Creating an Information Literacy Atmosphere Through Aesthetic Design: A Critical Analysis With Application Towards Instructional Design, Online Learning, and Information Literacy Instruction

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Abstract

Visually aesthetic design is an important part of the learning experience in relation to information retention and transfer. Colors, design and other elements of design have a marked impact on behavior and emotion. In this paper the author will make the argument that visually aesthetic design as it pertains to information literacy instruction in the classroom and online is a key tool for instructional designers and information literacy instructors. The research design is a critical analysis of interdisciplinary empirical research and literature from cognitive psychology, evolutionary psychology, product design, web design, human computer interaction, cultural anthropology, instructional design theory, online learning, and information literacy instruction. Throughout the critical analysis the author will give an overview on the empirical research, theory, and best practices in the field of online learning, instructional design, and information literacy instruction. The theory is not a substitute for substance and pedagogy, rather it is an enhancer and a way to gain credibility, and engage a wide variety of students and influence life-long informed learning. Throughout the paper the author will illustrate the importance of aesthetic design in information literacy instruction and online learning. This idea is important because information literacy, research methods, and critical thinking skills are not intuitive for the majority of students. Educators and designers need to engage students in every way possible to help them with information retention. Visually aesthetic design is another teaching strategy, which serves equally in the classroom or online, that can support the crucial skills of information literacy and lasting information retention.

Keywords: Aesthetics; Library Instruction; Information Literacy; Instructional Design; Best Practices

Introduction

Aesthetic design in an important part of the learning experience and can help improve information retention in synchronous or asynchronous environments. The analysis will analyze the connection between cognition, emotion, learning, and aesthetic design. It will also be an overview on the best practices for implementing aesthetic design principles into physical or virtual environments. The main discussion will cover instructional design, online learning, and the implication for improving information literacy through aesthetic design. The critical analysis is broken down into the following sections: 1.) Background and Introduction to Aesthetics and Learning 2.) Research Design 3.) Information Literacy 4.) Gut Reaction 5.) Evolution 6.) Tap into Intuition 7.) Bold & Beautiful 8.) Design Sells 9.) Web Design & HCI 10.) Culture and Aesthetics 11.) Theories and Best practices 12.)

Discussion 13.) Conclusion. The critical analysis will illustrate the importance of aesthetic design and the best practices for implementation in online learning, instructional design, and the author's profession, information literacy.

Aesthetic design is an underused principle that can improve the learning experience by creating an aesthetic education environment. The education theorist Charlotte Mason described "education as an atmosphere" (Mason, 1989, p.1). In a lot of ways, a traditional education environment like a classroom, website, or learning management system can be ubiquitous and encompassing like an atmosphere. However, to create an incentive for a learning experience the environment, or as Mason called it atmosphere, needs to welcoming, comfortable, simple, and well designed to connect with the emotion of the learner. One powerful design theory that address this issue is aesthetic design.

Aesthetics is an interdisciplinary concept, but it relates directly to online learning, information literacy, education, and the learning experience. This interdisciplinary nature is why it is applicable in many different environments including online learning and information literacy instruction—which is interdisciplinary, ambiguous and vital. It will be explored throughout the analysis. Aesthetics relate to the learning experience through instructional design principles, but it is also more holistic in its nature. For example, Aesthetics is not art, and it is not being an artist. Eisner (1982) stated "that aesthetics is distinct from art in that art generally implies making something. Aesthetics, on the other hand, is related to the experience secured from things already made… 'aesthetic' is more closely associated with the experience or appreciation of such form." In this interpretation aesthetics is almost art, but art as an experience (Dewey 1934; Dewey 1989). Martin (1986) clarified this difference further, "Art is something tangible and enduring. "Aesthetic" is generally thought of as an emotional response produced by a work of art or an artistic looking (or sounding) environment or event." This definition by Martin brings aesthetics into the environment of education and the learning experience as a feeling and as an experience. However, the idea of an education atmosphere or experience can be almost universal and difficult to define; so how can it be recognized? Sometimes it cannot be. Supreme court justice Potter Stewart famously said, "I shall not today attempt further to define the kinds of material I understand to be embraced within that shorthand description "hard-core pornography", and perhaps I could never succeed in intelligibly doing so. But I know it when I see it, and the motion picture involved in this case is not that" (378 U.S. 184). This quote represents the idea of a holistic learning experience and aesthetic design. It is simply an emotional response to external stimuli that can aid in education through aesthetics.

