

## CLASSROOM SEATING LOCATION AND ITS EFFECT ON COURSE ACHIEVEMENT, PARTICIPATION, AND ATTITUDES

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### Abstract

Research was reviewed on whether seating location in lecture-style classrooms influences college course grades. Empirical evidence suggests that it does not, or that the influence is so weak as to be of little general theoretical or practical importance. Empirical evidence also suggests, however, that seating location influences class participation and several self-report variables pertaining to attitudes about the course.

### Introduction

The impact of the classroom environment on learning and classroom behavior has long been of interest to educators and social scientists. Traditionally, this environment has been analyzed primarily in terms of social, organizational, and task-centered variables, not in terms of physical environmental variables (Weinstein, 1979). Recently this focus has shifted, and the role of physical variables such as lighting, noise, and classroom size and shape have been investigated. This review concerns the physical variable of classroom seating location and its possible effect on participation, attitudes, and achievement, typically operationalized as course grade. The issue is relevant to theories about the influence of spatial variables on psychological variables in general; it is also relevant to specific applied issues in education.

The issue of seating location as a causal variable, the concern of the present review, needs to be distinguished from the issue of seating location choice as an outcome or effect of certain personality variables, variables that in themselves might influence attitudes and behavior. In fact, disentangling the role of seating location as a cause of individual differences and as an effect (actually, a correlate) of individual differences has been at the core of research on this topic. There is a belief among most researchers that personality variables such as self-esteem, achievement motivation, tendency to verbalize, and possibly intelligence do affect seating location choice (Sommer, 1967; Walberg, 1969; Schwebel and Cherlin, 1972; Koneya, 1976; Dykman and Reis, 1979; Weinstein, 1979; MacPherson, 1984). Even given that personality influences seat choice, it could also be that seating location affects achievement and the classroom experience. Below, I review the empirical evidence for this hypothesis.

The prevailing belief in the literature is that seating location has been shown to affect course grades as well as certain behavioral and attitudinal variables (Weinstein, 1979; Holahan, 1982; Knowles, 1982; Levine *et al.*, 1982; Stires, 1982). In a review of the effects of the physical environment on education, Weinstein (1979) stated that the 'only physical variable that has been linked to differences in school

achievement is seating location' (p. 598), and that the 'weight of the evidence . . . seems to indicate that a front-center seat facilitates achievement, positive attitudes, and participation' (p. 580). Kelley (1977) found that 'the literature reviewed tended to support the hypothesis that student achievement was directly related to seating location in the classroom' (p. 13). In reference to his 1980 study, Stires (1982) claimed he 'found strong effects of seating location . . . supporting the environmental hypothesis. Seating location affected attendance, grades, attitude toward the course' (p. 363). Moore and Glynn (1984) stated that 'it is now clear that the physical location of pupils within a classroom can significantly affect both their behavior and academic attainment levels' (p. 235).

Studies that address this hypothesis are reviewed below, organized primarily chronologically. I focus on studies involving traditional lecture-style classes that utilize more or less typical row-and-column seat arrangements. These studies incorporate some variation in classroom size and shape, variation in course subject, and variation in the bases for grades in different classes (e.g., are exams text-based or lecture-based?). However, some of the studies are not specific about all of these variations, and the variations that are present in the existing research by no means exhaust the relevant possibilities. The review is restricted to college classes, for two reasons. First, nearly all research involving the causal role of seating location has been done with college students. Second, grade-school and high-school teachers often use nonrandom seating for disciplinary, interpersonal, or instructional purposes; seat assignment probably communicates teacher attitudes to students (Schwebel and Cherlin, 1972). In the studies with college classes reviewed below, seat assignment was usually random or alphabetical, and students were probably aware of the basis for their seat assignment.

