

OBSERVATION OF USER ACTIVITY PATTERNS IN OPEN AND TRADITIONAL PLAN SCHOOL ENVIRONMENTS

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Abstract

Do the activities of teachers and students in flexible space differ from the activities of teachers and students in traditional space? The paper reports the results from an observation technique used to explore this question. It is part of a larger project evaluating the open building systems project of the Study of Educational Facilities of the Metropolitan Toronto School Board. This report deals with 2,900 observations of classrooms, teaching areas, kindergartens, libraries, and commons in twelve schools (four traditional plan schools, four open plan schools and four SEF schools). The observers recorded the number of people in the spaces, the kinds of groupings, the activities, the amount of movement, and the number of different types of tools being used. The results show that the activity patterns in open plan schools are quite distinct from traditional plan schools. On the whole, there is less structuring of spaces, teachers are more personal and informal with the students. Students work more often in small groups or alone and use a greater variety of tools. Differences in activity patterns were related to the socio-economic status of the district and to the size of the schools. While part of the differences measured may be due to self-selection of teachers or a simple Hawthorne effect, some seems attributable to the nature of the physical space. Future extension of the study will attempt to establish relationships between activity patterns and behavioural outcomes.

Do the activities of teachers and students in flexible space differ from the activities of teachers and students in traditional space? How does the distribution of users in a space affect the way in which the space is used? Little empirical evidence is available to answer questions such as these.

A review of the literature showed that there have been many articles written on open plan schools and open style teaching which were pithy and discursive, but there are very few well thought out empirical studies (1). At the same time there are over a hundred observation instruments which have been used in classrooms, but the majority of these are concerned with the interaction among a small number of people, have very complex and elaborate coding schemes and have a very narrow range of generalizability (2). The only research that appeared useful from a theoretical and methodological point of view was the behavioural mapping research of Proshansky, Ittelson and Rivlin, but their reported results at the time of this study were concerned only with the behaviour of individuals rather than groups (3).

In general terms, the problem was to learn about the activities of all the humans in a building and to contrast this with the activities of other humans in other buildings. Since there appeared to be no developed theory or tested methodology to study such a complex issue the decision was made that it would be wisest to proceed on the broadest possible front with the simplest possible instruments and to rely on analyses that "rang truest" in terms of everyday human experience.

Therefore, the task was to identify those physical consequences or artifacts of activity whose presence or absence would be instantly measurable by relatively naive observers.

Another requirement was that the items had to have face validity. For instance, the number of discernably distinct noises appeared to result directly from the ongoing activities and the number of visually distinct groupings or clusters of people also appeared related to the variety of activities in a space. Also, the proximity of humans to one another and facial indications of pleasure or tension indexed to some extent the social tone or climate of an interaction.

The plan was to record precisely a number of these readily observable features of activity over a large number of spaces throughout the school over an extended time period. It was hoped that by "skimming" the school environment visually many times and in many places with human observers, it would be possible to capture some flavour of what was "going on" as well as an exact measure of how much was happening. An attempt was also made to develop an instrument which discriminated open style teaching from conventional teaching without regard to the subject being taught, the age level of the students, or the type of physical facility.

The report we are presenting here is part of a larger evaluation study of schools built by the Study of Educational Facilities (SEF) of the Metropolitan Toronto School Board, (4). SEF is now completing the first major open system project in Canada. More than 25 SEF schools are already in use in North America.

Sample

After a review of the literature and discussions with teachers, students, educators and other professionals, it was decided that the first year baseline study would include only junior elementary (K-6) schools. In addition to the four SEF schools chosen for this phase of the study, four open plan schools and four traditional plan schools were selected. Throughout this report, Non-SEF open plan schools are designated as NSO schools and non-SEF traditional plan schools are designated as NST schools. The four SEF schools were matched as closely as possible with the eight non-SEF schools on the basis of geographical proximity, size of student body, and the general demographic status of the neighbourhood. The SEF building system does not dictate open space, but the six local boards of education in Metro Toronto designed their SEF schools with open space of varying degrees.

Instrumentation

A form was developed for recording direct observations in schools. Prior to the actual pretest many class areas were observed in both SEF and non-SEF schools and informal discussions held with principals, teachers, and students. In addition, trial and error experimentation with various kinds of observational approaches lead to a method which allowed the observers to note unobtrusively how various kinds of space were being used by different people at different times.

Observers

The observers were either experienced teachers and/or interviewers. The same observers were used in the pretest and the formal test and were trained in several day-long sessions prior to and after the pretest. The observers were instructed to be friendly with the teachers and students, but to avoid direct involvement in school activities.