 John Dewey intuitively understood this connection, "Aesthetic describes a category of experience. Aesthetic experiences are heightened, immersive, and particularly meaningful ones" (Dewey, 1934; Dewey, 1989; Parish, 2009). In other words, aesthetics help you feel, and they assist in creating a connection to an experience; which is similar to creating an education experience (Hancock, 2004). In instructional design this is a key aspect of the creation of effective learning outcomes and curriculum and using aesthetic theory as a bridge to the learning experience. This experience helps connect the learner to an emotional understanding which helps with engagement in materials and inclination for attainment (Parish, 2009). Specifically, it promotes a connection to a learning experience and education environment.

Aesthetics as an arena and subset of education theory is a more holistic and inclusive view of the learning experience, and can greatly expand the effect of learning through a non-traditional lens, a

natural partner with instructional design (Parish, 2009). This is directly associated with education as an atmosphere. As Dewey (1916) knew, "it as a view of valuing a growing capacity and willingness to engage with and learn from the world and considers the continuity of experience" (p.9). The idea of creating an education environment that can aid with differentiated instruction, universal design, and can engage the learner immediately through sensory perception and emotion is vital for instructional designers, educators, and information literacy instructors.

Learning experiences are emotional and they come in many different arenas of life and mental viewpoints. Wilson (2005) describes this, "Learning experiences have many qualities, including cognitive ones, of course, but they also have emotional, social, cultural, political, and aesthetic ones" (Parish, 2009, p.4). Most importantly for instructional designers, information literacy scholars, and instructors, aesthetics can help learners connect with the material synchronously and asynchronously. This all has an effect on information retention and transfer, which is the ultimate goal of instructional designers, educators, and information literacy. Additionally, it creates a positive association with the learning design, which in turn creates opportunity for a learning experience.

Simply put, aesthetic design is about building the education atmosphere through carefully considered design principles and creating a lasting learning experience, which is a realization of information literacy, retention, and transfer. The aesthetic design framework is an additive to the environment, and if the students can be immersed in the environment they can recall the information embedded within it and become information literate.

Method
Research Design
The design is a critical analysis of empirical literature related to aesthetic design; this approach is used to assess and summarize evidence related to aesthetics in instructional design, online learning, and information literacy instruction. The quantity and diverse resources analyzed and compiled creates a coherent narrative of the key theories, empirical research, and a framework for adoption of the theory in online learning and information literacy. Due to the lack of data and literature in the discipline of study, online learning and information literacy; the author synthesized key research from the following disciplines: cognitive psychology, evolutionary psychology, product design, web design, including library web design, human computer interaction, cultural anthropology, instructional design theory, and online learning. Much of the literature and the foundation of the framework is synthesized from the seminal works of (Kahneman, 2013; Halsey, 2011; Miller, 2011; Dewey, 1916; Dewey, 1934; Dewey 1989; Norman, 2002; Norman, 2004; Mason, 1989; Wilson, 2005; Hancock, 2004; Parish, 2009; Tractinsky 2014). The critical analysis synthesizes and transfers this research in applied application towards information literacy through in all its forms.

These disciplines were chosen because their interdisciplinary nature and connection to education, learning, cognition, and information behavior. While many of the disciplines are not clearly related; they are through their association with aesthetics and its effect on the learning experience. The timeline of the sources is 1936-2016. The earlier works are historical literature on education. Many are seminal primary documents that are relevant to the history and evolution of education.

The selection criteria of the critical analysis followed a rigorous selection process grounded in authority, relevancy, and accuracy. The selection process included analyzing the types of studies, the

literature and data used, author, organizational reputation, journal impact rating, and Altmetrics and Bibliometrics of specific articles. It also included information selection criteria such as reputation in the field and how often the seminal piece, seminal author, or policy actor was referenced, cited, or mentioned depending on type of source (Porter, 2016).

Before an item was included in the critical analysis, each source was analyzed for accuracy, relevancy, and authority. The metrics for each field are the following:

- Accuracy: The information had to be accurate, reliable, correct, and from a respected source. It had to be supported by evidence, refereed when applicable, and verified by other sources or personal knowledge of content. It also was required to be free of obvious bias and common grammatical mistakes.
- Relevancy: The information had to be important to the specific research question and the relevant time frame.
- Authority: The source of the information was required to be from an authority in the field. The author and publisher had to be qualified to write on the topic. The author and organization credentials were required to be relevant to the topic and level of research.

Each source had to meet all three of these metrics to be used in the policy proposal. The checklist in Table 1 was created to record pertinent metrics of each type of source to assure quality (Porter, 2016). If the source met each metric, I would check the corresponding box. Following this process, it would be qualified to be used in the critical analysis.

