



IMPACTS OF DESIGN ON LEARNING

Multimedia in the Classroom

By Franklin Hill, Ph.D.

Sarah Cohen, Editor

INTRODUCTION

Imagine youngsters recognizing a square, oval, and rectangle on their instructional television. Pretty simple stuff, right? *Wrong!* The students actually were viewing a rectangle, circle, and square.

The cause of the “problem” is a poorly designed learning environment.

If students can’t even differentiate a square from a rectangle or a circle from an oval, how can we expect them to learn?? And how can we deny the impact of the design of the classroom environment upon quality education?

Quality school design must be a major concern of every educator and administrator.

QUALITY VISUAL LEARNING ENVIRONMENT

It can be assumed that a quality learning environment is one that should create a positive and efficient visual connection between the learner and the information being learned. The more clearly and accurately the students see the information, the better the likelihood they will learn to their highest potential based on their individual abilities and motivations. The reverse of that would be that the less completely and accurately students see information as part of the visual learning experience, the less likely they are to be successful in the overall learning process. Thus, one could assume that when the learning environment systematically detracts from the ability of students to accurately see and interpret important visual information, the students’ ability to learn is diminished. This article will explore some of the impacts the environment can have upon students’ ability to fully and accurately see information presented.

RESEARCH METHOD

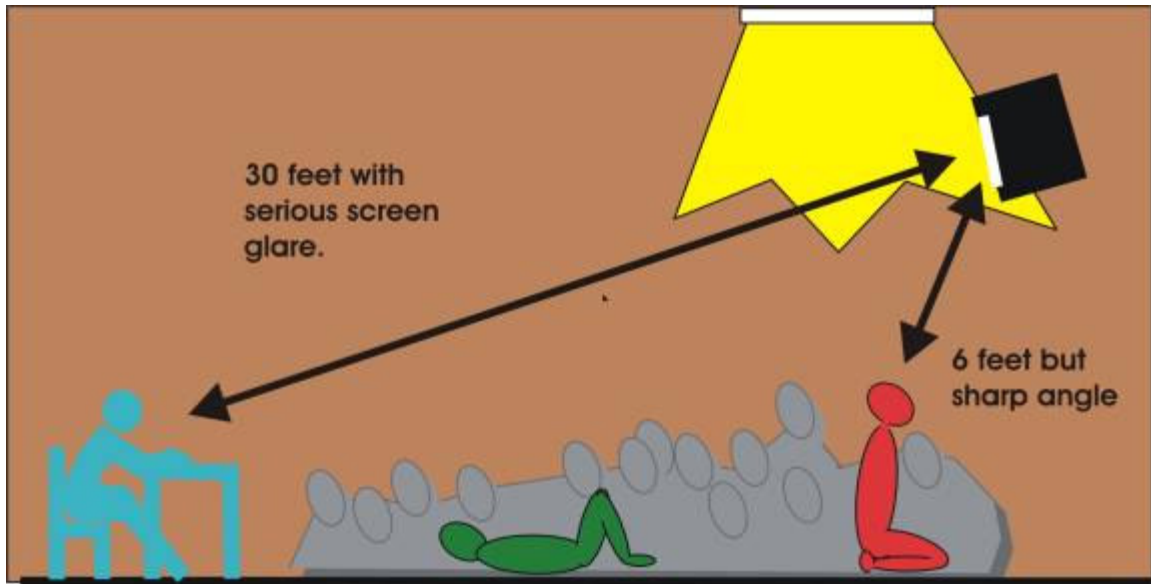
The research method for correlating the impact of environmental factors upon visual information transfer at the elementary grades must be conducted in a manner comparable to the sophistication of the students involved. Early elementary students are generally less able to document and discuss learning and instructional methods. They are even less able to effectively understand the impact of the learning environment upon the quality and success of their personal learning experience. Through a series of simple tests, however, it appears that there is reason to question the configuration of instructional TVs, computers, and other media in elementary classrooms.

Instructional Television: A common feature of most elementary school classrooms is the ceiling- or wall-mounted TV set. Commonly, it is placed in the corner by an adjacent exterior window. It is usually within 3-4 inches of the ceiling; thus, in close proximity to overhead lighting. The photo to the right is typical in its relationship and orientation to the learner.



The graphic below shows how some students are substantially below the TV and looking up, while others may be at a greater distance from the screen.





