

Gestalt Theory in Visual Screen Design – A New Look at an Old Subject

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Abstract

Although often presented as a single basis for educational visual screen design, Gestalt theory is not a single small set of visual principles uniformly applied by all designers. In fact, it appears that instructional visual design literature often deals with only a small set of Gestalt laws. In this project Gestalt literature was consulted to distil the most relevant Gestalt laws for educational visual screen design. Eleven laws were identified. They deal with balance/symmetry, continuation, closure, figure-ground, focal point, isomorphic correspondence, prägnanz, proximity, similarity, simplicity, and unity/harmony.

To test the usefulness of these laws in visual screen design they were applied to the redesign of an instructional multimedia application, 'WoundCare,' designed to teach nursing students wound management. The basic text-based screens in the original WoundCare application were replaced with graphical user interface screens, that were designed according to these principles. The new screen designs were then evaluated by asking students and others to compare the designs. The viewers were also asked to rate directly the value of using the eleven Gestalt design principles in the redesign, both for improving the product's appearance and improving its value for learning.

The evaluation results were overwhelmingly positive. Both the new design and the value of applying the eleven Gestalt laws to improve learning were strongly supported by the students' opinions. However, some differences in the value of applying particular Gestalt laws to the interface design were identified and this forms a useful direction for future research.

Introduction

Gestalt theory is a family of psychological theories, that have influenced many research areas since 1924, including visual design issues. Gestalt Theory is one of the foundations for instructional screen design. It is generally accepted that Gestalt theory may be used to improve educational screen design and thereby improve learning (Preece, Rogers, Sharp, Benyon, Holland and Carey1994). Gestalt Theories are usually expressed as laws, and there are many variants of Gestalt theory laws devised by different psychologists, for example Boring (1942) stated "in 1933 Helson extracted 114 law of Gestalten. All but half a dozen of these laws are applicable to visual form." Many of the laws are very

closely related or overlap, and it is often very hard to distinguish between them. The Gestalt laws explain how the individual elements from the environment may be visually organised into fields or structures (Koffa 1935). Traditionally the Gestalt laws are used to suggest how static visual elements should be presented in order to achieve effective visual results.

We noticed that only very few Gestalt laws are commonly applied to instructional visual screen design (Fisher and Smith-Gratto 1998–99, Preece *et al.* 1994). Being curious people, we wondered if some important laws were generally overlooked, so we examined the Gestalt literature and selected the laws that appeared to be the most important for visual screen design, and combined similar ones together. Thus, we identified eleven distinct laws that represent the major aspects of Gestalt theory knowledge about visual form. These laws seemed to contain the most relevant aspects of Gestalt Theory for computer screen design.

To test the value of these principles we applied the eleven laws of Gestalt to the visual redesign of an educational multimedia program, WoundCare, and then evaluated the redesigned application and examined the educational value of using the Gestalt laws in the screen design process. This paper is an account of how useful these laws were in a particular multimedia screen design and, by extrapolation, what benefit other designers may gain from using these design principles. Therefore the value and specific desirable approaches for the design of new multimedia technology based on an expanded Gestalt theory base is the key point of this paper.

The Key Laws of Gestalt Theory for Computer Screen Design

In this section we shall describe the eleven laws of Gestalt Theory we identified as having significant implications for computer screen design.

Law of Balance/Symmetry

A visual object will appear as incomplete if the visual object is not balanced or symmetrical (Fisher *et al.* 1998–99). A psychological sense of equilibrium, or balance, is usually achieved when visual 'weight' is placed evenly on each side of an axis (Lauer 1979, Preece *et al.* 1994: 79–80), for example, Figure 1.1 illustrates visual balance but in Figure 1.2 the image appears unbalanced.

