Designing Creative User Interactions for Learning

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Profitable creative ideas can emerge from within virtually any phase of the instructional design and development process. However, the design of user interactions is perhaps where learners can most directly experience the benefits of such ideas. In this article, the authors discuss principles of learner interaction as found in the instructional technology literature. They then present some observations about creativity from the creativity literature and attempt to contextualize creative interaction design, particularly in multimedia development, within broader aspects of creativity. Finally, they offer several suggestions for promoting the emergence of creative ideas within the work of designing user interactions for learning.

Introduction

When was the last time you were inspired to learn? It likely did not happen within a formal educational setting, but instead within some everyday context. Perhaps you stumbled across a television show, a YouTube video, or some Website that made you think differently about some important issue or topic. Whatever it was, somehow it grabbed you and made you want to know or explore more. When this happens, you probably don't even think about the fact that you are learning something, but instead allow yourself to be carried away by the feeling of adventure and satisfaction. The person or group who designed whatever it was that inspired you did something very special. Instructional designers and teachers should likewise "aspire to inspire." Of course, this is easier said than done.

In the field of instructional technology, there is a tension between the "art" and "science" of instructional design. The literature on instructional design gives mixed messages to people learning it formally for the first time. Although many instructional design scholars talk about the need to be creative and innovative, little guidance on how to be so is given. Also, one can get the feeling of creeping away from the "principles" of instructional design when approaching a design problem with a creative idea. Partly this is so because a creative act is a very personal thing—we probably rarely have the canons of instructional design in sharp focus at the moment that an original idea springs into our heads. Additionally, a creative approach to design must, in the end, be consistent with the principles of learning and good instruction. It is relatively easy to design traditional instruction that is boring, but modestly effective. Unfortunately, many designers apply models like Gagne's Nine Events of Instruction (Gagne, Wager, Golas, & Keller, 2005) in formulaic ways, leading to reasonably effective outcomes, but at the cost of disengaged learners who cannot wait for the instruction to end. This type of instruction might be fine for times when learners must be "in compliance" to complete some training for their jobs, but it falls far short of inspiration. The Roman architect Vitruvius advocated that well-designed buildings must exhibit firmness (be sturdy and not fall down), commodity (be designed to meet the functional needs), and delight (be a place where people enjoy the experience of being inside) (Kapor, 1996). So too should our instructional designs be well-built and functional, but they also should be a delight to the users.

Of all the design requirements leading to effective instruction, we focus here on interactivity, specifically designing interactions creatively. Interactivity relates to how you engage students in the instruction to make them willing and

enthusiastic participants in the learning. On one level interactivity is about having the learners do something. However, just the act of clicking buttons or typing text into a field says nothing about their level of engagement. It is not the quantity of activity, but the quality that matters. Rod Sims (1997) argued in favor of considering the design of interactivity as an artistic act, especially when in the context of designing digital media:

> The implementation of interactivity can be perceived as an art because it requires a comprehensive range of skills, including an understanding of the learner, an appreciation of software engineering capabilities, the importance of rigorous instructional design, and the application of appropriate graphical interfaces. (p. 158)

Thus, the activity of designing learner interaction can lend itself to adopting an artist's mindset, in which one is open to —even actively looking for—creative ideas. While not all instructional designers will necessarily adopt an artistic frame of reference for their work, there appears to be a growing recognition of this approach in the literature of our field (Clinton & Hokanson, 2011; Hokanson & Miller, 2009; Rowland, 1993; Visscher-Voerman & Gustafson, 2004).

Profitable creative ideas can emerge from within virtually any phase of the instructional design and development process (Clinton & Hokanson, 2011). However, the design of user interactions is perhaps where learners can most directly experience the benefits of such ideas. In this article, we discuss principles of learner interaction as found in the instructional technology literature. We then present some observations about creativity from the creativity literature and attempt to contextualize creative interaction design within broader aspects of creativity. Finally, we offer several suggestions for promoting the emergence of creative ideas within the work of designing user interactions for learning.

Defining Interaction

Incorporating interactions in computer-based learning resources has been regarded as an effective strategy for facilitating learning (Sims, 1997, 1999; Woo & Reeves, 2007). Interaction has been defined as "lessons in which the learner actively or overtly responds to information presented by the technology, which in turn adapts to the learner… interactive lessons require at least the appearance of two-way communication" Uonassen, 1985, p. 7). Commonly recognized components of interactive lessons include the ability to promote learners' active participation and engagement and to heighten user control so that effective learning can take place (Fenrich, 1997; Hannafin, 1989; Holmes, 1995; Kristof & Satran, 1995). Also, involving learners in discovering and constructing their own knowledge enables them to participate in their learning actively (Department of Communication and the Arts, 1995; Dickinson, 1995; Holmes, 1995).

