusion of various variables in the regression model. Using student final grade (%) as the dependent variable and gender as an independent variable, an independent t-test found that grades did differ on the basis of gender ($p < 0.002$), though again, not in the direction expected, as the mean final grade (%) for females (87.9541) was higher than that of males (86.0845). Thus, gender was added to the regression model. Additional independent t-tests explored the impact of school and room type on the dependent variable. A student's final grade (%) was found to be significantly higher ($p < 0.015$) when class took place in tiered classrooms (88.0383) compared to flat classrooms (86.5035), and as a result, this variable was added to the regression model. Although the school attended did not significantly impact the student's final grade (%), the p-value ($p < 0.066$) did approach significance, and thus was retained for the regression model as a possible control variable.

4.2. Seating Location

Hypothesis 1 stated that students who sit in the front row would outperform students who sit in other rows of the classroom. Regression analysis was conducted to determine the effect of seating location on student performance, using student final grade (%) as the dependent variable and seating location (front row *vs.* other rows) as the main independent variable. Control variables entered included seating type (tiered *vs.* flat), gender, and school (West Coast *vs.* South). Table 2 shows the results of this analysis. The model as a whole had an R^2 of 0.018 ($p < 0.001$), indicating a low predictive value.

4.3. Seating Type

Hypothesis 2 stated that students who sit in tiered seats in a classroom outperform students who sit in non-tiered seating. To determine the effect of tiered seating on student performance, regression analysis was conducted by restricting the data to the West Coast State School which had both flat and tiered classrooms. The dependent variable, final percentage grade, was the same. Room type (tiered *vs.* flat) was entered as the main independent variable, with gender as a control variable. Table 3 shows the

results of this analysis. Again, the model as a whole had an R^2 of 0.013 ($p < 0.002$), indicating a low predictive value.

Table 2. Regression analysis results for hypothesis 1.

Model Summary				
Model	**R**	**R Square**	**Adjusted R Square**	**Std. Error of the Estimate**
1	0.134 [a]	0.018	0.014	9.74046

ANOVA [b]						
	Model	**Sum of Squares**	**df**	**Mean Square**	**F**	**Sig.**
1	Regression	1849.649	4	462.412	4.874	0.001 [a]
	Residual	101,328.152	1,068	94.877		
	Total	103,177.800	1,072			

Coefficients [b]						
	Model	**Unstandardized Coefficients**		**Standardized Coefficients**	***t***	**Sig.**
		B	**Std. Error**	**Beta**		
1	(Constant)	90.426	1.323		68.359	0.000
	IV-Front	−0.861	0.691	−0.038	−1.245	0.213
	School Attended	−1.914	1.137	−0.052	−1.683	0.093
	Room Type	−1.197	0.647	−0.058	−1.851	0.064
	Gender	−1.906	0.596	−0.097	−3.196	0.001

[a] Predictors: (Constant), Gender, IV-Front, Room Type, School Attended; [b] Dependent Variable: Respondent's percentage grade (points earned/total points) × 100.

Table 3. Regression analysis results for hypothesis 2.

Model Summary				
Model	**R**	**R Square**	**Adjusted R Square**	**Std. Error of the Estimate**
1	0.112 [a]	0.013	0.011	9.94647

ANOVA [b]						
	Model	**Sum of Squares**	**df**	**Mean Square**	**F**	**Sig.**
1	Regression	1,247.862	2	623.931	6.307	0.002 [a]
	Residual	97,547.299	986	98.932		
	Total	98,795.160	988			

Coefficients [b]						
	Model	**Unstandardized Coefficients**		**Standardized Coefficients**	***t***	**Sig.**
		B	**Std. Error**	**Beta**		
1	(Constant)	88.920	0.606		146.694	0.000
	Room Type	−1.268	0.658	−0.061	−1.927	0.054
	Gender	−1.834	0.633	−0.092	−2.896	0.004

[a] Predictors: (Constant), Gender, Room Type; [b] Dependent Variable: Respondent's percentage grade (points earned/total points) × 100.