Several safeguards were built into the observation procedures to counteract observer bias. First, the observers were employees of a commercial research firm and not a school board. Second, the need for objectivity was stressed to the observers. Furthermore, the purpose of some of the questions was disguised and the observers alternated across different types of schools. Finally, spot checks were made on the observers.

Data Collection

Data was collected between mid April and mid May, 1971. Each of seven observers observed in several types of schools to control interviewer bias. Generally two observers made three independent cycles to 20 spaces in each school each day for a week. Each cycle followed a different route so that a picture of the total activity of the school was obtained. The observers recorded the number of people in the spaces, the kinds of groupings, the activities, the amount of movement and the number of tools being used. From these observations three main aspects of activity were derived: the general structure of the area; the teaching style; and the activities of the students. These three items were then combined in the analysis to gain an overall view of the activity patterns in each type of school.

In addition, observations were made of the dispersion of people in the spaces. This included such measures as the number of students in a space, the number of groups in a space, and the number of students working alone.

A shortened form was used for administrative areas, seminar rooms, and other special facilities such as the music room or gym. It should be emphasized that this report deals only with the results from 2,900 observations of general teaching areas, kindergartens, libraries, and commons, and excludes the data from other specialized areas.

General Structure of Area

The observers first looked at the arrangement of the furniture in the space. A space was judged to have had high definition if the furniture was set up in a very definite and organized pattern. This would occur in a space where student desks were arranged neatly in rows with the teacher's desk at the front, or where students' chairs were arranged in a formal semicircle around a teacher.

A space had low definition if the furniture was scattered around the room with little apparent pattern. Finally, a room in which some of the furniture was organized and the rest of it scattered was labelled combination.

A comparison of the types of schools showed that the SEF schools had the highest percentage of low definition spaces (38.1 percent), the NSO schools the highest percentage of spaces designated "combination" (68.5 percent) and the NST schools the highest percentage of high definition spaces (33.9 percent).

The observers also recorded the number of focal points in each space. For example, if an observer in a space saw one group of students looking at some rabbits, another group watching a TV program, and a third group working with a teacher at a flipboard, the observer would record three focal points for that space. If all the students were working independently and the teacher was walking about, this would be recorded as zero focal points

In the SEF schools, over half the time (53.1 percent of the observations) there were several focal points in a space, while in the NSO and NST schools, the observers reported several focal points in a space about one-third of the time (32.9 percent and 31.1 percent respectively).

The answers recorded on the furniture arrangement of and the focal points in the room were combined into a scale of structure. If a space had high definition and one focal point, it would be indexed as high structure; conversely, if the space had low definition and several focal points, it would result in a low structure score.

Table 1: Scale of Structure by Type of School (5)

Type of School	Structure			N
	High %	Medium %	Low %	
SEF	35.0	42.2	22.7	1051
NSO	49.2	44.0	6.9	846
NST	57.8	29.6	12.6	1003

Table 1 indicates that the SEF schools had the highest percentage of spaces with low structure scores (22.7 percent) and the NST school had the highest percentage of spaces with high structure (57.8 percent). The NSO school had the smallest percentage of spaces with low structure scores (6.9 percent).

In addition to differences among school types, the scale of structure varied with the socio-economic status of the neighborhood and with the size of the school. Schools which were in low socio-economic districts had a higher percentage of spaces with low structure and medium structure (18.2 percent and 41.9 percent respectively) than the schools in higher socio-economic areas. Schools in medium socio-economic areas had the highest percentage of highly structured spaces. On the other hand, the larger schools had a higher percentage of spaces with low structure than did the medium and smaller schools. The latter were most likely to have highly structured spaces.

Teaching Style

When an adult was in a room, the observers scored the adult as either being engaged or not engaged with students. To be scored as "engaged", an adult had to be talking with and/or listening to students. If the adult was observing students, talking with another adult or working alone, the adult was scored "not engaged."

A somewhat larger percentage of the adults in SEF schools were scored as engaged (77.0 percent) than in the NSO and NST schools (73.9 percent and 69.6 percent). The differences were statistically significant, but numerically small.

A situation was rated formal if the adult appeared tense, informal if the adult appeared relaxed, and neutral if the observer could not sense either tension or informality. The highest percentage of informal situations were found in the SEF schools (55.0 percent) and the highest percentage of formal in the NST schools (19.9 percent). The NSO schools had the highest proportion of neutral scores (48.4 percent).

