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Critical review of student seating location preferences in lectures linked to student performance.*

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Abstract — This literature review identifies the main literature that relates students' seat choice to performance and evaluates and interprets the literature results together with literature that highlights possible reasons for seat choice. The majority of research studies on the relationship between seat location and performance have identified that students seated in the central-front zones have higher course grades than students sitting further back. However, prior subject experience and academic ability may affect results and should be controlled within studies. Only a few studies have done this and most used self-reported academic grades, such as GPA, which have a potential for error, particularly amongst weaker students. A student's seat preference, rather than actual seat, may be a better indicator of performance. Seat preference maybe driven by the personality of the student. Students who are more motivated and are more positive about a course are more likely to sit in the central-front zones. Therefore, personality traits should also form part of a thorough study.

Keywords: Classroom, Ecology, Performance

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A critical review of student seating location preferences in lectures linked to student performance.

Prelude

Classroom ecology and performance is an area that regularly forms part of general discussions in the author's Accounting and Finance (AF) Departmental Meetings. The anecdotal evidence suggests that Asian males on the accounting degrees at the University of Greenwich tend to sit at the back of the lecture theatres and have lower progression rates, attendance and performance compared with females and other ethnic groups. Some colleagues believe that sitting weaker students in the central-front zone will improve results. There have been suggestions to force seating assignment to improve performance, reduce disruption and increase participation. This literature review summarises the current academic viewpoints on these issues which will inform the primary research for the doctorate in education dissertation and future action, if any, by the AF department to improve performance by managing the lecture theatre environment.

Introduction

The relation of classroom seating location to participation and student performance has been an area of research for academics since the early 20th century. Griffith (1921) commented that student grades on his psychology class varied with seat choice. Since then many academic studies have attempted to identify the relationship between seat location and

performance. Many of the studies conclude that grades reduce as students sit further from the front (Sommer, 1967; Becker *et al*., 1973; Levine *et al*., 1980; Holliman & Anderson, 1996; Benedict & Hoag, 2004). There is also a strong link by many studies between seat, attendance and performance (Brookes & Rebeta, 1991; Devadoss & Foltz, 1996; Perkins & Wieman, 2005; Cohn & Erikson, 2006). Other studies have identified a relationship not between sitting at the front and higher grades but with students who choose to sit in the centre and higher grades (Stires, 1980; Marshall and Losonczy-Marshall, 2010). However, other studies have found no link between seat location and performance (Armstrong and Chang, 2007; Kalinowski and Taper, 2007; Parker *et al*., 2011).

Some of the above studies where relationships were found have attempted to identify the causation for the link between seat location and performance (Burda and Brooks, 1996; Perkins and Wieman, 2005) and other studies have attempted to relate seat choice to enjoyment (Pedersen, 1977), participation (Sommer, 1967), classroom community (Campbell, 2009), personality (Pedersen, 1994), personal salience (Akimoto, 2000), intellect (Pedersen, 1994) and attitude (Brooks and Rebeta, 1991). Further conflicting studies conclude that seating location alone is insufficient to explain the phenomena and the relationship of personality traits to seat location is only a partial explanation and that students may adopt a social role associated with their seat location (Perkins and Wieman, 2005; Parker *et al*., 2011).

This literature review identifies the main literature that relates student's seat choice to performance and evaluates and interprets the literature results together with literature that highlights possible reasons for seat choice.

Literature review

The relationship between lecture seat location and course performance has been studied widely since the 1930s. The majority of studies have identified a positive relationship between sitting towards the front or front-centre of the classroom and higher grades (Becker *et al*., 1973; Benedict and Hoag, 2004; Marshall and Losonczy-Marshall, 2010).

Becker, Sommer, Bee and Oxley (1973) undertook three field studies building on the work by Sommer (1967) on seating and participation. The first two studies assessed the amount of student participation (measured by class related interactions with lecturer and other students) in different classroom arrangements, which will be discussed later, and the last study assessed the relationship between lecture seating position and several factors; grade performance, students' perceptions of who was or was not interested in the class, and students' liking of the lecturer as a person. This later study questioned 282 undergraduate students from three different classes taught in the same room (average 94 student classroom) at the University of California in the final third of a term when seating patterns were well established. They were asked their seat location, whether they usually sat within two seats of this seat, their sex, class, Grade Point Average (GPA), current class grade, liking for the teacher, and perceived similarity between them and the teacher (the latter two items on a 7 point scale). Only those who usually sat within two seats (i.e. same area) were included in the study (70%). The results indicated that class grades decrease as a function of distance away from the instructor, both towards the rear and sides. Those students sitting front-middle had significantly higher