### Review of Studies

The work of Robert Sommer and his colleagues germinated interest in seating-location effects in a variety of situations, including classrooms, hospitals, jury rooms, small discussion groups, and dyadic interactions in formal and informal social situations (Sommer and Ross, 1958; Sommer, 1961, 1967, 1969; Becker *et al.*, 1973). In traditional classrooms, Sommer and his colleagues have generally found that students sitting toward the front and center participate most. Participation decreases as one moves back or to the sides. However, all of their published research has involved non-random seat selection by students. In his 1967 study, Sommer reported that an average of 61% of the students made voluntary statements from the front and center location, but only 31% made statements from the back and side locations. Becker *et al.* (1973) studied three college classes meeting in the same room at different times, totalling over 200 students. They found significant grade decreases toward the rear and sides when all three classes were statistically combined. Students who chose to sit in the front rated their teacher more favourably, and their attitudes as more similar to the teacher, than students who chose to sit in the back. Sommer mentioned an unpublished study in his 1969 book that involved random seat assignments and found weak effects on participation. The study did not examine course achievement.

Although Sommer is acknowledged as one of the pioneers of seating-location effects, the largest and most extensive study of the phenomenon was reported in 1921 by C. R. Griffith. Several thousands of grades were tabulated for several large,

undergraduate classes meeting in five different classrooms. The bases for these grades is not described, nor is the exact sample size specified. All seating was alphabetically assigned. Only a small subset of the data is actually presented in the report, and the original data have apparently been misplaced (Knowles, 1982). Although no significance tests were performed, Griffith reported that the following pattern of grades was typically found: slightly lower (3–10%) in the front than in the middle rows, reaching a peak near row 4, and declining gradually toward the back. Grades declined more drastically in the last row, row 8, by about 10–20% compared to the middle rows.

More recent investigations have been specifically concerned with identifying location effects rather than selection effects. Kinarthy (1975) studied eight introductory psychology classes totalling 389 students. Classes met in a 'conventional' row-by-column classroom. Seats were randomly assigned. Initial seating preference was related to course grade, presumably exam based, but actual assigned seating location was not. There were several effects of seat assignment on other variables though. Students in the front and center communicated more with the teacher and were rated higher on attention and likeability by the teacher. In addition, students rated those seated in front as most attentive and most liked by the teacher, though these effects did not change systematically from the middle to the back. Students rated themselves as significantly more intelligent and liked by the teacher if they were seated in the front as opposed to in the back.

Koneya (1976) conducted a study that investigated class verbalization rather than course grades. He examined seven college classes totalling 138 students. Tendency to verbalize was behaviorally assessed in circular discussion groups at the beginning of the semester. Without an explicit instructor or discussion leader, the amount of time a given individual spoke should have reflected his or her personality [1]. Students then rated seating preference but were randomly assigned seats in a row-by-column setup. Results based on observation indicated that seat location had an effect on amount of classroom verbalization. Verbalization was high among those seated in a triangle of seats consisting of the five front-row seats, the middle three second-row seats, and the center third-row seat. Outside of this triangle, verbalization levels were uniformly low. These effects held for moderate and high verbalizers but not for low verbalizers, who said little regardless of where they sat. Initial seating preference was related to verbalizing tendency as well, suggesting that high verbalizers chose to sit near the front and center. Thus, as they pertain to class verbalization, Koneya found support for both the selection hypothesis and the environmental hypothesis.

Wulf (1977) studied two sections of an upper-division psychology course with a between-subjects design (total = 81). Classes met in a 20 × 26 ft room with rows of seats arranged in a horseshoe pattern around the instructor. Students from the first semester chose their own seats; students from the second semester were assigned seats alphabetically. Grades were based on exams. Some participation effects were found in the first semester, but no grade effects were significant in either class. The average grade was slightly higher in the front rows than in the rear rows.

In his unpublished doctoral dissertation, Kelley (1977) examined course grades and seating locations in 30 class sections totalling 1761 students in eight different classrooms. Three different courses were involved, courses in animal science, history, and engineering design graphics. The engineering course incorporated a lab in

addition to lecture. All but 2 of the 17 instructors assigned seats alphabetically. Kelley analyzed his data in terms of four distances from the teaching station: (1) 4–16 ft, (2) 16–28 ft, (3) 28–40 ft, and (4) 40–52 ft. Mid-semester and semester course grades, presumably exam based, were analyzed separately. None of the linear correlations between grades and distance were even close to significance. The patterns of means appeared random in that no front-back or center-side trends showed up consistently. Only the semester grades for the 373 history students differed significantly ( $P < .02$ ) by distance zone. The following pattern of mean grades was found for these three sections of the history course: distance 1 = 78.52, distance 2 = 73.38, distance 3 = 75.00, and distance 4 = 75.53. Unfortunately, this pattern matches neither Griffith's pattern nor the typical front-back pattern suggested by most research on seating location.