Some scholars have developed models describing multiple levels or types of interaction. These range from reactive interaction, which provides learners with little control of structure and content, to proactive interaction, which increases learners' control to explore and create knowledge (Rhodes & Azbell, 1985). Reactive interactions include page turning and clickable buttons to go over the content, limited user control of audio or video representations, and end-of-lesson quizzes with limited and undifferentiated feedback. This level of interactivity aligns with the learning "from" technology approach that Jonassen and Reeves described (1996). In contrast, proactive interaction, mainly based on the constructivist perspective (Aldrich, Rogers, & Scaife, 1998; Rhodes & Azbell, 1985), employs computers as a tool for learners to think with, explore, discover, collaborate, and actively participate in learning (Holmes, 1995; Sims, 1999). Microworlds, simulations, and educational games are often recommended for achieving this level of interactivity (Rieber, 2003, 2005). With technology that enables interactions, such as simulations or educational games, the greatest benefit to learners is safe and easy access to situations in the real world that are otherwise unsafe or inaccessible. Advanced digital media affords a high level of interactivity to learners that would be unattainable apart from the technology (Gredler, 2003).

The dramatic increase in e-learning (or distance education) made possible with advances in, and access to, Internet technology has placed significant attention on defining and supporting interaction within learning. This is due to the fact that virtually all interaction is mediated by technology, usually in asynchronous ways. In a review of interactivity within e-

learning, Bannan-Ritland (2002) describes four general categories of interactivity: (a) active involvement of the learner; (b) patterns of communication among learners and instructors; (c) participation within a range of instructional activities and technologies; and (d) interactivity as a form of social exchange. In a similar review of interactivity within e-learning, Hirumi (2002) put forward a framework of interaction that takes into account how the design of learning events or strategies leads to interactions between learners and humans or between learners and non-humans (i.e., technology). These two levels of interaction lead to a third level of learner self-interactions that includes "the cognitive operations that constitute learning as well as metacognitive processes that help individuals monitor and regulate their learning" (Hirumi, 2002, p. 144).

These reviews demonstrate how interactivity encompasses all aspects of teaching and learning, from communication between and among learners and instructors, to the activities and tasks within which learners engage. Increasingly, these interactions involve decisions about the design of intervening technology.

Finally, the evolution of the instructional design process has shifted attention away from content-centered models and toward models based on whole tasks or activities (e.g., Merrill, 2002, 2007; van Merriënboer, Clark, & de Croock, 2002). These models support the idea that learning is promoted when it is situated in an authentic and complete task within which all important concepts and principles are integrated. However, little guidance is available on how 'best to design or determine these tasks or activities. There is a dependence on designers working closely with subject matter experts in creative ways to develop meaningful interactions with these tasks and activities.

Even with this understanding of different levels of interactivity, we are still a few steps away from designing high-quality instructional materials with effective interactions. Instructional design, according to Rowland (1993), has to take into account learners' needs as well as the learning context of a specific situation. Otherwise, ineffective or inappropriate design can be the result, if instructional designers only follow systematic rules, models, or fixed procedures. Rowland (1993) further explained that the design process "is intuitive, creative, or artistic, and [it] emphasizes early attempts at solution rather than complete understanding prior to solution attempts" (p. 88). All told, instructional designers should carefully observe and consider specific situations and potential creative solutions.

Creative Interactions

What kind of interactions can be characterized as a creative interaction? Previous sections have highlighted that designers should attend specifically to the needs of target audiences, consider the learning context, and possess the knowledge of different types and levels of interactivity as well as instructional design models. However, while these elements contribute toward meaningful interactions, they are not necessarily sufficient to bring about interactions that can be called creative.

A product or an idea is generally considered creative when it meets two criteria: novelty and appropriateness (Amabile & Tighe, 1993; Nickerson, 1999; Perkins, 1988; Starko, 2005). The criterion of appropriateness or usefulness appears rather straightforward: learner interactions must contribute towards desired learning outcomes and must fit aesthetically within the overall design. Aesthetic appropriateness is a matter of good visual design, which is very important but not the main focus of this article. For appropriate visual design, the reader would do well to consult sources such as Krause's *Design Basics Index* (2004) (see also Parrish, 2005).

