

School programming, design, and evaluation: a community/university partnership

Programa de necessidades, projeto e avaliação de escolas: uma parceria comunidade-universidade

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Abstract

For decades, educational leaders discussed the components of a successful educational program, yet they have regarded the physical setting as an institutional backdrop receiving scant attention. Widespread misconceptions reinforce the view that the quality of school building has no impact on academic performance. Consequently, a gap exists between the educators' view of improving quality and the process of planning schools. School buildings ought to be an expression of the fact that exploration and discovery are important parts of obtaining knowledge. Current learning styles and teaching methods suggest the need for a new form of learning environment characterized by different activity settings and small-group activities. This middle school reflects recent efforts to promote small schools. It is the result of a lengthy collaborative process between the county public school system and a university to develop a 600-student school that includes three academic houses, each of which functions independently but under the same principal. Although school construction was completed in 2000, this case study focuses on the stages prior to design development and after building construction. A key factor in this study is the creation of a building program that responds to a curriculum featuring integrative, active, real world learning that involves significant contact with adults. Another important factor in the development of this case study is the assessment of the completed building from the students' and teachers' viewpoint after one year of occupancy.

Keywords: School facilities. Programming. Post occupancy evaluation.

Resumo

Por muitas décadas, especialistas em educação têm discutido os componentes de um projeto pedagógico bem sucedido, embora os espaços para abrigar tal projeto institucional, por outro lado, tenham recebido pouca atenção. A disseminação de interpretações inadequadas reforça a visão de que a qualidade do edifício escolar não tem impacto no desempenho acadêmico. Conseqüentemente, existe um distanciamento entre a visão do educador no que diz respeito à melhoria da qualidade e o processo de planejamento de edifícios escolares. Edifícios escolares deveriam ser uma expressão do fato que exploração e descoberta são partes importantes na obtenção de conhecimento. Estilos correntes de aprendizado e de processos de ensino sugerem a necessidade de uma nova forma de ambiente para o aprendizado, caracterizada por lugares para diferentes atividades, incluindo aquelas realizadas por pequenos grupos. Esta escola de ensino médio reflete esforços recentes para promover pequenas escolas. É o resultado de um longo processo de colaboração entre o sistema público escolar do município e a universidade, no desenvolvimento de uma escola para 600 alunos a qual inclui quatro ambientes, que, por sua vez, funcionam de modo independente, mas sob a responsabilidade de um único diretor. Embora a construção da escola tenha sido concluída em 2000, este estudo foca os estágios anteriores ao desenvolvimento do projeto e posteriores à construção. Um fator chave neste estudo foi a concepção de um programa de necessidade que responda a um currículo que envolva contatos significativos com adultos, de modo integrador, ativo, enfim, um verdadeiro mundo de aprendizado. Outro fato importante deste estudo é a apreciação do edifício como um todo, sob a ótica dos alunos e dos professores, após um ano de ocupação.

Palavras-Chave: Escolas. Programas. Avaliação pós-ocupação.

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Introduction

One-room schools were commonplace throughout rural portions of various countries including the United States, Canada, Australia, New Zealand, Scotland, England and Ireland in the late 19th and early 20th centuries (GULLIFORD, 1984). In most rural and small town schools, all of the students

rural areas. The image of the schoolhouse was suggested by its name; a single-story volume under a gabled roof. The structure's simple rectangular plan featured a centered doorway often marked by a bell tower. To the back of the room was the teacher's desk backed by a chalkboard. Windows in rows along either sidewall provided natural lighting and cross-ventilation.

This typical schoolhouse's layout suggested the behavior of the educational activity with the focus on the teacher as the dispenser of knowledge. Columns and rows of desks defined the method of teaching. During the late 19th and early 20th century, schools began to grow in size, as a result of a population migration sparked by the increase in industry and manufacturing. From 1900 to 1950 the classroom underwent very little change (SPRING, 1994). Larger school building designs arranged the typical one-room schoolhouse classroom into linear rows along either side of long corridors. Other school amenities, such as libraries and auditoriums, were added to these schools. To avoid disorganizing the image of the school brought on by these additions of space, buildings were symmetrically designed with large entrances and monumental volumes. Even as a new understanding of learning and teaching methods was developing the classroom remained essentially unchanged.

This monolithic classroom with its rows of desks became so canonized that an entire industry of school furniture was created. Specific grades had an outline of the proper quantity and size of furniture required, contributing to the dull consistency of classrooms. During this period you could travel to almost any school throughout the United States and find identical classroom environments.

