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ACTIVITY-ENHANCING ARENAS OF DESIGNS: A CASE STUDY OF THE CLASSROOM LAYOUT

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To what extent does the spatial layout of a classroom affect the activities conducted in that setting? Five different layouts were examined in this study to address that question. Perceptions of how classroom spatial layouts differ in the way they influence teaching and learning activities were elicited from primary teachers and evaluated in terms of their educational perspectives. They were uncovered by assessing teachers' beliefs about properties of various spatial designs, evaluating their spatial layout preferences, and by evoking their comments about the relative merits each layout has with respect to facilitating the conduct of activities in the classroom. The information collected in this way was evaluated and integrated with the use of similarity coefficients, q-mode factor analysis, and multi-dimensional scaling. Results from the case study strongly suggest that teachers perceive the influences exerted by various classroom spatial layouts on teaching and learning activities to differ, but their perceptions of such differences are clearly qualified by their educational perspectives.

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FACTORS INFLUENCING CLASSROOM ACTIVITIES

Resources, curricula, teaching competence, administration, organization, student characteristics, classroom management, and instructional strategies are frequently mentioned as the important factors in the conduct of teaching and learning activities (e.g., see Charles, *et al.*, 1996; Delamont, 1984; Denscombe, 1985; Emihovich, 1989; Evertson, *et al.*, 1994; Schwartz and Pollishuke, 1991). Indeed, there is little disagreement among educators that factors like these matter. But what of the classroom itself, within which such activities are actually conducted (e.g., see Bloom, 1989)? Does it make a difference how its spatial layout is designed? That is to say, can the basic configuration of a classroom qualify, enhance, or even compromise teaching and learning activities?

Though comparatively little effort has been devoted to investigating the significance of a classroom's spatial layout, a number of studies have examined potential relationships between other specific features of classrooms and some teaching and learning activities. Research has examined how "soft" and "hard" classrooms (Sommer and Olson, 1980), class size (Glass, *et al.*, 1982; Montello, 1988), and classroom seating (Moore and Glynn, 1984) relate to a variety of student participation and achievement measures. King and Marans, *et al.* (1979) reviewed and summarized much of this type of research as it was conducted during the 1960s and 1970s (but see also Altman and Wohlwill, 1978; Spencer, *et al.*, 1989).

More comprehensive studies have attempted to integrate multiple issues when reasoning about relationships between activities and educational settings. Design guidelines for learning environments in childcare centers have been developed to relate the goals of children's developmental programs to the programs' physical environments (Sanoff, *et al.*, 1972; see also Sanoff and Sanoff, 1981). H. Sanoff (1994) discussed how research findings, participation in the design process, and the development of the design itself can be integrated to create school settings that support activities and complement users' needs, objectives, and preferences. He emphasized the importance of the physical, intellectual, and affective aspects of child development and illustrated ways to relate behavioral objectives to *spatial needs.*

Moore (1986) investigated the effects *spatial definitions* of settings had on cognitive and social behaviors in childcare centers. His specific expectations were that indicators of child development would be related to architecturally well-defined behavior settings. He observed the behavior of children ranging in age from 2.5 to 6 years of age located in 14 childcare centers and found that significantly more exploratory behavior, social interaction, and cooperative behavior occurred in spatially well-defined behavior settings than in moderately or poorly defined ones.

Focusing on the Spatial Layouts of Classroom Settings

The work undertaken in this paper will focus on teachers' beliefs about the influences of a classroom's basic spatial form on the conduct of activity in that setting. Toward that end, three interrelated questions will be pursued: Do primary teachers perceive classroom spatial layouts as significant in the conduct of teaching and learning activities? Do they believe that there are differences among layout types in that regard? And what effects do their fundamental beliefs about the conduct of activities in classrooms have on their perceptions?

There are at least two reasons why it is useful to investigate the relationship of classroom spatial layouts to activities conducted in that setting. One is the general need for more information about the congruence between designer-intended space uses in a setting and user-intended uses of such spaces (e.g., see Smith and Keith's 1971 and 1984 discussions of the failure of a notable school design;[1] Gump's 1987 assessment of open-plan educational settings; and essays commenting on the state of design, in general, in the Plenaries of Seidel, 1994).

A more immediate reason pertains to the need for more knowledge about how a spatial layout of a setting relates to the *dynamics of activities* conducted in that setting. In the elementary level class-

FIGURE 1. The five spacial layout types used in the study.

room, for example, teachers *move about* while describing, explaining, illustrating, and attempting to stimulate groups of students. They engage in spatial innovation by rearranging student activities into distinct groups or clusters. They define and set interpersonal spatial relationships by allocating and maintaining "appropriate" spaces among students, as well as between themselves and students, for such purposes as avoiding crowding, reducing distractions, and maintaining social distances. Teachers also make use of the opportunities and limitations in their classroom's spatial layout to fix students' attention and to establish effective stimuli and information flow-routes throughout a teaching episode. In other words, movements, motions, orientations, positions, interactions, and arrangements are all part of the activity dynamics in the classroom. In this sense, the spatial layout of a classroom setting, because it is the arena for such behavioral dynamics, should have considerable significance for the conduct of its activities. The remainder of this paper elicits the views of the classroom's principal and most effective users to see whether, in their perceptions, layouts do have such importance in the conduct of activities.

PERCEPTIONS OF CLASSROOM SPATIAL LAYOUTS

In order to examine and compare perceptions of multiple layout possibilities, the guiding research question for this investigation was formulated in this way: What differences in enhancing teaching and learning activities do teachers perceive among a collection of five classroom spatial layouts? Seventy-nine teachers from four elementary schools were asked to respond to an interview instrument containing inquiries related to this research question. Thirteen of these were chosen from Maxey Elementary School, twenty from Humann Elementary, fifteen from Cavett Elementary, all three of which are located in Lincoln, Nebraska, and thirty-one teachers were selected from York Elementary in York, Nebraska.

The five spatial layout types used in the study are illustrated in Figure 1. They, along with their letters, A to E, were presented to the seventy-nine teachers for their various reactions to them (described below). The labels above them are used only for easier reference throughout this paper; they were not available to the teachers. Nevertheless, the labels do suggest some very general classroom design trends over time. For example, the rectangular configurations, A and B, are commonly found as spatial layouts for classrooms throughout older elementary schools. They appear to facilitate row and column student arrangements where teachers usually hold forth at the head of the room. The T-shaped, Fat-L, and Cross-shaped layouts, C, D, and E, suggest configurations that deviate in various ways from the rectangular format. The literature indicates that from the 1970s on, variations of these types appeared as layouts for classrooms designed to accommodate what were then called "innovative" approaches to the conduct of teaching and learning activities.