class grades, mirroring the results of previous studies on participation and seat location (Sommer, 1967, Barker 1968). In contrast, there was no link between class seat and GPA, which would seem to suggest that students do not always sit in the same location for different courses. The study also found a significant difference between the perceptions of students at the front and rear of the classroom, with students at the front liking the lecturer more and considering themselves more like them. 96% of students questioned also identified that the least interested students sat at the back and 76% of those questioned felt that the most interested sat at the front. The first two studies found no significant difference between room size and participation but they did find a difference between levels of participation between laboratory and lecture room environments, with more participation in laboratory settings.

The study by Becker *et al*. (1973) did not measure participation by individual students and thus could not relate participation levels to grade performance. It also relies on the students stating their GPA and class grade to date accurately as no cross referencing was made to overall class grade or current records on GPA for individual students. Student self-reporting of grades carries an error probability (average GPA self-reporting accuracy is 84% (Kuncel *et al*., 2005)), particularly for weaker students, who tend to report higher than actual results (Cole and Gonyea, 2010). The survey was conducted during lecture classes in the same room but on three different courses with no details about the study level of the students on each of the courses or if the course was a core class or optional class. The study also fails to mention the attendance level on the day the survey was conducted. Sommer (1967) concluded that attendance and participation have positive impacts on performance. Students who stated that they did not usually sit within two seats of the location that they were in on that day were excluded from the study. If students self-certify their approximate seating location as within

two seats of the survey location, it could be interpreted as two adjacent seats or two rows away which may place them much closer to the front or further back. The capacity of the lecture room is not mentioned and neither are details on the number of rows and number of seats in each row. This information is important, as the findings segment the room into front, middle and back and the central versus side areas were divided and analysed using a 3x3 analysis of variance. A nine section division of the classroom may not accurately indicate students' zonal seating preferences. Kitagawa (1998) puts forward a four zone model for use in research relating to seating versus performance, and other such measures such as personality traits, to overcome the variety of zonal analysis methods used throughout such studies. The use of a single consistent zonal seating model for studies involving seating versus other variables would provide clearer and more comparable results in the study of classroom ecology.

Perkins and Wieman (2005) conducted a study on a large classroom. An introductory Physics course for 201 non-science students, including first, second and third year students, was used to study the effect of randomly assigned seats on performance and attendance. The lecture theatre rows were allocated to four groups, on a distance from the front grouping scheme (dissimilar from the Kitagawa model), and the analysis of performance, attendance and beliefs in physics were measured and compared in the first and second semester. The average GPA of each of the four groups was the same, indicating, to the authors, similar group populations. However, the authors fail to mention how the GPA was "found": did the students self-report or was the GPA grade obtained from registry records? Other studies in this field have been more accurate by measuring individual GPA from registry records. If

this had been undertaken, then individual performance could have been measured to control against abnormal group distributions.

Halfway through the semester seating was reversed with students at the back moving to the front and vice versa. The results found that students in group 1, who started the course at the front, were much more likely to receive an A grade than students at the back and students who started at the back were six times more likely to receive an F grade. Attendance for the four groups showed two trends. The further back from the front students sat at the start of the course, the lower the average attendance and the larger the drop-off in attendance between the first and second half of the semester. The grades for students in groups who started nearer the front did not reduce when they moved to the rear of the room. Conversely, students who started at the back did not improve after moving towards the front in the second half of the semester. This may be due to the extra efforts made during the study to engage students at the back, with extra staff supporting in-class discussions, small group exercises with students sitting adjacently in the row and personal response systems (also known as "clickers") exercises.

The study's findings highlight how important the impact of initial seating and early engagement were on performance and attendance on that course. However, certain issues were not discussed, such as students from different stages of undergraduate study, possible impact of moving students like laboratory subjects (or increasing the feeling that they ar being streamed) and comparisons of second semester attendance drop-off for similar courses. Mercincavage and Brooks (1990) identified achievement motivation differences between first year students and students in subsequent years. First year students' achievement motivation reduced significantly the further these students sat from the front, whereas second and third

year students showed no change in achievement motivation related to seating position. Do students behave differently if they are part of a study? Research participants may behave differently when they are aware of the research, for example, as in the Hawthorne effect study or the psychological effects of mere participation in medical research requiring placebos and double blind techniques to counter the effect. "Hawthorne effects threaten to contaminate experimental treatments in educational research when subjects realise their role as guinea pigs." (Cohen *et al*., 2006;127).

