The Impact of the Educational Facility on Student Achievement
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A reflection by Catherine L. Wilson
based on the reading of

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By C. Kenneth Tanner and Jeffery A. Lackney

The following paper is a reflection by the author regarding the impact of the educational facility on student achievement. The reflections regarding this topic are based on the book entitled, *Educational Facilities Planning:Leadeeship, Architecture, and Management*, by C. Kenneth Tanner and Jeffery A. Lackney.

The author of this paper reviews relevant portions of the body of research which were cited in the book regarding this topic. After a review of the body of literature, the author reflects on the meaning that such information had to her as a student, as a teacher, and will have to her as a future school leader in the elementary school setting. The main purpose of this paper is for the author to reflect on the ways that this information could be applicable to her in the future as a school leader.

Introduction

The background of my educational studies have focused on the impact of teachers'pedagogical behavior on student achievement. I have focused primarily on education at the elementary level, and I have studied practices that are effective for teaching students in the general education setting, the inclusive (special education) setting, and the setting for students who are gifted and talented. I have implemented such strategies during my career as an elementary school teacher and a curriculum specialist in the public school system for the past ten years. I have showcased my ability to implement such strategies through earning my National Board Certification in 2002. The reflections include my experiences in school facilities as a student and as a teacher. They also include my reflections on ways in which I could implement this information in the future as a school leader.

Literature Review

The literature in the following section highlights the trends in educational architecture and the impact of the physical environment on student achievement in the elementary school.

Trends in Educational Architecture

The following literature review is based on the chapter entitled "Trends in Educational Architecture" by C. Kenneth Tanner and Jeffery A. Lackney (2006, pp. 25-43).

Several trends are influencing the design of learning environments, and these trends include principles for site and building organization, principles for primary educational space, principles for shared school and community facilities, community spaces, principles related to the character of all spaces, and principles related to site design and outdoor learning spaces. School designs are returning to smaller, more neighborhood focused buildings, and buildings are being designed with more-homelike atmospheres in mind. The following sections highlight some of the key points of each of these design principles, which have been developed to aid school districts and school architects in developing school facilities that are supportive of educational outcomes:

A) Principles for site and building organization: 1)Efforts are being made to make schools the center of community learning, so that people of all ages can benefit from the building as a center for learning. 2) Efforts are also being made in some locals to branch formal learning from existing solely in the schools to existing throughout the community in areas such as zoos, museums, libraries, and other workplace settings (Bingler et al., 2003; Fielding, 1999). 3) Plans are being made to create smaller schools, as smaller schools provide greater opportunities for students to participate in school activities, leadership roles, and extracurricular activities (Barker & Grump, 1964). 4) Emphasis on the impact of well-defined neighborhoods which help foster a sense of the school as part of the community is also occurring, as such neighborhoods help to instill a sense of school pride (Moore & Lackney, 1994). 5) Some schools are also seeing the benefits of creating home-like atmospheres to help children feel more comfortable and to help them concentrate more on their learning (Moore et al., 1979). 6) Circulation pathways are being designed to create spaces for socializing that can also be supervised (Moore et al., 1979). 7) Schools are also being designed to inhibit crime through use of surveillance and access control (Crowe, 2000).

B) Principles for primary educational space: 8) School designs are returning to clustering key areas (Brubaker, 1998). Sometimes grade levels might share an area, or sometimes several classes from multiple grade levels might share the space. This return to cluster grouping helps create a sense of community, but the openings between the shared spaces is smaller than the open cluster grouping of the 1960 s and 1970 s, as the tremendous open spaces shared by such clusters allowed for too many distractions (Weinstein, 1979). 9) Some school designs are also providing space for sharing instructional resources so that the learning process will be supported. 10) Other designs are allowing for a variety of learning groups and spaces to accommodate different sized groups of learners (Taylor & Vlastos, 1983; Weistein & Mignano, 1997). 11) Additional research regarding the benefits of the environment cite that smaller class sizes allow for greater student achievement than do larger classes (Achilles, 1992; Finn & Achilles, 1990). 12) Also,

providing for resource rich well-defined activity pockets, such as structured reading, have been shown to significantly increase students literature use (Meek, 1995). 13) Some schools have integrated early childhood education into the school to encourage early learners to get a start when their window for early learning opportunities is open. Such early childhood education being integrated into the school also helps ease later transitions to the upper grades (Harms, 1994; Jones & Nimmo, 1994). 14) Research also shows that the formation of an individual s identity and sense of self-worth is heightened by having personalized space (Berdekamp & Copple, 1997). This sense of a home-base can be created by creating common areas where lockers can be arranged into small areas for informal socializing. Younger grades can have clustered areas for nap time. 15) Teachers personal spaces for planning and sharing ideas, separate from the students, can encourage their development as professionals (Johnson, 1990). 16) Providing spaces for project-based, hands-on learning can foster the occurrence of such activities in schools, and such spaces can also provide for cooperative learning. Both hands-on learning and cooperative learning help students understand and apply academic principles (Costa & Lievmann, 1997; Bridges, 1992). 17) Decentralizing administrative space allows for educational leaders to be involved and accessible throughout the school instead of being hidden away in remote offices.

