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On the Use of Displays in the Classroom: An Examination of Student Interaction and Learning

F. Chris Curran

ABSTRACT

The literature in educational research contains a dearth of studies on the effectiveness of visual wall displays. This paper reports two experiments performed in order to assess the level of interaction between students and visual wall displays as well as the level of student learning that takes place as a result of visual wall displays. In the first experiment, a series of messages were hidden in a bulletin board and the frequency of students finding these messages was recorded. In the second experiment, students were tested on material that had only been presented in the visual wall display medium. Student learning due to wall displays was assessed along the lines of gender and academic ability. In the case of the first experiment, student interaction with the display was found to be minimal. In the second experiment, 34% of students could successfully recall information presented in the display. Females were significantly better at recalling the information than males, and academically gifted students were significantly better at recalling the information than regular students. It was concluded that larger wall displays are preferable to smaller ones and that wall displays should not be the sole medium of presenting a topic.

INTRODUCTION

Visual wall displays such as bulletin boards have long been a mainstay in both elementary and secondary classrooms. Such visual wall displays are often used as a means of posting enrichment material, review material, and completed student work. While such displays do provide a visually enriching sight upon entering the classroom, the creation and revision of these displays also requires a significant amount of time and effort on the part of the teacher. By examining the interaction between students and visual wall displays, this study attempted to determine whether or not teachers are justified

in committing extended time and effort to the creation of visual wall displays such as bulletin boards.

While numerous resources that offer advice and direction in the design of visual wall displays are available, very few studies have been performed to examine how students interact with such displays or how displays contribute to student learning (Walls as Learning Centers, 1999; Kelley, 1961). Many of the resources that do report on the success or failure of visual wall displays are limited to unsubstantiated or anecdotal claims (Johnson, 1994). As of 1989, only two studies had been performed on the effectiveness of visual wall displays, and literature searches yielded a dearth of substantial research on the subject since that point in time (Dungey, 1989).

In the first of these two studies, Collingford examined student interaction and learning from bulletin boards (Dungey, 1989; Collingford, 1978) In one experiment, Collingford placed a secret message on a bulletin board in twenty classrooms. After three weeks, only one student could successfully repeat the message, thereby leading Collingford to conclude that merely placing material on the wall does not result in student learning. In a second experiment, Collingford placed a sample of student work with a fictitious name on a bulletin board. As before, only one student gave evidence of interacting with the bulletin board by commenting on the anomaly.

In the second of these two studies, Creekmore compared the learning outcomes of students in a classroom with visual wall displays and a classroom without visual wall displays (Dungey, 1989; Creekmore, 1987). Creekmore had two teachers teach a series of ten lessons using the same lesson plan and alternating between the use of a classroom with visual wall displays and one without. Creekmore determined that the use of visual wall displays increased student learning outcomes in four out of the five lessons.

The experiments reported in this paper attempt to build on the work of Collingford and Creekmore by further examining whether or not students interact with visual wall displays and the effectiveness of visual wall displays for student learning.

This paper reports two experiments which were undertaken to examine student interaction and learning outcomes as related to visual wall displays. The first experiment, Experiment 1, attempted to determine the extent to which students interacted with a visual wall display. The second experiment, Experiment 2, attempted to determine the extent to which student learning took place as a result of interacting with a visual wall display. Student interaction with visual wall displays was expected to be minimal. Student learning from visual wall displays was also hypothesized to be minimal. Both genders were expected to demonstrate similar interaction and learning outcomes.

METHODS

Experiments 1 and 2 were both conducted in a seventh grade science classroom located in a rural Southern town. In Experiment 1, a new bulletin board was introduced into the classroom. The bulletin board was prominently located on the side wall facing the classroom's entrance. The bulletin board's theme was land biomes, a unit recently completed in the course. The physical board consisted of a United States map bordered by blocks of text highlighting key points of the each of the land biomes found in the United States. Each block of text consisted of a title, approximately one paragraph of text in 16pt font, and a picture of the biome. A total of five land biomes were featured on the display.