4.4. Room Configurations

In order to further examine the tiered classroom effect on student performance, we grouped different classroom types (tiered and flat) based on their specific configurations. Different layouts were assigned different letters. An explanation of classroom configurations can be found in the Research Design section of this paper. A correlation analysis confirmed that both gender and the expanded room configuration variable correlated significantly with the dependent variable at the 0.01 level. To better understand the true relationship between the specific room configurations and student's final grade (%), an ANCOVA was performed in which gender was specified as a covariant. Prior to completing this analysis, an ANCOVA was used to determine that the interaction term between gender and room configuration was non-significant ($p < 0.656$) thus justifying its removal from the final model. As the partial eta squared of the interaction term in this initial analysis was near zero (0.002), homogeneity of the coefficient for the covariate across all levels of room configuration (the factor variable) can be assumed. Table 4 shows the results of the final analysis of covariance in which the interaction term is deleted and gender is used as a covariant. The tests of between-subjects effects in the ANCOVA model indicate significant results for both the dependent variable of room configuration ($p < 0.001$) and the covariant gender ($p < 0.01$).

Table 4. Effect of room configuration on respondent's percentage grade (ANCOVA).

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	3,409.979 [a]	5	681.996	7.028	0.000
Intercept	2,081,777.003	1	2,081,777.003	21,453.928	0.000
Gender Covariate	864.789	1	864.789	8.912	0.003
Room Configuration	2,529.377	4	632.344	6.517	0.000
Error	95,385.181	983	97.035		
Total	7,615,329.222	989			
Corrected Total	98,795.160	988			

[a] Dependent Variable: Respondent's percentage grade (points earned/total points) × 100.

Table 5 summarizes the mean difference between the various room configurations as well as the significance level of the difference between the paired groups. Final percentage grades of students who sat in the tiered rooms with side seat configurations were found to be significantly higher than for those students who sat in flat configurations with chairs ($p < 0.001$) or regular tiered classrooms ($p < 0.001$). What is interesting is that the tiered classroom with side seats had the second highest mean (89.57), while the straight tiered seating with no side seats had the lowest mean (85.04). Surprisingly, the flat connected chairs—often thought to be the most uncomfortable form of seating arrangement—had the highest mean (90.36). One question that arises from this analysis is why students in a straight tiered classroom performed more poorly than students in a tiered classroom with side seats.

Table 5. Pairwise comparisons among different room configurations.

(I) Room Configuration	(J) Room Configuration	Mean Difference (I-J)	Std. Error	Sig. [a]	95% Confidence Interval for Difference [a]	
					Lower Bound	Upper Bound
Tiered w/side seats	**Flat-chairs**	3.090 *	0.767	**0.000**	1.584	4.596
	Tiered	4.524 *	1.089	**0.000**	2.386	6.662
	Flat connected chair	−0.793	1.809	0.661	−4.342	2.757
	Flat long tables	2.561	1.743	0.142	−0.860	5.981
Flat–chairs	Tiered w/side seats	−3.090 *	0.767	**0.000**	−4.596	−1.584
	Tiered	1.434	0.973	0.141	−0.477	3.344
	Flat connected chair	−3.883 *	1.742	**0.026**	−7.301	−0.465
	Flat long tables	−0.530	1.672	0.751	−3.811	2.752
Tiered	Tiered w/side seats	−4.524 *	1.089	**0.000**	−6.662	−2.386
	Flat-chairs	−1.434	0.973	0.141	−3.344	0.477
	Flat connected chair	−5.316 *	1.904	**0.005**	−9.052	−1.581
	Flat long tables	−1.963	1.843	0.287	−5.580	1.653
Flat connected chair	Tiered w/side seats	0.793	1.809	0.661	−2.757	4.342
	Flat-chairs	3.883 *	1.742	**0.026**	0.465	7.301
	Tiered	5.316 *	1.904	**0.005**	1.581	9.052
	Flat long tables	3.353	2.342	0.152	−1.242	7.948
Flat long tables	Tiered w/side seats	−2.561	1.743	0.142	−5.981	0.860
	Flat-chairs	0.530	1.672	0.751	−2.752	3.811
	Tiered	1.963	1.843	0.287	−1.653	5.580
	Flat connected chair	−3.353	2.342	0.152	−7.948	1.242

Based on estimated marginal means; * = The mean difference is significant at the 0.05 level; [a] Adjustment for multiple comparisons: Least Significant Difference (equivalent to no adjustments).