C) Principles for shared school and community facilities: 18) Community forums that are open spaces with a town-square meeting quality have been used in some schools to provide for community activities such as dance, music, community meetings, and art (Fanning/Howey Associates, 1995). 19) Community conferencing areas for staff, students help foster communication, which is essential for success. 20) Creating separate niches of space for business partners, community members, and teacher/student conferences can provide the privacy needed for such individuals to conduct business and foster relationships. 21) Schools need to account for virtual learning through the internet and have both wired and wireless digital, audio, and video connectivity. Such connections enable teachers and students to have greater resources as well as access to institutions of higher learning (Nair, 2000).

D) Community Spaces: 22) Schools, especially in more rural areas, take on social service functions that are often provided by the local government. Schools in urban school districts often instruct tech-prep and vocational programs (OECD, 1996a). Ideally, such schools should have areas for such job preparation. 23) Parents can benefit from a parent-information center with information applicable to child development and issues related to their child's education. Parents can also share information with each other and visiting parents can have a better understanding of the school community. 24) Many schools are providing health-care to the surrounding community, and in such schools adequate waiting areas and exam rooms are essential.

E) Character of all spaces: 25) Buildings should be designed with areas both convenient to teachers and to the scale of the students, and the student areas should be designed with their developmental stages in mind. 26) Natural and full-spectrum lighting should be maximized, as they have been found to reduce mental fatigue and sooth students with hyperactivity disorders (Dunn et al., 1985). Students react positively to rooms with

natural light, and student performance is also increased in such rooms. When possible, full spectrum lighting is preferable to fluorescent lighting. 27) Healthy buildings, with good air quality and adequate thermal conditions are essential for maintaining students health, dexterity, attention spans, and physiological well-being (McGuffey, 1982; Cohen et al., 1986). 28) Appropriate acoustics, which minimize high intensity noise, are essential to minimizing the harmful effects which can have major effects on student behavior and achievement. Sound absorbing materials and acoustical barriers should be used to minimize acoustical distractions (Maxwell & Evans, 1998).

F) Site design and outdoor learning spaces: 29) Transitional spaces between indoor and outdoor learning spaces provide additional areas for learning activities. Porches and overhang areas can provide such transitional spaces. 30) Maximize outdoor learning opportunities by designing nature trails, gardens, ponds, and other outdoor learning settings. 31) Children should be separated from vehicles and service for purposes of safety.

The Physical Environment and Student Achievement in the Elementary School

The following literature review is based on the chapter entitled ”The Physical Environment and Student Achievement in the Elementary School” by C. Kenneth Tanner and Jeffery A. Lackney (2006, pp.266-306).

Based upon information from a study conducted by the National Center for Educational Statistics (NCES, 2000), the physical environments of current schools are inadequate. According to this study, approximately one-fourth of schools in the United States were in less than adequate condition, and forty-three percent of the schools studied were unsatisfactory in either their lighting, heating, ventilation, indoor air quality, noise control, or security. These problems are more pervasive in rural areas and in overcrowded schools. Schools where minority students have more than a 50% enrollment were more likely to be seriously overcrowded.

While this study brought to light the current standing of the actual school buildings in the Unites States, the study did not demonstrate the impact which such building factors had on student achievement, nor did the study include other factors which have been shown to have an impact on student performance. Such additional factors include other design variables such as movement classifications, large group spaces, architectural layout, daylighting with views, color, scale, and location of the school site, instructional neighborhoods, outdoor learning areas, and instructional laboratories.

As no valid or reliable measures existed to indicated the degree to which the physical environment of the school affects student achievement, Tanner and Lackney (2006) conducted a study to review the designs of schools physical environments and analyze how they might be related to student achievement. The authors compared the design classifications of the school s structural and movable architectural components and natural, outdoor components to the academic achievement measures of third and fifth grade mean scores on the Iowa Test of Basic Skills (ITBS).

This study reviewed the literature regarding effective design components which have been demonstrated to have positive impacts on student achievement. Such components were touched on in the first review section, Trends in Educational Architecture , and include movement classifications, large-group meeting places, architectural design, daylight and views, color, scale, location of school site, instructional neighborhoods, outdoor environments, instructional laboratories, and environmental noise.

Tanner & Lackney (2006) used these eleven sets of design classifications as a foundation to develop a 10-point Likert scale per item. They included twenty-five rural elementary schools in the sample. The results showed a significant correlation associated with the fifth grade students' test scores and school design classifications. The overall ranking of the design classifications according to their contributions to the variance in the test scores was 1) Instructional neighborhoods, 2) Movement, 3) Instructional laboratories, 4) Daylighting and views, 5) Architectural design, 6) Color, 7) Large-group meeting places, 8) Outside learning areas, and 9) Location.

