

The Classroom Environment

I. Introduction

The classroom is a place where students spend a good portion of their daily lives. It would be safe to assume that as such, the classroom should be a place of comfort and interest to all students so that they may feel at ease in the learning environment. A classroom that smells strange or offensive has poor lighting, and erratic temperature swings can be not only a distraction to students but also lead to health issues such as headaches and nausea.

The classroom is also a place where learning is facilitated with the provision of the tools necessary to allow all students the opportunity to learn by any means available regardless of handicap, learning disorder, disabilities. If students with disabilities are not provided adequate access, equipment, modified instruction, and comfort both physically and socially then the results of the effort put forth by teachers administrators, school boards and the communities that these students live in will be severely degraded and the economies of scale associated with these efforts will fail to provide the most cost effective solutions to the challenges of meeting all children's needs.

II. The Physical Classroom

The physical appearance of the classroom is important to the process of learning. The room design, color scheme, seating arrangements, and presence of plants are just a few of the factors that can enhance the ability of students to reach the full potential of learning.

A. Color: Color is a very important factor in our lives. Color affects us in ways that we do not even realize through subconscious means. Advertising agencies and marketing experts have long used color to enhance their ads and to persuade individuals to purchase their products.

In the classroom, research has shown "that younger children find high-contrast and bright colors such as red, orange and yellow stimulating, so those colors may work better in a preschool or elementary setting.

Adolescent students may respond better to colors such as blue or green which are less distracting or stress-inducing. The brightness difference between a classroom ceiling and the furniture finish should not exceed a ratio of 3 to 1."

"Being sensitive to each age group's different responses to color is key in creating an environment stimulating to their educational experience". (1)

B. Lighting: Lighting has a great effect on the classroom environment in that it is not only a basic requirement for humans to see but it also has an effect on the ability to comfortably learn. Lighting that is too harsh or bright can cause fatigue and thus induce sleepiness or headaches. Some students may also feel anxious and "less safe" in a harshly lit area as opposed to a warmly lit area. The feeling of coziness in the classroom can be a great enhancement to student comfort.

Artificial Lighting:

Inasmuch as we are all individuals, we are also different in what we feel are our comfort zones. Some students may need more or less light than others. As a result it would be unrealistic to assume that one size fits all as far as lighting is concerned. With the advent of new technology and computer controlled environmental systems, it is conceivable that classroom lighting profiles can be created to ensure that all students get the most comfortable lighting available.

FIG. I

Instead of the large banks of glaring fluorescent lighting that is ever present in most schools and office buildings, an alternative can be found in classroom lighting with several banks of dimmable fluorescent lighting with computer control and programmable options. It is also important that fluorescent lighting with ballast that operate above 30 Khz be employed as lower frequency systems can interfere with infrared technology that may also be employed in the classroom. Once a seating plan is established, questionnaires can be filled out by students indicating their preferences, once the data is acquired, the classroom lighting can be programmed to provide brighter and dimmer areas within the classroom.

Chalkboard lighting should be applied directly to the chalkboard. This will increase visibility and reduce glare from overhead lighting. This technique can also be employed with whiteboard and smart-board technology.

Natural Lighting:

Natural lighting has been shown to enhance students' comfort levels and as such windows are usually in integral part of any classroom design. Many schools that were constructed as recently as the 1990's were designed with the best of intentions in many ways fall short of the mark given what today's technology has to offer. Windows in the classroom while employed for decades to offer natural lighting can be significantly improved upon through today's technology. One drawback with standard windows is that sunlight sometimes shines in directly onto students' faces especially during the morning hours. This would prompt the use of shades to close the light off.

Another technology is the use of Liquid crystal shading. Glass that is impregnated with dipolar molecules such as a monochromatic LCD computer screen can be electronically controlled to darken the window thus shading the window without closing off the outside environment completely as is the case of a manual shade. FIG. I.

C. Audio

Audio and acoustics are critically important to learning. Students' hearing varies with the individual. It is important that all students in the classroom have the ability to hear without straining due to low volume or distance from the source. Several speakers can be employed throughout the classroom to ensure that all students receive the same level of audio reception.

Students with slightly different hearing characteristics can be positioned in the classroom such that the speaker volume and characteristics can be adjusted through the computer control.

