

Society Demands Educators Embrace Graphic Imagery

Dr. Jerry P. Galloway
Georgia Southern University

We are the television generation. Our children will know nothing that does not include the fast-paced, quickly changing, color-filled world of television. Virtually every aspect of our lives is filled with colorized imagery. Even our burger wrappers aren't plain white paper. Company logos decorate every part of every product. Every commercial, every announcement, publication and product demands at least a colorized, collage of imagery and graphics designed to catch our eye and attract our immediate attention.

Virtually any screen presentation is now considered passé and poorly designed if lacking icons, graphics or other visual imagery. Icons can be used to represent information, concepts and ideas (Borg & Staufenbiel, 1992) and linkages (hotspots) to other information sites. Graphic symbols may only decorate screen displays yet can be used to convey or identify information, summaries or overviews, supplying instructions, and indicate position, size, representation, and more (Pettersson, 1993). This study examines how preservice teachers use and relate to graphics in web page design.

Graphics are among numerous important components of screen displays (Schaefermeyer, 1990) from text style to scrolling effects and graphic line design (Aspillaga, 1992). Overall screen design and graphic appearance are also important variables in effective communication and user-interface for hypermedia of all types including web page design (Descy, 1995; Van Brakel, et al., 1995). Research has shown that computer screen displays can affect learning (Costello, 1995; Hathaway, 1984) and retention (Aspillaga, 1991). Even the early years of computer technology in education called for software that would more fully utilize the visual versatility of the medium. Graphics and graphic imagery do affect the learner's understanding of material and provide additional meaning to text displays. But, the role that graphic symbols play in screen design should also account for the needs of specific audiences (Emery, 1993).

So, it should be no surprise if students are easily bored with black and white textbooks or perhaps ignore lecturing instructors. Perhaps if the teacher was Jessica Rabbit or Tron, a mix of animation and real life, then students might pay more attention or be more motivated. Traditional books are already being replaced by electronic media. For example, students at Empire High School in Vail, Arizona, are giving up traditional textbooks completely to be replaced by electronic media. "School officials believe the electronic materials will get students more engaged in learning" (Wired News, 2005). Electronic media has long been packaged with traditional textbooks (Turner & Land, 1988; Roblyer, 1999), and now, so-called electronic textbooks serve as modern alternatives to print media (Desberg & Fisher, 1998; Galloway, 2003).

The Internet and teachers' web pages have taken on a significant role in education but their style and content vary widely. It seems common to want to include clip art and other graphic imagery to enhance the appearance of their web pages. Literally millions of web sites provide clip art and graphics for use on web sites (Yahoo Search, 2005). As teachers learn to build web sites to support their own teaching, they too may seek to include clip art and enhance their web pages with graphic imagery. And, there are more than enough resources on the web to not only support, but to encourage graphic development in web pages, (Sharp and Sharp, 1997, Yahoo Search, 2005).

Structured or systematic classifications of the communication, information or effectiveness of graphics are difficult because judgments are likely considered subjective or ambiguous. Tiemens (1993) provides seven categories to account for visual imagery: (a) duration, (b) transition, (c) framing, (d) view angle, (e) orientation, (f) motion, and (g) content. While this classification system might be useful, Tiemens calls for the need to organize or classify the use and application of graphics and visual imagery to better analyze their value. Communication value, the conveyance of ideas through visual

representations, is difficult to analyze and catalog without rules and codes for the application of graphic imagery. Misanchuk and Schwier (1995) further attest to the problem of lacking protocols for guiding the design of graphics and screen imagery for instructional purposes.

This author proposed earlier a six-level hierarchy for classifying the role of graphics in communication (Galloway, 2000) and suggested a value system for evaluating graphic imagery. This model has been further refined for this study as outline below.

A Model of Graphics Usage

The earlier model provided 6 discrete levels:

- (a) decoration with basic, abstract geometric shapes,
- (b) decoration with simple clip art and basic images,
- (c) decoration with more sophisticated or commercial clip art,
- (d) thematic or topic -supporting decoration,
- (e) graphics that convey ideas, and
- (f) more sophisticated communication of abstract concepts and relationships.

This model is potentially awkward because all graphics might be considered decoration in some sense and, sometimes, commercially designed imagery is no better than drawing your own.

The modified model still has 6 categories or levels but breaks graphics down into three common roles at two levels each, as shown in Table 1. The 3 roles are still considered hierarchical representing higher forms of communication.

Table 1.
6 levels of graphic use representing higher forms of communication.