Table 1 Resource Checklist

Source Type	Criteria	Check
Peer reviewed	Accuracy	Y
	Relevancy	Y
	Authority	Y
Websites	Accuracy	Y
	Relevancy	Y
	Authority	Y
Monographs	Accuracy	Y
	Relevancy	Y
	Authority	Y
Popular Literature	Accuracy	Y
	Relevancy	Y
	Authority	Y/N

Environmental Scan
An environmental scan is a methodical survey of all relevant data and literature to identify pertinent information to address strengths and weaknesses in a policy arena, macroeconomic market, and industry environment (SHRM, 2012). And because of this systematic analysis it was used as the search

strategy for the analysis. The search strategy was an exhaustive environmental scan of all relevant literature.

The process included using advanced searching techniques such as Boolean operators and keyword string theory, building blocks approach to literature analysis, pearl growing, controlled vocabulary and refined searching, data mining, and footnote chasing to create a comprehensive landscape of the literature. The advanced searching process was used through subject specific databases such as ERIC, JSTOR, Academic Search Complete, Research Library, Google Scholar, Lexis Nexis Academic, Social Sciences Citation Index, PyscInfo, Georgia Institute of Technology Discovery Service, and Education Research Complete. To analyze potential seminal monographs I completed an exhaustive search through World Cat to find relevant monographs on education and design.

The literature is applied through a lens of online learning, instructional design, and information literacy; which is the authors discipline and professional perspective. The critical analysis is broken down into key sections contained within the seminal works and diffused from other related disciplines.

Literature Review
Information Literacy
The Association of College & Research Libraries defines information literacy as:

> Information literacy is a set of abilities requiring individuals to "recognize when information is needed and have the ability to locate, evaluate, and use effectively the needed information." Information literacy also is increasingly important in the contemporary environment of rapid technological change and proliferating information resources. Because of the escalating complexity of this environment, individuals are faced with diverse, abundant information choices--in their academic studies, in the workplace, and in their personal lives. Information is available through libraries, community resources, special interest organizations, media, and the Internet--and increasingly, information comes to individuals in unfiltered formats, raising questions about its authenticity, validity, and reliability. In addition, information is available through multiple media, including graphical, aural, and textual, and these pose new challenges for individuals in evaluating and understanding it. The uncertain quality and expanding quantity of information pose large challenges for society. The sheer abundance of information will not in itself create a more informed citizenry without a complementary cluster of abilities necessary to use information effectively.
>
> Information literacy forms the basis for lifelong learning. It is common to all disciplines, to all learning environments, and to all levels of education. It enables learners to master content and extend their investigations, become more self-directed, and assume greater control over their own learning (American Library Association, 2016).

Information literacy is a crucial interdisciplinary skill in the 21st century information driven environment. Aesthetics are directly related to information literacy through the growing multi-media interfaces that proliferate in learning experiences and the need to combat cognitive dissonances involved in the virtual learning environment. As the growth in access to online information and digital learning objects continues, the need for information literacy will continue. And because of the universal demand for information literacy, simplifying and designing learning experiences founded in

aesthetic design is a relevant goal for educators, instructional designers, and information literacy instructors. Information is more complex and ubiquitous than ever, thus, the following empirical research will clarify the need for aesthetic design in the learning experience.

The analysis will also demonstrate actionable steps for implementing aesthetic design in online education, instructional design, and information literacy instruction. In this manner the following critical analysis synthesizes the disparate vital work in aesthetic design and illustrates the importance of aesthetic design in information literacy and creates a framework for application.

Gut Reaction

Learners cannot always separate critical thinking and analysis from their instinctual gut reaction, and because of this, students cannot define between how they feel and how they think about education content. Empirical research on emotion and cognition suggests the aesthetically pleasing objects affects our emotions positively. For that reason it encourages learning and information retention (Norman, 2004; Miller, 2011). Due to this, aesthetic design can have a positive effect in online education and information literacy instruction.

Designing with aesthetics theory for online learning and information literacy instruction will make the education atmosphere more user friendly and help with information retention. More than that, it is an immediate emotional connection to the visual presentation of materials. And this is connected with learners understand objects and interpret information about those objects and experiences (Anderson, 2009; Zhang, 2009). First impressions are hard to overcome and are crucial in design and learning experiences. The aesthetic interaction between an object or education atmosphere is usually the first interaction and response (Ulrich, 2008, p. 2). When learners are repelled by the design, the education atmosphere is damaged, and this can be hard to overcome. However, aesthetic design of an education atmosphere can help overcome any negative emotional response to the material or object. A positive interaction with the aesthetic design can help create a conducive environment for online learning and information literacy. For example, research suggests that aesthetics aid in the self-control over learner's education atmosphere, and this is associated with the research in the fields of behavioral economics that show that self-control is limited (Norman, 1988; Hassenzahl, 2004; Tractinksy, 2004; Gailliot 2007; Vohs, 2007; Muraven, Tice & Baumeister, 1998).