Millard and Stimpson (1980) found no grade effects of seating location. They randomly assigned introductory psychology students ( $n = 43$ ) in one class to seats located in one of three distance zones: rows 1 and 2, rows 4 and 5, or rows 7 and 8 (rows 3 and 6 were excluded). The rows consisted of 10 seats, and the floor sloped upwards moving away from the front of the room. After two weeks, students took a multiple-choice exam and were then randomly reassigned to a new distance zone as a zone group. After two more weeks, students took exam 2. The mean exam scores were nearly identical in the three zones: 99.77 in the front, 100.65 in the middle, and 100.14 in the rear. Although no effect on grades was found, increasing distance was related to decreases in self-reported class enjoyment, interest, motivation, and feeling of inclusion.

A study by Levine *et al.* (1980) employed a within-subjects design with one class of introductory psychology students ( $n = 159$ ) meeting in an amphitheatre-style classroom. At the start of the semester, students selected their own seats. After four weeks, their voluntary participation was assessed by two observers. The students took exam 1, a multiple-choice exam, and were then randomly assigned to new seats. After another four-week period, participation was again assessed and exam 2 was administered. There was a front-back difference on exam 1 scores but no center-side difference. Also, verbal participation did not differ according to seat location after 4 weeks. There were no exam 2 score differences according to location; in fact, the mean test score was about 0.7 of a point out of 50 higher in the rear of the room. Verbal participation was significantly greater in the front after week 8, however. The authors concluded that test grades reflected selection effects and that participation reflected location effects. They did not explain why participation differences were not found after the first 4 weeks as would be expected if their conclusions were valid; even though students initially chose their seats, they would presumably still be subject to any influences of seating location.

Stires (1980) examined two sections of introductory psychology (total = 279) held in the same room, a large amphitheatre-style room with seats arranged in a horseshoe pattern. One instructor taught both sections, one meeting at 9.10 a.m. and the other at 10.20 a.m. The 9.10 students chose their own seats, but the 10.20 students were alphabetically assigned to their seats. Multiple-choice exam scores from the entire semester were summed and compared. Students sitting in the middle scored higher than those sitting on the sides as a main effect, but the interaction with class section was not significant. However, a planned contrast comparing sides and middle separately for each section was significant in the seat-choice class but not in the seat-

assigned class. As a main effect, students sitting in the front did not score significantly different than those sitting in the rear. Students sitting in front apparently scored higher than those sitting in the rear in the seat-choice class and slightly lower in the seat-assigned class, though the interaction was also nonsignificant. Students' ratings of how much they liked the course and how much they liked the instructor followed a pattern similar to that of the exam scores, except that the middle-side difference was significant only for the seat-assigned section, by a planned contrast. No front-back differences were found for students' ratings. Stires suggested that these results support an environmental hypothesis rather than a selection hypothesis.

A recent study by Buckalew *et al.* (1986) involved 215 undergraduate psychology students from nine classes held at two universities. Although students apparently chose their own seats, the study is reviewed here because the exact seating method is not specified by the author and may have been random. Average course grades were higher in the front halves of classrooms than in the rear halves, though not significantly. Although it's not possible to discern from the published article, it appears that students were not required to stay in the same seats and may have moved around during the semester.