The criterion of novelty involves several important considerations. First, if something must *ultimately* be new in order to be considered creative, extremely few human ideas would qualify as creative at any given time. However, an idea might be new only to the designer personally. if a particularly effective approach to learner interaction is a new and unfamiliar line of thought for a designer, then the cognitive mechanisms believed to be associated with creativity (e.g., Ward, Smith, & Finke, 1999) have occurred at some level. This would be the case regardless of whether the designer soon discovers that others have been working with the same idea. Novelty can therefore be considered local or relative.

Next, for whom, if not for the designer, must an idea be novel? And, for that matter, for whom must the idea be appropriate? One might seek a general answer to this question in the systems approach to creativity described by

Csikszentmihalyi (1999): ideas are judged to be novel and useful by the primary audience, those in the creator's professional field, who work in a particular domain. For example, a creative breakthrough in the domain of theoretical physics would have as its primary audience the body of theoretical physicists around the world. But in the unique case of instructional multimedia design, the audience is typically a specific set of selected learners; novelty and appropriateness therefore have meaning only in the perception and experience of the learner; creative interaction either has meaning in this sense or it has no meaning at all.

Novelty can also be viewed as happening by degrees (Mandler, 1995). In the experience of the audience or user, novelty is that which comes as a surprise (Bruner, 1962). A learning experience is novel or surprising if it has never been seen or heard-of before; it can also be meaningfully novel if it is something heard-of but not yet seen, or something rarely seen, or something merely uncommon.

Such a continuum of novelty suggests that there is a broad array of possibilities open to the designer in creating some degree of surprise and delight in the experience of the learner. Novelty for learners does not normally "wear off," because typically each instance happens with a new learner. A designer can become aware of an idea that most learners will not have seen; the designer then masters this technique and uses it to good effect for virtually all of the target learners, for whom the idea will be at least uncommon if not unheard-of.

A creative approach to designing learner interactions would therefore seek to use best practices for instructional multimedia design while trying to push into the realm of novelty to some degree for a given project. In other words, designers of creative interactions seek to surprise and delight their learners wherever they can with out-of-the-ordinary interactive experiences.

Enhancing Creativity to Design Creative Interactions

Creativity is a vital component that designers must consider in developing interactions. In this section, seven suggestions are provided to design creative interactions for learning activities.

Suggestion 1: Resolve to Be Creative

Most people assume creative people are those who are "smart." However, this idea does not find general agreement among scholars (Sternberg & O'Hara, 1999). Some scholars have reported that no distinct relation between intelligence and creativity has been identified (Perkins, 1988; Torrance, 1975). In other words, a highly intelligent person is not necessarily creative, and vice versa. Additionally, Nickerson (1999) contended that if one wants to be creative, merely possessing high intelligence will not suffice. What matters rather is whether an individual values creativity or not. If one values originality, one will constantly strive to come up with new ideas (Starko, 2005). Hence, the first step to enhance one's creativity is to resolve to be creative.

Suggestion 2: Pursue Positive Affect and Relaxation

Being relaxed and joyful can contribute to being creative (Norman, 2004; Ziv, 1983). This is especially important in the stage of brainstorming. Isen (1993) described how being happy, feeling good, and having fun can expand one's thought processes. Kelly shared that at the onset of a design project, designers should maintain a broad perspective, with openness to emerging directions, and try not to be apprehensive about moving forward efficiently toward the goal (Kelley & Hartfield, 1996). A design that is creative can emerge from designers' exploration. For example, you can invite team members to a brainstorming session, where snacks, drinks, and music are provided. Set an environment that is comfortable and relaxing. Remind your team members that any idea can be helpful and no judgment should be made during the session. The tenet for brainstorming is to let the thinking flow.

Suggestion 3: Carefully Consider Users' Experiences

To develop a product that is creative, designers need to overcome the challenge of understanding "end-users' unmet and unarticulated needs" (Norman, 2004, p. 74). In most cases, users are unaware of their true need. Thus, it is

designers' responsibility to discover users' needs and combine the articulated and unarticulated needs to design a product that can satisfy end-users. Instructional designers are trained to collect information early from stakeholders or subject matter experts about learners' situations and the content. However, data gathered from these experts might still be incomplete. If the situation allows, instructional designers ought to visit learners' environments and observe the performance context and learning context. Through observation, instructional designers can learn important insights from learners.