Design/Layout	Level 1. <i>Basic Shapes</i>	Level 2. <i>Advanced Shapes</i>
Decorative	Level 3. <i>General/Random</i>	Level 4. <i>Thematic</i>
Representational	Level 5. <i>Simple Concepts</i>	Level 6. <i>Relationships/Analogies</i>

Level 1 is the lowest form of graphics usage – in terms of communication value – and generally includes basic, abstract geometric shapes (boxes, lines, circles, arrows, etc.) used mainly to separate or delimit screen areas, to create borders, separate text, and perhaps provide some color. These are general shapes and may decorate screen appearance or focus attention on other screen components. While very basic in design, such imagery may still be very important in setting up screen layout.

Level 2 is still a matter of design and layout but includes more sophisticated imagery. Graphics are more likely to be commercially designed for the role they play. These may be clip art images such as a notebook, window or stage, courtyard or patio, but still used to delimit screen areas, provide borders or containers, focus on screen content, etc.

Level 3 however is more decorative. Shapes and images, drawn or commercial might be placed generally or randomly around the screen. A smiley face, stick figure, a star or the sun, etc., literally decorate but serve no specific communication purpose.

Level 4 is still decorative but supports or creates a theme or focuses attention on a particular idea. For example, an apple or school house for teachers, a car or stop light for drivers, a compass or sextant for explorers, etc., provide a thematic decoration.

Level 5 makes a significant advancement in communication where clip art and graphic imagery convey and represent ideas. They may instruct or be referenced in instruction. The images themselves are not mere decoration and are intended as the focus of the display. For example, triangles for instruction on geometry, a clock for telling time, component parts for constructing machines, all serve to convey actual ideas in the web page's message.

Level 6 is considered the highest level of representation where imagery conveys specific, complex ideas and concepts important in the communication. Such application might convey conceptual relationships in the imagery itself but more sophisticated and complex than level 5. For example, morphing an image of a rotating carousel into a spinning earth used to illustrate planetary rotation, can all be done without the need for text. Although animation or action is incidental to the point, here the graphic imagery itself serves to convey the complete idea.

Of course, having a classification system doesn't ensure any reliability in perception for evaluating graphics usage. After observing teachers' use of graphics on web pages across a number of years, the author noted the almost exclusive use of simplistic and ornamental graphics that contributed little if anything beyond mere decoration. It was hypothesized that students are not aware of the communication value that graphics can have or perhaps students are biased in judging their own web page creations. To examine this further, the focus of this study addresses two general questions: (a) how, in terms of this classification system, do preservice teachers utilize graphics in their web pages, and (b) what are their perceptions of their own graphics usage relative to the model.

Methodology

A group of preservice teachers (n=41) were selected from a required educational computing course because they were typical of students previously observed. A mix of male (n=7) and female (n=34) beginners seeking admission to the teacher education program, all were required to prepare and post online a web page that was motivational, eye-catching and consisting of both graphic imagery and text. The specific proportions of each and the role of the various components were left entirely to the individual student. The design and layout were also left up to the individual.

The students' web pages were evaluated for the role and level of graphics usage according to the model. Because web page design could vary so widely and every page is unique in at least some way, graphic imagery was targeted in 7 different ways:

- (a) Judge the overall use of graphic imagery – the page as a whole.
- (b) Identify and judge the highest-rated graphic on the page.
- (c) Identify and judge the lowest-rated graphic image on the page.
- (d) Identify and judge the most visually prominent imagery on the page.
- (e) Judge any graphics near the top of the page.
- (f) Judge any graphics near the middle of the page.
- (g) Judge any graphics near the bottom of the page.

This approach was deemed both versatile enough to accommodate any web page and comprehensive enough to encompass graphics no matter how they may be arranged. Evaluating these 7 considerations involved assigning a value of 1 for the lowest rating to a 6 for the highest. Averaging these ratings produced a composite score representing the individual student's overall graphics use.

Some considerations were specifically excluded from evaluation so as to minimize any interference with the independent evaluation of the graphics themselves. These included:

- (a) overall page design and aesthetic quality.
- (b) whether the page is elaborate or simple.
- (c) overall page color or text-style themes.
- (d) page backgrounds.
- (e) dysfunctional, failed or "broken" graphics.

(f) hyperlinks – ignore both function and purpose.

Web page URL's were randomly arranged and numbered and presented to a panel of 3 judges. There was no communication between the judges and they scored the web sites independently. Students were also asked to rate their own web site and had no knowledge of the judge's identities or scores.

Judge 1 was an experienced computer teacher from a local middle school who had completed the state's computer program for an endorsement on his teaching license. Judge 2 was a recognized community artist. He made his living as an artist and served a local community program as a teacher and web page designer. Judge 3 was an experienced web page designer and she had taught web design as an adjunct at the university. She has also been recognized as an amateur artist for many years. These individuals were deemed highly qualified to examine web pages and particularly well suited to identify and consider graphic imagery on their merit regarding the 6 levels.