The observers also recorded the adults' physical position in relation to students. If, for example, the adult was bending down to a child or kneeling beside a child, the situation was scored personal. If the adult was close enough to touch a student or was formally helping a student with no physical barriers between them, the situation was scored conventional. Finally, if the adult was at a blackboard, behind a desk, or beyond touching distance of the children, the situation was scored distant.

Approximately 43 percent of the situations in all types of schools were scored conventional. However 29.1 percent were scored personal in SEF schools, compared with 19.0 percent in the NST schools and 13.2 percent in the NSO schools.

A scale of the style of teaching was developed by combining the engagement or non-engagement of the adult, the formality or informality of the situation, and the adults' position in relation to the students. A high style indicated that the teacher was not engaged, and was formal and distant in relation to the children. A low style score resulted when the teacher was engaged with the students, appeared relaxed, and was within personal distance of the students. A medium score resulted when a teacher was engaged but where the social atmosphere was neutral and the teacher was sitting with a group.

Table 2: Scale of Teaching Style by Type of School

Type of School	Scale of Style			N
	High %	Medium %	Low %	
SEF	11.1	44.5	44.5	893
NSO	18.9	53.5	27.7	636
NST	22.4	48.6	29.0	942

The results in Table 2 indicate that the highest percentage of adults with low style scores was in the SEF schools (44.5 percent), the highest percentage of medium style scores was in the NSO schools (53.5 percent), and the highest percentage of high style scores was in the NST schools (22.4 percent).

Schools which were large in size and in low socio-economic districts had a higher percentage of low style scores. Schools in the high socio-economic districts and schools small in size tended to have the smallest percentage of low style scores.

Activities of the Students

The observers next recorded the movement of people in the space. The amount of movement was rated none if no students were walking, or if only one adult or student was walking. If there were two to five people walking about, movement was scored moderate. Where more than five people were walking about a space, movement was scored as considerable.

Across all schools, the observers found considerable movement in 9.5 percent of the situations. However, in 50.5 percent of the spaces in SEF schools, there was moderate movement. This compared with 36.0 percent in the NSO schools and 31.9 percent in the NST schools.

The variety of tools being used by the students is also a measure of activity. All tools were divided into six categories as follows:

- Fixed Marking and Reading: chalkboard, display or bulletin boards.
- Portable Marking and Reading: all books and notebooks, pencils, pens, experience charts, etc.
- Manipulative Cyclical: table games, sports equipment, sand or water play, puppet play, test tubes, math shapes, scissors, carpentry tools, maintenance tools (brushes, brooms, carpet sweeper, cloths).
- Manipulative Non-Cyclical: materials consumed in activities such as woodworking, sculpting, painting, cutting, pasting and in making collages, clothes and puppets.
- Non-Powered: whistle, hand bell, and all musical instruments; magnifying glass, telescope, microscope; scales, paper cutter, abacus; bicycles, tricycles; typewriter or any other machine which is not powered.
- Powered: electric drill, electric bell, electric typewriter, intercom, telephone, sewing machine, all AV equipment.

Theoretically, all six different varieties of tools could be used in a space at any one time.

The observers found that three or more categories of tools were being used 48.3 percent of the time in SEF schools, 20.8 percent of the time in NSO schools, and 23.4 percent of the time in NST schools.

The amount of noise in a space was also taken as a measure of the activity. Three levels of noise were used. The first, called silence, referred to situations in which no one or only one person was talking; the second was the hum level in which there was a gentle hum of talking and activity; the third or high level was that which was judged likely to disrupt other people in the room or in adjacent areas. For example, singing and piano playing would normally indicate a high level, but the gentle strumming of a guitar would be in the second level.

Overall, the NST schools were the quietest while the SEF schools had the highest percentage of ratings in the middle noise level. However, in both SEF and NSO schools, about 16 percent of the spaces fell into the high noise category, whereas only 9.6 percent of the spaces in the NST schools were judged to have a high noise level.

In addition to rating the overall noise level for each space, it was necessary to get some idea of the number of distinct noises. The observers were asked to close their eyes and listen. They then simply counted the number of sounds that they were able to discriminate. Using this measure, the observers identified three or more sounds half of the time in SEF schools, one-third of the time in the NSO schools, and one-fifth of the time in the NST schools.

The scores obtained regarding movement of children, variety of student's tools in use, and the number of distinct noises were combined to form a scale of physical activity. The highest score on the physical activity scale described a space in which more than five children were walking around, many categories of tools were in use, and which had many distinct noises. A low score described a space in which all the students were seated at their desks working silently or listening to a teacher's instruction.

