

# **Graphic Design Principles Can Improve Functionality and Effectiveness Of Technology Knowledge Bases**

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CERTIFICATE OF APPROVAL

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## ABSTRACT

Many classroom technology knowledge bases in higher education are created by technicians whose natural inclination is to create overly detailed text-based articles. Their aim is to cover all scenarios an end user may encounter, and provide as much information as possible. These articles are unattractive, cumbersome, and often deter the institution's faculty and staff members from utilizing them as an information resource. By developing these articles with graphic design principles in mind, they become more user-friendly and functional as a tool. Strong emphasis on images, color, and simplicity provides an effective alternative to large blocks of text. Many studies have concluded that people in a variety of age groups perform better as learners when information is presented in multi-modal format, such as infographics. These methods combine text with images to provide a more concise and clear delivery of content. Beyond better understanding, they also cite that the experience is more enjoyable, which may lead to repeated use of this format. This project reimagines the information in a typical knowledge base and applies a new visual aesthetic using Gestalt's principles of design, consistent iconography, and interactivity. It aims to create a more intuitive and simplified experience for the institution's end users.

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## BACKGROUND

In higher education in the 21st century, it can be assumed that a vast majority of classes and events are taking place in spaces containing information technology. A typical class may employ displays such as projection and flat panel televisions, or interactive devices such as microphones and webcams. For most of these sessions, the professor will probably rely on their laptop or an installed desktop computer to pull up their email, notes, presentations, etc. As an IT technician currently working at a mid-size institution, one of my responsibilities is supporting the faculty and staff in using the technology in these rooms.

It is important to remember that there is a vast spectrum of tech savvy amongst the end users and they may require extra instruction on how to use the specialized systems. Not all audio visual and computer systems are designed the same way across different college campuses, so a learning curve is to be expected. To help support users, we create technology knowledge bases with text based articles explaining how to use the equipment in great detail so that they can understand the full scope of capabilities.

After nearly two decades of providing technical support at two different mid-size colleges, my experience has shown that many of the campus faculty and staff do not turn to the knowledge base articles for instruction. When asked why, general responses indicate that there was too much reading, or that the information was too hard to find and/or understand. The purpose of my research for this project is to help guide me through creating a new style of knowledge base that incorporates images, graphic design principles, and limits the amount of extraneous text when possible. Taking inspiration from infographics as a medium, I will create an interactive site that is attractive and facilitates quicker understanding of the technology

equipped spaces on campus. Time is valuable, and I hope to help reduce how long users need to spend finding the answers they need to successfully run their classes and events.

## ARTICLE RESEARCH

When beginning my research, I sought out information in two different areas to aid with the creation of my project. The first topic of investigation was graphic design theory with particular emphasis on the Gestalt principles, and the second topic was the impact of graphic aids in the learning process. Building a functional IT knowledge base website would require proper planning with regards to color scheme, layout, and understanding how Gestalt's principles could aid in reader comprehension and reduce cognitive load. By researching how graphics and images in learning materials support the learner's understanding of the content, I am able to leverage those findings into creating a more functional knowledge base.

I used Google Scholar, as well as my current institution's library to search for relevant articles in this field. For articles relating to graphic design and Gestalt principles, I reached as far back as 1998, as most of these ideas tend to be long standing. For articles relating to visual learning, the oldest article I will be referencing is from 2012. This is an area of study that is ever evolving as new research is constantly being performed, so it is important to utilize recent articles only. The most recent article in my research comes from 2019. The articles retrieved hail from the United States of America, Germany, Malaysia, Brazil, Turkey, and Thailand. It was important to gain perspective from different regions around the world, as what I am trying to accomplish by updating knowledge base design is not only applicable to local U.S. learners, but for learners everywhere. Gestalt psychology began in Germany in 1910 when its founders, Max Wertheimer, Kurt Koffka and Wolfgang Kohler studied how different elements in a design

worked with each other to create a cohesive whole. These observations came from designs in multiple cultures and seemed to be universally accepted (Behrens, 1998, p. 299).