The late 60s and early 70s was the era of the open classroom; the first significant classroom development since the modern school was invented (BARTH, 1972). Educational theories in understanding how children learned suggested that the school environment should promote social interaction at various levels. Eliminating individual classroom cells, the open classroom design sought to let students freely migrate into small working

met in a single room. There, a single teacher taught "the three Rs" (reading, writing and arithmetic) to seven or eight grade levels of elementary-age boys and girls. While in many areas one-room schools are no longer used, it is not uncommon for them to remain in developing nations and groups and participate in different learning activities. It allowed teachers, normally isolated from one another, to interact. In general, the open classroom school intended to bring the school community together. But, it failed and many open classroom school buildings still in use today have undergone extensive renovation, restoring walls that identified the traditional classroom. The failure of the open classroom was not due to misplaced motivations, since design ideas that unify school communities are still sought after. The open classroom school failed to recognize the disorder caused by visual distraction and noise, and the territorial need for boundaries (GUMP, 1987).

Images of schools

Metaphors shape the way school problems are defined and are influential in shaping behavior. Metaphorical images of schools are influential in the debate about the quality of schools and school reform. In an article about school images, Schlechty and Joslin (1988) describe the most commonly held school images as:

- (a) the school as a factory;
- (b) the school as a hospital;
- (c) the school as a log;
- (d) the school as a family; and
- (e) the school as a war zone.

The school as a factory is a deeply embedded image in educational theory and practice. The factory metaphor suggests mass production, assembly line techniques, and quality control. It supports the argument that principals should be viewed as managers, teachers as workers, and students as products to be shaped and manipulated. The school as a hospital metaphor views the need to distinguish management and professional decisions. Hospital models, such as diagnostic-prescriptive teaching, individualized instruction, and batteries of tests, approach the more clinical aspects of schooling. The school as a log, refers to a classic form of education where the basics are emphasized, teachers are given high honor and status, and are carefully selected and supported with materials and resources. The school as a

family recognizes that children should be treated as unique individuals; the whole child should be taught; and children should not be pushed to perform until they are ready. This model assumes that the relationship between the teacher and the child is the most important relationship in the school. School as a war zone conveys an image of conflict and hostility, and that aggressive action is an expected part of school and classroom life. Winning and losing become more important than cooperation and accommodation.

The notion of the school as a place of work is clearly the most widely held image, which is reinforced by talk of home work, class work, and busy work. The contemporary workplace, however, has shifted from the factory to the knowledge-based industry, suggesting a synthesizing metaphor, the school as a knowledge work organization. Drucker's (1969) prediction of the dominant occupation of the future will be knowledge work. Therefore the student of the future will be the knowledge worker.

The learning environment

One hundred and fifty years ago, the first classrooms represented a common teaching method. Today teaching methods have changed, while the physical nature of the classroom has not. An examination of current learning styles and teaching methods suggests a new form of learning environment characterized by different activity settings and small group activities.

The formal school curriculum describes the intended courses of study activities and outcomes. However, much is learned outside the formal curriculum. Educators describe this idea as incidental learning, which derives from many sources, one of which is the physical environment of the school.

School buildings should express the idea that exploring and discovery is an important part of obtaining knowledge. Students can relate positively to the forms and variety of school architecture. Activities within schools have educational and social aspects, yet the idea is that quality in both of these is important for the operation and development of schools. It is not only the teaching spaces that serve to deliver the curriculum, but also those places where students spend time, and these too should receive attention.

People are more aware that social areas in schools are important (BAUM; VALINS, 1977). This goes beyond the traditional requirements of rooms in which students and teachers can meet and eat. It stems from the view that an overall atmosphere

needs to be created that help students identify with, and feel ownership of, the environment in which they study and play. Social space should provide places for quiet contemplation and formal and informal play. A variety of places are needed, both inside and outside the school, where children can meet together in groups, sometimes small, sometimes large. Such places need the physical characteristics that convey welcoming, and promote the feeling of belonging and of ownership.

Buildings and spaces convey messages reflecting the inner life, activities, and social values of the users. Characteristics like shape, color, or arrangement help building users make vividly identified mental images of the environment (SANOFF, 1994). These environmental cues have something to say about the people who occupy buildings as well as the people who created these buildings. Similarly, people read these cues, make judgments, and act accordingly. These messages play an important role in people's comprehension of the environment. Specific environments can be evaluated as to the different interpretations of the messages conveyed:

(a) A school is a functional environment. Good design means that space is organized efficiently and flexibly, and facilitates adaptation to different uses, groups of users, and changing circumstances. The design of the school should take into account the needs of adults and children with physical handicaps, and permit a variety of sound and lighting conditions. These are not simply technical issues; they should be considered relative to the need for different types of social environments.

(b) A school is a learning environment. Spaces should be created that foster the social and psychological conditions in which learning is most likely to be successful.

(c) A school has an aesthetic dimension. Buildings are visual objects. They can be stimulating both in terms of their intrinsic design and their use.

(d) A school is part of its wider environment. A successful design will enhance the history and traditions of the school as an institution, utilize and create a harmony with the local ecology and complement the surrounding physical environment (SANOFF, 2001).