Table 3: Scale of Physical Activity by Type of School

Type of School	Physical Activity			N
	Low %	Medium %	High %	
SEF	16.9	66.1	17.0	1042
NSO	26.6	67.5	5.8	838
NST	43.1	50.4	6.5	944

SEF schools had more than double the proportion of high physical activity scores relative to the NSO and NST schools, 17.0 percent vs. 5.8 percent and 7.5 percent respectively. However, in the middle range of the scale, the SEF and NSO were similar (66.1 percent and 67.5 percent respectively). The NST schools scored lowest on the physical activity scale (16.9 percent). Medium size schools, and schools in middle level socio-economic areas had a greater proportion of low physical activity.

Distribution of People in the Space

Another question of concern was the number of groups that were using a space. Was the class sitting together as one group or dispersed in smaller groups? When a class was kept together, all the students generally were doing the same kind of task. In smaller groups, students could still all be doing the same task but there was more opportunity for different groups to be doing different things. A variety of groups in the teaching areas presumably permitted more children to learn in different ways and at different speeds.

Looking across types of schools, it was found that all children in a space were in one cluster 40.0 percent of the time in the NST schools, 31.0 percent of the time in the NSO schools and 25.5 percent of the time in the SEF schools. On the other hand, there were four or more clusters of student 44.3 percent of the time in SEF schools, 41.9 percent of the time in NSO schools, and 34.0 percent in the NST schools.

As one would expect the greater the number of clusters formed in one space, the smaller would be the size of the largest cluster. The average size of the largest cluster was smaller in the SEF and NSO schools than it was in the NST schools.

Where several clusters existed, one would expect more students to be working on their own. The results indicated that in SEF schools, three or more students were found working alone almost half the time (48.7 percent) while in the NSO and NST schools three or more students were working alone about 25 percent of the time, 26.5 percent and 28.2 percent respectively.

In the very real sense, the number of groups, the size of the largest group, and the number of people working alone is determined by the number of students in a space. Looking across types of schools, the observers reported that in the NST schools, there were 21 or more students in a space 77.7 percent of the time, as compared with 58.3 percent for the SEF schools

and 56.4 percent for the NSO schools. At the same time, there were between one and twelve students in a space 8.0 percent in the NST schools as contrasted with 18.3 percent in the SEF schools and 22.1 percent in the NSO schools. To some extent, these findings probably reflected the lower occupancy rates in the newer schools.

The data generally indicated some common sense notions such as if the number of students in a space went up, the more likely that the number of clusters would also go up. However, the interrelationship among these variables also pointed to facts which were not as easily predicted. For example, there was a higher percentage of three or more students working alone in spaces containing 13-20 people than there was in spaces which contain 21 or more people. Put in a somewhat different manner, there was a higher percentage of no children working alone in a space that had 21 or more children than there was in a space which had one to twelve children. However, the data did illustrate that as the number of clusters in a space increased, the number of children working alone increased. These interrelationships will be further investigated.

Examination of the data showed that schools in medium socio-economic districts had the highest frequency of having 21 or more students in a space, were least likely to have students working alone, and were more likely to have only one cluster in a space. Schools in low and high socio-economic areas were similar in the number of students working alone, but those in high socio-economic districts had fewer children per space while those in low socio-economic areas had more clusters formed in their spaces.

Scale of General Activity

This scale was an overall measure of the general activity taking place in the schools. The scale was constructed by summing the scores from the scale of structure, scale of teaching style, and scale of physical activity. For simplicity of presentation, the index was reduced to a trichotomy of low, medium, and high general activity. All the variables in the scale were positively related. That is, if the furniture in the space were arranged with high definition and if there were only one focal point, then there was a good possibility that the teacher was acting formally and that the students were probably in one cluster and using few categories of tools. Such a space would have received a low general activity score and provided a pretty good picture of a "standard" school setting.

On the other hand, if the furniture in the space were randomly arranged and if there were several focal points, it was likely that the teacher would be acting in an informal manner within easy reach of the children. There was also a good possibility that a variety of tools would be in use by several clusters of students and that several students would be working alone. Such a situation would yield a high general activity score and would, in many educators' opinions, typify desirable "open plan" education.