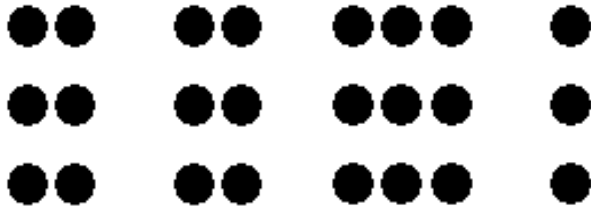


Figure 1.1: Balance

Figure 1.2: Imbalance

Law of Continuation

Continuation is the eye's instinctive action to follow a direction derived from the visual field (Fultz 1999). For example, in Figure 2 our eyes follow the road from the bottom to the top of the picture.



Figure 2: Law of Continuation

Law of Closure

Fisher and Smith-Gratto (1998–99) point out that “open shapes make the individual perceive that the visual pattern is incomplete” and the “sense of incompleteness serves as a distraction to the learner.” Our minds will tend to close gaps and complete unfinished forms (Fisher and Smith-Gratto 1998–99, Fultz 1999). In Figure 3 the letters used to form the word “CLOSURE” are sliced into parts but our minds complete the unfinished forms.



Figure 3: Law of Closure

Law of Figure-Ground

We distinguish the foreground and background in a visual field (Fultz 1999). Two different foreground colours let the viewer perceive different things from the same illustration, as illustrated in Figures 4.1 and 4.2. If our focus (foreground) colour is black, then in the Figure 4.1, you can see a vase. In Figure 4.2, when the background is black, we see two faces.

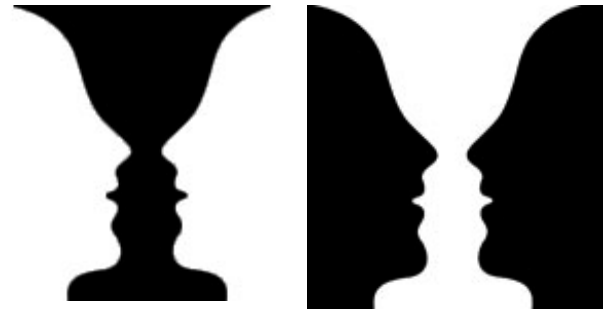


Figure 4.1: Vase

Figure 4.2: Two Faces

Law of Focal Point

Every visual presentation needs a focal point, called the centre of interest or point of emphasis. This focal point catches the viewer's attention and persuades the viewer to follow the visual message further (Lauer 1979). Figure 5 shows how a differently shaped element appears to protrude out from among other elements and draws attention.



Figure 5: Changing Shapes

Law of Isomorphic Correspondence

All images do not have the same meaning to us, because we interpret their meanings based on our experiences. If we were to see the image in Figure 6 on a computer screen, we would interpret its meaning as a help or question icon, even if we could not understand the Finnish word “Apua,” because we associate a question mark with ‘help’ based on past experience.



Figure 6: Help Icon

Law of Prägnanz (Good Form)

Fultz (1999) defined prägnanz (good form) thus: “A stimulus will be organized into as good a figure as possible.” Good form is a simple design or a symmetrical layout. Figure 7, shows how the IBM logo consists of little white bars to form three individual letters.

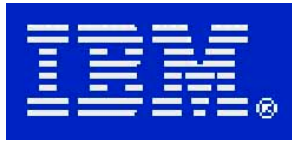


Figure 7: IBM Logo

Law of Proximity

“The law of proximity states that items placed near each other appear to be a group” (Fisher and Smith-Gratto 1998–99). Viewers will mentally organise closer elements into a coherent object, because they assume that closely spaced elements are related and those further apart are unrelated (Fulks 1997, Fultz 1999). In Figure 8, we mentally arrange the dots into three horizontal rows, because the dots in the rows are closer together than in the columns.

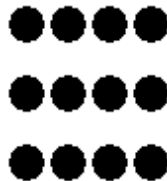


Figure 8: Three Horizontal Rows

Law of Similarity

According to Fisher and Smith-Gratto (1998–99) similar objects will be counted as the same group and this technique can be used to draw a viewer’s attention. In Figure 9, the viewer can recognise a triangle inside the square, because these elements look similar and thus part of the same form (Fultz 1999).