There may be an association between the allocated seat and the social role associated with that seat's location. Parker *et al*. (2011) propose this as a possible explanation for the above results from Becker *et al*. and Perkins and Wieman, based on their study on seat location and participation.

Parker *et al*. (2011) measured participation and end of course performance by randomly assigning half the 55 final year biochemistry students to specific seats for the whole course ('stay' group) while the other half moved every class in a sort of rotation so that every 'move' student sat in all areas of the classroom. They found that student participation for the stay group decreased the further they sat from the front but participation for the move group was similar in all areas of the classroom. They did not find a link between seat location and performance for either the stay or the move groups and thus concluded that location on students' performance is hard to measure and inconclusive and that the effect of seat location on participation is more evident. However, their seat location versus performance can only apply to the twenty-four students in the stay group. Parker *et al*.(2011) raise this as possible limitation of the findings of their study in this area together with a possible increased

participation (and thus perhaps performance) of move group students due to an "action seat" effect (Totusek and Staton-Spicer, 1982 – seats with high interaction) from moving every week to a new seat. There may also exist a reduction in the effect of seat location and performance with smaller class sizes and the higher the stage of study. Kalinowski and Taper (2007) also found no relationship between seat location and performance for their study of 45 second year biology students. This course met four times per week; three 50 minute lectures and one two and half hour laboratory. The class size was small, met much more than classes in other studies and there is also a possible weaker relationship between seat choice and performance at higher academic stages.

Individual student's subject experience, actual past performance and current GPA, age, year of study were not identified and factored into the above findings by Becker *et al*., Perkins and Wieman, Kalinowski and Taper, and Parker *et al*. and thus it is difficult to assign performance from these studies to seat alone. Benedict and Hoag (2004) undertook a study to identify if a student's preferred seat, as opposed to their actual seat, was related to their performance in that class. No other study, to this reviewer's knowledge, has done this although Kitagawa (1998) used student seat preference for creating his zonal model. Benedict and Hoag used key variables for controlling for other factors that might influence results, such as prior subject knowledge, performance in entrance exams, GPA (from registry records) and gender. They found that seating preference and final seat location are factors affecting performance. Those who prefer to sit nearer the front of the room had a higher probability of receiving A grades whereas those who prefer the back of the room had a higher probability of a D or F grade. Those who were unable to sit in their preferred location at the back and were forced forward received higher grades. Those who were forced back from the

preferred location suffered no grade reduction. Those forced from the middle-aisle seat to the side aisle seats had a lower probability of receiving an A and a higher probability to receive a D or F grade. Seating preference had statistical and behavioural significance. Those who preferred to sit with friends had a higher probability of receiving a D or F grade and reduced probability of receiving an A or B grade.

The study was conducted in 1997 on students studying two courses in the same lecture theatre with a capacity of 184 in Microeconomics and Macroeconomics. Students were given free choice of where to sit in the first and second sessions. During the second session a seating map was drawn up and the seating was fixed for the remaining classes of both courses although it is not clear how the study dealt with students who were not in attendance on that day. From the 338 students (180 micro-economics and 158 macro-economics) registered on the courses only 198 (59% - 121 (67%) micro-economics and 77 (49%) macro-economics) were used in the study as 72 were absent and 16 had dropped out by the middle of the courses when the survey was conducted and another 50 were missing data on key variables, mainly GPA (mostly for new 'freshmen' – USA first year undergraduates) and college entrance scores. The authors tested for 'selection sample bias' as they were worried about the impact of losing such a large proportion of subjects and were satisfied that the sample selection problem had only a small impact.

The study by Benedict and Hoag (2004) is seminal. Since its publication, almost every journal article in classroom ecology studying seating and performance and other measures has referred to this study. However, there are major issues in the study which are rarely raised. Firstly, the courses selected. These courses are not mutually exclusive and have

significantly different student compositions. A large proportion, 62%, of students on the macro-economics course were at least in their second year and 90% had studied a previous economics course, as opposed to only 17% and 39%, respectively, in the micro-economics course. It is common to study micro before macro in economics, however both courses contain students from all levels and thus comparing results from them does not provide for a balanced like-with-like or a first year versus second year plus students comparison. Secondly, the level and period of the study. The study was undertaken in the fall (autumn) on two first year level conceptual courses. The noteworthy and important principle to control for past performance and GPA automatically excluded all first year students or those transferring from other institutions that joined in autumn (45 students). Thus the study should be either undertaken on second year and higher level courses undertaken if controlling for GPA or on using college entrance exam scores for first year level courses. Thirdly, poor attendance during the survey may have biased the results of the survey. 72 students were absent on the day of the survey 19 (14%) from micro-economics and 53 (41%) from macro-economics. Having identified a significant bias for higher level students and poor attendance in the macro-economics course, the authors should have excluded the finding from macro-economics and used only the findings from the micro-economics course.

