

Effects of Interactive Multimedia in E-Learning On Learners and Developers

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Abstract

The e-learning field creates a dynamic environment that stimulates learners through self-directed training while applying theories of communication and management practices. E-learning accomplishes self-directed learning by utilizing animation authoring tools to develop interactive multimedia. Interactive multimedia are media that uses multiple forms of information content and information processing to inform or entertain the user. The purpose of this report is to analyze current practices in the e-learning industry regarding the use of interactive multimedia as a learning tool. The analysis will look at the positive and negative effects that the tool has on both the learners and developers.

Definition

The e-learning industry refers to the effective integration of a range of technologies across all areas of learning. E-learning technologies are designed to support learning by encompassing a range of media, tools, and environments. E-learning allows for both synchronous and asynchronous learning environments. E-learning acts as a catalyst for authentic and meaningful learning experiences (Bassoppo-Moyo, 2006).

An important characteristic of e-learning is its interactivity, which is possible through animation authoring tools. Interactivity can be broken down into four levels: simple clicking/activity, making basic choices, problem solving, and creation. These levels can be used sequentially, primarily to build learner confidence in the content or the instruction, or they can be used to complement one another. Thus interaction is a strategy to engage learners through a hierarchy of tasks beginning at the basic level of navigation and ending in a more dynamic interaction of creating in real-life stimulations. (Aldrich, 2005; Roy, 2006)

Interactive multimedia is engrossing because it provides the opportunity for deep involvement, which captures and holds learner interest. Interactive multimedia is also engrossing because it is multi-sensory, incorporating sounds, images, and text. It is individualized, allowing users to navigate through information to build their own unique mental structures based on exploration. Interactive multimedia is also engrossing because it facilitates collaborative creation through project-based learning that provides opportunities for authentic collaboration (Mishra & Ramesh, 2005).

The current applications of e-learning include instructional training in fields that have limited accessibility, such as microscopic research, and limitations due to travel, such as environmental training for the armed forces, as well as a multitude of other fields. The

use of animation software to create interactive multimedia provides stimulation, activity, and visibility.

Applicable Theories

Many different learning theories can be applied to instructional design, including constructivist theory, action-orientation, McGregor's Theory Y, and activity theory. The learning theory that is best applied to e-learning is the constructivist theory, which is a theory of learning in which humans construct meaning from current knowledge structures. Constructivist theory is important to e-learning because the goal of e-learning is to train adult learners by increasing knowledge and adding to their schemas. Therefore, e-learning is learner-controlled because learners must apply their current knowledge. The learner can decide how much training is needed by what they already know. In this way, e-learning is designed to be "adjustable" by the learner; if a learner knows they need more instruction, they can continue the training. However, if a learner is proficient in the subject, they can move ahead more rapidly. In other words, learners' prior knowledge determines the pace of the e-learning course. Thus, according to the constructivist learning theory, instruction plays a less important role (Harris, 2002; Mishra & Ramesh, 2005; Schroeder & Spannagel, 2006).

Another applicable theory to e-learning is action-orientation, a learner-centered pedagogy that emphasizes the importance of learners' activation. Through activities based on interaction with their environment, learners construct knowledge. E-learning establishes activity through interaction multimedia because learners are participating in active learning instead of the typical passive learning in traditional training settings. Learners are active because they navigate through the training, complete tasks, apply their knowledge, and conceptualize in a "live" environment. The action-orientation theory is applicable to e-learning because an important feature of e-learning is immersing the learner in the training (Harris, 2002; Mishra & Ramesh, 2005; Schroeder & Spannagel, 2006).

Both learning theories are based on the primary assumption that learning in general is an active and constructive process, which ought to be self-directed, situated, and embedded in social interaction (Mishra & Ramesh, 2005; Schroeder & Spannagel, 2006).