### **Is There an Effect of Classroom Seating Location on Course Achievement, Participation, and Attitudes?**

To address this question, one needs to consider studies that have manipulated seating location. The early study by Griffith (1921) suggests that seating location might affect course achievement, though grades were actually lower in front than midway back, dropping again towards the back. Unfortunately, no significance tests were performed, and only a small subset of the data was actually presented. We must accept Griffith's 'eyeballed' conclusions on faith because the large data base has presumably been misplaced. Although one would probably expect an environmental effect to strengthen with additional exposure to that environment, Griffith reports that the differences diminished across the semester. Regression to the mean predicts such a result for random effects. Kelley (1977) found one weak, significant effect out of several comparisons, but the pattern of means was the exact converse of that reported by Griffith. Like Griffith's pattern, though, Kelly's also did not reflect a systematic decrease in grades moving toward the rear of the classroom. Of the additional five studies involving random seat assignment reviewed above, only Stires (1980) found any significant effect on course grades. That effect was a middle-side difference that was actually nonsignificant when the seat-assigned group was analyzed separately from the seat-choice group. Though using a variety of classrooms and a variety of experimental designs, the other four studies found no effect of seating location on course grades (Kinarthy, 1975; Wulf, 1977; Levine *et al.*, 1980; Millard and Stimpson, 1980). An additional study by Buckalew *et al.* (1986) that apparently did not involve seat assignment also did not find a significant relationship between seat location and course achievement. Though it would be useful, a formal meta-analytic procedure (e.g., Cooper, 1979) would be difficult or impossible to perform because several of the studies reviewed did not present appropriate means, standard deviations, or significance tests. Also, different researchers have split up the classroom space in many different ways (rows, zones, absolute distance, etc.), and it is not clear how one should combine these to test any single directional

hypothesis. Nonetheless, patterns of means across studies did not suggest any systematic trends. In several cases, for instance, performance in the rear of the room was as high or higher than performance in the front of the room. These non-significant and inconsistent trends were obtained in spite of the fact that other consistent and significant relationships with seating location were found, as discussed below.

It appears that the available research does not support the hypothesis that seating location in college classrooms has any consistent effect on course achievement. In addition, other studies that may have been conducted and resulted in null effects, or inconsistent effects, are likely to be over-represented in the population of unpublished manuscripts, though the extent of this 'file drawer problem' (Rosenthal, 1979) would be very difficult to ascertain. A very weak effect may exist, so weak as to require thousands of subjects to reveal it (Knowles, 1982). Also, any effect may depend on several course and classroom variables that are not systematically examined in the existing research: the course content and grading system; the class style (e.g., lecture, seminar); the room size and shape (e.g., sloping floors); the presence of aisles, pillars, and windows; seat arrangement and lighting; and the number of students and their overall seating configuration (where do they sit in an unfilled classroom?). Effects of seating location may depend on interactions with student or instructor characteristics (cf. Koneya, 1976). Especially important may be the fact that existing research uses exams, typically multiple-choice, as the operationalization of course achievement. And these studies do not specify the extent to which exams are based on classroom material as opposed to text material. However, the fact that several studies incorporating hundreds or thousands of subjects have found inconsistent and nonsignificant trends suggests that any effect is so small and/or specific to particular classroom designs, instructors, or students with particular characteristics that it is of little general interest or importance. Also plausible from an empirical stance is that no effect exists, but studies have occasionally revealed random trends.

However, this is not to say that seating location has no effect on classroom behavior or attitudes. Several studies reviewed above that utilized random or alphabetical assignment found higher levels of class participation among students sitting in the front and center of the room than among students sitting in the back or to the sides (unpublished study discussed in Sommer, 1969; Kinarthy, 1975; Koneya, 1976; Levine *et al.*, 1980). Only one study, Wulf (1977), did not find such an effect. Kinarthy (1975) and Millard and Stimpson (1980) found higher self-ratings of intelligence and enjoyment of the class, higher self-ratings of feeling of inclusion in the class, and higher self-ratings of motivation among students seated toward the front. Stires (1980) found that students sitting in the middle of the room rated the course and the instructor more positively than students sitting to the sides. Kinarthy (1975) found that students sitting in the front tended to be rated by other students as being more attentive and liked by the teacher, and that these students were rated by the teacher as more attentive and likable. No studies that have measured student or teacher ratings have failed to show location effects.

Thus, classroom seating location does have a fairly robust influence on certain behavioral and self-report variables, though not on course grades. As Marx (1983) suggested, one would probably expect increased participation and more positive classroom experiences to influence attention and long-term memory storage. The

research considered above, however, does not support this idea. A parsimonious way to interpret this research involves the participation effect and its influence on the self-report measures. Some mechanism or set of mechanisms, considered below, induces or facilitates verbal participation in the class. These mechanisms may lead directly to increases in the student's motivation, attention, and enjoyment of the class, or the increased participation may lead to these increases. Test grades do not increase, though, because they may reflect other causes such as intelligence, study habits, and general achievement motivation. This notion is consistent with that of Williams (1971), who claims that class participation is not related to general IQ, and only very weakly related to course achievement. If the course exams are derived primarily from text material, attention in class would not necessarily influence exam grades to a large extent. It is probably true that talkative students appear more intelligent, attentive, and motivated to the teacher and to other students. Consequently, they are better liked by the teacher. Both self-perception theory (Bem, 1972) and dissonance theory (Festinger, 1957) suggest that students might form attitudes toward the course on the basis of observations of their own classroom behavior.