5. Conclusions

Seating selection within a classroom can have an impact on students and student performance. It was an expectation when this project was undertaken that strong differences would be found in performance based on seating position. The author who served as instructor in these classes felt strongly that those students sitting in the front of the classroom substantially outperformed other students. The data proved otherwise. Instructors struggle with best classroom practices, particularly in an age when electronic devices divert attention from learning. Given the results of this study, it appears that student performance is not significantly altered by seating position as the only regression model variable which proved to be significant was gender.

It may be that a misalignment between students' preferred seat selection and a seat chosen or randomly assigned by the instructor may influence student performance, but in general seating simply does not matter. This is good news because if seating did make a difference, instructors would face a dilemma in determining how to award the "best" seats as clearly not every student can occupy the front row. Furthermore, if seating did matter, then the instructor might carry the burden of moving the

poorer performers up front into the best seats so as to encourage improvement in performance, but only at the expense of the other students.

The other factor examined in this study was classroom environment. The results initially suggested that room type may have an effect on a student's final grade as room type approached significance ($p < 0.054$) in the test of our second hypothesis. Unfortunately, although the overall results of an ANCOVA which controlled for gender were significant, the results of pairwise comparisons were contrary to expectations. It was expected that students who sat in both types of tiered classrooms would perform better than students who sat in at least one type of flat classroom. While these expectations were met when comparing tiered rooms with side seats to those with flat chairs, it was surprising to learn that the final grades of students who sat in tiered classrooms with side seats were significantly higher than those who sat in regular tiered classrooms. There seems to be no logical reason why the performance of students sitting in a tiered classroom *vs*. a tiered classroom with side seats should vary.

Another finding of interest was that students who sat in the least comfortable form of room configuration—the flat connected chairs (sometimes called chair desks)—outperformed both those who sat in tiered classrooms ($p < 0.01$) as well as those who sat in chairs in non-tiered classrooms ($p < 0.05$). This may suggest that students who sit in more comfortable seating are more likely to let their minds wander or in some cases, even doze off, while less comfortable seating keeps students more alert and on edge.

5.1. Limitations

As with most studies, this project is not without limitations. One of the largest challenges with the data was lack of variance. The average grade by these graduating seniors was a B+ (3.297). This limited the statistical power, and because students need at least a "C" grade in their capstone course to graduate, students in this sample may be more highly motivated than they might be otherwise. The fact that students were seniors certainly contributed to the lack of variance, as students who fail to graduate due to poor performance typically drop out during their freshman or sophomore year. Thus, a study of freshman students may well have found different results.

Another limitation of this study is that all students in these capstone courses participated heavily in team work, which can minimize the effects of seating location. As a capstone course, these results may not be generalizable to other business courses or to courses in other colleges. Furthermore, the effect of seating and room type could be cofounded by other variables not studied here, such as attendance or the length of class.

This sample included only undergraduate students. It might be that seating matters to graduate or executive students. These courses place less emphasis on grades and more on interaction and learning, so seating might make a difference. Because all of the data was collected from one instructor, it might be that this particular instructor favors back row students and thus the instructor's behavior negated any effect that might otherwise be present. This study was also limited to a class size of no more than 45 students and placed in classrooms that hold no more than 60 students. There may be seating effects in smaller seminar classes or large classes that were not present in this study.

5.2. Future Research

The lack of significant results related to seating location and the unexpected findings related to room configuration may be due to limitations of the study. Researchers should replicate the study in a course were student engagement is highly valued and necessary for learning. Research should also be conducted in classrooms of different sizes and in courses where data can be collected from multiple instructors. The authors suggest also collecting data on the type of seat in which the student is most comfortable. Several students noted in their comments that they were uncomfortable in their randomly assigned seats. Finally, research should be conducted among freshman and/or sophomore students, and perhaps at the graduate level, in order to determine the impact of seating location and seating type on different student groups.

Conflicts of Interest

The authors declare no conflict of interest.

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