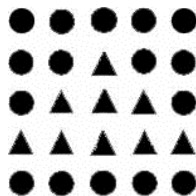


Figure 9: Triangle Inside Square

Law of Simplicity

“When learners are presented with visuals, there is an unconscious effort to simplify what is perceived into what the viewer can understand” (Fisher *et al.* 1998–99). The simplification works well if the graphical message is already uncluttered, but if the graphics are complex and ambiguous the simplification process may lead to unintended conclusions. For example, Figure 10.1 is better for teaching about the Southern Cross than the cluttered Figure 10.2.



Figure 10.1: Southern Cross



Figure 10.2: Southern Cross and Other Stellar Objects

Law of Unity/Harmony

According to Lauer (1979) “Unity implies that a congruity or arrangement exists among the elements in a design; they look as though they belong together, as though there is some visual connection beyond mere chance that has caused them to come together.” If the related objects do not appear within the same form, the viewer will consider the separate objects to be unrelated to the main visual design, leading to confusion. Figure 11.1 is an example lacking in unity, whereas Figure 11.2 is an example of unity in presentation where all of objects are arranged together into a unified form.

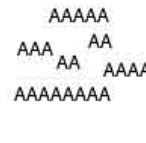


Figure 11.1: Non-unified Visual Presentation

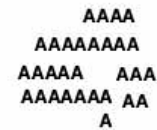


Figure 11.2: Good Unity in Visual Presentation

Gestalt Theory in Multimedia Screen Design: WoundCare

We examined the benefit of using the eleven Gestalt laws, in the redesign of a real multimedia application. The WoundCare multimedia program (Ross and Tuovinen, submitted) was developed over a number of years for nursing students. However, very little effort had been spent on the program’s user interface, and so the visual screens were revised. This allowed us to investigate the benefits and limitations of the broader set of Gestalt laws for the visual screen design process.

The initial WoundCare screen is shown in Figure 12.1a, and the redesigned screen in Figure 12.1b. Instead of drop down menus under the File heading, the action options for the program are provided as buttons in the new screen format. We will explain the layout of the new visual elements in Gestalt terms.

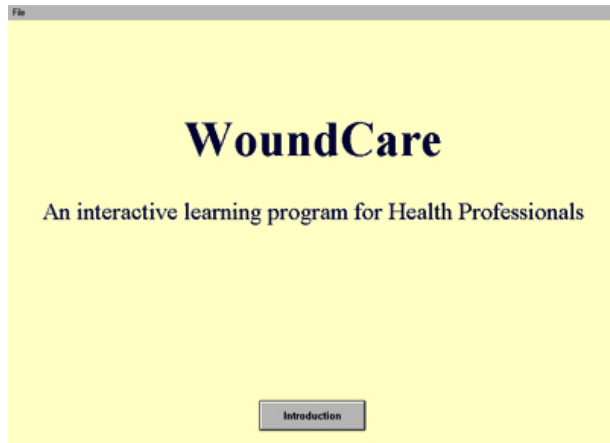


Figure 12.1a: Original Wound Care Screen Design.

pattern has facilitating features and purpose. In Figure 12.1b, the round graphics illustration and buttons combine the screen elements to achieve closure.

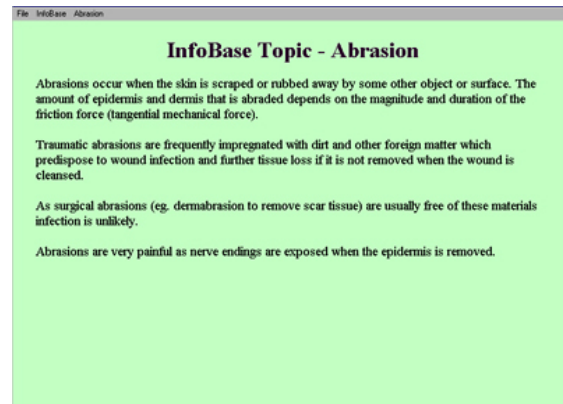


Figure 12.2a: Standard Old WoundCare (Infobase section) Text Screen.