Eliciting perceptions of something as complex as a spatial layout requires that, for fuller understanding of them, multiple information sources be exploited to reflect their various facets. With this in mind, teachers were asked to relate what comes to their mind when thinking about each of these five

TABLE 1. Properties of classroom designs.

We now want you to examine these classroom designs one at a time. We want you to tell us, in your opinion, whether each feature in the ITEM TABLE below describes a property of the design you are observing. If you believe a specific item describes a property of the design you are examining, then give the item a check. If you believe it does not, then ignore that item and go on to the next one in the table. Please go through the entire table of items when examining each classroom design. Begin with classroom design A.

for Design A ☐

☐ 1. This classroom design is nonstandard in shape.

☐ 2. This design facilitates the enactment of supervision and vigilance in the classroom.

☐ 3. The design mainly encourages single-group coordinated activity in the classroom.

☐ 4. This design primarily encourages fixed time-scheduling of classroom activities.

☐ 5. This classroom design supports directed focusing of student activity.

☐ 6. This classroom design facilitates front-facing orientation of students.

☐ 7. This design makes possible multiple and diverse activity in the classroom.

☐ 8. This design is essentially a compact one and enhances unified spatial layout of activities.

☐ 9. This design fosters flexible time-scheduling of activities.

☐ 10. This design makes separation of classroom activity possible and enhances privacy among activities.

☐ 11. This design makes possible multiple orientations of student activity.

☐ 12. This design is the standard institutional shape.

☐ 13. This design facilitates multiple focusing of classroom activities.

☐ 14. This classroom design promotes the creation of multiple space-uses and enhances flow potentials between them.

layouts. They were also asked to express their beliefs about whether each layout design had or did not have specific properties related to teaching and learning activities. Finally, they were asked to illustrate their relative preferences for the five different layouts. The discussions that follow describe how these three requests were presented to teachers in the sample and the ways they responded to them.

Property Judgments of Classroom Spatial Layouts

Table 1 lists 14 properties which, based on responses to them in a pretest and information gathered about them from educational literature, appear to have considerable relevance to a spatial layout's potential to facilitate teaching and learning activities in the elementary classroom.

As is evident in the directions of the table, teachers were asked to examine each of the five spatial layouts illustrated in Figure 1 and indicate whether these property items did or did not describe them. In this way, seventy-nine teachers evaluated five spatial layouts for the presence or absence of these fourteen properties. An index measuring similarity in responses (i.e., agreement responses ÷ total possible responses) was then used to compare property judgments between any two of the teachers.[2] The index ranges in value from an upper limit of 1, indicating identical judgments between the two, to a lower limit of 0, indicating no similarity in judgments (see Amedeo and York, 1990; Cheetham and Hazel, 1969; Rivlin and Rothenberg, 1976; and Wishart, 1969, for its use).

These similarity comparisons among property judgments were calculated for all possible pairings of teachers and for each of the five spatial layout designs. This resulted in five matrices, one for each layout, containing similarity values. These matrices were then factored individually (using a q-mode

TABLE 2. Classroom layout-design, property-characterization by groups of teachers.

Group #	1		3		1		3		1		2		4		1		2		1		2	
Teachers in Group	24		19		23		18		25		7		9		32		8		28		17	
Classroom Design	A		A		B		B		C		C		C		D		D		E		E	
Property Present?	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
Items or Property of Design from Table 1																						
1. shape is nonstandard	1	23	0	19	0	23	0	18	24	1	7	0	9	0	28	4	7	1	28	0	17	0
2. facilitates supervision and vigilance	24	0	19	0	22	1	18	0	0	25	7	0	9	0	7	25	8	0	0	28	2	15
3. encourages single-group coordinated activity	24	0	19	0	23	0	18	0	1	24	0	7	0	9	1	31	0	8	0	28	0	17
4. encourages fixed time-scheduling of activities	18	6	17	2	23	0	18	0	0	25	0	7	0	9	0	32	0	8	0	28	0	17
5. supports directed focusing of student activity	20	4	19	0	17	6	17	1	0	25	4	3	9	0	1	31	8	0	0	28	8	9
6. facilitates front-facing orientation	23	1	17	2	22	1	18	0	1	24	0	7	2	7	2	30	8	0	0	28	3	14
7. makes possible multiple and diverse activity	0	24	0	19	0	23	0	18	25	0	7	0	9	0	32	0	8	0	28	0	17	0
8. is compact and enhances unified spatial layout of activities	0	24	19	0	0	23	18	0	22	3	7	0	0	9	10	22	5	3	0	28	0	17
9. fosters flexible time-scheduling of activities	0	24	0	19	0	23	0	18	22	3	7	0	9	0	27	5	6	2	28	0	13	4
10. makes separation of activity possible and enhances privacy among activities	0	24	0	19	0	23	0	18	25	0	6	0	9	0	32	0	8	0	28	0	17	0
11. makes possible multiple orientations of student activity	0	24	0	19	1	22	0	18	25	0	7	0	9	0	32	0	8	0	28	0	15	2
12. is the standard institutional shape	24	0	18	1	22	1	18	0	0	25	0	7	0	9	2	30	0	8	0	28	0	17
13. facilitates multiple focusing of activities	1	23	0	19	0	23	0	18	25	0	7	0	9	0	31	1	8	0	26	2	15	2
14. promotes creation of multiple space-uses and enhances flows between them	1	23	0	19	0	23	0	18	23	2	7	0	9	0	31	1	8	0	28	0	16	1

format) to see if teacher groups, based on commonalities in property judgments, were present in each.[3] Table 2 illustrates the more prominent groupings that emerged from this analysis for each of the five layouts.

With regard to classroom layout of the shallow rectangle type, A, Table 2 illustrates that groups 1 and 3 have similar perceptions for all fourteen design properties except one. Both groups perceive the shallow rectangle to be a standard design, one which facilitates supervision and vigilance, encourages single-group coordinated activity and fixed time-scheduling, supports directed focusing of student activity, and is mainly a front-facing orientation design. Both also believe that the shallow rectangle is standard in shape, makes difficult a variety of orientations, does not facilitate multiple focusing, and does not support multiple space-uses. The property that distinguishes these two groups from one

another is number 8. The nineteen teachers in group 3 believe that this shallow rectangle layout is essentially a compact one and enhances a unified spatial layout of activities, while the twenty-four teachers in group 1 believe just the opposite with respect to this property.

Table 2 shows that property 8 also provides the distinction between the two groups that emerged from the responses to the deep rectangular-shaped layout, B. For example, groups 1 and 3 agree on the presence and absence of all properties listed in the table except number 8. Perhaps this result is to be expected, because layout designs A and B appear to be similar spatial configurations.