Hearing impaired students can be assisted with the use of Bluetooth receivers which will enhance the audio part of the lesson. The teacher can utilize a transmitter that is routed through the computer and each Bluetooth headset can be tuned to the same address. Lessons that utilize PowerPoint or other media can be interfaced with the Bluetooth technology through the computer. Because Bluetooth is short range technology, the potential for interference with other classrooms will be diminished.

D. Air Quality

Air quality is of utmost importance in today's classroom. Many school districts have had to suffer the extreme expense of remediation due to inadequate or insufficient HVAC equipment. Indoor air quality has a direct impact on learning in that poor air quality can lead to increased sickness and absenteeism. Often the air system itself can be the cause of the problem in that systems using re-circulation/condensation technology can become clogged with dust and mold, thus causing increased potential for respiratory ailments. When at all possible, "Regenerative" heat exchanger systems which allow for the use of continuous fresh air introduction should be employed particularly in new construction.

E. Temperature

Optimal thermal characteristics in the classroom are important. If students are uncomfortable due to excessive heat or cold, the learning process is interrupted. This is because our nervous systems will override our thought process if we are uncomfortable. If students are too cold or hot, their thoughts will not be focused on the lesson but instead on ways to overcome the uncomfortable nature of the environment. Most HVAC systems are adequate for comfort, but some older buildings may have degraded systems that are no longer in peak operating condition.

F. Seating

Schools of thought on seating are varied. While most literature seems to agree that the standard row and column arrangement of the traditional classroom is not the best, it is probably dependent on the subject matter that is taught as to whether a more traditional approach is recommended or not. Learning groups seem to be the recommended approach but not all subject matter in all age groups and levels is conducive to this type of learning style. With the right amount of visual apparatus, and proper positioning of audio enhancement, the traditional style classroom can be slightly modified to provide a sense of both. Staggered and concentric seating can give a sense of space and community as students are more aware of each other's presence by the contoured nature of the seating. FIG I

III. Technology

A. Computers

Today's technology offers many opportunities to design and construct facilities that are completely integrated for computer technology. Computer integration in the classroom comes in many forms. Computers can be implemented as tools for the teacher in preparing and presenting lessons through various media such as PowerPoint or DVD.

Computers can also be used by the students in the classroom to augment the lesson or to playback media specific to that students needs such as closed captioning and even audio enhancements.

Computers can also be employed at the very center of the environmental control of a classroom as outlined in section II were lighting, audio, and temperature can be controlled and classroom profiles can be programmed to specifically default to the appropriate classroom levels based on the student body requirements o the class.

Additionally, computers are at the forefront of Instructional media in that lesson plans can be developed and produced through systems such as Task Stream, and PowerPoint. Once produced these plans can be stored and replayed. They can also be provided to students with special needs in the form of media or paper for further study.

B. Smart Board

Smart-whiteboard technology is a relatively new and extremely versatile technology. There are several types available but all offer the ability to use non aromatic markers to write on the board with. They offer computer interfacing while allows touch-tap control fro changing to the next slide in the presentation. With the implementation of Smart Whiteboard technology, the need for dusty chalkboards, smelly markers, bulky overhead projectors, and other media resources can be reduced.

Several Smart-whiteboards can be deployed in the classroom and interlocked so that whatever appears on one can be displayed on the others. This will give all students the opportunity to see what is displayed on one of several boards in the room. FIG. I.

"Smart claims its Smart Board interactive whiteboards to be the world's leading interactive whiteboards, "combining the simplicity of a whiteboard with the power of a computer." A touch-sensitive display connects to a PC running Linux, Windows, or Mac OS, and a digital projector displays the computer's image on the screen. Teachers and students control software applications directly from the display, and notes are written in digital ink, with work saved for later reference and sharing.

Key new features in Smart Board software version 9.5 are said to include:

- a gallery search option
- annotation tools

- full drag-and-drop functionality
- pre-loaded digital content
- the Freehand Screen Capture tool
- the ability to attach and export files

The software offers multi-language support in English, Spanish, French, German, and Brazilian Portuguese.”

IV. Desks and Teachers Stations

All student and teachers desks and workstations should be equipped with capabilities that allow internet access and wireless communication including Bluetooth, to the extent that the desk is required to maintain specific applicable hardware. The use of wireless laptops for classroom use may supercede the need for hardwired hookups. Power should be distributed to each desk for computer use and ergonomic technology should be employed to ensure maximum comfort. Teacher’s stations should include any Smart-whiteboard or instructional technology interfaces required as well as those for computer controlled environmental devices such as lighting, temperature and sound.

Fig. 1. Classroom Layout