What mechanism or mechanisms might lead to greater participation and class-directed attention among students assigned to sit in the front and center? Sommer (e.g., 1969) has suggested eye contact and its effect on nonverbal expressive contact between teacher and student, a view echoed by Koneya (1976), Weinstein (1979), and Levine *et al.* (1980). Caproni *et al.* (1977) examined this hypothesis in a small class ( $n = 13$ ) arranged in a seminar style. They found higher participation among students that had greater eye-contact availability with the instructor, even after the instructor changed seats several times. However, Caproni *et al.* (1977) did not measure eye contact or gaze duration directly. They operationalized eye-contact availability in terms of a student's seating position relative to the instructor. Those opposite and facing the instructor demonstrated highest verbalization, followed by those sitting at right angles to the instructor, and those sitting next to the instructor. Thus, while the results are probably consistent with the eye-contact hypothesis, they do not address the relationship between seating location and amount of eye-contact directly. Factors such as interpersonal distance might account for the results.

Other plausible mechanisms for the participation effect include the possibility that students in the front and center believe they are under more direct surveillance by the instructor. They participate more out of a desire to bolster their images in the eyes of the instructor or out of a desire not to appear inattentive or rude. A common idea is that certain seat locations afford better vision and audition, making class-directed attention easier and participation more convenient (Griffith, 1921; Stires, 1980). Still other hypotheses could be conceived, but current research on the psychological mechanisms of the classroom experience is scant and inconclusive.

In conclusion, the commonly held belief that classroom seating location has been shown to influence course achievement is not supported by existing research. Several studies were reviewed that generally found no significant effects. The few trends that did show up did not follow a consistent pattern, especially not the often suggested pattern of highest grades in the front and center, declining toward the back and sides. If such an environmental effect does exist, it is so small and so strongly moderated by classroom and individual difference variables as to be of little theoretical or practical importance. Classroom location does influence class

participation and several self-report variables, however. Interesting areas for further research involve the mechanism or mechanisms of these effects, and reasons for the lack of a relationship between course achievement and these classroom experiential variables. Research on interactions between seating location and individual difference variables, as well as research on specific course and classroom variables as they moderate seating location effects, might also be fruitful.

### Acknowledgements

The author wishes to thank Matthias Giessler, David Kenny, Douglas Kenrick, Nancy Russo, Edward Sadalla, and several anonymous reviewers for their helpful comments on earlier drafts of this manuscript.

### Notes

[1] Stires (1982) criticized this measure of natural verbalizing tendency on the grounds that one's verbalization is greatest with those seated opposite (Steinzor, 1950). Thus, students seated opposite the teacher or experimenter would be expected to verbalize the most. However, Koneya did not indicate that anyone but the students actually sat in on the discussions, nor that anyone was designated as the discussion leader. But even if there was no discussion leader, the verbalization of a given student cannot be considered independent of the verbalizations of other students. The most obvious reason is that individuals sitting opposite high verbalizers would be expected to show increased verbalization.