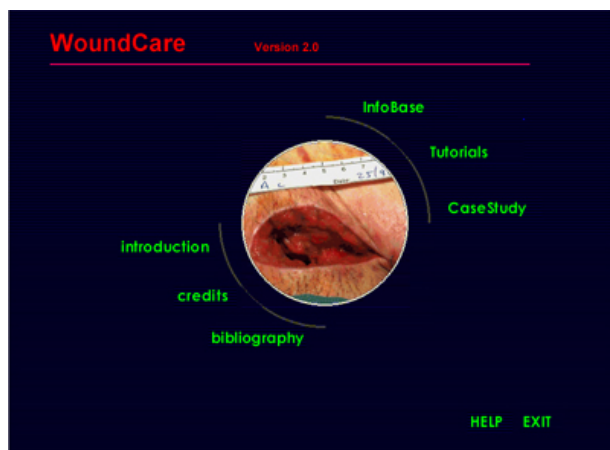


Figure 12.1b: Revised Screen Design of Initial Screen.



Figure 12.2b: 'Standard' Old Woundcare (Infobase) Photograph With Summary Text.

Simplicity

Comparing the old and new designs in Figures 12.1 to 12.4, one can observe we tried to achieve simplicity. We avoided cluttering the screens with masses of unrelated material, in haphazard patterns.

Balance

On a computer screen balance can be achieved by adjusting the items on the screen to equal visual weight. In Figure 12.1b, the central animated graphics illustration acts as a visual pivot for the whole screen to achieve visual balance. The left hand and right hand side text buttons balance and the red WoundCare title is also balanced with the right bottom "Help" and "Exit" text/button elements.

Closure

Although readers try to achieve closure in their minds, a designer cannot design an incomplete screen and assume learners will try to complete the bits, unless the overall

Continuity

In every new screen we used the 'Continuity' principle to persuade the learner's eye to complete a tour of the whole visual screen.

Proximity

In the new design, for example in Figure 12.2d, each visual element is identified and clearly placed close together in functional groups. The space and round box create a border to delineate different groups, associating each group with its function.



Figure 12.2c: Standard Old Wound Care (Infobase) Full-screen Photograph.

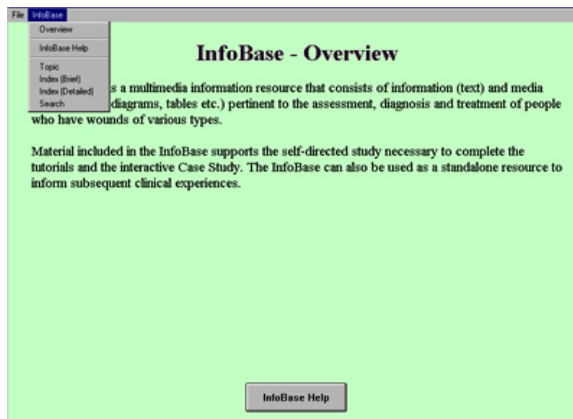


Figure 12.4a: Old Infobase Introduction Screen

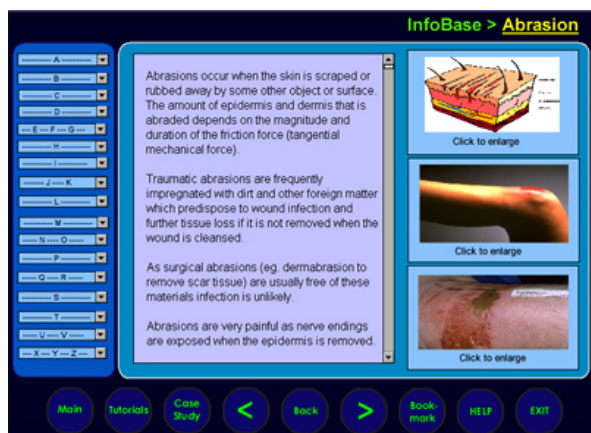


Figure 12.2d: New, Integrated Design of Navigation Controls, Text and Graphics.