For that reason, and considering the research in feeling and emotion in education, it is crucial to take that into account when designing digital learning objects and information literacy sessions. Emotion can control learner's decision making skills and cloud their judgment. As Dirksen (2011) explained, instructors need to "talk to the elephant not the rider" (p.26). The elephant is the unconscious instinctual level of the brain. The rider only has so much control before the pure mass of strength, energy, and recklessness takes over that is the elephant. Cognitive resources such as memory, focus, and control are finite and exhaustible, so the designer needs facilitate the choice structure (Dirksen, 2011, p. 126). When learners are forced to struggle through learning materials, whether synchronous or asynchronous that are poorly designed, their finite control is very limited and they quickly become exhausted (Miller, 2014). Designing aesthetically to create an education atmosphere that reflects information literacy will help with that since it is intuitive to a learning experience. Much of this institution is evolution.

Evolution

In evolutionary psychology scholars argue that our cognitive abilities have not evolved greatly in tens of thousands of years, and because of this many of our responses to objects or experiences are driven by reproductive instincts. Ulrich describes this theory at length:

> Beauty is the moving experience associated with information processing by aesthetic judgment adaptations when they perceive information of evolutionary historical promise of high reproductive success. The classic example of evolutionary aesthetics is that humans on average find symmetry attractive in potential mates. And in fact, even today, facial symmetry is correlated with reproductive health, and so it is plausible that rapidly detecting and being attracted to facial symmetry is an aesthetic judgment adaptation that could have led to relatively higher reproductive success (Thornhill & Gangestad, 1993). Evolutionary aesthetics also convincingly explains a wide range of other responses, including an aversion to slithering snake-like objects and a preference for landscapes that provide protection and vantage points. A central tenet of evolutionary aesthetics is that adaptations are shared by essentially the entire species and so to the extent that an adaptation explains an aesthetic response, it does so universally (Ulrich, 2008, p.3)

Hekkert (2006) has investigated this even further. There exists a uniform aesthetic acceptance of certain things in human beings because of our instinct for survival. Human beings want to survive and most adaptations for survival have been related to aesthetic experiences (Hekkert, 2006, pg.5). So it makes sense that aesthetic experiences and objections connect with learners cognitively. Beyond that, aesthetics is an important part of human history, emotion, cognition and evolution, and to separate emotion from critical thinking and education content is to create an unpleasant education atmosphere, which is not conducive to information literacy and online learning. Simply, the research displays an association between evolution and intuition.

Tap into Intuition

Aesthetic design is intimately related to the emotional condition of a learning experience, and this includes cognition. For example, "There are three levels of emotional design, parallel to the brain's three levels of processing: the visceral level, the behavioral level, and the reflective level" (Miller, 2011). Miller explains this in detail in his seminal piece, Aesthetics and e-assessment: the interplay of emotional design and learner performance, all three can have a marked effect on learning and information retention as described in the previous section. Visceral design is focused on the immediate appearances and embraces the emotion and the moment, including aesthetic metrics such as feel, look, and even color. Think about what the color red communicates, anger, warmth, and fire; this is all part of the aesthetic experience and is elemental (Norman 2004; Miller 2011; Aslam, 2012). Aesthetics are inherent in information processing and contribute to overcoming negative emotional responses in an education atmosphere. As Ulrich (2008) described, overcoming repulsive aesthetic design is difficult, and in online learning and information literacy it is unmanageable.

Creating a learning experience through aesthetics will help minimize this affect. Much of this is intuitive, but empirical research has shown how simple design can affect a learner's information retention. For example, Song (2009) gave two groups a list of tasks to complete, the only difference between the two lists were the fonts used. The groups were asked to rate the lists on how easy or

difficult the tasks would be to complete successfully. In both groups the tasks shown in easier to read formats were rated as easier to complete. Reference Table 2 for an adaptation of Song's research.