In order to experience healthy development, students require certain needs to be met. Schoolagers require diversity, which entails different opportunities for learning and different relationships with a variety of people (LEVIN; NOLAN, 2000). In a school that responds to its

students' need for diversity, one would not find students all doing the same thing, at the same time, in similar rooms. One would not expect to see students sitting in neat rows of desks, all facing teachers who are lecturing or reading from textbooks. Instead, in responsive schools, students and teachers would be engaged in different learning activities in and out of the classroom. A variety of teaching methods including small group work, lectures, learning by doing, individualized assignments, and learning centers, would be used (JACOB, 1999).

Students need opportunities for self-exploration as they integrate the change of adolescence into a new sense of 'self,' and as they begin to think about future vocations and avocations. They need opportunities for meaningful participation in school and community. Not only can schools provide the structure and means for students to have a real voice in the running of their schools, but they should also have the opportunity to identify and carry out projects that will improve the school environment, such as building outdoor recreation and nature areas.

At a regional CEFPI conference, Lackney (1999) summarized several research based design principles that are fundamental in developing a school building assessment program. They are as follows:

- (a) Stimulating environments: The use of color and texture; displays created by students so they have a sense of connection and ownership with the product.
- (b) Places for group learning: Special places such as breakout spaces, alcoves, table groupings to facilitate social learning and stimulate the social brain; turning breakout spaces into living rooms for conversation.
- (c) Linking indoor and outdoor places: Encouraging student movement, engaging the motor cortex linked to the cerebral cortex, for oxygenation.
- (d) Public space: Corridors and public places containing symbols of the school community's larger purpose to provide coherency and meaning that increases motivation.
- (e) Safety: Safe places reduce threat, especially in urban settings
- (f) Spatial variety: Variety of places of different shapes, color, and light, nooks & crannies.
- (g) Changing displays: Changing the environment, interacting with the environment stimulates brain development.

(h) Resource availability: Provide educational, physical, and a variety of settings in close proximity to encourage rapid development of ideas generated in a learning episode. This is an argument for wet areas/ science, and computer-rich workspaces to be integrated and not segregated. Multiple functions and cross-fertilization of ideas are main goals.

(i) Flexibility: A common principle in the past continues to be relevant. Many dimensions of flexibility of learning places are reflected in other principles.

(j) Active/passive places: Students need places for reflection and retreat away from others for intrapersonal intelligence as well as places for active engagement for interpersonal intelligence.

(k) Personalized space: The concept of home base needs to be emphasized more than the metal locker or the desk; the need to allow learners to express their self-identity, personalize their special places, and places to express territorial behaviors.

(l) The community as a learning environment: Utilize all urban and natural environments as the primary learning setting, the school as the fortress of learning needs to be challenged and conceptualized more as a resource-rich learning center that supplements life-long learning. Technology, distance learning, community and business partnerships, home-based learning, all need to be explored as alternative organizational structures for educational institutions of the present and future (SANOFF, 2001).

School size

Barker and Gump (1964) and Garbarino (1980) have studied the effects of school size. They conclude that small schools offered students greater opportunities to participate and exercise leadership roles. While they recognized that big schools might be able to provide some services that small schools cannot, ultimately they concluded that it might be easier to bring specialized services to small schools than to raise the level of participation in large schools. In a comprehensive review of 103 studies of school size, Cotton (1996) noted that students in small schools viewed particular subjects and school in general more positively. Fowler and Walberg (1991) summarized a number of corroborating studies that reported larger schools being more detrimental to student achievement.

The educational literature abounds with articles touting the virtues of small neighborhood schools (COTTON, 2001; RAYWID, 1998; VANDER ARK, 2002). In Florida, for example, policy makers have mandated much smaller maximum school sizes than typical of today's schools. Advocates for smaller schools cite as evidence for their position the growing body of research indicating that such schools are better at improving the academic achievement of students who have not been successful in traditional settings, bringing about increased graduation rates, obtaining greater student involvement in school co-curricular activities, and helping to overcome challenging student behavioral situations. Parents believe that teachers and administrators in small schools know individual students better, that students have more opportunities to participate in organized activities, and that those attending smaller schools are safer.

The university/community middle school

This middle school project located in North Carolina was 12 years in the making from concept to occupancy. It's the first in the nation to combine the resources of a public school system, a land-grant university, and an advanced research and development community known as the Research Triangle. Located on the new 1,200-acre university campus, the school constitutes the first phase of collaboration between the university and county's public school system.

For several years county public school and university administrators talked about establishing a middle school and an affiliated teacher development/outreach program on the new university campus. In 1993, a planning committee was established, composed of approximately 15 classroom teachers and administrators and 15 university professors and administrators, predominantly from the College of Education and Psychology. Aided by a small planning grant, the

committee was asked to develop an educational program and governance agreement for the school.

The Committee met as a whole 10 times over a two-year period and held a community workshop, which was attended by more than 150 people. Six formal task forces, numerous ad hoc groups, and meetings augmented its work with key people from community agencies as well as each of the university's colleges.