Within the text of three out of the five biomes, a message unrelated to the topic of the display was embedded. The message read as follows: "If you are reading this, please write down your name and the letters 'GB' on a slip of paper. Hand this in to Mr. ------. Do not tell anyone else about this or you will lose your reward!" The bulletin board was left on display for a total of two weeks. During this time, the teacher recorded the date at which a student reported finding the secret message.

In Experiment 2, the teacher administered a test question which tested student knowledge of information presented solely through a visual wall display. A display measuring approximately one

foot high by eight feet long was hung above the front white board in the classroom. The display contained the following phrase: "Attitude is a little thing that makes a big difference". The display was easily readable from any position in the classroom. The display was present in the classroom for approximately fourteen weeks.

At the end of this period, an additional question was included on a regularly scheduled test. The question asked students to complete the following phrase "Attitude is a little thing ___ ___ ___ ___ ___." The students were informed that each blank corresponded to one word. Additionally, the students were informed that the question would serve as a bonus question and would not count against their grade if answered incorrectly. Responses were considered correct if they contained at least two of the three following words: "makes", "big", and "difference".

The test question was administered to a total of forty-eight students in a series of three classes. One of the three classes was an accelerated version of the course containing academically gifted students. The gender breakdown consisted of the three classes with twenty males and twenty-eight females. The results were analyzed along the lines of class type and gender.

RESULTS

In Experiment 1, no students reported finding the hidden messages in the two week period during which the messages were posted.

In Experiment 2, it was found that 35% of students were able to correctly complete the sentence included on the test. Table 1 contains the response breakdown of Experiment 2.

Table 1: Experiment 2 Response Breakdown

Number of Students	Number of Correct Answers	Number of Incorrect Answers	Percent of Students with Correct Answer (%)
48	17	31	35

When the results of Experiment 2 were placed in the context of class type, namely regular or

academically gifted, it was found that students in the gifted class were nearly six times more likely to answer the question correctly. In the first regular class, Regular 1, none of the students answered the question correctly, whereas in the second regular class, Regular 2, 27% of students answered the question correctly. Combining both regular classes yielded a 13% correct answer percentage in comparison to the gifted class' 76% correct answer percentage.

Table 2: Experiment 2 Response Breakdown by Class Type

Class Type	Number of Students	Number of Correct Answers	Number of Incorrect Answers	Percent of Students with Correct Answer (%)
Regular 1	16	0	16	0
Regular 2	15	4	11	27
Combined Regular	31	4	27	13
Gifted	17	13	4	76

When the results of Experiment 2 were placed in the context of gender, it was found that girls were significantly more likely to correctly answer the question presented on the test. Results of Experiment 2 by gender are shown in Table 3.

Table 3: Experiment 2 Response Breakdown by Gender

Gender	Number of Students	Number of Correct Answers	Number of Incorrect Answers	Percent of Students with Correct Answer (%)
Male	20	1	19	5
Female	28	16	10	57

DISCUSSION

The results of Experiment 1 suggested that the level of interaction between middle school students and visual wall displays was at best minimal. It was concluded that in the absence of teacher initiated interaction with the display, students were highly unlikely to partake in even basic observation of the display. The fact that students did not interact with the display could in part be due to the small

font size used. Given that the rules of the classroom under study did not allow large amounts of time for students to move freely about the room, the lack of student interaction may have been in part due to a lack of opportunity to interact with the display. This might suggest that larger displays which can be readily viewed from students' seats may be more suitable for engaging students in interaction with displays.

Experiment 2 provided evidence of some interaction between students and visual wall displays insofar as 35% of students were able to correctly complete the phrase displayed. Given that this percentage only represented the number of students who could successfully recall the information from the display, the percentage of students interacting with the display was likely somewhat higher. The fact that Experiment 1 provided little evidence for student interaction with the visual wall display while Experiment 2 provided significant evidence for such interaction suggested that the difference between the size of the wall display was important for engaging students with the display. The larger display used in Experiment 2 was likely interacted with more because it could be read from greater distances than the display used in Experiment 1. A further possibility was that the difference in time posted in the classroom between the two displays contributed to the difference in student interaction with the displays. The fact that many students could recall the information from the visual wall display in Experiment 2 suggested that the wall display did facilitate student learning of the material presented.