Table 4: Scale of General Activity by Type of School

Type of School	Scale of General Activity			
	Low %	Medium %	High %	N
SEF	32.5	48.7	18.8	887
NSO	49.1	45.1	5.8	634
NST	58.6	31.7	9.8	941

A higher proportion of spaces in SEF schools ranked in the medium and high range of the general activity scale than did NSO and NST schools. The NSO schools had almost the same number of spaces in the medium range of the general activity scale as did SEF schools (SEF 48.7 percent, NSO 45.1 percent, and NST 31.7 percent). More spaces in the NST schools fell into the high end of the general activity scale than did NSO schools (SEF 18.8 percent, NSO 5.8 percent, and NST 9.8 percent).

Large schools in low socio-economic districts had the highest proportion of spaces in the middle and high range of the general activity scale. Small schools in the middle socio-economic areas had the highest number of spaces at the lower end of the general activity scale.

The number of students in a space was related to the general activity scale scores. Spaces with 13-20 students had double the number of high scores on the general activity scale as spaces with one to twelve students or those with 21 or more students (20.7 percent, 11.3 percent and 9.9 percent respectively). Half the spaces with between one to twelve students scored in the middle range of the general activity scale as compared with 40 percent in the spaces with 13-20, or 21 and more students. Finally, 50 percent of the spaces with 21 or more students scored in the low end of the scale, as contrasted to 40 percent of the spaces with one to twelve or 13-20 students.

As one would expect, spaces that only had one cluster had the highest proportion of scores at the low end of the general activity scale.

There was also a positive relationship between the number of individuals working alone in a space and the amount of activity indexed on the general activity scale. In other words, the more children working alone in a space the greater the total amount of activity in a space.

Summary

One point should be clarified. While it is true that overall the SEF schools had higher general activity patterns than did the NSO and NST schools, there were NSO and NST schools which had patterns as "open" as the SEF schools. At the same time, there were SEF schools which were not as "open" as some of the NSO and NST schools. The differences in level of activity could have resulted from differences between the teachers rather than from differences among the facilities. However, there were no significant differences across types of schools in the teachers' age, sex, years of formal education, years of experience, etc. The only significant difference that was found was that over half of the teachers in the SEF schools asked to teach in their schools compared with less than a quarter in the NSO and NST schools. Given that all the SEF schools were new and received a lot of publicity about their "flexibility", it is likely that a high proportion of open style teachers self-selected themselves into SEF schools. There is also the possibility of a "Hawthorne" effect as SEF schools hosted many visitors.

While it has been shown that there were different activity patterns in the three types of schools, it is not yet established whether or not these patterns have differential effects on what the children learn.

The results obtained and the above discussion led to the following general and specific conclusions:

1. The instrument generated data which can permit comparisons in activity levels not only between whole buildings but also between floors or sections within a building and between time periods. It seems ideally suited to monitoring the development of open space programs across a period of several years.
2. The SEF schools were quite distinct from NSO and NST schools. On the whole, in SEF schools there was less structur-

ing of spaces, teachers were more personal and informal with the students, students worked more often in small groups or alone, and used a greater variety of tools than in NSO or NST schools.

3. Large schools which were in low socio-economic districts tended to have more "open" patterns than schools which were in middle or high socio-economic districts and which were either medium or small in size. Small schools which were in the middle socio-economic category tended to have the most traditional patterns. These results could have been due to the fact that the low socio-economic status schools which were large in size in this sample were also likely to be "inner city" schools. In recent years, these inner city schools have received more "special" teachers and larger amounts of money for tools than the other types of schools. These factors might have had something to do with the "open" patterns seen in these schools.
4. Teaching areas in which there were 13-20 students tended to have more "open" patterns than spaces with either a small or a larger number of students.
5. While it has been demonstrated that there are different general activity patterns in each type of school, the next step is to determine whether or not these patterns have differential effects on what the children learn. Next year the observation instruments will be refined and coupled with tests for such things as creativity, group problem solving and sharing of information.

Notes

- (1) Metropolitan Toronto School Board. Study of Educational Facilities. "Annotated Bibliography of Research on Open Space Schools," Toronto, 1971.
- (2) Mirrors for Behavior II: An Anthology of Observation Instruments. Edited by: Anita Simon and E. Gil Boyers. Philadelphia, Classroom Interaction Newsletter in cooperation with Research for Better Schools, 1970. 2 volumes.

- (3) Proshansky, Harold M., Ittelson, William H., Rivlin, Leanne G., eds., Environmental Psychology: Man and his Physical Setting. New York, Holt Rinehart and Winston, 1970, p. 27-37, 173-183, 419-439, 658-668.
- (4) Metropolitan Toronto School Board. Study of Educational Facilities. E5: Academic Evaluation-an Interim Report. Toronto, 1971. 210 pp.
- (5) All tables significant at the .000 level.