A joint venture such as this, while beneficial to all in the end, is initially much more complicated than other kinds of projects. Although specialists at the College of Education envisioned a school where innovative teaching practices and methods would be introduced; it was evident that the traditional architectural model for designing schools was inappropriate and obsolete. They realized that architectural issues would have to be addressed simultaneously with programming and technological requirements. County or university administrators did not conduct programming coordination, but instead by Henry Sanoff, professor of architecture. After several months of intense study and collaboration, a program was developed with design elements such as relational diagrams and recommendations for integrating current teaching practices and emerging technologies (Figure 1). The program required the approval of no fewer than 100 specialists, administrators, and educators from the county and the university.

The academic house

The middle school is composed of four clusters of approximately 200 students each. Each cluster or "house" contains four teams of 50 students and two teachers. Each of the four teams has its own classroom or learning environment composed of several learning centers (Figure 2).

Centennial Campus Magnet Middle School Project

CLASSROOM

2000 Square Feet

USER INFORMATION

- Each "double classroom" team will have 2 teachers and 50 students
- Teaching assistants, NC State faculty, students, community professionals, observers, elective teachers, and parents will also use the space periodically

ACTIVITY OBJECTIVES

- To provide a secure, nurturing environment for students engaged in classroom and outdoor activities
- To provide a place for students to work in small groups and as individuals on school projects
- To facilitate individual research and exploration on state of the art interactive media equipment
- To provide a multi-purpose place for elective teachers to work with students on integrated, curriculum-based projects
- To encourage students' social interaction

PROXIMITY INFORMATION

- Classrooms must have direct access to outdoors
- Classroom should be adjacent to science classrooms, multi-purpose spaces and outside areas
- Each House must have ADA accessible toilets located near the entry for student convenience
- Teachers' team planning offices should be directly adjacent to classrooms with a visual connection between both areas
- Students should have direct access to cubby or locker storage areas in the classroom

DESIGN REQUIREMENTS

- Provide ample wall surface for team presentations
- Create visual separation between learning centers
- Introduce architectural forms that reflect group size and respective activities
- Provide clearly articulated learning centers clustered around large group (25 students) activity space
- Movable partition or dividers may be used to separate classroom into two smaller components
- Provide a water and gas source within each classroom
- Daylighting should provide ample light upon work surfaces
- Provide daylight controls for computers and AV presentations
- Incorporate acoustical treatment to diminish noise transmission within classroom
- Provide area for unobtrusive observation
- Provide clusters of storage cubbies in various parts of the room

NOTES

This classroom space is where the students will spend the majority of their school time. It is important that this space meets a variety of functional, aesthetic, social and academic requirements. The classroom space should be flexible enough to accommodate a wide range of teaching methodologies and variant group sizes. Specific learning centers should be identified to determine the classroom layout. The room should be equipped to support a variety of science activities that do not require specialized lab equipment.

Figure 1 - Sample program data form

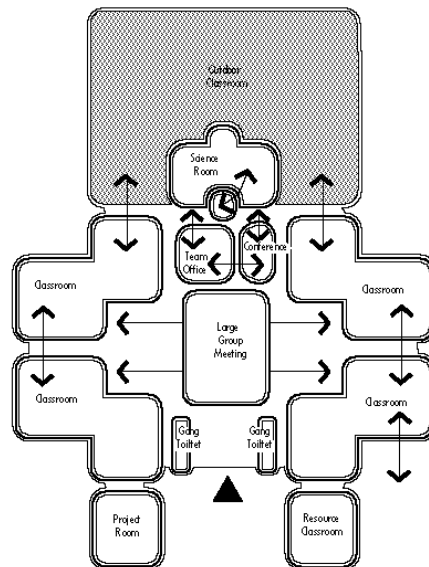


Figure 2 - Diagram of an academic house with four classrooms clustered around a large group area

The creation of identifiable clusters of space that students can call their own is important. Clustering by grade level will give students a strong sense of group identification; grouping students and teachers together into purposefully small interdisciplinary teams reinforces opportunities to develop strong personal relationships. The intent is to allow a sense of closeness to develop between students and teachers that enhance the development of intellectual growth, academic achievement, and emotional and social maturity.

The 50-student core-learning environment is intended as a setting for a problem-centered integrated curriculum supported by a team teaching approach. These small teams, working in one large double room feature instructors with competence in at least two disciplines, such as social studies and science. The interdisciplinary team is a way of bringing teachers and students together to establish genuine learning communities. When teachers and students are grouped together into interdisciplinary teams it creates educational glue that holds together almost every other aspect of the school program. The teachers on the team will have joint planning time. All teach the same students, and the students on the team have the same teachers in the basic academic program. Teachers and students also share the same basic physical area of the school and the same schedule.

Learning environments, therefore, need to allow for a multitude of teaching and learning strategies. Students should be able to move from independent to cooperative learning. Smaller multi-use spaces will support small-group instruction and group projects.