Not only are learning theories applicable to e-learning, but communication theories are as well. Specifically, e-learning utilizes McGregor's Theory Y communication management theory because it states that humans are creative, inventive and curious. In the e-learning environment, learners are motivated and curious to complete the real-life tasks. Another characteristic of Theory Y is that workers can exercise self-control and self-direction, which is applicable to e-learning and interactive multimedia because self-guidance is a defining asset.

Finally, activity theory is applicable to e-learning and interactive multimedia. Activity Theory is a tool for the study of *doing*. Objects of the Activity Theory are activity and task, such as the interaction and real-life situations involved in e-learning. The outcome is transformed learning and teaching. In Activity Theory, stakeholders (learners, developers, etc.) and technology are dynamically interrelated. This is evident as e-learning uses subject matter experts to develop content that is easily editable. Also, the learners themselves illustrate Activity Theory's interrelation, because in e-learning, the learners control the function of the course by choosing when, where, how, and how much

they learn. Activity Theory also focuses on user experiences, which is the ideal method in e-learning: interaction. This interaction produces internalization and externalization. Learners internalize the mental processes and perform external behaviors (completion of tasks) that are intended to transfer to the workplace. These actions and goals become operational and habitual. The ability to transfer internalized behaviors to the workplace supports the activity theory because the theory also considers the social settings and relations that shape learning dynamics. The norm that is associated with e-learning is that it must have evident benefits on the learners' work life. In summary, the Activity Theory states that active subjects (learners) use tools (interactive multimedia) to interact with the world (simulations) to achieve their goals (performance improvement) in the work place (social setting) (Benson & Whitworth, 2007).

Positive Implications on the Learner

Interactive multimedia are media that uses multiple forms of information content and information processing including text, audio, graphics, animation, video, interactivity to inform or entertain the user. Interactive multimedia provide several benefits for learners in e-learning. Interactive multimedia promote motivation, which accelerate learning; enable knowledge transfer through retention; and provide manipulative experiences unavailable in a normal classroom environment (Aldrich, 2005; Jackson, 2007).

These manipulative experiences are important to e-learning because they stimulate motivation. If motivation to learn is low, very little learning will occur; if motivation for learning is high, it will occur even when materials are poor. Motivation occurs with interaction because interaction stimulates more than one sense to enhance retention. (Aldrich, 2005; Allen, 2003)

Interaction improves retention because it involves both visual and auditory senses to stimulate both learning and recall. According to Birnbrauer (1986), people learn 11% from hearing and 83% from seeing. Retention is 70% after 3 hours from material heard only, which decreases to 10% after 3 days. Retention from material seen only is retained 70% after 3 hours, but decreases to 20% after 3 days. Material both heard and seen is retained 85% after 3 hours and 65% after 3 days.

Another positive effect of interactive multimedia in e-learning is that learners have the opportunity to manipulate experiences. Overt participation and practice are significant aids to comprehension and application. Learners learn more when they are able to handle tasks and questions with a high rate of success (Aldrich, 2005; Birnbrauer, 1986; Lee & Owens, 2000).

Animation interactive multimedia accelerates how people learn because learning occurs in context, activity, and reflection. Effective learning occurs when the learner actually *works* with the subject (interacts with it). Interaction helps to replicate real life and thus aids in transfer of knowledge. The purpose of interactivity is to embed learners in a situation that allows them to experience a real-life activity and to obtain feedback on that activity to improve their skills. Activity involves learners; frequent activity results in in-depth learning experiences for each learner, not just for selected learners or volunteers (raising of hand). E-learning ensures learning because each learner must achieve and demonstrate competency in order to complete the training. Competency demonstrates the learner's motivation to perform. Therefore, it is important that e-learning training offers "something for everyone" in order to encourage motivation (Brennan & Lockridge, 2006; Learning Styles, 2006; Luther, 1992; Roy, 2006).

Developing deeper meaning and lasting understanding enables knowledge transfer. If meaningful experiences and the knowledge they convey are easily forgotten, they might as well

not have occurred. Time spent in training is expensive, so it is important that evidence support a cost-benefit. Learners need to be able to show their upgraded skills in the workplace.