Table 2 Instructions for Lifting Weight

Stand up straight with your feet flat on the ground and knees slightly bent	Stand up straight with your feet flat on the ground and knees slightly bent
Lift each dumbbell individually until your palm faces your shoulder	Lift each dumbbell individually until your palm faces your shoulder
Lower each dumbbell individually and slowly until your arms are at rest with your palms facing away from your body	Lower each dumbbell individually and slowly until your arms are at rest with your palms facing away from your body
Repeat exercise eight times	Repeat exercise eight times

(Song 2009; Dirksen 2011)

Simple improvements such as a more readable font can help create the aesthetic education environment, and it is a subtle way to influence information retention and literacy. In online learning and information literacy every improvement that is possible in the education environment should be investigated for use, including the significance of beautiful design.

Bold & Beautiful

Pretty things work better. Even color sends messages on the usability and the design of an object. Color is a crucial element of aesthetic design and usability. Colors influence emotions, communicate ideas, and affects moods. Depending on the message to be communicated designers choose different colors, and this is key to aesthetic design and an education atmosphere (Aslam, 2012). Attractive design is not just a marketing tool or a pop culture phenomenon and has been empirically tested multiple times as directly correlating to enhanced usability. For example, three seminal pieces in this field were described by Norman (2004), in his book Emotional Design. Two Japanese researcher, Karuso and Kashmira (1995, 1997) set up two identical ATM machines that were completely functional. However there was one key difference. On one machine the buttons were aesthetically designed and the machine was much more attractive than the other. In all three studies, 1995, 1997, and 2004 when it was replicated in Israel, the subjects repeatedly had much less trouble using the more attractive machine. The attractive machines actually worked better because of the design.

The literature is intuitive with evolutionary psychology and information processing in cognition. When we are tired or frustrated attractive design can help with completion and satisfaction of a task, and we also overcome perceived dead ends that can happen with poor design (Anderson, 2009). However there is another argument to the conclusion of their research. We want attractive,

aesthetically pleasing objects to work better. We want them to succeed, so we try harder subconsciously (Anderson, 2009). This could be a viable alternative, but even if this is so—the aesthetic design did not make the object more usable—but the perception of the design made it seem so, it still supports the claim that aesthetics of design can help create a more functional learning environment and support education as an atmosphere and information literacy. In spite of this, aesthetic design has not been represented as often in an education setting as in product design.

Design Sells

Design sells. There is something about sleek, minimal, aesthetic design of a product that makes it usable. The experience of the product is an aesthetic experience, the look, the feel, the smell, it creates an atmosphere of aesthetic design, and it is a crucial aspect to any object or artifact. For example, Mark Boulton (2005) a usability expert uses the example of car design. Cars sell because of the design. Take a moment to picture two cars, one attractive, and one built for utility. The attractive car made you smile, or crave to be behind the wheel, and it made you feel or connected you to a memory or a dream. These images are seared into our subconscious, and good design and attractive objects create an emotional response (Boulton, 2005). The empirical research supports this claim as well. For example, a seminal study by Nelson (1973) linked aesthetic design to signals of quality in product design (Ulrich, 2008, p.13).

As previously explored by Norman, Anderson, and Miller, it does not matter if it is reality or not, what matters is perception. All of this is directly related to cognition and usability. Nothing is created in a vacuum, it is a construct, and design is part of that construct, it reminds you of experiences, sensations, and emotions. Just like an education atmosphere. Product designers have a purpose, and this purpose is to communicate action. Buy, consume, visit (O'Nolan, 2009); for our purpose as educators, instructional designers, and information literacy instructors, it should be similar, retain, learn, understand, and move forward with the knowledge attainted. The tools are there, perfected by decades of demographic and cognitive research, we just have to use them. It is not just products, but online interfaces that focus on this extensively.

Web Design & HCI

Web design and Human Computer Interaction has intuitively used aesthetic design for decades. It is a foundation of what they do and a core element of their purpose, communicating information effectively. And this is incredibly important for in instructional design, online learning and information literacy. Much like the previous sections, empirical research supports the case for aesthetic design. For example Fogg et al. (2003) "found that over 45% of consumers made judgments about the credibility of websites based on the site design, "including layout, typography, font size, and color scheme" (David & Glore, 2011 p.2). This happens almost immediately, the subconscious kicks in and connects the design to the usability. In 3.42 seconds users judge the credibility of the website based off its appearance (Alsudani & Casey, 2009. p.1; Robins & Holmes, 2008). And Neilson (2012) claims that users will turn away immediately. Of course the design choices are the user's preference but there are best practices for aesthetic design that will help with these issues to be covered shortly. All of the research is crucial to our jobs as education practitioners and connects to the creation of a learning experience through aesthetic design.