The school's integrative curriculum proposes to engage students in a variety of issues, themes, and problem solving situations where they draw on knowledge and skills from a variety of disciplines. While much of this work is intended to be facilitated by the two-teacher teams, specialty teachers are intended to work on the projects, engage in discussions, experiment with ideas and concepts, generate dialogs, debate issues, solve problems, create models, plan presentations, or otherwise engage in active learning tasks.

Special efforts are made to adjust educational programs to match each student's learning styles and capabilities. Resource Rooms in each House support supplemental activities for students experiencing curriculum difficulties. These rooms are large enough to provide a variety of learning centers and instructional techniques. As the exceptional student population changes, administrators and teachers will specifically

address the programmatic needs of this special population.

Client perspective

In late, 1995, the firm of Boney Architects was selected to conduct a site comparison of several 18-acre locations within a predetermined 35-acre sector on the new university campus. Within the 18-acre allocation, the school building footprint, its playing fields, parking lots, and school bus pick up and drop off would be included. The limited acreage was due to the high land cost, estimated at \$500,000 an acre. Once the site analysis for the school was completed, the project was placed on hold by the county as it waited for the school bond legislation to pass. The county school system approved the project in 1997. Both county and university officials prepared a list of suitable architects for the project and Boney architects was the first choice from both groups because of their school experience and familiarity with the project. Consequently, they were selected as project architects.

One of the most significant issues that arose during the intervening year, because of the complex arrangement between the university and county school system, occurred over the ownership of the property. Typically, non-academic buildings on the campus would be constructed by the university and leased to a particular business organization. This arrangement proved to be too costly so the approach was altered where the county would build the school and lease the land from the university. Because of the procedural change and limited availability of land for the site, a more compact building would be required. An agreement was subsequently reached between the university and the county for a 50-year lease for the property on which the school sits.

A joint task force was formed to work with the architects, comprised of ten representatives from the university and county school system that met on a regular basis through the schematic design process. Typically, school project management includes two people, one representing planning and programming and the other representing construction management. In this case, other county staff was included in the review process, such as middle school, fine arts, technology, and media personnel, since this project was more complex than the typical school buildings constructed in the county. Overall, about thirty people were involved in the schematic design review process, including university representatives from campus planning, real estate, and the School of Education.

The shift in ownership of the school from university to the county created some tension within the client group because of the unique nature of a school based on academic houses. For example, additional staff would be needed for special services and other programmatic functions that the county could not provide, which required reductions in the amount of area allocated to certain functions. Similarly, the architect offered several design alternatives that were supported by the county group but rejected by the university representatives because the solutions deviated from the concept of three independent academic houses. Another controversial issue was related to the concept of the classroom designed for 50 students and two teachers. The original intention was to construct an unobstructed space that could be subdivided into several learning centers allowing teams of students to engage in different projects simultaneously. The university representatives opted for a movable partition to divide the classroom, however, county school officials reported unsuccessful experiences with movable walls and recommended a permanent wall with double doors to allow movement between the two classrooms, a solution that clearly compromised the intent of team teaching.

The lack of programmatic clarity between the county and the university task force members often placed the architects in a weak and compromising position. This confusion is attributed to the changes in the client representatives. None of the members of the joint task force were involved in the discussions that had occurred in the years preceding the passage of the school bond. Consequently, the architect was caught in the crossfire between task force members as they debated the interpretation of the original programmatic intentions.

The schematic design of the school with its three academic houses was completed by the spring of 1997 and approved by the county, a university review committee, and the county school board. By the Summer of 1997, the design development drawings were sent for review and approval to the county, the university review committee, the state department of insurance, and the state office of construction (the unusual event of a county school being constructed on state property involved the

state office of construction, which required regular project reviews). The school opened to the students in the fall of 2000 (Figure 3).

Post occupancy evaluation

The school environment affects students and teacher's health, work, leisure, emotions, and a sense of place and belonging. When the school environment works well students' lives and educational performance are enhanced. While the school environment is intended to support student's individual needs, it is necessary to gain knowledge about their diverse needs and how the physical environment satisfies them. Evaluation is the systematic assessment of environmental performance relative to defined objectives and requirements. The assessment process is a means of providing satisfactory environments for the people who own, manage, and occupy them.

A post-occupancy evaluation (POE) is an assessment process that can be applied to any type or size of school environment. The type of POE utilized for a particular situation is a function of the amount of time available, the resources, and the depth of knowledge necessary.

Prior to initiating the middle school POE, several preliminary steps required consideration, in preparation for on-site data collection. Client briefing about the nature of the process, the type of activities involved, and shared responsibilities are necessary before conducting the POE. In addition, background information, such as building documentation, schools organizational structure, and liaison individuals, is necessary to establish a POE plan. The plan includes the development of specific information gathering methods, sampling methods, authorization for photographs and surveys, and data recording sheets. Initially, observing the building under working conditions for several hours was sufficient to prepare a data collection plan.