One way learners can show their skills in the workplace is by contributing to company knowledge management systems. Knowledge management is how groups of people make themselves collectively smarter. E-learning makes knowledge management possible because it allows access to information, reusability, easy sharing and transmitting. E-learning makes shared experiences through its collaborative tools as learners collectively exchange questions and thoughts about the nature of a problem (Allen, 2003; Horton & Horton, 2003; Jackson, 2007; Mishra & Ramesh, 2005).

However, psychological or psycho-sociological obstacles are present in knowledge management systems. One obstacle is knowledge “hoarding,” which is very predictable in an environment in which rewards are based on an individual’s accomplishments and possession of unique knowledge. Another psychological obstacle in knowledge management projects involves embarrassment. Most people don’t like to admit they don’t know something. However, these psychological obstacles occur minimally in e-learning communities because anonymity is present; the learner is not visibly present as they are in a traditional classroom setting (Suler, 2004; Wallace, 2004).

Anonymity, defined as people you encounter cannot easily tell who you are, is a prevalent concept in e-learning because interactive multimedia is a one-on-one environment. This one-on-one environment facilitates the same options and same performance criteria for all learners. E-learning is blind to racial, cultural, and sexual differences because it offers no more or less learning support to any individual. (Allen, 2003; Luther, 1992; Suler, 2004)

E-learning promotes disinhibition because those normally shy in training can become more extraverted. This is because there is no identity or physical visibility in e-learning training. According to dissociative anonymity, nobody knows who they are, so learners can express themselves more openly. Age, culture, or gender are not visible in e-learning. This results in an equal opportunity for learners to voice themselves. Also, in asynchronous interactions those who are introverted have time to think, thus eliminating a pressure that is present in traditional educational settings. What influences others in the e-learning field is skill in communicating, persistence, and quality of ideas (Suler, 2004).

E-learning promotes communication and interaction from those who are typically shy. Asynchronous communication, communication across space and time, promotes the interaction of naturally introverted people because they are more comfortable when they have space and time for contemplation before engagement.

The accessibility of e-learning is also a positive because there is no waiting or traveling. Learners can begin training the moment they need it without having to wait for a training seminar. E-learning also supports just-in-time learning, is that learners can access the learning at their own convenience. Accessible learning results in making learning more widely available to a broader range of people that would normally be unavailable to participate in traditional training. E-learning also allows learners to pace the training to their own needs; those that work faster are not held up by slower participants. Another benefit is that learners do not need to travel to participate in training. Minimal travels and shorter learning time result in less time away from productive work and lower training costs (Wallace, 2004).

Negative Implications on the Learner

Negative consequences that interactive multimedia have for learners include the problems resulting from self-guidance, diminished media richness, and issues regarding technology compatibility.

The premise of e-learning is that learners self-guide through the training, which is problematic for those not used to being self-directed learners, are uncomfortable without an instructor or are not comfortable relying on objectives. These variations on learners' preferences may result in a hesitancy and reluctance to learn. Those whose learning style requires more structure and guidance may become frustrated. Some less-experienced or less well-disciplined learners may also make poor decisions about how much information they need, resulting in information overload. Also, e-learning may be time-consuming for first-time learners because the instructional systems are more complex than conventional training thus requiring more time to master (Learning Styles, 2006; Mishra & Ramesh, 2005; Piskurivh, 1993).

A negative effect of e-learning is that the media richness associated with face-to-face communication diminishes when communication goes electronically. The diminishing of media richness can be resolved by using multimedia such as adding visuals to text. The lack of nonverbal cueing, a technique that is rampant in traditional delivery systems, poses a great challenge to online assessment. The film *The Opportunities and Limitations of Corporate E-learning* (2005) addresses this issue, stating that "social implications of a classroom environment keep learners from walking out, whereas the online environments causes attention problems." Learners can become confused, or lost in cyberspace if instruction is on the web, or even be distracted by the environment. Therefore, animation software is important in creating interactive multimedia to increase the chance of participation "attendance." Animation and interaction promote curiosity and a fun learning environment. Dolasinski (2004) also supports this view by stating that "people learn best when they are relaxed and enjoying themselves. People also learn more when both the analytical and creative sides of the brain are engaged (p. 4)" (Bassoppo-Moyo, 2006; Brennan & Lockridge, 2006; Rennecker & Godwin, 2005).