When tested,[\[1\]](#) the findings appeared to suggest that improperly mounted instructional television may diminish a student's ability to recognize the most basic shapes accurately. When a brief display of three common shapes (square, circle, rectangle) was presented to students, the interpretation of the information varied based on the angle of incidence of the observer, the distance from the TV, and the impact of overhead lighting that causes screen glare. The simple figures below, when seen straight on, are obvious.

Head-on View



Square



Circle



Rectangle

As the angle of incidence changes between the observer and the screen, the "apparent" shapes of the objects appear to change in relation to the observer. The steeper the angle of incidence, the more distorted the objects can become. As the angle gets most severe (15° or less), the objects can actually "look" like a rectangle, an oval, and a square.

View from Below



Rectangle



Oval



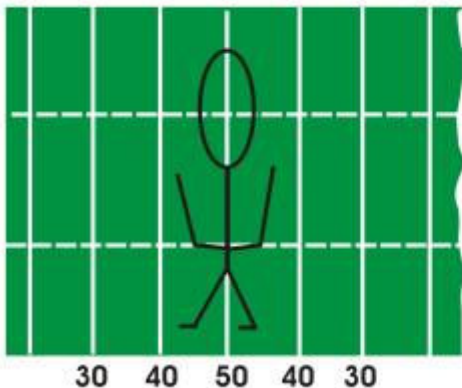
Square

COLLEGE HALFTIME SHOW

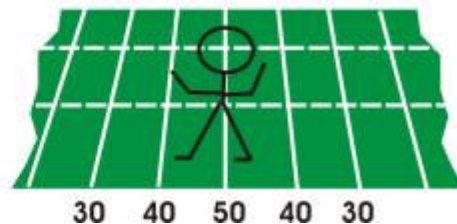
If you have ever attended a college football game and watched the band during halftime, you have seen formations composed by the marching band members. What the observer may not know is that the arrangement of band members on the field is substantially distorted to compensate positively for the angle of incidence from the observer to the field.

The graphic below on the left is a bird's-eye view of the stick man. The graphic to the right shows the stick man as viewed from the stands. The reverse of this concept helps us understand that the angle of incidence distortion may occur from the wall-mounted instructional television to the student sitting below.

View from Top



View from Bleachers



In addition to the basic initial research identified above, the logic of the argument is obvious. The angle of incidence, glare, and distance are factors in accurately interpreting the information disseminated from an instructional television. Yet, we have used wall- or ceiling-mounted TV units for decades.

DISTANCE AND ANGLE FACTORS

Never would anybody invite 20 guests to their home for the Super Bowl and ask some to sit **35 feet** away from the screen. Our schools do. Even sports bars have a better angle of view than many schools.

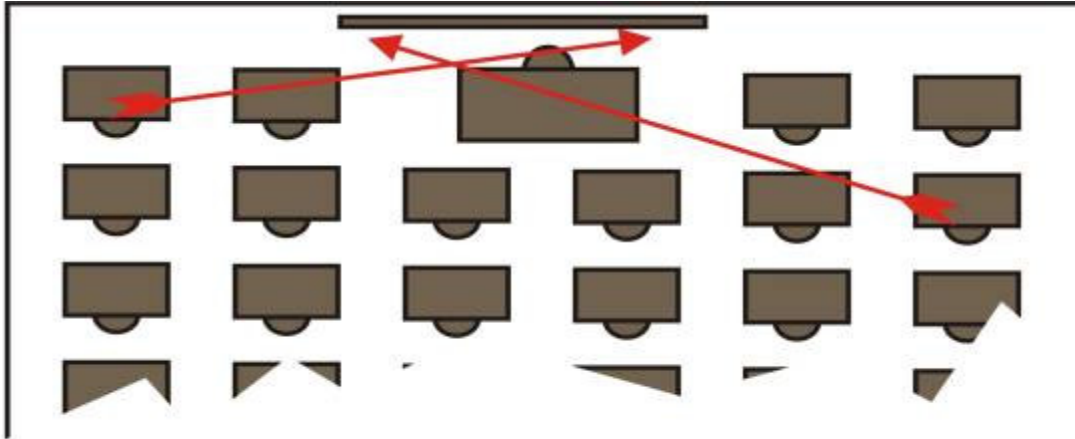
Distance: Some students are over 40 feet from a wall-mounted TV.



Angle of Incidence: The angle of incidence can equally impact poorly placed and lighted large-screen projection video or overhead projector use in the classroom.



The graphic below shows a horizontal interpretation of the angle of incidence problem to the screen, say in a science lab. The same distortion in form occurs.