In the property characterizations of the T-shaped design, C, distinctions among the three groups illustrated lie in different beliefs about the presence or absence of properties 2, 5, and 8. For example, teachers in group 1 feel that this T-shaped layout, C, does not facilitate supervision and vigilance in the classroom nor does it support directed focusing of student activity. Yet, groups 2 and 4 characterize this T-shaped design as supporting directed focusing. There is also perceptual disagreement about whether this layout design is a compact one which enhances unified spatial layout of activities. Groups 1 and 4, for example, believe it is not, while all the teachers in group 2 feel that it does exhibit this property.

Differences in the presence-absence responses to properties 5 and 6 account for the distinction between the two groups emerging from the perceptions of the Fat-L layout, D. Group 1, for example, sees the Fat-L layout as not supporting directed focusing of student activity or facilitating a front-facing orientation of students, but group 2 perceives this layout in just the opposite way with regard to these two properties.

In reference to the last of the five classroom layouts, teachers in the larger of the two groups overwhelmingly perceive this cross-shaped design, E, as one that does not support directed focusing of student activity or allow for front-facing orientation. Instead, they believe that this layout makes possible multiple and diverse activity, fosters flexible time-scheduling, makes separation of activity in the classroom possible, enhances privacy among group activities, and allows for multiple orientations. The second grouping of teachers perceive this cross-shaped design in much the same way, in that they largely agree that these properties are its features. Some divergence, however, is noticeable between the two groups in the sense that the teachers in this second group are split down the middle as to whether this layout supports directed focusing of student activity and are also not unanimous about the presence and absence of properties 6 and 9.

General observations about perceptions of spatial layout properties. Comparing those beliefs exhibited in Table 2 about alternative designs of classroom spatial layouts reveals that teachers divide into different groupings with regard to their property perceptions. This leads to a number of observations. One is that there is no unanimous property perception of any of the five designs; instead, multiple, but distinct, perceptions of the same layout design emerge. Another is that the five designs seem to fall into two broad classes, with designs A and B in one class and C, D, and E in the other. The latter layouts seem to be perceived as more flexible for innovative teaching than the first set, but the properties perceived as characterizing the two rectangular layouts (A and B) in this first class appear to be those that facilitate control and focus in teaching and learning activities, and such features may not reflect trivial or traditional needs.

In retrospect, though these results are, to some degree, informative and, in some cases, even unexpected, asking teachers to indicate which of 14 properties do and do not characterize each of five classroom layouts may be somewhat restrictive, in the sense that no opportunity is provided for teachers to entertain properties not present in Tables 1 or 2. Furthermore, a checkoff directive like this evokes little more than a nominal response from a teacher because of its nature, which provides few opportunities for further elaboration about possible extended implications of that response. Limitations such as these tend to inhibit attempts to more fully understand the perceived importance of classroom spatial layouts in the conduct of teaching and learning activities. With thoughts like these in mind and with a desire to expand upon implications potentially inherent in these property

beliefs, additional facets of perception, such as teacher *layout preferences* and their *thoughts* about these layouts, were also examined.

Teacher Spatial Layout Preferences

Layout preferences were elicited by asking teachers to rank-order which of the five configurations used in this study would best support their beliefs about teaching and learning activities, which would next best support them, ... , and so on to a final inquiry of which would least support their beliefs about these activities. Appendix 2 illustrates how each of the teachers ranked the five layouts in response to this request.[4]

Multi-dimensional scaling assessments of layout preferences. There is information implicit in these rankings which would, *if extracted*, reveal much about such things as the differences teachers perceived among the classroom layout types when expressing their preferences, broad criteria employed by teachers when discriminating among the layouts, and perceived similarities and dissimilarities among the layouts. Information of this nature is not visually apparent from the raw rankings. For that reason, a non-metric, multi-dimensional scaling (MDS) was performed on the preference rankings in an effort to extract it.[5] Generally, when applied, MDS provides a conceptual space, implied by the original discriminations (e.g., preferences), within which are depicted the separations among the things being ranked (e.g., classroom layouts) and among the rankers themselves (e.g., teachers). Figure 2 illustrates the conceptual space obtained when MDS was applied to these teacher preference rankings of the five spatial layouts.[6]

FIGURE 2. MDS assessment of preference rankings. Letters "A" to "E" refer to the five spatial layouts; dots to teachers; and outlines to clusters of teachers.

The relative positions of the five layouts, A to E, in the two-dimensional MDS space of Figure 2 suggest a number of things about the way teachers have conceptualized these layout designs when expressing their preferences. In general, teachers seemed to perceive the T-shaped design, C, and the Fat-L layout, D, as very much alike, so that they are near to one another in this MDS space. The same appears to be the case for the two rectangular designs, A and B. Yet, in comparing the positions of these two pairs, it is clear that teachers perceive the first layout pair, C and D, as being quite different from the second pair, A and B. The cross-shaped design, E, is viewed as somewhat distinctive in itself, relative to either of the two pairs; although, based on its location, it is probably conceived as more like the T-shaped and Fat-L layouts than like the two rectangular designs.

The remaining dots shown in the MDS space of Figure 2 reflect the positions of the teachers, as dictated by the relative preferences they expressed for the five different spatial designs. Teachers preferring any one of the five as "best" are generally closer to that design in the space than to others. Their actual locations, however, are also influenced by their preference choices for the remaining four

layouts. In addition, teachers preferring the same layout as "best" are closer together in the space, their actual separation being influenced by their other four choices as well.

Focusing on the directional trends of the layouts, the two-dimensional configuration of this MDS space suggests that, collectively, teachers used two fundamentals when they discriminated among the five designs to express their preferences. The vertical dimension, having layouts A and B on one end with C and D positioned on the other, suggests that they made something like a *traditional-nontraditional distinction* when discriminating among the designs. The horizontal orientation of the space, having A and B on one end and E on the other, implies that they also used a *spatially complex-spatially simple* distinction as a second criterion when mulling over their preferences. If an imaginary southwest-northeast diagonal is passed through this preference space just below its center intersection, an impression is gained that teachers perceived classroom layouts as either more spatially complex (e.g., as in C, D, and E) or spatially elementary and compact (e.g., as in A and B).

It is evident that this scaling assessment of preferences reveals additional information about teacher perceptions of classroom layouts. For example, the scattered distribution of teachers in the MDS space indicates that not all teachers perceived the layouts in the same way. Might these perceptual differences be products of differences in educational perspectives? The next section explores that possibility.

Relating Classroom Layout Preferences to Educational Perspectives

Figure 2 illustrates the presence of *several* clusters in the MDS space, suggesting that, in a number of instances, teachers expressed similar spatial layout preferences. As is evident, some clusters contain many teachers bunched closely together, while others contain fewer and are more loosely spaced. The closer the teachers are in a cluster, the more similar their layout preferences are likely to be. But what accounts for these particular clusters and their distinctiveness?