Figure 12.4b: Old Infobase Index Screen Design

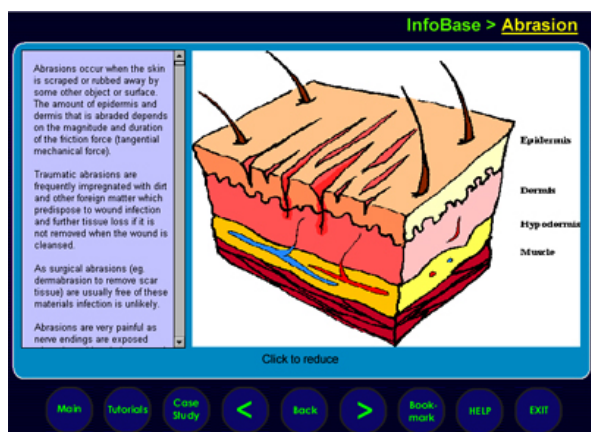


Figure 12.3: New Integrated Design, Showing Graphics in Large Scale with Associated Text and Navigation Controls.

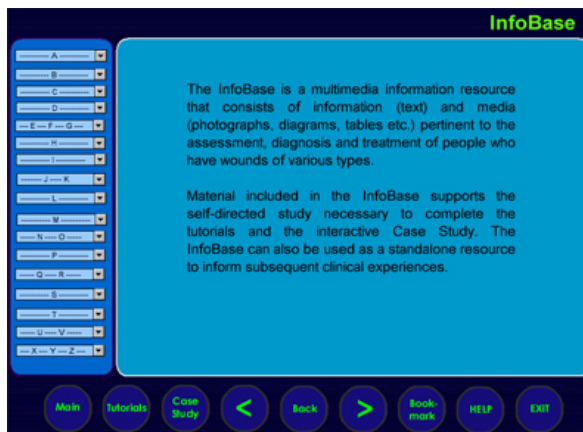


Figure 12.4c: New Design of Infobase Introduction

Focal point

Lauer (1979) said, "When everything is emphasized, nothing is emphasized." Too many focal points are likely to confuse learners and diffuse their interest. The focal

point in Figure 12.2d is the text area, but the focal point has changed to an image in Figure 12.3.

Figure-Ground

Colour enables a reader to distinguish figure and background on a computer screen (Fisher and Smith-Gratto 1998–99). For example, in Figure 12.4c, the dark blue background contains two different light blue round boxes, and each round box contains a differently coloured text or drop down menu.

Similarity

As well as using similarity to group similarly perceived items together, a reader’s attention may be drawn by breaking similarity, for example by highlighting, underlining or dimming keywords. We could also use sound, flashing and animation to distinguish the key phrases and other contents. These effects create unique characteristics to attract the reader’s interest and guide the learner to the relevant learning material for improved learning. For example, a distinctive sound was used in the redesigned Case Study to distinguish different segments of the work.

Unity/Harmony

The challenge of the law of unity/harmony in design is how to organise the related objects into the same form, to encourage learners to combine the individual objects into a whole when they are the first perceived. Within each section of the program we used the same type of transition to jump to the next page, in order to distinguish different section segments. On every screen we used the same text font, the left hand side was always used for a sub-menu, each section title was always placed at the top right hand corner, and the negative button was placed consistently at the bottom of the screen.

Evaluation

A pilot version of the redesigned WoundCare program was evaluated. The representative screens from each of

the three main program sections had been redesigned, but the design had not been applied to the all the screens in each program section. There were 12 participants in the evaluation, ranging from university students with previous experience with the original WoundCare program to academic staff and people who had not seen the program previously. Firstly, informal interviews and observations were conducted where the participants compared the two programs, then the participants completed a questionnaire.

WoundCare Visual Screen Design Survey Results

The first five questions of the survey sought opinions about the quality of the redesigned visual interface (Table 1).

Overall, the evaluators rated the new interface design as more effective with better usability than the original version. In addition to the favorable survey ratings the student comments were also positive, for example “I found the program is very eye catching and user friendly.” “This is an excellent version of the WoundCare program. It is easy to look at and to work through. As a study tool, it assists with the basics of WoundCare in an easy to follow fashion.”