## GRAPHIC DESIGN PRINCIPLES

The two main areas of graphic design research were the Gestalt principles and infographics. Condly (2003) quotes Cassells & Green (1991) when defining the Gestalt principles as those which “describe how we perceive whole patterns and organize information into meaningful units” (p. 2). When we look at groups of elements, our mind will begin to apply connections and importance to them based on certain factors. These factors make up the various principles in question. The most common are figure/ground, closure, similarity, common region, and proximity. The latter three (similarity, common region, and proximity) will be implemented during the creation of my knowledge base project.

The principle of similarity is when we perceive elements as being related due to likenesses with each other based on shape, color, size, etc. (Condly, 2003, p. 7). A real world example of this would be when standing in the aisle of a supermarket, looking at the products on the shelves. There might be hundreds of different individual items, but our brains will begin to group them based on the similarities of their packaging, in this case, their brand. Upon first glance, we might notice that there are four different brands of macaroni and cheese on the shelves due to each brand having a distinct logo and color scheme. As we look closer, we might notice that there are varieties within those brands, allowing us to take this principle another level further.

Moller et al. (2012), quote Palmer (1992) when defining the principle of common region as “a connected, homogeneously coloured or textured region or an enclosing contour.” (p. 741) A real world example of this would be a circular for a supermarket, where items that are on sale



are shown within a red colored block on the page. The color block grabs our attention, but also helps the reader to understand that only the items contained are on sale. This grouping based on a common background makes them special, and quickly conveys that they are related.

The principle of proximity is defined as seeing items that are closer together in relation to other items, as a group (Condly, 2003, p. 5). A real world example would be the end caps of the aisles in a supermarket. These items are physically separated from the other items on the shelves and given their own prominence in their own space. This distance from the other merchandise makes them special and defines them as a collection all their own.

Infographics are a method of presenting information that has been around for years, but has gained popularity in the digital age with the advent of smartphones and internet 2.0. They are a leading form of information dissemination in our current culture (Naparín & Saad, 2017, p. 15). In today's fast paced world, it is important to the reader to be able to find, and understand information quickly and efficiently. Lindblom et al., (2016) quote (Krum, 2014) when they state that an infographic is "larger graphic design that combines data, visualizations, illustrations, text, and images together into a format that tells a complete story." (p. 38) Lyra et al., (2016) describe infographics as "a type of information visualization that uses graphic design to enhance human ability to identify patterns and trends." (p. 1) The main purpose of infographics as a tool is to help readers more quickly understand a set of data than if they were to read it in a text-based format. This inclusion of graphic design principles supports the idiom "a picture is worth a thousand words".

## VISUAL LEARNING

Understanding how people learn is important to the success of designing knowledge bases. Many technicians are in the position of being the ones tasked with writing technology

instruction articles for end users, but they fail to grasp the needs of that audience. Technicians will typically include all of the minutiae in text-based format so that they can cover every possible scenario a user may encounter. When readers are overwhelmed with large blocks of text in a situation where they are looking to quickly find answers, they are failed by the design.

Yarbrough (2019) states that “Online courses should be created with the learner in mind, a focus on ease of navigation and a support for clarity of content.” (p. 5) While this statement applies to curriculum based courses, it can also be applied to the scenario described above. Studies show that incorporating visually pleasing graphical elements into designs greatly improves understanding of content and reduces cognitive load on the reader (Wilson, 2012, p. 27). Yildirim (2016) supports this concept when he states “...since students spend less time to learn the information presented by infographics and they are exposed to less amount of cognitive load, the thought that infographics are more instructive may be established.” (p. 106) Cognitive load is defined as “the mental effort that a learner applies on learning, and thereby the learners can focus more on the content rather than trying to decode the way it is presented.” (Lyra et al., 2016, p. 1)

## RESEARCH AND STUDIES

Various studies have been conducted testing the hypothesis that incorporating visual and graphical content into normally text-based content, or replacing it outright, will aid learners. Vanichvasin (2014) explored this concept in an experiment where 20 fourth year college students were given six infographics in support of the course content. They were given questionnaires to “examine the impact of the quality of learning in two dimensions, that is, infographic as visual communication tool measuring appeal, comprehension, retention and infographic as learning tool measuring satisfaction in a 5-point Likert Scale format and overall

quality of learning in those two dimension via open-ended questions.” (p. 138) The responses indicated that infographics could enhance reading comprehension and appeal when used as a visual communication tool, and that their opinions of infographics as a learning tool were positive. (p. 135)