Culture & Aesthetics

The literature in cultural anthropology investigates the connection between emotion and experience in aesthetics, and is in fact, a vital part of the disciplines research agenda. Many cultural anthropologists view aesthetics as, "(1) aesthetics is the perception of attachment of values to experience; and (2) aesthetic experience is the re-creating of experience through which those values are reconstituted and/or transformed.) (Sharman, 1999, p. 178). This research focuses on the association between aesthetics and emotional experience; including cognition. Sharman continues stating that the cognitive process is involved in the emotional response to experience (178). The research done by (Sharman, 1997; Shelton 1992) and others in the field of cultural anthropology reinforce the role of aesthetics in experience and emotion, which compounds with the previous research associating emotional experience and a successful learning experience.

Cultural aesthetics also reinforce the view of symmetry in beauty and the evolution of aesthetic in the human experience across culture. Cultural anthropologists have enhanced the study of aesthetics through the valuable addition to the literature of aesthetics on a holistic scale, Layton (2011) summarizes this idea eloquently:

> I conclude that, while there is little doubt that aesthetic appreciation of symmetry is grounded in our evolved psychology, the socially-constructed environment plays a vital, perhaps pre-eminent role in determining the adaptiveness of alternative strategies for the display of artistic skills, and that the appreciation of beauty is now experienced in many contexts beyond those in which it plausibly evolved. (Layton, 2011 p.1)

The cultural anthropologists often generalize on the effect of aesthetics across cultures. This critical analysis takes a more limited assumption based on the clear correlation between aesthetics and emotion and experience; which reinforces the thesis of the importance of aesthetic theory in the application of aesthetic theory in online learning, instructional design, and information literacy.

Theory & Best Practices in Online Learning, Instructional Design, and Information Literacy
Instructional Design

Instructional design interacts with all the previous empirical research and many elements of education. The traditional components of instruction are field of study, subject matter, pedagogy, teacher, instructional designer, and the learner (Parish, 2009, p. 3). As these components interact they need to be interacting within the education atmosphere created through aesthetic design. This is a philosophy and a way of thinking when it comes to creating a learning experience that represents the ideals of information literacy. Again, this is not about being an artist, and it is not about replacing core instructional design frameworks like ADDIE—Analysis, Design, Development, Implementation, and Evaluation—but it is about complimenting existing structures and being an additive to online learning and information literacy instruction. Aesthetics help support these existing structures, and more importantly help engage learners. Simply, it is about navigating through a cluttered landscape to find and use what you need, and taking into account aesthetics in design that motivate a long-lasting learning experience (Wilson, 2005; Miller et. al, 2008). And lasting learning experience should be the goal for instructional designer and any information literacy instructor. The education atmosphere of information literacy is too often point and click bibliographic instruction without any active design of learning outcomes based around solid instructional design methodology. Aesthetics is one solution to this. Furthermore, tweaking this atmosphere with aesthetic design can help create the life-long learning

atmosphere that is the goal of the ACRL information literacy framework explored previously—or at least hold the learner's attention and help with information retention on the key concepts presented. Many of the elements of online learning and information literacy are under the umbrella of aesthetic instruction design, but they are also significant enough to differentiate between.

Online Learning in Information Literacy

Aesthetic design in information literacy instruction for asynchronous access is especially important. Miller (2011) describes the LMS as the learner's classroom. So the online interface becomes their education atmosphere, and it can have a marked impact on their retention and satisfaction with distance learning. Empirical research has shown this correlation. For example, Miller (2011) ran a study that examined aesthetic design in e-assessment for distance learning. The experimental study had 66 postsecondary students were randomly assigned to a treatment group (Group one) and a control group (Group two). Group two had little aesthetic design, and group one had several elements that were aesthetically designed. The tasks for both groups were identical and only differences was the elements were aesthetically designed. "Findings suggest that aesthetic design significantly decreased participant cognitive load and increased participant satisfaction, willingness to continue use, voluntary self-assessment time, and task performance" (Miller, 2011, p. 1). Hancock (2004 & 2009) replicated this study and had interesting responses from the learners.

> Nearly twice as many students answered that they "Strongly Agreed" that the course was attractive (13 to 7) with the point average for the experimental group being 3.81 compared with the average for the control group being 3.27. The difference between the two increases when asked if the appearance made them want to visit the website with the averages for groups A and B being 3.27 and 3.87 respectively. This supports that student recognize and prefer an attractive learning environment.

These experimental studies support the claim that aesthetics in design can improve an education experience through aesthetic consideration in the online environment and improve information behavior (Miller, 2011). As practitioners, we can use this framework and research to create a learning experience that is conductive to learning and represents information literacy. To do so the best practices of design should be followed.