As expected, Experiment 2 provided evidence that students in a gifted class were more likely to engage in learning through a visual wall display. The results suggested that students in a regular class may require more effort on the part of the teacher to engage the students with the display and facilitate student learning. In contrast, the posting of information in the form of visual wall displays in a class of gifted students may be a viable source of student learning without the need for the teacher to actively interact with the display.

When analyzed along the lines of gender, Experiment 2 suggested that female students were

significantly more likely to learn from a visual wall display. This result suggests that information presented in the form of a visual wall display may need to be reinforced in other mediums for the majority of male students to learn the material.

One possible source of error in Experiment 2 was the possibility of student academic dishonesty during the taking of the test. If students copied off of other students, the results of the experiment would be falsely high. Additionally, the possibility of students from one period talking to students from another period prior to those students taking the test was a further source of error.

Overall, it was concluded that visual wall displays are a useful medium for presenting material so long as the displays are readily readable from a distance. The displays should be used as a supplement rather than the sole means of presenting some item of information. In the future, further experiments exploring the effects of visual wall displays should be undertaken. It would be informative to repeat the experiments reported in this paper on a larger scale, with a different student demographic, and with a different age group.

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The Art of Giving and Taking Good Notes

By: Rachel Heinz

My students, like most, loathe the note taking process. Although I try to make my lectures entertaining and interactive, the task of taking good notes can be daunting. It is hard for students to pick out key points, and it is even harder for them to write quickly and accurately. I sympathize with their frustrations because I know that I, a graduate student, have not yet perfected this skill. It is from my experiences in giving notes that I have come up with a solution that works in my classroom, and I think it can be used be used in any science classroom.

Being a naïve first year teacher, I did not think twice about giving my students a whole mess of information in a short period of time, expecting them to make connections, synthesizing the information. I quickly learned that my assumptions about students and their abilities left both my students and me frustrated. My first step in solving this major problem was small but made all the difference in the world. I simplified. I took big concepts and broke them down into mini-lessons, picking out only key words and phrases for students to copy in their notes. From these mini-lessons, students were able to answer my questions and seemed to grasp the concepts with greater certainty. However, they still could not make connections between mini-lessons.

My second step in solving this problem was to create guided notes. Guided notes allowed me to involve my students in the lesson, while moving through the material at a quicker pace. This left room for more independent practice and group work. Students were able to feel involved without feeling overwhelmed. My incentive for completing the guided notes was to collect them and grade them. However, this quickly became too

much work for me, and I often had trouble grading all of the guided notes each evening. Now, I leave it up to the individual student whether or not he or she wants to complete the guided notes. My incentive for the notes and for keeping a binder in my Introduction to Biology course is that students are able to use their guided notes on their exams. When I create exams, I make sure that a good portion of the exams are straight from the notes. It only took one test for students to realize that the guided notes are key to their successes in my classroom.

The guided notes process in my room is fairly self-regulating, allowing me to be hands-off. My students are learning not only to keep a binder (on their own), but how to take good organized notes. This is a skill that is extremely important and extremely hard to master. I would recommend using guided notes in any science class because there is so much information in the science curriculum. It can be overwhelming. By using the notes, the instructor is simplifying the learning process and helping students help themselves.

Teaching Science is Jumping Through Hoops

During my first semester of teaching high school science, I have learned a lot. At times it has seemed as though I were jumping through hoops. Day in and day I out teaching high school many things were experienced. From start until now, my teaching methods have changed drastically.

It all began back in August on a warm morning full of freshly sharpened pencils and the smell of perfume and cologne from the numerous 148 plus students I taught on day one. Over the summer, summer school was held each morning to help prepare me for the year to come. By the second week of June, I was well into my first week of actually being back in a classroom with a teacher who was not a doctor, not teaching me. It was a very different experience seeing how things operated back on the middle school level. Even with a slight step up to the high school level, things were still on a much lower level than I had become accustomed to in the past four years.