The initial expectation in this study was that teachers' views on teaching and learning issues relating to the conduct of activities in the classroom should influence, in some consistent manner, the ways teachers express their preferences for the five spatial layouts. Hence, *prior* to the request that they rank their layout preferences from best to worst, teachers were asked to indicate their inclinations toward such educational issues and also toward closely related design items by responding to the scales illustrated in Table 3.

Instructions directed teachers to mark an "X" on each of the scales in this table at a location that best reflected their views on the corresponding issues. Their responses were then coded from 1 to 5, where a larger number meant that it was made closer to the right end of the scale and a smaller number meant that it was made closer to the left end. Once this task was completed, teachers were then asked to rank-order their spatial layout preferences. The reason for this sequence in the interviewing process was not only to keep these two tasks cognitively proximate to one another but also in that particular order. Table 4 combines teachers' responses to these issues with their preference rankings of the five spatial layouts for the purpose of describing and contrasting the larger clusters present in the MDS space of Figure 2.

Description and assessment of cluster 1 in the MDS space of Figure 2. Most of the 32 teachers in cluster 1, when expressing their inclinations toward teaching and learning issues, registered their responses closer to the right, or high end, of the E and H scales illustrated in the center section of Table 4. These issues reflect student learning themes and are the most important for teachers in this cluster. However, they also responded closer to the high ends of teaching and learning scales C, I, and K, as well.

Given such responses, it is plausible to describe the educational perspectives of the teachers in cluster 1 as those that emphasize, in the conduct of teaching and learning activities: exploration, examination, inquiry, hands-on involvement, independence and spontaneity, small group and/or individualized cur-

TABLE 3. Preference orientations for educational and design issues.

TEACHING AND LEARNING ISSUES:

Please express your preferences regarding these teaching and learning issues by marking an x on each scale A through K at a location that best reflects your views and their intensity.

Arrangements of Classroom Activities:

A. Fixed Time-Scheduling — Alterable Time-Scheduling

B. Entire Class or Large Groups — Small Groups or Individual

Student Expression and Response:

C. Directed, Controlled, and Planned — Independence and Spontaneity Encouraged

D. Complying/Conforming — Nonconforming/Spontaneous

Student Learning:

E. Drill, Practice, Rehearse — Explore, Examine, Inquire

F. Group Learning — Individual Learning

G. Teacher Directed — Learner Generated

H. Listening and Observing — Hands-on Involvement

Course or Class Materials:

I. Class Curriculum — Small Group and/or Individualized Curriculum

J. Core Curriculum for Class Level — Curriculum Geared to Circumstances

Class Direction and Development:

K. Teacher-Centered — Emerge From Student Activities

CLASSROOM DESIGN ISSUES:

Please express your preferences regarding these classroom design issues by marking an x on each scale A through G at a location that best reflects your views and their intensity.

A. Fixed Spatial Arrangement of Student Working Facilities — Alterable Spatial Arrangement of Student Working Facilities

B. Classroom Design Having Single Front-facing Orientation of Students — Classroom Design Adaptable for Multiple Orientations of Students

C. Classroom Layout Promoting Single-Group Coordinated Activity — Classroom Layout Promoting Multiple and Diverse Activity

D. Classroom Design Facilitates Supervision and Vigilance — Classroom Design Facilitates Separation and Privacy

E. Classroom Designed Mainly for Directed Focusing — Classroom Designed for Multiple Focusing Potential

F. Classroom Design is Compact for Unified Spatial Layout — Classroom Design is for Multiple Space-Use with Flow Potentials

G. Classroom Design is Standard Institutional Shape — Classroom Design is Nonstandard in Shape

TABLE 4. Design preference frequencies and average scores on issues for teachers in MDS clusters.

		C1	C2	C3	C4	C5
CLUSTER NUMBER:						
TEACHERS IN CLUSTER:		32	13	6	6	5
SPATIAL LAYOUT DESIGNS:		PERCENTAGE OF BEST/WORST				
Shallow Rectangle/Design A	BEST				67	60
	WORST	59	54			
Deep Rectangle/Design B	BEST					40
	WORST	41	46	33	33	
T-Shaped/Design C	BEST	9	23	50		
	WORST					
Fat-L Shaped/Design D	BEST		77	50	33	
	WORST					20
Cross-Shaped/Design E	BEST	91				
	WORST			67	67	80
TEACHING AND LEARNING ISSUES:		AVERAGE SCORE ON SCALES				
A. Fixed Time ... Alterable Time Scheduling		2.98	3.04	3.10	3.25	2.37
B. Large Group ... Small Groups or Individuals		3.34	2.36	3.28	3.18	2.53
C. Directed & Controlled ... Independence & Spontaneity		3.63	3.10	3.10	2.82	3.21
D. Complying/Conforming ... Nonconforming/Spontaneous		3.15	2.58	2.54	2.57	2.30
E. Drill, Practice, Rehearse ... Explore, Examine, Inquire		3.83	3.43	3.99	2.65	3.52
F. Group Learning ... Individual Learning		3.27	2.75	3.18	2.54	2.96
G. Teacher Directed ... Learner Generated		3.46	3.07	2.88	2.73	3.03
H. Listening & Observing ... Hands-on Involvement		3.88	3.66	3.71	3.57	3.57
I. Class Curriculum (CU) ... Individualized/Small Group CU		3.30	2.40	2.62	2.38	2.73
J. Class Level Core CU ... Circumstances Geared CU		3.15	2.37	2.17	1.83	3.09
K. Teacher-Centered ... Emerge From Student Activities		3.37	3.17	2.40	2.14	2.99
CLASSROOM DESIGN ISSUES:		AVERAGE SCORE ON SCALES				
A. Fixed Facilities Arrangement ... Alterable Arrangement		3.99	3.55	3.91	3.15	3.23
B. Single Front Orientation ... Adaptable/Multiple Orientation		4.30	3.68	3.46	3.29	3.39
C. Single-Group Coordination ... Promoting Multiple Activity		4.20	3.75	4.04	3.23	3.51
D. Supervision and Vigilance ... Facilitates Separation and Privacy		3.01	3.02	3.21	1.95	2.14
E. Designed for Directed Focusing ... For Multiple Focusing Potential		3.98	3.34	4.07	2.39	2.71
F. Compact Design/Unified Layout ... Multiple Use/Flow Potentials		4.17	3.70	4.11	2.80	3.28
G. Standard Institutional Shape ... Nonstandard In Shape		3.95	3.80	3.68	2.30	2.76

riculum, and class development emerging out of activities. *Table 4 illustrates that 91 percent of the teachers in this cluster declared that the cross-shaped design, E, would best facilitate the exercising of these views in the classroom and the rectangular shaped layouts, either A or B, would least support them.*