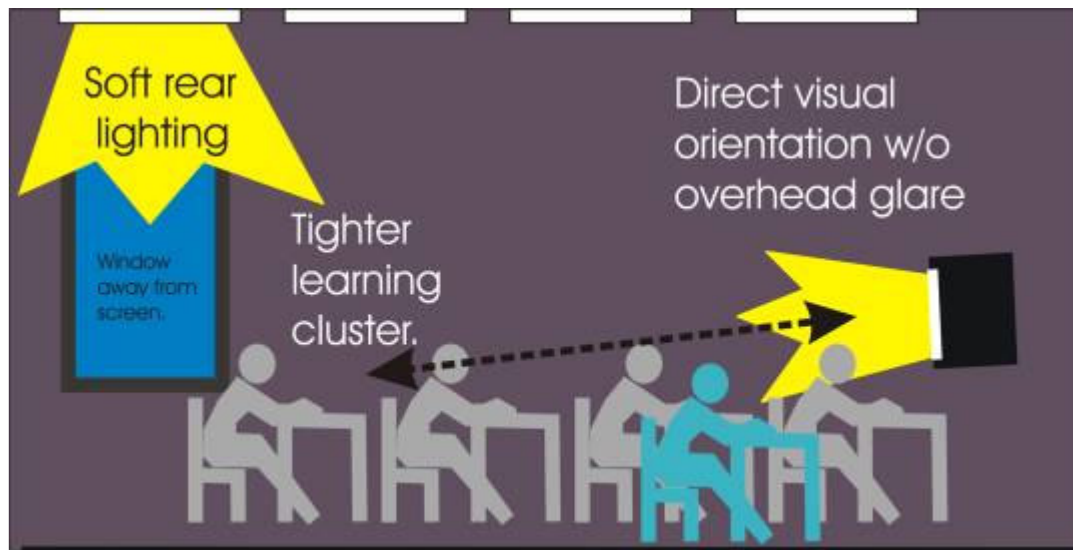
Computer-Based Training: One might assume that computer-based training is not subject to the environmental impact characteristics of instructional television or large-screen projection video/overhead projector use. The photograph below to the left, however, shows a compounding environmental problem when a computer keyboard is inlaid below a glass-top workstation. Whereas the angle of incidence and proximity to the screen may be thought to be acceptable for the student, the angle of incidence to the overhead lighting and resultant glare become the impeding environmental factors for accurate visual learning. So, when it comes time to differentiate between the snail and the snake, difficulties in interpretation can arise.



THE SOLUTION—Low-Cost/No-Cost

There are a variety of suggested low-cost/no-cost solutions to maximize the visual relationship between the learner and the emerging variety of instructional technologies utilized in the general classroom. They include:

- Utilize movable cart-mounted or cabinet-mounted instructional televisions to lower the TV, improving the angle of incidence, and reducing the distance to the observer.
- Take time to adjust lighting (if flexible lighting is provided) to reduce screen glare (walk the room to “see” what students see).
- Orient the TV away from other distractions in the classroom or outside windows.
- Consider using the instructional television in smaller groups (5-15) rather than solely for large-group (30 students) instruction.
- Educate students on the impact of visual learning and allow them to participate in positioning themselves in the best manner possible.
- For the earlier elementary grades, a much lower instructional television cart may be appropriate. See the graphic that follows. Teacher guidance to align the environment with learning becomes essential, as this age group is less likely to have the skills to do it themselves.



Common Sense Stuff

Further Research: The analysis portrayed in this article is certainly preliminary although logical and defensible. Additional research is strongly encouraged to include varied classroom configurations, increased statistical samples, and adjustments for age group/cultural mix, etc.

IN CLOSING

In some of the instances above, students missed the basic understanding of visual data presented by as much as 40% or more. It seems incredibly logical that seeing only half of the necessary information does not fulfill the expectations of a quality learning experience and equal educational opportunity. If we deleted every other word from the text, every other paragraph from a chapter, or if we allowed students to only see half of a movie, one would obviously conclude that would be educationally inappropriate. Thus,

one cannot help but conclude that to see and understand visual materials presented in the classroom are part and parcel of the quality learning experience.

Teachers are encouraged to write Franklin Hill with photographs and their own research as it applies to confirming or modifying the information contained in this article. Information forms and questionnaires are available at www.franklinhill.com or e-mail us at frank@franklinhill.com. Toll Free at 1-888-4FHAplan

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[1] Preliminary testing only. Not intended to provide statistical analysis.

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