Another negative consequence of interactive multimedia in e-learning is the technical issues involved. Learners need to be able to access computers with exact software capabilities to view and play the multimedia. Computer capabilities including bandwidth that affect online speeds may prevent many learners from accessing multimedia efficiently or reliably. Assuring accurate computer facilities, as well as the initial purchase of e-learning training, can be very costly. Also, there is a high cost and difficulty of converting current traditional training and instructional materials into e-learning for corporations who opt to use their own materials (Horton & Horton, 2003; Wallace, 2004).

Positive Implications on the Developers

Interactive multimedia are created by animation software benefits developers from a marketing standpoint. Key benefits that will be examined include uniqueness of work and optimization through consistency, quality of content through regulation and development of unique experiences, evidence of accomplished objectives through measured performance, and the ability to update and modify e-learning in a timely way.

Morris (2006) stated that with instructional design, a developer could take a system and apply the same system to all instruction across all content areas. In other words, the

systems approach is used to bring a common process to develop any instruction in the same way. This process results in developers creating “signature” work that can be marketed. Once a developer establishes a process for developing an e-learning course, it is beneficial to use the same process throughout all courses to assure consistency in design and structure. The systematic approach to instructional design is also a way to organize instructional experiences so that learning is optimal. It is optimal because learners become aware of patterns and are able to complete courses with minimal functional problems. Developers use a systematic approach to accomplish two things: trademarked e-learning that is unique and e-learning that optimizes learning because of consistency; both are marketable traits (Harris, 2002).

Another “marketable trait” in e-learning is the content quality that is now being produced due to industry standards. National standards associations have emphasized the overall dimensions of quality of the educational experience through regulations of the industry. Standards and regulations have resulted in the disengagement of instructional design corporations that created ineffective learning environments because they are unable to compete. The film *The Opportunities and Limitations of Corporate E-learning* (2005) states that the instructional design field is fairly new, and therefore adjustments to how the field works have evolved (Bassoppo-Moyo, 2006; University of Washington, 2005).

A way that developers can uphold the quality of the educational experience is to provide valuable content. Interactive multimedia are capable of illustrating interconnected processes within complex systems, enabling nanovisualization and manipulation of the microscopic, embodying new experiences that cultivate cultural empathy, and making the unseen and unknowable tangible. Developers are able to provide content and product that normally would not be possible. In other words, interactive multimedia creates increased valued content because it enables developers to create visuals and graphics for things that are too small, too complex, or too far away for a typical learner to see daily (Jackson, 2007).

Establishing better content through interaction can be fruitless if learning is not verified. Therefore, another benefit is that the creation of interactive multimedia provides better ways to measure performance and provide assessment in e-learning. Such examples include quizzes, concept mapping, and activities that give immediate feedback that is both negative (counteracting) and positive (amplifying). Feedback helps engage the learner and provides a tool to demonstrate a learned skill. By demonstrating and tracking learner performance, developers have “proof” that their training is accomplishing its objectives. This proof makes e-learning more substantial in the view of the corporations purchasing it (Dolasinski, 2004).

Animation software and server connections allow for changes to content in only a few minutes as opposed to other multimedia vehicles, which require hours or days to change. This is beneficial to developers, because time is a valuable commodity as success for knowledge-based workplaces relies heavily on the continual upgrading of skills. Therefore, it is beneficial for developers to make changes to instruction as quickly as possible to avoid losing business (Dolasinski, 2004; Luther, 1992; Wallace, 2004).