Their high end responses to the design issues B, C, E, F, and G, illustrated at the bottom section of Table 4, suggest that these teachers perceive this cross-shaped layout, E, as one which is nonstandard in shape, is adaptable for a variety of student orientations, promotes the conduct of diverse activity, and permits multiple space-uses with flow potentials between them. Here is how they rationalized their selection of this classroom layout as their most preferred one:

> *"There are multiple options for varying instructional grouping and team teaching." "It looks like the arrangement would lend itself to the use of learning centers and small group activities." "Large group activity center w/ smaller activity centers on wings." "Lots of corners for centers w/ a certain amount of 'semi-privacy.'" "Options for placing centers around the room to explore." "Multiple possibilities." "Would have room for large group instruction but still have areas for individuals and small groups." "Available space for a multitude of different activities with space as a buffer." "Whole group area yet separate areas for kids to do individual or small group activities." "Corners provide many options for room (table, materials, etc.)." "Lots of spaces for small groups w/ direct supervision." "Spaces, different areas to go to." "Teacher can*

still see everyone if located correctly." "Many different activities." "This option provides space to explore without disrupting other groups, yet a space to come together as a whole class."

It is clear that these teachers view the cross-shaped layout design, E, as one offering much potential for establishing multiple instructional groupings. They see it as a design that affords space for the usual large classroom group, while simultaneously allowing for smaller interest and learning groups requiring relatively more privacy. In that sense, E is perceived as a rather flexible spatial layout facilitating much innovation in the arrangement of students for a variety of instructional and participation purposes. The remaining nine percent of the teachers in this cluster, who chose the T-shaped layout, C, as most supportive, focused on this same message.

Teachers in cluster 1 offered these comments as to why rectangular layouts, A or B, have been designated by them as *least supportive* of their educational perspectives:

"Rows." "Traditional classroom setting with the students facing one direction being instructed, not much space for small groups or regrouping." "Boring, little room for creativity." "Too balanced; difficult to break into areas." "Very stagnate [sic] *— no nook areas." "Too constricting — everything is squished." "1 room schoolhouse." "Too long — lose unity." "Not flexible — No areas for small group instruction." "Set up for teacher directed instruction." "Long and narrow limits usage of space." "Not very flexible." "Teacher directed, traditional, less child centered." "Boring — institutional — straight rows." "Wide open with no privacy." "Too square and makes it seem like the teacher is the center of instruction." "To* [sic] *controlled." "One large space — hard to separate off part of the room." "Best designed for large group instruction."*

Obviously, the main sense of their comments about the rectangular designs is the inverse of what they said about the T-shaped and cross layouts, C and E. They perceive these rectangular ones, A and B, as inflexible and constraining with respect to facilitating innovative and/or creative arrangements of students for instruction and participation. Note their use of the term "traditional," an expression that seems to be well mirrored in the *configuration* of the MDS space.

Description and assessment of cluster 2 in the MDS space of Figure 2. The second cluster, located in the upper part of the MDS space, is also fairly sizable, containing 13 teachers, or 17 percent of the sample. Table 4 illustrates that most of the teachers in this second group preferred the Fat-L shaped layout as most supportive of their educational perspectives, while the remaining teachers preferred the T-shaped design for that purpose. All of the teachers in this cluster, however, selected one of the two rectangular layouts, A or B, as the design which least supports their views about teaching and learning activities.

As is evident in Table 4, their educational viewpoints resemble rather closely those in cluster 1. For example, with regard to the teaching and learning issues, E and H, nearly all of those in this second cluster responded to the high or right end of these scales. This indicates that they, like those in the first cluster, also favor exploring, examining, and inquiring activities in the classroom, together with a hands-on approach to student learning activities. It is also clear, as suggested by their responses to the design issues C, F, and G in the third part of Table 4, that teachers in this second cluster would ordinarily prefer a layout that was adaptable for a variety of student-activity orientations, one that permitted multiple space-uses with flow potentials between them, and one that was nonstandard in shape. Even in the case of layout features, then, their aspirations resemble those of cluster 1.

Given their most preferred selections, however, the teachers of cluster 2 did not choose the cross-shaped design, E, as their best. *Rather they perceived that the Fat-L and, to a lesser degree, the T-shaped layouts best fulfilled their teaching and learning objectives about classroom activities and were perceived to have the complementary design properties to do so. The rectangular designs were perceived as inadequate in both regards*. Here are the reasons teachers in cluster 2 gave for choosing these layout designs as most supportive of their educational views:

For the Fat-L:

"Nice area for students to come together to listen or play together." "It seems to work well with all types of instruction — both exploratory as well as direct." "Multi-group arrangement. Either large group/small group interaction can take place." "Lots of choices for teaching." "Students able to move to own area but can still be easily supervised." "A separate place for sand/water, paint & playhouse." "Wide open with area of individual work." "Areas for small groups, areas for large groups and wall space for visuals and furniture." "It is possible to have a small group working relatively secluded while a larger group is involved in an activity." "Diversity."

For the T-shaped:

"Large group and small group space. There may be room to have activities at the end and students could be seen and/or gather as a group without furniture in the way. Sit in a circle, etc." "Large area — small group corner(s)." "Large group working and others away from them doing individual activities."

As to why the rectangular layouts, A or B, were perceived as least supportive of their educational perspectives, teachers in this second cluster responded in this way:

"Too square. No quiet areas." "It's boring — there are no 'nooks' or areas to have small groups learning together." "Limits arrangements — very traditional." "No choices." "It is very confining." "No specific areas for centers." "Only for large group use." "Too long and narrow — no place for individual or group work without everyone involved." "Not much available for diverse room settings unless classroom furnishings were such that room could be partitioned off."

A classroom configuration that makes it possible to establish multiple arrangements of students for teaching and participation purposes, then, is one that matters for those teachers in cluster 2. According to their layout preferences, the spaces of the Fat-L and the T-shaped designs facilitate the distributing of students in a variety of ways during a class period; the rectangular ones do not.

Figure 2 shows the presence of still additional clusters of similarity among teachers in their layout preferences. These, however, are smaller than the two larger clusters just described. As such, they may hint at the presence of minority views about spatial layouts among teachers, but this cannot be substantiated with the sample size employed in this study. Nevertheless, three of these smaller clusters display enough characteristics to merit brief descriptions here.

Description and assessment of cluster 3 in the MDS space of Figure 2. All six teachers in the third cluster selected either the Fat-L or the T-shaped layouts as the most supportive designs (see Table 4). Two chose the deep rectangular layout as least supportive, while the remaining four chose the cross-shaped design for that designation. This latter choice suggests that these teachers perceive the cross-shaped layout quite differently than teachers do in other clusters. Their comments below about a need for a "balanced approach" help to explain why they do.