This study has implications for teacher training institutions, educational decision makers, school boards, and planners for designing or remodeling schools. Teachers should be exposed to the information that demonstrates the important connections between the physical environment and student achievement. Teachers should allow for daylight and open the window areas to allow natural daylight into the classrooms. Those who plan and design schools should certainly take these factors into consideration when making plans for upcoming building or remodeling of schools.

Reflections on the Impact of the Physical Characteristics of the Learning Environment on Student Achievement

The information regarding the impact of the physical characteristics of the learning environment on student achievement resonated with experiences that I had as a student, as a teacher, and had implications for areas upon which to focus as a future school leader.

Reflections from Student Days
As a student, I remember the importance of school lighting. While I do not have the data regarding my achievement variables in classrooms with light or without light, I can say that the years that I enjoyed the most were years that my homeroom classrooms had light. There were a couple of years that I was in classrooms without daylight, and I recall feeling tired and comparatively unmotivated to the years that I was in rooms with daylight views. I also spent my fifth grade year in pod built in the early 1970's. While feeling a greater sense of community, I remember that the distractions were great from all of the surrounding noises. The teachers weren't happy with the extreme openness of the setting, as they had created many barricades with stacked milk crates, movable cabinets, and other physical objects to try to diminish the distractions from the surrounding classrooms. Unfortunately, these huge pods didn't have windows either.

In high school, we had several community areas were important to feeling a connection to the school. There was one major indoor gathering area as well as an outdoor courtyard. These allowed students time to socialize and have a sense of a home base.

Reflections from Teaching
As a teacher, I have worked in classrooms with and without windows. I believe that both the students and I were more attentive and enthusiastic in rooms with windows than the ones without. I even missed having a window so much that I made a window with curtains and a view.   While this did not create the benefits from the daylight, it was symbolic of the need which we had for such a window. Somehow, it did seem to ease the negative impact of having no view.

I have not worked in a school that had a teachers' lounge or an area for teachers to gather and talk, but I think that such a place would be helpful to building a sense of community. Too often I feel like we are only there to work and the environment is not conducive to building relationships. Such relationships are essential to creating environments where teachers are happy to share ideas and to collaborate. The feeling has been too formal in the schools where I have worked. The schools in which I conducted my student teaching internships did have teacher lounges, and these were helpful to building relationships with other teachers.

I recall not having a private area in the school to conduct phone calls or meet with parents, and I felt that this was insensitive of the administration. Teachers are professionals who do need to conduct phone calls and conversations, and I felt that my sense of professionalism was diminished by not having such areas. Having private areas to talk on the phone, converse with students or adults, or plan lessons would have been helpful to providing a sense of professionalism among the staff.
I believe that building a home-like atmosphere is helpful to students, and I strived to create such environments in my classrooms. I would have a carpeted area with books and home-style sofas and chairs. The students always enjoyed sitting and relaxing in these areas during free times or reading times. They also enjoyed using these areas during group collaborative work, and I believe the relaxed atmosphere allowed them to participate more positively with each other.

Implications for Future School Leadership
As a future school leader, I am now more aware of the studies regarding the importance of these physical characteristics of the learning environment, and I am certain to share such information with teachers. Whenever possible, areas for teachers to gather and students to gather for informal socializing as well as educational functions should be provided. Outdoor spaces should be maximized for learning environments. Teachers should open blinds to provide for daylight. Community clusters are helpful to creating a sense of belonging and comfort. Centers or rooms which focus on instructing certain subjects help students focus on the tasks at hand, and such centers should exist in classrooms and in larger rooms when possible. Students can feel like scientists when going to a science discovery lab or authors when going to a writing or a literature room. Specific subject area centers can also be designated within teachers' classrooms.

Certainly, when opportunities for influence into school design exist, I can voice thoughts or concerns regarding the research on effective physical/learning environments. While many of the schools built in the county where I currently reside are large (designed for 800 or more elementary students), as a school leader I can arrange for teachers to be clustered together to create smaller learning environments within the larger school. Creating learning spaces throughout the interior and exterior of a large school is an important area upon which I could focus, as well as creating a more home-like atmosphere whenever possible.

Conclusion

I have enjoyed learning more about the impact of the physical learning environment on student achievement. The current trends in educational architecture are taking such information into account, and schools are being designed with such research in mind. I enjoyed seeing the ways in which my experiences in school facilities correlated with literature on the impact of the physical environment. As a teacher, I believe I implemented many of the strategies for creating physical environments that were conducive to learning. Somehow, probably from my experience as a student, I knew that lighting and comfortable, homelike atmospheres were conducive to learning. As a future school leader, I look forward to sharing this information with teachers and creating a larger school environment conducive to student learning.

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