

## **Classroom Acoustics I: The Acoustical Learning Environment: Participatory Action Research in Classrooms**

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**Abstract:** This pilot study used participatory fieldwork in a number of kindergarten through eighth grade classrooms. The parameters of an acoustic setting that support a learning environment are complex. Dynamic interactions among all participants (administrators, teachers, students, parents and research team members) makes a difference in learning. It was found that what people do in classrooms depends on the social make-up, anticipated behavior, intellectual level, teaching methods and theories, the hearing capacity of participants, as well as the physical characteristics of the classrooms. Participatory action research (PAR) resulted in the development of appropriate classroom observation tools utilizing checklists, summary scales and hierarchical rating scales. The learning climate, lesson clarity, instructional variety, task orientation and student engagement were observed and used to identify variables for the acoustical studies. The PAR was instrumental in determining the protocol for the acoustical measurement studies described in Classroom Acoustics II. Field observations began with an understanding of the various adaptive behaviors of the classroom participants such as how the teachers modified their location and sometimes even the furniture to maintain short speaker to listener distances. The findings indicate that a range of solutions are needed to improve the acoustical learning environment in classrooms including innovative teaching methods, improving room acoustical design, reducing background noise levels in rooms and in some cases using amplification systems.

### **PARTICIPATORY ACTION RESEARCH**

Participatory Action Research (PAR) methods were used to understand the dynamics of classroom communication and behavior settings in several elementary and middle schools. The researchers observed many hours of classroom instruction; met with teachers to discuss communication, learning and the acoustic environment of classrooms; and discussed the results of the observations with teachers and administrators. An observation tool was developed that was used to evaluate behavior and communication in the classrooms. The results of the observations were used to determine source and receiver locations for a testing protocol to evaluate the acoustics of the rooms.

### **RESULTS**

There were two basic teaching situations that were observed in the classrooms: lecture-style teaching and small group instruction.

#### **Lecture-style teaching**

Lecture-style teaching was described as when a teacher would stand or walk across the front of the room speaking to students seated in rows of seats evenly distributed throughout the room. The teachers would lecture; present material on a chalk or marker board; ask questions of the students; ask students to come to the board to complete problems, etc. This teaching method was most prevalent in the middle and high school classes visited.

**Rearranging the desks.** Very few of the teachers in the schools observed by the researchers used a straight lecture mode of teaching. Classrooms in grades four and up appeared to be arranged for lecture-style teaching. Most of the teachers in the rooms that were observed used this basic room organization as a point of departure for very interesting and effective teaching methods. In middle school English class the desks were arranged in 5 rows of 6 desks each at the beginning of the day. For the first class, the teacher had the students arrange them in a circle with her desk in the middle to discuss a reading assignment. During the next class, the desks were rearranged again into groups of four or five so students could work in small groups on an upcoming report.

**Using the aisles.** In Spanish class, the desks were arranged in rows as well. The teacher constantly walked back and forth across the front of the room. She then walked down the aisle past two or three desks. She returned to the front, walked two aisles over and proceeded part way down that aisle. Then she walked to the board, wrote some verb conjugations on it, walked down an aisle asking students to repeat what was written on the board. She returned to the front of the room again. These situations of teachers actively engaging the students in a dialogue were encountered in most rooms observed. There were no instances observed of teachers giving a lecture from a stationary position at the front of the room in grades k-6.

### Small group instruction

The second basic teaching style was small group instruction. This involved students sitting in round tables dispersed throughout the room. A teacher would work with one group on reading for example, while an aide would work with another group on math. Several tables of children would be engaged in art, maps or other activities without a teacher or an aide present. The children were expected to complete certain tasks at each table. After a few minutes they would rotate to the next activity. There were several modifications to the small group instruction method including "making the rounds"; story time at the front; and maintaining quiet in the rooms.

**Making the rounds.** Making the rounds was the way in which the team described the teacher lecturing to the groups of children seated at round tables as s/he walked around the inner circumference of the circle of tables. As s/he walked around the class, s/he would repeat instructions or the information that was presented at almost every table. The close speaker to listener distances and the repetition of the words appeared to be key elements in the students comprehension of the tasks.

**Story time at the front.** During "story time at the front" the teacher would ask all the students to come to the front of the room and sit on the floor in a close group. S/he would sit in a special chair to read a story or present special material to the boys and girls. The elevated acoustic line of sight, close distances between the teacher and students and the specialness of the situation created an atmosphere that was conducive to concentration.

**Transitions between activities.** The day was deliberately broken up into relatively short time periods with discrete transitions between them. During these transitions, the students would move from their positions seated on the floor for a story for example and go to their table to complete written work. During the transition they were allowed to talk to their friends, move around and enjoy themselves.

**Maintaining relative quiet.** The teachers used very interesting strategies to bring the transition period to an end and instill quiet in the room so the next activity could begin. One teacher played a 2 minute long audio tape that all the children knew would end in 2 minutes. About half way through the tape, she raised the volume slightly so the children would know they only had 1 minute left to get settled. By the time it was over, they had to be seated, quiet and ready to work. Another clapped her hands several times which was the 30 second warning. When she clapped again, everyone had to be seated. Another turned the lights off and then on again. This was the signal to be ready. Another asked the students to "stop, look and listen" so they could hear. One of the more effective methods to get the students quiet was for the teacher to speak very quietly, but very deliberately and clearly. The children would sense that something important was about to happen and would quickly quiet down and pay attention. These techniques were also used, among others, when the teachers wanted to speak and the children were making noise or were too restless to pay attention. The short work periods with the deliberate activity periods in between them were thought by the teachers to keep the students on task when they were supposed to be.

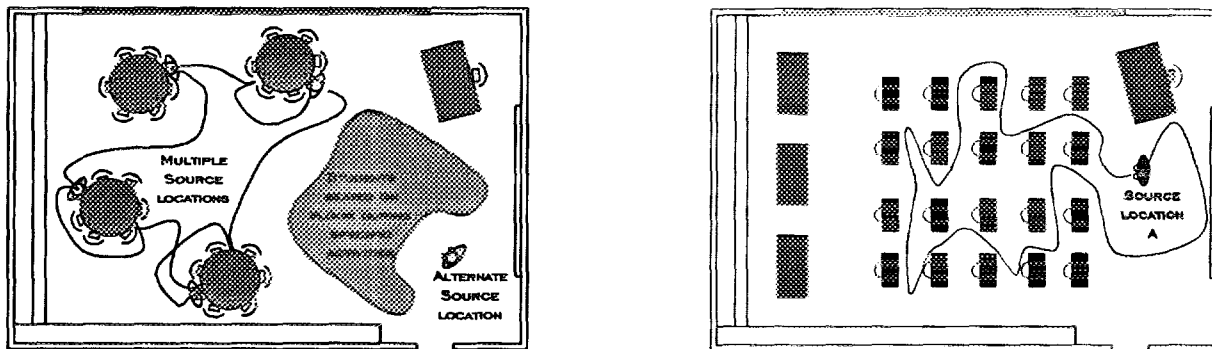


FIGURE 1. Plan sketches of classrooms showing arrangements for small group instruction (left) and lecture mode instruction (right).

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