Their high average scores on the teaching and learning scales C, E, and H in Table 4 indicate that teachers in this third cluster prefer independence and spontaneity in student expression, the use of exploration, examination, and inquiry in instruction, and a hands-on approach to student learning. Likewise, their high average scores on all design-issue scales suggest a preference for a classroom that is adaptable for multiple and diverse student-activity, supports alternate spatial arrangements of student working facilities, and allows for separation of activities with privacy. *For the teachers in cluster 3, then, the Fat-L and T-shaped layouts are perceived as configurations that fulfill their design preferences and support their views about teaching and learning activities, while the cross-shaped and, to a lesser extent, the deep rectangular layouts are perceived as designs that do not*. Here are the comments they offered to explain their selections of the Fat-L and T-shaped layouts as best and the deep rectangular and cross-shaped designs as least supportive, respectively:

"A separate nook area for privacy, different activity." "Since I am a believer of balance — I think I can go smoothly (with this structure) in and out of different settings — sometimes using

the teacher directed mode and sometimes using student centered mode. This room gives me the option." "Area to place big tables." "Whole group area, but also space for different centers." "Interesting." "It has shape & it is not the standard room."

"No special little places for students to go." "In E — there is no balance — it seems totally student oriented — which I do not promote. I believe kids need both direction *and a chance to explore." "Too busy, hard to work with so many corners." "Too chopped up but could be fun." "It might make it too difficult to arrange the room."*

Brief description and assessment of clusters 4 and 5 in the MDS space of Figure 2. The teachers in clusters 4 and 5 have layout preferences that are noticeably different from those in the previous three clusters. Table 4 illustrates that nine out of the *combined* eleven teachers in these two clusters have selected a rectangular layout as best for supporting their teaching and learning views. No other teacher from any of the three previous clusters chose a rectangular design for that purpose. Furthermore, eight of these eleven teachers designated the cross-shaped layout as least supportive of their educational views about the conduct of activities in the classroom. This contrasts sharply, for example, with the ninety-one percent choosing this layout as best in cluster 1.

In terms of layout preferences, then, these teachers are quite unlike those in the first cluster and noticeably unlike those of the second; their choices of most and least supportive are, for the most part, the reverse of the teachers in clusters 1 and 2. For want of a larger sample, these observations should certainly be treated as tentative; yet, combined, teachers in clusters 4 and 5 constitute fourteen percent of the total sample employed in this study.

Given these differences in design preferences from the previous clusters, it might be tempting to reason that the teaching and learning views of the teachers in these two groupings should be the reverse of those in clusters 1 and 2. As the middle section of Table 4 illustrates, this is simply not the case. Hence, the pattern emerging in this study is that different perceptions exist of which layout designs would be most and which least supportive of essentially similar educational perspectives about teaching and learning activities in the classroom.

Teachers in these last two clusters did, however, have a much lower average response to the design issue in D than those in the other three clusters (see last section of Table 4), suggesting a greater concern for a layout that facilitates supervision and observation of students in the class. This helps to explain that, for them, the most supportive layout designs, then, are likely to be the rectangular ones, A and B, and possibly even D, but certainly not E!

Their comments rationalizing their choices of the rectangular designs or even the Fat-L layout as most supportive were:

(For D)*"It's like what we have. I like it." "Having a large area for whole group/teacher directed lessons, and spaces for small or individual work areas."* (And for A) *"It resembles the way my class is set up right now. Students can work in different places but I can keep an eye on them to supervise learning." "Desk arrangement is freer & not dependent on room shape."*

As to their least supportive layout design:

(For B) *"It would limit learning only to large group more easily." "Too many children clustered in the center throughout activity."* (And for E) *"Too cut up — looses* [sic] *options for layout of classroom." "Too many corners to deal with, and too many 'blind spots' for students to be out of view for supervision." "Too many unseen corners." "E has too many corners & flow could be a safety problem." "Hardest to monitor." "I did like 'E' at first, maybe because it's unusual, but it would possibly be a bit exclusive (as opposed to inclusive) in design and somewhat limiting. Any of these could be workable though, depending on arrangements within." "Too many corners — children can be out of teacher's vision."* (From the one teacher in this cluster choosing D) *"Hidden Spots."*

There are indications of two other clusters in the MDS space of Figure 2 (i.e., clusters 6 and 7), but these contain only five and four teachers, respectively. Their small size inhibits a compelling description here.

CONCLUSION

All settings, but classrooms in particular, have clear patterns of conduct, norms, and expectations embedded in their behavioral agendas, which tend to restrict and significantly qualify individual expression and behavioral initiatives. With respect to teaching and learning activities, Bloom places strong emphasis on the significance of a setting's context when he states that, "from an ethnographic perspective, the location of learning to read and write is in the social context constructed in the classroom; or, in other words, in the classroom culture" (1989:109).

But activity settings are structured spatially so that their basic spatial form is an essential part of their context. This, in part, accounts for why activities, though obviously directed at contexts, require a variety of orientations, positions, and movements to enact, continue, and complete. It is in this sense, then, that the spatial layout of a setting influences the way its context becomes workable.

In this study, the fundamental inquiry was as follows: Can the basic configuration or spatial layout of an elementary school classroom support or inhibit the ways teaching and learning activities are conducted in that setting? Results from this investigation strongly suggest that the answer is a qualified "yes" or "it depends." The results show that it depends on the type of spatial layout and its design properties, on how both are perceived by those who use and manage activities in the classroom, and on the teaching and learning perspectives of those users.

When evaluating the ways teachers associated properties with the five spatial layout examples used in this study, it became clear that there was no universal perception of any of the five. Instead, different perceptions of the same layout emerged. Teachers *generally* perceived the five layout designs as consisting of two groups: the rectangular shaped ones, A and B, in one group and T-shaped, Fat-L, and cross-shaped configurations, C, D, and E, in the other. They viewed the latter group as more flexible for innovative teaching use and characterized the rectangular layouts in the first group as those that more readily facilitate control and focus in teaching and learning activities.

A multi-dimensional scaling analysis of teachers' rankings of their layout design preferences illuminated and reinforced these general impressions but, in particular, provided much more clarity about the finer details within these perceptual trends. It showed that teachers perceived the T-shaped and Fat-L layouts, C and D, as very much alike, as they did the two rectangular shaped ones, A and B; at the same time, however, they viewed these two pairs as very different from each other. They perceived the cross-shaped layout, E, as distinctive in itself relative to either of these pairs, though, in general, they thought it was more like the first pair of layouts than the second.