Beginning science teachers should have some type of tangible guide to read and follow. Classroom management should be included, but in this guide, emphasis should be directed towards science on the middle to high school level. As I stepped into my very own classroom for the classroom, I did know exactly what I was going to do. That day, I knew what I was to do a bit too well. Teaching science to high school students, for the first time, is nothing like what is experienced in college. Fresh out of college, with proper training, I still held on to some of the teaching styles of my professors I saw each day in college. At this school, a secondary school, there were neither college freshmen nor graduate students to be found. The students in the desks in front of me were merely children still growing up and not college students preparing for lecture on Monday, Wednesday or Friday.

Even with the information gathered from the students, none of them cared to remind me that I was far from the esteemed halls of Millsaps College and the University of Mississippi. That being so, the students expected to see worksheets, along with what was being taught to them each day. Sure, I knew what a worksheet was, but where on earth do they come from and when is the time to grade the smaller lab safety and classroom rules quizzes?

Before arriving at my school, no one told me about acquiring worksheets or any other class activities. Having finally arrived, there were no textbook supplementary materials to be found. The only question left for me was, other than an out-dated textbook, where am I to pull materials from and gather good, up-to-date material?

Thankfully I had amazing professors back in college who knew about my graduate plans. I was given a new, yet to be released college textbook, the professor's review edition. That along with other varying items has done wonders for my instruction.

Instruction has come along way, for me. My humble beginning as a new teacher who taught similar to the ones who have taught him for past four years has ended. Before the good came the bad and possibly even ugly. The dispositions of the students I teach still seem to be positive. Students are interested in science and lab, especially.

Lab is the best tool a science teacher can use. In my very brief teaching career I have come to find out that the lab is a powerful tool. The students love lab so much that they would rather go to the lab to have class rather than have class in our classroom. After their first lab experience, they were hooked. There are not enough lab opportunities available since I share a lab with another teacher, but when we can get in there, it is the best!

At one point, the students asked, on consecutive days, "when are we going back to the lab?" Being the teacher I am, the students were taken to the lab before the week ended. They thoroughly enjoyed every moment. The small activity the students did allowed for us to take the scenic route to the lab, outside...that helped, too. Now everyone wants to have class outside. That very same day, students in my other classes were begging to be allowed to go outside, too. I had no idea what I started.

On another note, as I have been taught, teaching with inquiry at the forefront may cause others to be skeptical and even somewhat critical of your teaching methods. Teaching in itself is no easy task. Teaching science is not any simpler than any other subject. Being a first year teacher with everyone putting in their input on what to do and how to do it, things get hectic. Surely every person in America will not see everything the same way, but there ought to be some commonalities found somewhere. A teacher is never a finished product. Trying things and seeing what does not work is one way of doing it. With the help of some type of manual or book of things to do each day, every week or from time-to-time, in science would be very helpful.

What was not helpful to the beginning science teachers is having people who do not know science offer assistance as to how to teach science. There were a lot of very helpful comments and worthwhile givers of advice but some of which simply caused a search for one's own worth...then came the questions, is this what I want to do? Is it worth it? Why?

After all came class in Oxford. The motivating words from methods class gave inspiration. I learned many, many things in the Advanced Methods in Science Teaching Class. Labs, case studies, Science News and most of all the sharing of lessons. Those alone,

gave me the extra boost needed to get over the confusion of what to teach, how to teach it and what actually works in my classroom.

Jumping through hoops is not fun. Now that I know what works and how to properly instruct, in a way conducive to involved science learning in my classroom, I can step through the hoop when need be; other than that,science in my classroom will continue to be fun and full of interesting learning, overflowing with inquiring. Students who take my class and perform well will be scientifically literate and have an excellent foundation set for the furthering of their science learning.

Schuyler Huff

Learning the Language of Holly Springs Mississippi

Moving from Michigan to Mali I expected to have some communication lost in translation. But, moving from Michigan to Mississippi I never expected to have trouble communicating with my students and neighbors.