Usefulness of Gestalt Visual Screen Design Principles for Learning

The second section of the survey (Table 2) asked the participants to directly evaluate how useful the eleven Gestalt laws were for the redesign of the WoundCare program’s appearance. This section gives the most direct information about the comparative value of the eleven laws for educational computer screen design.

The question was: “How well was this principle used in the visual design of the WoundCare screens?”

Question (N= 12)	Yes	Undecided	No
Are the new interfaces better than previous WoundCare version 1.1?	100%	0	0
Was learning easier with new interface?	85%	15%	0
Is there enough detail and instruction in the presentation to enable you to carry out the tasks/exercises?	100%	0	0
Was the navigation easy to follow?	100%	0	0
Are the links between the text and graphics/photographs/tables clear enough?	100%	0	0

Table 1: Questions and Results about the Quality of Redesigned Visual Interface

Visual principle based on Gestalt laws (N= 12)	1 %	2 %	3 %	4 %	5 %	Mean
1. Balance/symmetry				50	50	4.5
2. Continuity				65	35	4.3
3. Closure				65	35	4.3
4. Figure-ground				65	35	4.3
5. Focus			17.5	17.5	65	4.5
6. Isomorphic correspondence			16	50	34	4.2
7. Good form				65	35	4.3
8. Proximity				85	15	4.2
9. Similarity				65	35	4.3
10. Simplicity			16	34	50	4.3
11. Unity/harmony				15	85	4.8

Table 2: Value of Using 11 Gestalt Laws in Visual Design of Wound Care

(Answer key: 5 = Very well, 4 = Well, 3 = Neither well nor poorly, 2 = Rather poorly and 1 = Very poorly)

Visual principle based on Gestalt laws (N = 12)	1 %	2 %	3 %	4 %	5 %	Mean
1. Balance/symmetry				50	50	4.5
2. Continuity				50	50	4.5
3. Closure			17.5	50	35	4.2
4. Figure-ground		16.6	16.6	16.6	50	4.0
5. Focus			16.6	35	50	4.3
6. Isomorphic correspondence			33	33	33	4.1
7. Good form			17.5	50	33	4.2
8. Proximity				65	35	4.3
9. Similarity			33	17.5	50	4.2
10. Simplicity			16	34	50	4.3
11. Unity/harmony			15	50	35	4.2

Table 3: Learning Benefit From Gestalt Principles

(Answer key: 5 = Very useful, 4 = Somewhat useful, 3 = Undecided, 2 = Minimal value and 1 = No benefit)

The next set of questions asked the evaluators to estimate how beneficial the specific Gestalt principles were for student learning (Table 3).

Analysis and Discussion

In the redesign of the main WoundCare screens all of the eleven Gestalt laws identified were found to be useful by an overwhelming number of respondents, as indicated by the means of the responses (all 4 or above). In fact, clear reservations were expressed by only two people about the value of applying only one law, relating to figure-ground. A greater number of respondents were undecided about the specific educational benefits of eight laws, that is,

four people relating to isomorphic correspondence and similarity, than about the quality of application of the laws to the WoundCare redesign. Only two people in each case were undecided about the visual design value of applying the three laws relating to focus, isomorphic correspondence and simplicity to the interface redesign. Thus it appears that students and staff, most without special visual education, can recognise the value of the eleven Gestalt laws to visual interface design and to their own learning from multimedia designed using such principles.

Conclusion

This paper has explored a wider range of Gestalt laws than is often recommended for visual design of educational software. Eleven laws have been distilled from the Gestalt literature and these laws were applied to the visual redesign of a multimedia educational program, WoundCare, in order to improve its appearance and educational effectiveness. The user evaluations indicate that all the identified Gestalt laws are beneficial for visual screen design and learning effectiveness. However, they are not recognized to be uniformly beneficial for learning and design improvement, so it will be useful to examine the relative benefits of these principles more thoroughly in subsequent research, to arrive at better guidance for visual designers.

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