Positions of the spatial layouts in the MDS *preference* space suggested that teachers used two dimensions to discriminate among the five spatial layout designs in this study. They applied both a *traditional-nontraditional* and a *spatially simple-spatially complex* distinction to illuminate their perceptions of differences between the rectangular types and the three non-rectangular forms. This application was consistent with the ways they characterized the property make-up of each of the layouts and their teaching and learning perspectives about the conduct of activities in the classroom.

Another unexpected finding, and one illustrating the finer details, was the presence of clusters among the spatial-layout preferences. Evidence clearly illustrated that there were perceptual types among the seventy-nine teachers in the sample, for they divided into at least five, and perhaps seven, clusters in the MDS space. These clusters varied in size from very large ones containing 32 teachers to small ones containing as few as four members. In the first five of these groupings, the perceptual homogeneity of each cluster was distinctive relative to the homogeneity of the others and especially

plausible when compared with the educational perspectives, layout design views, and descriptive comments of the teachers within it. The last two clusters were not examined due to their small sizes.

It was tempting to relate these distinct clusters and what they represent to the various characteristics of the teachers within them (see Appendix 1). However, just using the data available on age, sex, teaching experience, and subject taught, no discernible pattern could be detected.

Discussion

The research design employed in this study is, to a considerable extent, more open-ended than structured, in the sense that there are fewer categorical and scale constraints than are usually evident in the standard survey approach. This has both advantages and disadvantages: though conceptually rich, the information elicited has limitations on how susceptible it is to interpretation.

In addition, the sample itself was relatively small and, for the most part, one of opportunity. Teachers, of course, are quite busy, so it was notoriously difficult to arrange for 79 of them to respond to the data-gathering instrument over a reasonable amount of time. Then, too, the teachers interviewed came from only four elementary schools in two districts. Under these circumstances, if this approach is to fit in anywhere, it would have to be a case study (see Hamel, 1993). Logical restrictions exist on any attempts to formally attribute these results to a larger population.

Nevertheless, this case study is a plausible *beginning* research format for this particular topic. At this time, an hypothesis-driven, statistical-inference design for tackling this issue is difficult to construct. In addition to the enormous problem associated with attempting to delimit a population and then select an adequate probability sample to represent it, there is a more substantial reason why a formal hypotheses-driven research format is not possible at this time. The body of person-environment-behavior theory available for generating such hypotheses does not entertain spatial structural conditions as one of its special cases. In this sense, the theory is incomplete. Wineman, *et al.*, explain it this way: "Incomplete in the sense that we have not done a good job of relating behaviors to structural characteristics of built space. By structural characteristics, I am referring to those characteristics of space that can be quantified and compared among buildings and across building types" (1998:4). (But also see Moore’s 1986 comments on this issue.)

This paper started with the basic assumption that the purpose of a design is to facilitate and enhance the enactment, continuance, and completion of activities appropriate to the setting the design exemplifies. This assumption is based more on common sense or logic than on any persistent and universal convention designers (e.g., architects) proclaim. Many designers may not see this as the purpose of design. Rapoport (1994) comments on this issue when he discusses "the need for (what) knowledge." In that same vein and source, see Russell’s (1994) "Can design schools survive the ’90s?" What is evident from this study is that teachers overwhelmingly responded quite straightforwardly to questions about the relative ability of classroom spatial layouts to facilitate activities, and they did so virtually without critical comments about the usefulness of speculating in that way. We have a strong sense that, for teachers, configuration of workplace is a significant dimension of design from the viewpoint of enhancing the enactment, continuation, and completion of activities to reach specific educational goals.

APPENDICES

APPENDIX 1. Teacher profile information.

Elem. School	Teacher Code*	Age	Male/Female	Full/Pt. Time/Sub.	Years Teaching
Cavett	TC1F	35	F	Full	12
Cavett	TC2F	47	F	Full	17
Cavett	TC3F	27	F	Full	6
Cavett	TC4M	41	M	Full	15

APPENDIX 1, continued.

Elem. School	Teacher Code*	Age	Male/Female	Full/Pt. Time/Sub.	Years Teaching
Cavett	TC5F	39	F	Full	17
Cavett	TC6F	42	F	Full	21
Cavett	TC7F	25	F	Full	4
Cavett	TC8F	51	F	Full	21
Cavett	TC9F	23	F	Full	1
Cavett	TC10F	---	F	Full	16
Cavett	TC11F	49	F	Full	26
Cavett	TC12F	43	F	Full	---
Cavett	TC13F	33	F	Full	10
Cavett	TC14M	28	M	Full	1
Cavett	TC15F	26	F	Full	7
Humann	TH1F	39	F	Full	16
Humann	TH2F	35	F	Full	12
Humann	TH3F	40	F	Full	10
Humann	TH4F	28	F	Full	5
Humann	TH5F	57	F	Full	16
Humann	TH6M	26	M	Full	4
Humann	TH7F	30	F	Full	6.5
Humann	TH8F	26	F	Full	0
Humann	TH9F	43	F	Full	20
Humann	TH10F	47	F	Full	24
Humann	TH11F	27	F	Full	6
Humann	TH12F	26	F	Full	3
Humann	TH13F	51	F	Full	17
Humann	TH14M	29	M	Full	7
Humann	TH15F	29	F	Full	5
Humann	TH16F	49	F	Full	15
Humann	TH17F	43	F	Full	19
Humann	TH18F	43	F	Full	12
Humann	TH19M	33	M	Full	10
Humann	TH20M	29	M	Full	6
Maxey	TM1F	47	F	Full	24
Maxey	TM2F	28	F	Full	5
Maxey	TM3F	48	F	Full	14
Maxey	TM4F	26	F	Full	1
Maxey	TM5F	38	F	Full	---
Maxey	TM6F	39	F	Full	19
Maxey	TM7F	27	F	Full	5
Maxey	TM8F	33	F	Full	7
Maxey	TM9F	25	F	Sub	2.5
Maxey	TM10F	28	F	Full	7
Maxey	TM11F	37	F	Full	7
Maxey	TM12F	52	F	Full	5
Maxey	TM13F	35	F	Full	12
York	TY1F	40	F	Full	18
York	TY2F	40	F	Full	3
York	TY3F	49	F	Full	20
York	TY4F	50	F	Full	22
York	TY5F	32	F	Full	0
York	TY6F	30	F	Full	9
York	TY7F	30	F	Full	8
York	TY8F	49	F	Full	23
York	TY9F	43	F	Full	21
York	TY10F	36	F	Full	1
York	TY11F	39	F	Full	18
York	TY12F	38	F	Part	9
York	TY13F	58	F	Full	38
York	TY14F	44	F	Full	16
York	TY15F	47	F	Full	15
York	TY16F	49	F	Full	15
York	TY17F	36	F	Full	15
York	TY18F	---	---	Full	---

APPENDIX 1, continued.