My first day teaching at Holly Springs Junior High School my biggest obstacle was understanding the students. When surveying the students on what they already know, I could barely understand the vocabulary words they were trying to express. When asking students their names, I could barely understand what they were saying. I was embarrassed at the number of times I asked students to say their name and still pronounced it incorrectly. I thought I was saved when assigning books and asking students to spell their names one by one, but students would spell so quickly and with such strong accents, I still was lost!

For the first two weeks of school I left extremely humbled and a little humiliated. Here I am, a new teacher at my school with no reputation in the community, and my students think I am an idiot because I can't even understand "English." I feared I was losing respect rapidly among my students. And, most likely, I was.

I was incredibly frustrated that first two weeks. After over $100,000 spent for an undergraduate education at a reputable college, I was losing respect for seeming unable to speak properly. Although I was the only person in the room speaking "proper" English, I seemed stupid because I didn't hear "human" when my students said "hurmen" or

understand that they were asking a question when saying, "I can sharpen this, Ms. Murrca."

I am confounded by Holly Springs and its linguistic isolation from the rest of America. Although my students are constantly bombarded with mainstream media voices and accents, which I emulate, I am just as incomprehensible to them as they are to me. I have learned that the layers of educational inequality have more levels than I imagined. I have learned to teach and communicate in another language: the language of northern Mississippi and the language of Holly Springs. The only language my students have a glimmer of a chance to learn and understand as new information will enrich their lives.

Teaching what you don't know.
By: Sara Ruddock-Harris

Sounds like an abomination—"teaching what you don't know." However, standing in front of a classroom of 30-or-more students as an "authority" in a course entitled "Biology" lends itself to this abomination. Studying the Mississippi state framework for my subject (biology II), I was flabbergasted by the notion that the state thought the in a lifetime, let alone a semester, I could cover an objective as broad and as vague as: "Relate gene expression (e.g., replication, transcription, translation) to protein structure and function. (DOK 2)" (MS Framework 3c). My first response to such an objective was, "people spend lifetimes studying just transcription, and the state expects me to teach this to a group of teenagers in the space of a semester and still wants me to cover other topics." Little did I know that this was the smallest obstacle I would overcome in attempting to construct a curriculum based on the state framework.

My fear in teaching gene expression was based on my broad knowledge base in the material; I was afraid that I would have *too much* material for my students to digest and process in the allotted time. Pruning and prioritizing solved that problem. However, my unfounded fear in teaching topics like transcription paled in comparison to the sheer horror I experienced after I realized that the state expected *me* to teach nine broadly based objectives on *natural selection.* I don't know the first thing about NATURAL SELECTION! There's Darwin then... I can talk day-and-night about transcription, translation, and replication; but natural selection—let's just say my content knowledge has room for improvement. What am

I going to do?

First, save it for last! I am definitely not advocating this approach, but I waited until the very last minute to teach natural selection. I hoped above hope that we would not have time for it. The state does not test my course, so what is the harm in skipping a competency? I plowed through every other competency. I did not look at the state framework on natural selection until the last month of the semester. It was a now-or-never moment. Teaching on a four-by-four block, time goes quickly in a semester long course. I had to decide NOW if I was going to cover natural selection. I decided to take to the challenge.

Second, open the textbook. I barely use my course textbook, because—it's terrible! My students struggle reading a two-page article in the New York Times. The majority of them read significantly below grade level.[1] Taking this into consideration, why would my school district select a book written on a college reading level? More than just the reading level, the book's content is convoluted and boring. Thus far in the semester, I have only used the textbook once in class. I usually consult the state framework to get an idea of what my students are expected to learn, read the chapter(s) in the assigned textbook on the topic, study other biology textbooks,[2] search the Internet for more resources on the topic, and lean heavily on my previous knowledge. After this sometimes long and arduous process, I splice together these resources to make my lesson plans and construct my own

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[1] During a writing assessment that asked the students to read and relate a New York Times article on professional sports, genetics, and drug to the topic covered in the course, one of my students asked, "Can't you just read it to us?"