### References

- Becker, F. D., Sommer, R., Bee, J. and Oxley, B. (1973). College classroom ecology. *Sociometry*, **36**, 514–525.
- Bem, D. J. (1972). Self-perception theory. In L. Berkowitz (ed.), *Advances in Experimental Social Psychology*. Vol 6, pp. 1–62. New York: Academic Press.
- Buckalew, L. W., Daly, J. D. and Coffield, K. E. (1986). Relationship of initial class attendance and seating location to academic performance in psychology classes. *Bulletin of the Psychonomic Society*, **24**, 63–64.
- Caproni, V., Levine, D., O'Neal, E., McDonald, P. and Garwood, G. (1977). Seating position, instructor's eye contact availability, and student participation in a small seminar. *Journal of Social Psychology*, **103**, 315–316.
- Cooper, H. M. (1979). Statistically combining independent studies: a meta-analysis of sex differences in conformity research. *Journal of Personality and Social Psychology*, **37**, 131–146.
- Dykman, B. M. and Reis, H. T. (1979). Personality correlates of classroom seating position. *Journal of Educational Psychology*, **71**, 346–354.
- Festinger, L. (1957). *A Theory of Cognitive Dissonance*. Stanford, CA: Stanford University Press.
- Griffith, C. R. (1921). A comment upon the psychology of the audience. *Psychological Monographs*, **30** (136), 36–47.
- Holahan, C. J. (1982). *Environmental Psychology*. New York: Random House.
- Kelley, C. W. (1977). The relationship between the distance from the instructor to the student and grades received. *Dissertation Abstracts International*, **38**, 4A. (University Microfilms No. 77–20 435, 2001–2002).
- Kinarthy, E. L. (1975). The effect of seating position on performance and personality in a college classroom. *Dissertation Abstracts International*, **37**, 4A.



- Knowles, E. S. (1982). A comment on the study of classroom ecology: a lament for the good old days. *Personality and Social Psychology Bulletin*, **8**, 357–361.
- Koneya, M. (1976). Location and interaction in row-and-column seating arrangements. *Environment and Behavior*, **8**, 265–283.
- Levine, D. W., McDonald, P. J., O'Neal, E. C. and Garwood, S. G. (1982). Classroom seating effects: environment or self-selection—neither, either, or both. *Personality and Social Psychology Bulletin*, **8**, 365–369.
- Levine, D. W., O'Neal, E. C., Garwood, S. G. and McDonald, P. J. (1980). Classroom ecology: the effects of seating position on grades and participation. *Personality and Social Psychology Bulletin*, **6**, 409–412.
- MacPherson, J. C. (1984). Environments and interaction in row-and-column classrooms. *Environment and Behavior*, **16**, 481–502.
- Marx, R. W. (1983). Student perception in classrooms. *Educational Psychologist*, **18**, 145–164.
- Millard, R. J. and Stimpson, D. V. (1980). Enjoyment and productivity as a function of classroom seating location. *Perceptual and Motor Skills*, **50**, 439–444.
- Moore, D. W. and Glynn, T. (1984). Variation in question rate as a function of position in the classroom. *Educational Psychology*, **4**, 233–248.
- Rosenthal, R. (1979). The 'file drawer problem' and tolerance for null results. *Psychological Bulletin*, **86**, 638–641.
- Schwebel, A. I. and Cherlin, D. L. (1972). Physical and social distancing in teacher-pupil relationships. *Journal of Educational Psychology*, **63**, 543–550.
- Sommer, R. (1961). Leadership and group geography. *Sociometry*, **24**, 99–110.
- Sommer, R. (1967). Classroom ecology. *Journal of Applied Behavioral Science*, **3**, 489–503.
- Sommer, R. (1969). *Personal Space*. Englewood Cliffs, NJ: Prentice-Hall.
- Sommer, R. and Ross, H. S. (1958). Social interaction on a geriatrics ward. *International Journal of Social Psychiatry*, **4**, 128–133.
- Steinzor, B. (1950). The spatial factor in face-to-face discussion groups. *Journal of Abnormal and Social Psychology*, **45**, 552–555.
- Stires, L. (1980). Classroom seating location, student grades, and attitudes: environment or selection? *Environment and Behavior*, **12**, 241–254.
- Stires, L. (1982). Classroom seating location, order effects, and reactivity. *Personality and Social Psychology Bulletin*, **8**, 362–364.
- Walberg, H. J. (1969). Physical and psychological distance in the classroom. *School Review*, **77**, 65–70.
- Weinstein, C. S. (1979). The physical environment of the school: a review of the research. *Review of Educational Research*, **49**, 577–610.
- Williams, R. L. (1971). Relationship of class participation to personality, ability, and achievement variables. *Journal of Social Psychology*, **83**, 193–198.
- Wulf, K. M. (1977). Relationship of assigned classroom seating area to achievement variables. *Educational Research Quarterly*, **2**, 56–62.

*Manuscript received: October 1987*

*Revised manuscript received: 17 March 1988*