Design Best Practices

The Seven Principles

The fundamental concepts for good design as they pertain to online learning and information literacy can be synthesized from the foundation of universal design, the Center for Excellence in Universal Design:

1. Equitable Use
   a. The design is useful and marketable to people with diverse abilities.
2. Flexibility in Use
   a. The design accommodates a wide range of individual preferences and abilities.
3. Simple and Intuitive Use
   a. Use of the design is easy to understand, regardless of the user's experience, knowledge, language skills, or current concentration level.
4. Perceptible Information

a. The design communicates necessary information effectively to the user, regardless of ambient conditions or the user's sensory abilities.
5. Tolerance for Error
    a. The design minimizes hazards and the adverse consequences of accidental or unintended actions.
6. Low Physical Effort
    a. The design can be used efficiently and comfortably and with a minimum of fatigue.
7. Size and Space for Approach and use
    a. Appropriate size and space is provided for approach, reach, manipulation, and use regardless of user's body size, posture, or mobility (Center for Excellence in Universal Design 2016).

These elements are the foundation of design and will help guide instructional designers and information literacy instructors in the best practices in design. Following the implementation of the seven principles should be Aesthetic design.

Guidelines for Information Literacy Instruction & Online Learning
Williams (as cited in Hancock, 2004) breaks the entire concept of visual design down into four basic principles "Contrast, Repetition, Alignment, and Proximity" (p.18). These basic principles can then be subdivided further into visual elements such as, type, color, use of color, size, line design, shape, and space. Below are best practices gathered from the research synthesis for sound aesthetic design.
1. Contrast
    a. Contrasting all elements to make different ideas very different.
2. Repetition
    a. Repeating the use of the same visuals for specific content enhances information retention.
3. Alignment
    a. All elements should have connection to other elements on the page. Do not put a pretty picture just because it is pretty.
4. Proximity & Uniformity
    a. Items that relate to each other should be grouped close together to make them one visual unit. This helps organize the page visually and clusters similar information together.
5. Picture Superiority
    a. Images will help with information recall and memory
6. Color:
    a. Use appropriate colors for content.
    b. Be aware of emotional connection to color and spacing.
    c. Color-coding
        i. Color-code different sections of your subject matter. This will help with information recall as the brain will connect each idea to the color it is attached too.
7. Intrinsic Subject Matter
    a. Make sure the elements are intrinsic to the subject matter on content or it can have a negative effect on learning and retention. (Thalheimer, 2004; Williams, 1994, 1998;

Halsey, 2011; Mintzer & Snodgrass, 1999; Martin, 2004; Aslam, 2012; Hancock, 2004, pg. 18.; Miller 2011).

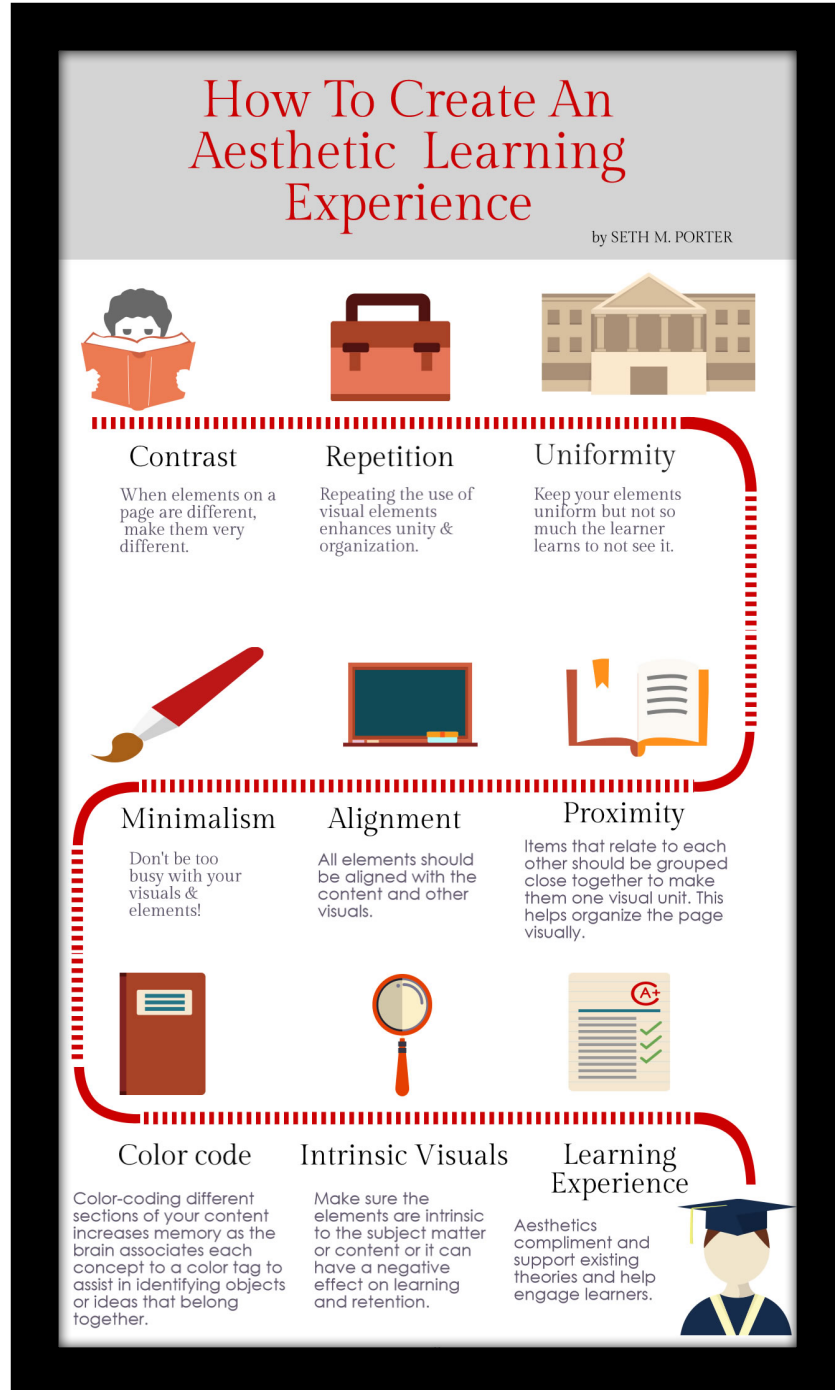Figure 1 is a visualization of the processes described above.