Data collection and analysis precede the interpretation of the results into useful findings. Reporting and presenting the findings of the POE are vital to the client's understanding of the results. POE findings typically describe, interpret, and explain the performance of a school building

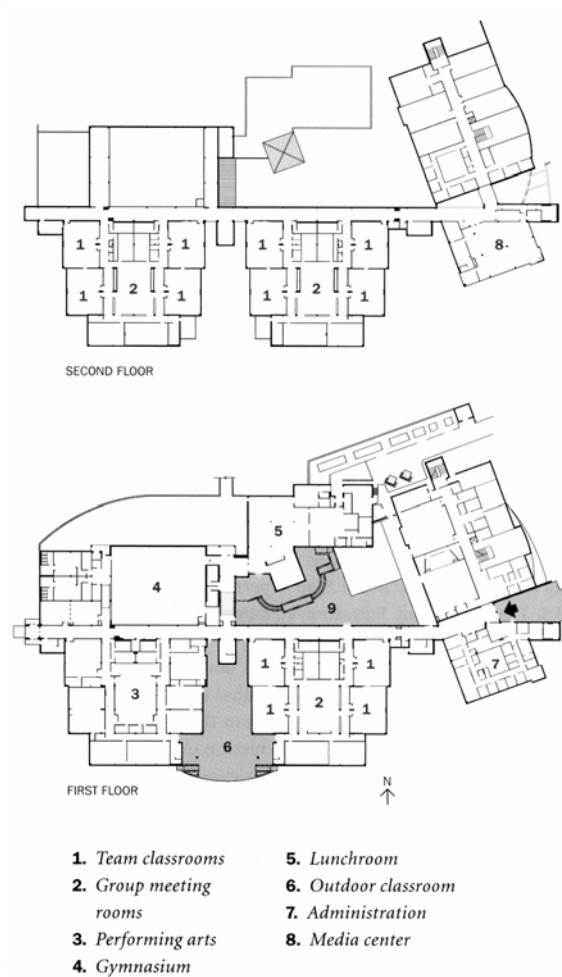


Figure 3 - Architects first and second floor plan with four academic houses

School building assessment

A comprehensive assessment tool is the School Building Rating Scale (SANOFF, 2001). This qualitative assessment tool is organized into categories that are essential components necessary for meeting the demands of an optimum learning environment. The components of the rating scale include physical features, outdoor areas, leaning environments, social areas, media access, transition spaces and circulation routes, visual appearance, and safety and security. Building users such as students and school staff rate fifty-six statements pertaining to the school building. The seven-point rating scale is based on a continuum from very unsatisfactory (VU) to very satisfactory (VS). Since all the criteria represent qualitative impressions of the school environment, perceptual differences are bound to occur between students and school staff (SANOFF, 2001).

The survey sample consisted of an equal number of students from sixth, seventh, and eighth grades totaling 78 completed surveys. All 40 teachers

participated in the survey. The survey was conducted towards the end of the first year of the school's opening.

Table 1 represents the most important issues highlighted by teachers and students. The results were obtained by performing a two-sample *t* test with independent large samples ($N_1 > 30$ and $N_2 > 30$) a statistical model that analyzes differences between mean values. The results indicate the mean and standard deviation for students' and teachers' responses. Mean values display the responses for each group (the highest 6.51 and the lowest 3.61). Standard deviation shows the average amount that both groups' responses deviate from the mean values.

The significance level for each question about the difference in responses for students and teachers were obtained from a *t* test and *p*-values. A *t* test was calculated from the data to determine the significance difference between the responses of both groups for the 56 questions represented in the

survey. Highly significant values were identified as $p < 0.01$ with a considerable higher t test value.

Among these aspects the most significant difference in responses of both groups was observed for the display areas for students' work in classrooms, which had the least p -value (< 0.0001) and t test statistic value (4.61). In summary, this survey indicates that. The teachers' responses to the items were, in all cases, more favorable than responses from the students, but that the overall impressions of both students and teachers were favorable. Where there were significant differences in perceptions, teachers believed that the learning environments were friendlier than the students did. Teachers, in contrast to the students, indicated that the classrooms created a stimulating atmosphere for learning. They also felt that there was adequate control of internal and external noise levels to a greater extent than the students did. For teachers, the most satisfactory features of the school were the visual appearance of the exterior and interior of the school building, and the harmony of the school building with the surroundings. In general, they felt that it was a safe indoor environment and an appropriate building for learning. The lack of a direct connection from most of the classrooms to the outdoors was cited as a disadvantage, particularly since the building is sited in a forest setting. Private spaces and quiet eating areas for students inside and outside the building were also limited.