Both Becker *et al*. (1973) and Benedict and Hoag (2004) conducted studies with relatively small sample sizes from different academic stages at only one point in time. The inclusion of students from three different year levels may impact on the validity of the results for the UK. Marshall and Losonczy-Marshall (2010) conducted a study across 15 years on the relationship between seating location, performance and attendance on students attending three accountancy courses. Two of the courses were only available to second year students

and the third to third year students. A total of 70 classes of approximately 30-35 students in each provided total data from 1829 students. All the classes were taught by the same tutor in the same room. Students were allowed to select their own seat in the 63 seat capacity lecture theatre and after approximately 2-4 weeks students tended to sit in the same seat (estimated by the lecturer). For analysis the classroom was divided into rows, columns, front two rows and back two rows with the centre row not counted, middle of the room and periphery (outer columns and rows). Results indicated that students sitting in the more central part of the classroom had higher grades and attendance than those students sitting in the less central parts of the classroom. Women had higher attendance but there was no difference in grades between men and women. However, there was a positive correlation between attendance and course grades.

Even though this study did not control for past performance and experience or examine seat selection rationale, this study provides a long term analysis in a stable environment of the relationship of seat selection, attendance and performance in the accounting field. Only having approximately half the number of students in comparison to the capacity of the room does not create a normal lecture theatre spread of seating which may reduce the numbers of students in certain sections making the results not easy to compare between sections or applicable to classes with 75% or more of the capacity. This study should have also measured exact seating and compared seating, attendance and performance by level of academic study, given that one of the courses was only for final year students. Marshall and Losonczy-Marshall (2010) suggested that future research use a standard structure, such as Kitagawa's (1998) zonal model, for analysing differences in the classroom yet they fail to use it themselves.

Conclusion

The majority of research studies on the relationship between seat location and performance have identified that students seated in the central-front zones have higher course grades (Becker *et al*., 1973; Benedict and Hoag, 2004; Marshall and Losonczy-Marshall, 2010).

Prior subject experience and academic ability should be controlled within studies but only a few studies have done this and most used self-reported academic grades, such as GPA, which have a potential for error of 16% (Kuncel *et al*. 2005), particularly for weaker students (Cole and Gonyea, 2010).

A student's seat preference, rather than actual seat, may be a better indicator of performance (Benedict and Hoag, 2004). Seat preference maybe driven by the personality of the student. Students who are more motivated and are more positive about a course are more likely to sit in the central-front zones (Becker *et al*., 1973; Pedersen, 1994). However, Benedict and Hoag (2004) contradict their findings by identifying that those students who prefer to sit at the back and are forced forward performed better. If seat preference is an indicator of performance, then a student who is forced forward should not perform differently. Thus there may be an association between the allocated seat and the social role associated with that seat's location (Parker *et al*., 2011). Benedict and Hoag (2004) found some students preferred to sit closer to friends. This usually leads to sitting further back, where there is more

space, which in turn leads to greater distraction and possible adoption of those seats' social role.

Studies have been undertaken across many different academic fields with similar results, although most studies are based in the USA and have been undertaken in classes with mixed student study levels, first year to final year undergraduate students. Patterns of student motivation and attitude differ between academic stages (Mercincavage and Brooks, 1990) and thus studies that use classes that incorporate students from multiple academic stages will have weaker results in relation to UK accounting courses.

Many of the studies have been undertaken at a single point in time using surveys on relatively small lecture classes (with a few exceptions, for example, Perkins and Wieman, 2005) while only a few have been conducted over a longer period to reduce error rates and increase the sample size (Marshall and Losonczy-Marshall, 2010). However, the study by Marshall and Losonczy-Marshall (2010) used a small lecture with less than 50 students.

The author of this paper would be uncomfortable for the AF department to consider action on the basis of the above literature review. A study similar to that of Benedict and Hoag (2004) on large classes using similar controls but over a longer period and across different academic levels separately is required. The study should include motivational trait analysis together with a standard classroom analysis model such as the one developed by Kitagawa (1998).

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