Figure 1 How to Create an Aesthetic Learning Experience

Discussion

The literature analyzed and discussed describes a correlation between aesthetic design and the formation of a learning experience. Furthermore, the attractiveness of an instructor can impact the information retention and transfer of the student, so the assumption of an association between aesthetic content and the creation of a learning experience is an appropriate assumption (Westfall et.al. 2016). The most surprising finding from this experiment was the lack of association between attractiveness, success, and sexual interest. The researchers state it was, "driven by processes independent from human sexual attraction, such as attention and motivation" (Westfall et.al. 2016, pg. 168). They even claim that it is just human nature to pay closer attention to attractive things. This finding and many like it demonstrates the impact of aesthetics on an education environment and the significance of implementation in online education, instructional design, and information literacy.

As discussed previously, through the critical analysis, there is a strong association between how something looks and how it works. As the growth in information and online education continues these findings are critical for instructional designers, education theorist, instructors, and information literacy instructors. The theory analyzed argues the importance of aesthetic theory based on empirical research from numerous disciplines and the crucial connection between information literacy and aesthetic design. However, the analysis stops short of generalizing outside of the role of emotion, experience, and the connection between aesthetics and the learning experience. Therefore, the theory is valuable for future research and intellectual discourse. Moreover, the critical analysis indicated a limited path forward for practitioners to take significant action to embrace the empirical literature discussed and create an aesthetically guided learning experience in the physical or virtual classroom.

The analysis has shown a transferable association between general aesthetic theory in education and peripheral disciplines to online learning and information literacy instruction. However, further experimental research is needed to confirm the theory in the stated arena. With that said, the author recommends adopting the best practices of aesthetic instructional design whenever possible founded on the literature explored throughout the analysis.

Conclusion

Creating an aesthetic education atmosphere is not about replacing content, instructional design theory, or creating art. It is about adding aesthetic design to the idea of education as an atmosphere and embedding information literacy through aesthetic design. Through the critical analysis of empirical research in cognitive psychology, evolutionary psychology, product design, web design, human computer interaction, cultural anthropology, instructional design theory, and online learning; aesthetic design is a constant element of usability and good design.

Aesthetics are inherent in the creation of learning experiences; and information literacy strives to connect the learner to the right information artifact as efficiently as possible. But even more than that, information literacy strives to embed information literacy into the learner's daily lives. Aesthetics have been adapted in almost every discipline and information literacy in an applicable discipline for implementation. Instructional designer and information literacy scholars can use aesthetics as a benchmarking tool for their instructional design and to reach learners through a valuable and aesthetically distinct avenue. Simply, make a good first impression and hook learners through aesthetic design, and in doing so this will aid in creating an education atmosphere that is conducive to information literacy, retention, and understanding.

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