[2] I have acquired textbooks from my high school and college biology classes, as well as, textbooks from professional development and lying around the school.

handouts and guided notes sheets on the topic. However, this time my content background, which is usually my strongest resource, is the weakest link. So, I turned to the textbook. Although the content was dense and hard to comprehend; luckily, my textbook had great figures, tables, and images on Darwin and natural selection for my use.

Third, scour the Internet. In my adventure in teaching, I have found some immensely beneficial Internet resources for lesson plans, laboratory exercises, and handouts.[3] However, my never-fail resources failed me this time. I could not find a resource that could supplement my lack of subject knowledge. Then, a miracle—I found a great National Geographic's special about Darwin and natural selection on YouTube conveniently broken up into 10-minute episodes.[4] The special covered background on Darwin, information on his voyage on the H.M.S. Beagle, Darwin's specimens, fossil evidence, homologous structures, population change, evolutionary trends, contributing scientists (such as Lyell and Malthus), and more! That is when it all came together. I found a web hint that allowed me to download YouTube clips on my computer, and, therefore, circumvent my school's block on YouTube.[5]

Fourth, pull it together. I watched the National Geographic's special. I read the chapters in the text. I dissected each subsection on natural selection covered in the textbook, parsing out the key terms and concepts. I watched the special over-and-over again until I picked it clean of concept connection questions that overlapped

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[3] Look at Biologycorner.com, specifically http://www.biologycorner.com/worksheets.html.
[4] Darwin's Secret Notebooks
[5] Mac OS X Hints: http://www.macosxhints.com/article.php?story=20070420014456930

with the subsections in the textbook. Subsequently, I crafted guided handout sheets with critical diagrams accompanied by questions on the clips. Now, I had a plan! I taught a subsection each day followed by the accompanying clip. I discovered a hands-on group activity that covered an additional section on natural selection. This ensemble of resources helped differentiate instruction based on learning styles, covering auditory (lecture), visual (clips), and kinesthetic (activity) learners. In addition, each subsection had built in remediation because the students heard the same or similar information covered by the clips, the activity, and me.

Finally, teach! The first Monday of my new unit, I jumped in headfirst. I knew I planned as thoroughly as possible. I put the bell work up, wrote out the daily objective, scribbled down the day's schedule, and began. Students poured in and the day went like every other day. Success! Hearing myself talk during the lesson and reflecting on the day, I was even convinced that I knew what I was talking about because miraculously I did! Did it all go exactly as planned? No, but it never does. Did my students learn something they did not know before? Yes.

I recognized most of the angst that rose in my throat about teaching natural selection from similar insecurities that I felt when I had to teach my first lesson this summer. As a new teacher, fresh from undergraduate studies, I was emerging from my role as a student, a novice to the daunting position as a teacher, an authority. As an undergrad, yes, I was expected to have prior knowledge on the subject matter, but my place in the classroom was based on the fact that I did not know everything about the subject. I assumed a teacher's sole purpose in the classroom is to know everything. However, I have altered this standpoint drastically in the few months

that I have been teaching.

Currently, I understand that the learning never stops. There will always be a question that a student poses that stumps me or a subject I do not yet fully understand. My role in the classroom is to be a learning facilitator. The onus is not on me to know everything and simply disclose my knowledge, but to work with my students to play with and mold the subject matter to best suit them. With this new outlook in mind, I now realize that I have to be my first student. I have to re-teach/teach topics I am familiar with and topics I am less comfortable with to myself, so I can try to anticipate my students' needs and questions.

Although preparing to teach natural selection was my biggest struggle, teaching natural selection was my biggest success. My discomfort with the subject matter forced me to find resources that captivated me and therefore were more likely to captivate my students. I wrote plans with more details because I knew I had very little background to fall back on. All in all, I think natural selection was my best unit. If I could change anything about the planning process, I would have made sure to consult with other teachers in my department. While I am the only one currently teaching my subject, some collaboration with more seasoned teachers in the department might have provided an additional resource. I think some of my hesitation in asking my coworkers for help stemmed from the fear I previously discussed. However, this is just another step in my learning process.