Suggestion 4: Approach Things from Different Perspectives

Since creativity has been described as "the ability to see ordinary things differently" (Egbert, 2008, p. 130), instructional designers should train themselves to observe a situation from as many perspectives as they can. In an interview, Kelly suggested that when you look at an object, look from different angles (Kelley & Hartfield, 1996). For example, you can look down on the object from above or examine an object from an ant's point of view. Another tip is to use an object or material in an uncommon way. Taking a match box as an example, how can you use a match box other than for holding matches? You could place a candle on the top of the box as a candle holder. With different elements interplaying, creative ideas can emerge.

Suggestion 5: Use Specific Techniques for Promoting Creative Ideas

Specific techniques for reinforcing one's ability to be creative have been proposed by various authors (e.g., Gordon, 1961; Osborn, 1953; Root-Bernstein & Root-Bernstein, 1999). Osborn (1953) proposed five techniques to come up with creative ideas. The first technique, *combination*, is to put things with different functions together so as to illuminate the possible combination of each object's purposes. For example, to teach beginning photographers basic photography techniques, combining video demonstrations with the database of questions and answers posted by other members may multiply their respective effectiveness in learning photography. The second strategy is *rearranging*. Reordering the content or trying different layouts to present the materials can contribute to potential creative ideas. When you rearrange one component of an entire instruction, you may end up shuffling other components. Using the teaching of *Inspiration* software as an example, unlike traditional ways of explaining basic functions to learners at the beginning of a tutorial, an instructional designer can reorder the teaching sequence by demonstrating a completed concept map and ask learners to create the same concept map by exploring *Inspiration* themselves in a given amount of time. After learners' exploration, more explanation of different functions of the program can then be provided. The third strategy, *adapting*, is borrowing ideas from other objects and applying them to a particular purpose. For instance, for language learning, many teachers use chants to reinforce students' memorization of vocabularies. However, when applying the idea of chants to adolescents, the learners may complain that rhyming with chants is childish. Instead, they might like to use the same chant and adapt it into a rap. The fourth technique that may be beneficial to creative instructional design is *substituting*. It is an act of changing an element from A to B. While substituting, you may need to confirm that B has some similar functions as A. Putting this into the context of instructional multimedia design, if you originally design an Internet scavenger hunt activity to teach students proper use of the Internet, you may then identify other types of activities to substitute, such as a *Flash*-based scavenger hunt. Finally, *making modifications* is the last suggested technique to lead designers to creative ideas. Designers observe learners' experiences in interactive activities and then make changes to improve the learning module. For example, if a video provided in the learning module is too long, the instructional designer might want to reduce the length of the video to retain learners' attention. Creative ideas may emerge during the modifying process.

Suggestion 6: Be Reflective and Persistent

Designing a creative interaction requires various types of thinking, such as brainstorming for the creative stage and reflection for the realization stage (Norman, 2004). In the early stages, designers may focus mainly, on brainstorming to generate a great number of ideas. In contrast, after ideas are produced, designers must then shift to examine all possible alternatives, to consolidate, and then to realize the design. In this latter stage, designers' reflective thinking plays a major role. Careful consideration of learners' characteristics, situation, and their learning context followed by the evaluation of the generated ideas is indispensable to a useful creative design. However, it is not guaranteed that after a

cycle of reflection you will achieve a successful creative interaction, since you are likely to experience failure at times. Creative design requires perseverance (Starko, 2005) to overcome barriers, to endure several rounds of failure, and to expose and overcome negative emotions. In a word, being reflective and persistent is one of the keys to realizing creative design of learner interactions.

Suggestion 7: Become an Experienced Professional Instructional Designer

Finally, creative work requires domain knowledge. As Nickerson (1999) noted, "people who do noteworthy creative work in any given domain are almost invariably very knowledgeable about the domain" (p. 409). However, as an instructional designer, your domain is not a specific content area; rather, it is the work of creating meaningful learning experiences. Thus, while fresh creative ideas are possible and desirable for novices, ultimately the key to increasing the likelihood of creative ideas in your work is to become an experienced professional instructional designer by doing lots and lots of instructional design. Examples of long-term fluent practice and creative output can be found in eminent creators across all domains, including musicians, painters, poets, astrophysicists, organic chemists, political leaders, etc. (Bukofzer, 1947; Csikszentmihalyi, 1996; Weisberg, 1999). The salient lesson here for the instructional designer is to become as active and as fluent as you can in designing interactive multimedia.

Conclusion

A well-designed interaction leads to learners' active participation, which enables learners to explore content and to construct their own knowledge, Additionally, a good interaction is creative so that learners can engage in learning on both cognitive and emotional levels. However, many instructional designers tend to question their creativity. The suggestions in this article are intended to help instructional designers develop their design process and facilitate their development of creative interactions.

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