Generally, students believed that the middle school was an appropriate building for learning. They rated many of the school features such as visibility of entrances and circulation throughout the building as satisfactory. Their responses to the instructional areas were positive and they felt safe within the building. They were less positive about the outdoor features of the school, namely street noise, and a lack of places for learning and eating. This dissatisfaction can be partially explained by current school policies that restrict students from using outdoor areas. Students, too, would have preferred classrooms to be directly connected to the outdoors, and they commented about the inability to personalize their own place in the classroom. The school building designed to the scale of children was less satisfactory for students than for teachers. Finally, the buildings' accessibility for people with disabilities was rated as less satisfactory for students than for teachers.

Classroom assessment

A number of follow-up interviews were conducted with teachers from each grade level to elaborate on key findings reported from the survey. Teachers felt that the least satisfactory features were classroom-related. Although the original intention as stated in

the program was to create an open classroom for 50 students and two teachers, the county representatives decided to create two classrooms separated by double doors. The double doors between the classrooms limited student movement since they were frequently closed. The doors were open for a short period of time in the mornings and during team teaching activities, but this decreased as grade levels increased. Classroom seating arrangements were directly related to how frequently the two classrooms shared common activities. The sixth grade classroom seating arrangement typically consisted of table groupings that allowed some visibility between classrooms when doors were open. Classroom seating patterns throughout the school varied to include rows, groups, and a circle. The variety in the student's desk arrangement was a result of the teacher's view of a pedagogically effective layout. Several classrooms were more teacher-centered, where they would spend more time at a specific location. Higher teacher mobility was apparent in classrooms with clustered seating arrangements. Mobility and centeredness influence teacher's movement patterns and how they interact with students in the classroom. Student centered classrooms are those where there is greater teacher mobility and more interaction with students. The most teacher-centered classrooms have a seating arrangement organized in a circle.

There is also considerable evidence that the classroom environment can affect many attitudes and behaviors. High levels of density have resulted in dissatisfaction, decreased social interaction, and increased aggression. "Soft" classrooms have been associated with better attendance, greater participation, and more positive attitudes towards the class, the instructor, and classmates. Relatively minor design modifications introduced into existing classrooms have been shown to produce changes in students' spatial behavior, increased interaction with materials, decreased interruptions, and more substantive questioning. These findings are important because it is possible that more positive attitudes and behaviors may eventually result in improved achievement. Patton's research (2001) of classroom teachers survey responses revealed that cluster seating arrangements enhanced students' learning of individual, basic academic skills.

This display of classroom layouts illustrates how the environment sends different messages that influence students and teachers responses and expectations. From the variety of classroom layouts it is evident that there are differences in teaching style and that the arranged learning environment can encourage or discourage students' interaction and involvement to support their learning (Figure 4).

Important Features	N	Mean Values	St. Dev. ¹	T ²
Classroom walls for displaying students work	s=78 t=40	s=5.58 t=3.98	1.79	4.61
Teacher friendly learning environments	s=73 t=38	s=5.37 t=6.47	1.52	3.63
Teachers workspace	s=78 t=40	s=5.15 t=6.25	1.53	3.68
Control of internal and external noise level	s=77 t=39	s=4.77 t=5.87	1.63	3.44
Stimulating classroom atmosphere for learning	s=76 t=40	s=5.18 t=6.25	1.58	3.46
Secured storage spaces for teachers	s=72 t=38	s=4.69 t=5.97	1.94	3.29
Harmony of the school building with surroundings	s=72 t=40	s=5.38 t=6.38	1.58	3.21
Outdoor learning environments	s=78 t=39	s=4.54 t=5.59	1.68	3.19
Comfortable and stress-free classrooms	s=78 t=40	s=5.12 t=6.15	1.66	3.16
Accessibility for people with disabilities	s=77 t=40	s=5.37 t= 6.3	1.51	3.15
Areas of instruction for the arts	s=76 t=39	s=5.80 t=6.51	1.16	3.11
Student friendly learning environments	s=74 t=39	s=5.59 t=6.44	1.41	3.06
Building designed and built to the scale of children	s=78 t=38	s=5.55 t=6.37	1.35	3.06
Visual appearance of the interior of school building	s=73 t=40	s=5.53 t= 6.4	1.53	2.89
Outside quiet areas for eating	s=75 t=40	s=3.61 t=4.73	2.08	2.73
Visual appearance of the exterior of school building	s=74 t=40	s=5.65 t=6.43	1.46	2.71
Outdoor play areas for students	s=78 t=40	s=5.01 t=5.88	1.68	2.64
Secured storage spaces for students	s=74 t=39	s=4.97 t= 5.95	1.87	2.63

¹ Standard deviation, t and p values comprise both students and teachers results.

² p-value<0.01 highly significant.