Yarbrough (2019) references a study by Miller & Barnett (2010) in which they presented three different communication tools to 138 undergraduate students. The first was that of a map without any text that cited cancer occurrences within an apartment complex that indicated a large number of instances within a specific building. The second communication was the same map, but accompanied by an explanation of the risk of living there in a text-based caption. The third communication contained no images, but only text describing what the map was about and the risk involved. Miller & Barnett found that both the image-only, and text-only communications were “useful but imperfect” (p. 3) but when they were combined as in the second communication, it became a more effective tool for comprehension and retention. (p. 3)

In Yildirim’s (2016) study, 64 college students were surveyed on their opinions of how well infographics affected their learning. (p. 100) Responses revealed positive attitudes towards this type of information communication. Results demonstrated that infographics were preferable to text-based materials, and that when learning new information they will seek out documents containing such content. (p. 103) Additionally, respondents indicated that they prefer interactive infographics over static ones when available. (p. 103) One important piece of data is that overwhelmingly, they are not interested in infographics that are too long to read. (p. 102) This is significant because while a designer may choose to utilize an infographic because it has been proven to be an effective method of communication, they have a responsibility to make sure that it is not so content dense as to create a large cognitive load on the reader.

Lyra et al., (2016) conducted a study of 27 undergraduate college students to determine the level of learning effectiveness and appeal of an infographic versus a graphics+text design. 15 different general knowledge examples were used, each infographic had its graphic+text counterpart. The important distinction here from other studies reviewed is that both of the communication tools include graphical content. However, only the infographics include artistic graphic design elements while the graphics+text examples use minimal graphs. See figure 1 and figure 2 below. (p.2)

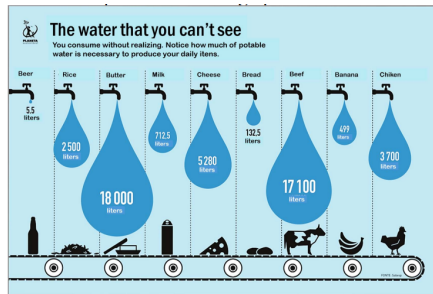


Figure 1. Infographic example.

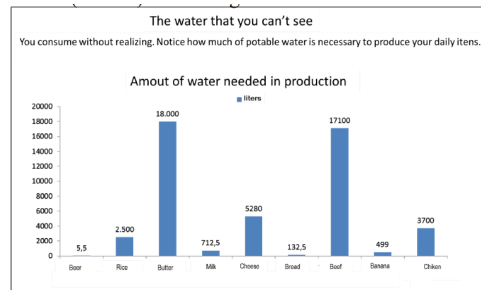


Figure 2. Conversion to graphic+text.

The students performed a pretest before instruction on their knowledge of the content, then a post-test after instruction. They then took a delayed post-test a week after instruction to assess knowledge retention. Data showed that infographics worked better for learning and retention after the delayed post-test, but the difference in pleasure given by either mode was very minimal. (p. 5)

## CONCLUSION

The studies provide solid evidence that including graphical content into information communications helps the reader to not only understand the content, but makes it a more enjoyable experience. The experience is further enhanced when functional interactivity is employed. As Lyra et al. (2016) discuss, to reduce the cognitive load of the reader, it is important to design activities that include visual content. (p.1) Amongst graphical instruction materials, infographics are some of the most sought after modes of communication by readers

and are highly likely to be shared amongst other readers with similar interests. (Yıldırım, 2016, p. 106) This is particularly important in my field as an IT technician working in higher education. I would like the knowledge base that I design to be a pleasant experience, one that the institution's faculty and staff are willing to share amongst their colleagues. Yarbrough (2019) states that good infographic design will facilitate more positive reactions, whereas poor designs will fail at conveying the proper information. (p. 4) The use of Gestalt principles of similarity, proximity, and common region will help ensure a functional knowledge base design aesthetic that will guide readers more quickly to the desired location and help them understand the information better. With these findings in the above mentioned studies and the research on graphic design, I am confident that developing a technology knowledge base rooted in these ideas will help users be more willing and able to access the information they need.

## APPENDIX

Project Website

[people.sunyit.edu/~mcinermw/capstone](http://people.sunyit.edu/~mcinermw/capstone)

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