An evaluation web site was provided to assist judges in accessing students' web sites and recording their scores. All 41 web sites were evaluated by each of the judges who's scores were averaged for each student. All three judges' scores were then averaged to produce a single composite judge's score for each student. This composite judge's score for each student was compared with the student's score to determine any variance in perception of the 6 levels of graphics in the student's web page.

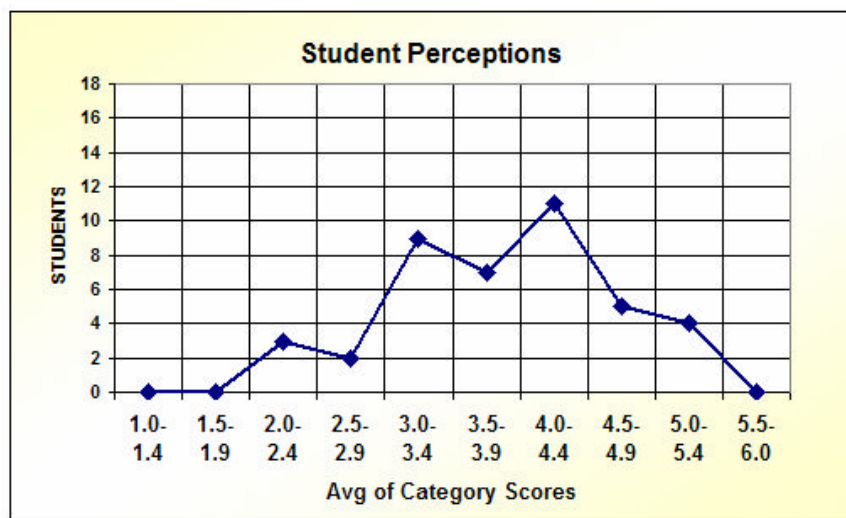
Numeric evaluation scores have the potential of ranging from a low of 1 (corresponding to the lowest possible level of graphic usage) to a high of 6. Variance scores have the potential of ranging from a low of zero (no variance, exactly matching judge's scores) to a high of 6, indicating widest possible variance between student's and judge's perceptions.

Results

Students' perceptions varied widely as averaged scores ranged from a low of 2.3 to a high of 5.1 with an overall group average of 3.8 for all 41 participants. Figure 1 shows the distribution of students' self-perception scores by level. As shown, there were no scores below the 2.0-2.4 grouping and no scores above the 5.0-5.4 grouping. The majority of students (11) viewed their graphics usage in the 4.0-4.4 range. While 4 students believed they used graphics to represent at least simple concepts (level 5), 5 students recognized that they had not exceeded the design or layout usage at level 2.

Figure 1.

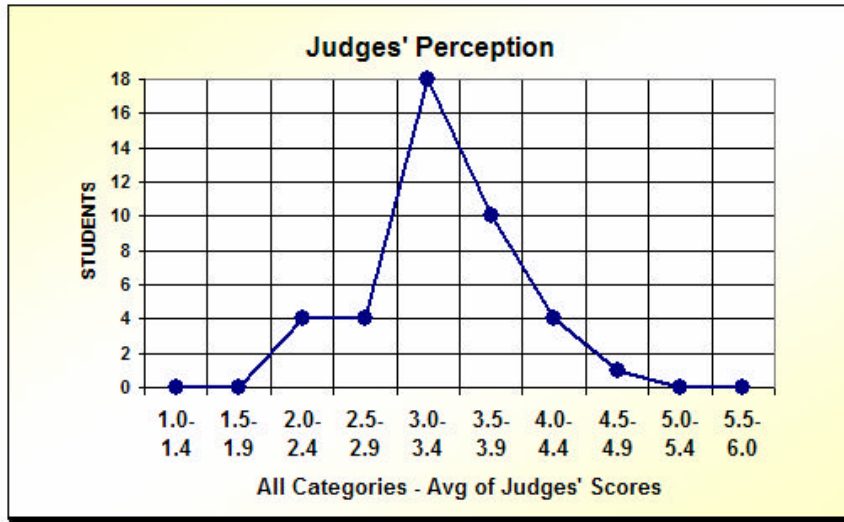
Students' average scores* of self-perception on level of graphic use.



* Overall "group" average = 3.8

The judges' scores (Figure 2) placed students more centrally located with a greater number of students at level 3 (28) considered randomly or generally decorative. Judges recognized nothing at the representational levels of 5 or 6 and judged 8 students' usage as design and layout at level 2.