Table 1 - Differences between teachers and students

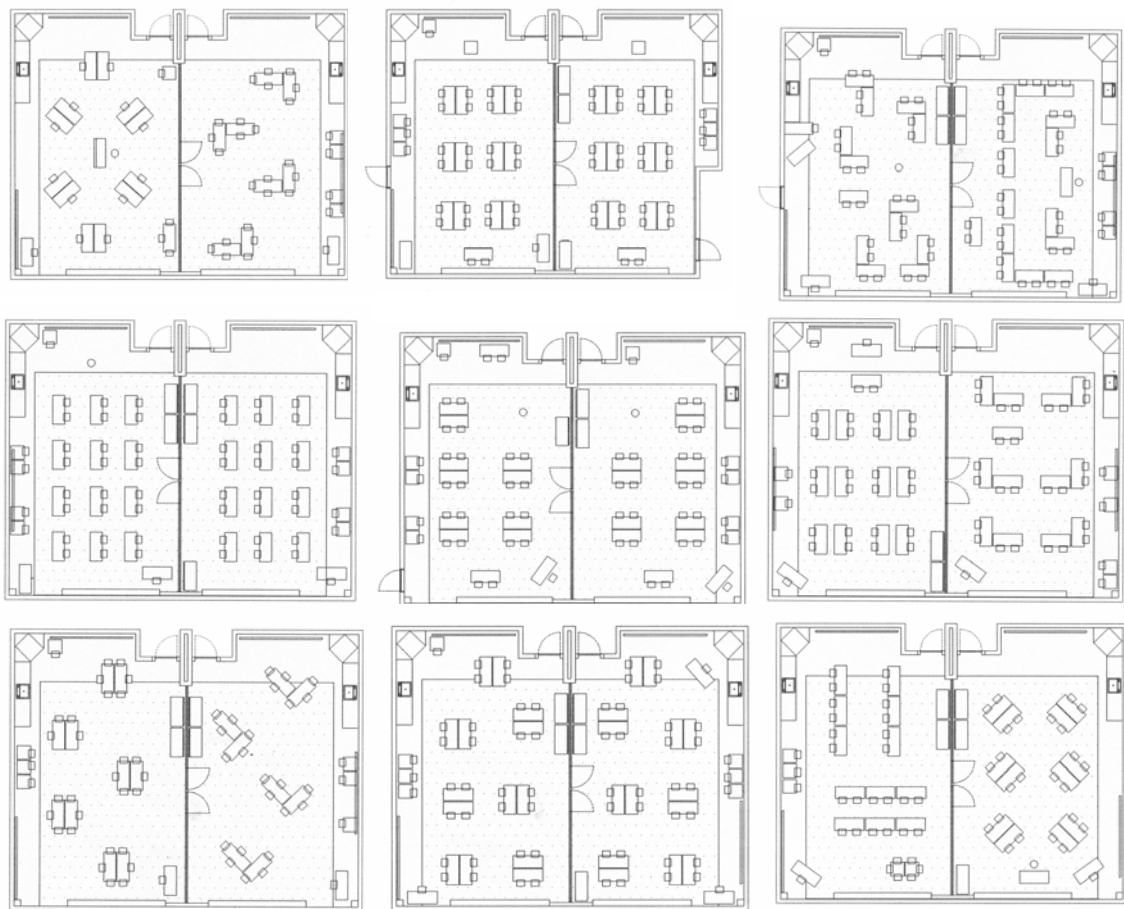


Figure 4 - Classroom layouts of 6th, 7th and 8th grades

Conclusion

To maximize the potential of active integrated learning, students and teachers will need new ways of using time, space, and grouping procedures to explore educational issues. Because young adolescents need a sense of belonging, of feeling part of a group with which they can identify, the academic house allows them to be divided into small, personal units. The two-teacher academic teams with approximately 50 students per team working in one large "double room" was identified as key element in developing the organization and structure for the school. Within the large team, small teams were envisioned to promote close personal relationships, allow teachers to effectively build upon student's interests, strengths and learning styles, and to encourage team planning and more flexible use of time.

The aims of the middle school as stated in the building program included supporting a variety of student groupings and ways of learning. There was a desire for all rooms to open to the outdoors to

encourage their use as an extended classroom; flexible walls and movable furnishings were envisioned to address changes in instructional strategies; places were envisioned where students could display their work.

The original vision for the school was not entirely realized. Although the program identified site requirements for a school building to be constructed on one floor with adjacent outdoor areas for each classroom, high land costs influenced university officials' decision to select a smaller site that dictated a two-story building. Consequently, this decision denied direct access to outdoor areas for classrooms located on the second floor. The restricted site limited the creation of special places for outdoor learning activities, a desirable feature identified by many environmental educators.

While the concept of the three academic houses was evident in the design and operation of the school, the internal structure of each house into team classrooms was not implemented as originally envisioned. This can be partially

explained by the shift of key people at various stages of the planning process. More pragmatic people involved in the implementation of those visionary ideals replaced those individuals responsible for shaping the vision of the school. Furthermore, the schoolteachers were not part of the planning process and were unaware of the documents describing the school's vision.

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