Elem. School	Teacher Code*	Age	Male/Female	Full/Pt. Time/Sub.	Years Teaching
York	TY19F	38	F	Full	15
York	TY20F	52	F	Full	20.5
York	TY21F	45	F	Part	21
York	TY22F	36	F	Part	13
York	TY23F	21	F	Student	---
York	TY24F	57	F	Full	33
York	TY25F	45	F	Part	22
York	TY26F	50	F	Full	long time
York	TY27F	46	F	Full	6
York	TY28F	38	F	Part	16
York	TY29F	42	F	Full	22
York	TY30F	23	F	Full	2
York	TY31F	41	F	Full	20

*Teacher Code: TCIF, for example, refers to teacher (T); Cavett (C); ID number (1); gender (F).

APPENDIX 2. Preference rankings of five classroom designs.[4]

Teachers	Design				
	A	B	C	D	E
c1f	3	5	2	1	4
c2f	4	5	2	3	1
c3f	4.5	4.5	1	3	2
c4m	5	4	2	3	1
c5f	4	3	2	5	1
c6f	4	5	3	2	1
c7f	5	4	3	2	1
c8f	4	5	2	3	1
c9f	4	3	1	2	5
c10f	4	5	3	2	1
c11f	4	5	2	1	3
c12f	1	5	4	2	3
c14m	1	2	3	5	4
c15f	5	4	2	3	1
m1f	4.5	4.5	1	2	3
m2f	5	4	1	2	3
m3f	2	1	4	5	3
m4f	5	4	2	3	1
m5f	5	4	3	2	1
m6f	5	4	2	3	1
m7f	5	4	2	3	1
m8f	5	4	1	3	2
m9f	3	4	5	1	2
m10f	4	5	2	1	3
m11f	4	5	2	3	1
m12f	5	4	2	3	1
m13f	3	4	2	5	1
h1f	4	5	2	3	1
h2f	4	3	1	5	2
h3f	2	3	4	5	1
h4f	3	4	1.5	5	1.5
h5f	2	1	4	3	5
h6m	5	4	2	3	1
h7f	1	2	3	4	5
h8f	2	1	4	3	5
h9f	3	2	4	5	1
h10f	1	3	4	2	5
h11f	3	2	1	5	4
h12f	4	5	2	3	1
h13f	5	4	1	3	2
h14m	5	4	3	2	1
h15f	5	4	2	3	1
h16f	5	4	3	2	1

APPENDIX 2, continued.

Teachers	Design				
	A	B	C	D	E
h17f	4	5	2	3	1
h18f	5	4	2	3	1
h19m	5	4	2	3	1
h20m	1	2	4	3	5
y1f	1	5	3	2	4
y2f	4	3	2	1	5
y3f	5	1	4	2	3
y4f	4	5	2	1	3
y5f	5	4	3	1	2
y7f	3	5	2	1	4
y8f	4	5	2	1	3
y9f	5	4	3	2	1
y10f	2	3	4	1	5
y11f	4	5	2	1	3
y12f	4	5	2	3	1
y13f	5	4	1	2	3
y14f	3	2	5	4	1
y15f	5	3	4	2	1
y16f	1	3	4	2	5
y17f	5	4	3	1	2
y18f	3	4	1	2	5
y19f	5	1	4	2	3
y21f	5	4	3	1	2
y22f	2	2	5	2	4
y23f	4	3	1	2	5
y24f	5	1	4	3	2
y25f	4	5	2	3	1
y26f	5	4	3	1	2
y27f	4	5	2	1	3
y28f	2	3	4	1	5
y29f	4	5	2	3	1
y30f	3	2	4	5	1
y31f	4	5	3	2	1

NOTES

1. L. Smith and P. Keith conducted a relatively extensive ethnography (see reference *Anatomy of Educational Innovation*) of an open-plan elementary school in the American Midwest. In general, the school was well-known at the time by educators and architects because of both its innovative group-approach to instruction (rather than grade structuring), its stage-oriented curricula, and its spaces, which were specifically designed to facilitate such an approach. Hence, the authors used the pseudonym "Kensington School" in their work to protect the school itself. Their primary interest throughout the ethnography was to examine the congruence or fit of the designed spaces with the actual use of these spaces by teachers, students, and aides.

2. The formal expression of this index is as follows: $S_{ij} = (A + D) \div (A + B + C + D)$, where i and j refer to two individuals being compared (in this case, teacher i and teacher j) and the four uppercase letters refer to the kinds of agreements or disagreements that can be noticed when the responses of these two teachers are compared for their similarity. A, then, refers to the frequency both teachers agree that properties in Table 1 characterize a specific classroom layout and D refers to the frequency both teachers agree that properties in this table do not characterize that layout. B and C refer to the frequencies of two types of disagreement, respectively, between the two teachers, as in teacher i believes that a property is part of a spatial layout while the other teacher does not or vice versa.

3. Space limitations do not permit the display of the five sets of rotated q-mode factor results in this paper. They are, however, available upon request to the authors of this paper. For each design, the members that would constitute a group were determined by teacher loadings (usually 0.60 and above) on the q-dimensions of the rotated factor results. The q-dimensions (i.e., factors) all had eigenvalues greater than one. Small groups were not deemed robust enough to merit description in this paper.

4. The rankings of two of the original 79 teachers were not usable, due to their incomplete expressions.

5. Evaluating the ways in which teachers, equipped with their beliefs about teaching and learning activities, ranked the five classroom layouts may help to clarify how designs influence teaching activities. Ranking involves discriminating among the things being ranked. Those doing the ranking typically mull over the things to be ranked in terms of the differences in values they are perceived to have on some property or characteristic of interest. Because of the presence of personal idiosyncrasies, unique ways of assessing value often play a role in such discriminations. For that reason, the metric representing the separation

between things in any ranking frequently remains only nominally understood by observers. Therefore, little can be assumed about its quantity characteristics except the obvious intended ordinal relations like things are greater than, less than, or equal to other things. Nevertheless, significant value information may sometimes be so apparent in the product of rankings that it is possible to exemplify it in some broad or general way. The procedure available to do just that and employed here to analyze teacher rankings of classroom designs is a non-metric multidimensional scaling, or simply MDS.

6. MDS models for application on these kinds of data are found in the *Alscal Routines* embedded in both SPSS and SYSTAT general statistical packages. The MDS model used here is designated as "Euclid" and the level of input data was ordinal (in this case, rankings). Kruskal's S-stress formula 2 is used, and, for the matrix in Appendix 2, the configuration derived by MDS consisting of two dimensions, where stress was 0.15960 (a measure similar to scree cut-off assessment in factor analysis) and the resulting fit was RSQ (i.e., squared correlation between the positions derived and the model space), was 0.97493.

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