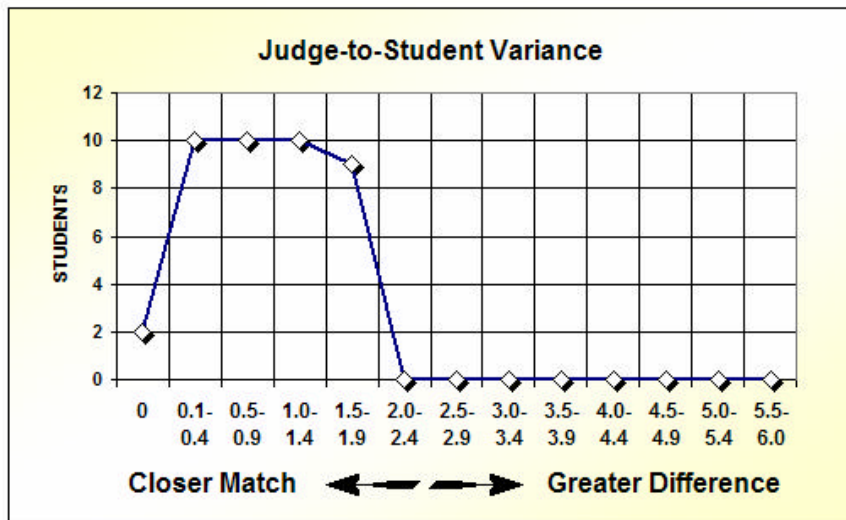
Figure 2.
Judges' average scores* of students' level of graphic use.



* Overall average = 3.3

On a student-by-student basis, Figure 3 shows that judge's scores tended to match closely with student's self-perceptions. Interestingly, the highest variance was a mere 1.9 out of a possible 6.0. And, 2 students' perceptions matched the judges exactly.

Figure 3.
Differences* between judges' and students' scores of level of graphic use.



* Overall average variance = 0.5

On an overall basis, judges' scores varied from students by only 0.5 indicating a very close match for the whole group. Generally, students' scores were closely aligned with the judges' independent scoring.

Discussion

Virtually all of the preservice teachers employed graphics in their web pages in a variety of ways. Interestingly, while it was anticipated that students might view their graphics usage as very high, judging themselves yielded an overall score of only 3.8 suggesting that they may have been more moderate in their self-perception. A large number of students (16) scoring themselves with a level 4 suggests that they perceive a thematic role in their graphics usage. The overall average indicates that they perceive their graphics as at least generally decorative.

Although 4 teachers believed they were using graphics at the representational level, the judges, as averaged together, indicated otherwise scoring no graphics at this level. This was the most striking variation between the judges and the teachers. Overall, the teachers and judges were in close agreement in judging the graphics. The judges' overall score was 3.3, only 0.5 below the students' perceptions, indicating a close agreement with the students' perceptions.

Looking at judges' scores on a teacher-by-teacher basis, the widest disparity between judges and teachers still only amounted to no more than 1.9 and the judges twice matched teachers' perceptions exactly. While it was originally thought that there would be a much larger difference between teachers' self-perception compared to the judgment of more experienced web designers, instructors and artists, this data suggests otherwise.

So, why do students utilize graphics at the middle and lower levels, based on the model? It was originally thought that either students do not understand the nature of communication with graphics or perhaps they had an inflated self-perception of their own products. These results suggest that their self-perception is moderate and perhaps realistic. At least it is reasonable to suggest that their self-perception is as reliable as judgments by more experienced designers.

It may still be the case that instruction specifically targeting the nature of graphics communication, relative to the model or not, could elevate the usage of graphics in teachers' web pages. While it was originally thought that students may not realize how their graphics usage corresponds to higher levels of communication, it may still be the case that students do not know how or are not able to integrate graphics better, given their experience and computing skills.

Nevertheless, in spite of less experience and a relative lack of skill in computing, the close match between these teachers and the judges' evaluations may be due to the over saturation of graphic imagery in society as a whole. That is, there is no population in our modern television society that could serve as a reasonable control group with zero exposure to graphic imagery. Both teachers and judges alike watch the same television commercials, see the same billboards along the highway, and attend the same movies as everyone else in our society.

In order to explore this further, it is suggested that this study might be replicated by first instructing students on the nature of graphics communication using this 6-level model. Specifically, the higher levels of how graphic imagery can represent and communicate ideas and complex concepts independent of text should perhaps be emphasized. It has been said that a picture is worth a thousand words. Certainly, the modern advertising world knows this very well as our attention span grows ever shorter and our usage of graphic imagery becomes an increasing part of our communication system.

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