In summary, animation software provides marketable and valuable instruction because it allows developers to create unique works that are content-based and modified in a timely manner. It also allows for tracking of learner performance to assure accomplishment of objectives.

Negative Implications on Developers

Interactive multimedia has several negative implications for developers. Social implications including generation differences and learning differences must be highly considered. Technical issues also affect developers negatively because technology advances result in the need for continuous training, technology compatibility, and system maintenance.

Course management systems that are used to create e-learning training vary in type and delivery approach from institution to institution. This variation means that when an instructional designer changes jobs extensive training is needed. This can be problematic for those with limited time schedules or those limited in current technology trends, such as older generations. Technology advancement is a social implication that affects training for developers because of generational differences. Training developers who have been in the field for years do not always have the same knowledge of new technologies as recent graduates and those in the “digital generation.” The digital generation is characterized by multiprocessing, multimedia literate, knowledge navigators, and prefers discovery-based learning. The advances in technology have resulted in social implications because of an increased competition among the different generations. The digital generation may threaten other generations because of their enthusiasm to learn new technologies independently. In summary, increased advances in technology and competition among developers have resulted in a need for continuous training (Bassoppo-Moyo, 2006; Jackson, 2007).

Another technological consequence is software compatibility. Software must be prepared, ordered and learned to develop interactive multimedia. The ever-changing advancements in technology have led to a need for continuous upgrades and training. Advances in technology also result in software malfunctions and maintenance costs. Not only do developers need to be aware of how software affects their design process, but they must also take into account that the learner must have compatible software to view interactive multimedia. Therefore a preliminary assessment of learners and possible adjustments to e-learning materials is necessary to assure compatibility (Birnbauer, 1986; Horton & Horton, 2003).

Another technical issue that has negative implications for the developer is administering assessment instruments for e-learning courses. Assessment may be difficult because there are few ways to ensure that those being assessed are who they say they are. It is difficult, if not impossible, to reliably ascertain a participant’s identity when communicating over a geographically dispersed environment. Assuring one’s identity across the Internet is difficult to do because a learner can easily have someone else complete the training for them. This unreliability is negative for the developer because the lack of learner identification can affect system integrity. It affects system integrity because if a learner does not complete the training themselves, they may not be able to transfer their learned knowledge and skills to the workplace. Therefore, the e-learning training looks ineffective in the eyes of the corporation and may affect future purchases of it.

Developers must understand the dynamic of today’s workforce when developing training. Each group brings its own influences and preferences to the workplace. People learn in many different ways. Training needs to use many different styles to help people connect with the material. A social issue to be concerned with is adult learning. Adults have their own reasons for learning; they already have busy lives and rich networks of social interaction. Therefore, e-learning would seem ideal for lifelong learning, however, it must work for all ages. The user group that prefers interactive, non-linear and dynamic

entertainment experiences known as the “digital generation” and are more acceptable of e-learning training. However, it must also work for those with various levels of technical exposure and interest. This brings to the table the question: how do they make interactive simulations geared toward older generations? Caring about learner’s motivation and learning styles is another example of the Kantian ethic. Developers must have a real care for how people learn to provide a useful experience. (Dolasinski, 2004; Horton & Horton, 2003; Jackson, 2007; Learning Styles, 2006)

Recommendations & Practices

After analyzing industry works and research, several recommendations for e-learning practices have been deduced. They include practicing front-end analysis, utilizing subject matter experts to assure quality content, aligning structure with objectives, addressing goals, and product testing.

Perform front-end analysis on audience needs to assure design principles align with their performance abilities because each audience is not one size fits all. Cultural and educational background should be considered when developing content. Therefore, recruitment of subject matter experts are highly recommended (Lee & Owens, 2000)

Another recommendation is the use of subject matter experts to assure quality content. Many times, interactive multimedia is used solely for the purpose of entertainment. Along with the recommendation of subject matter experts, Bloom’s *Taxonomy of Educational Objectives* should be utilized to avoid the “bells and whistles” of interactive multimedia. The basic level of Bloom’s Taxonomy Start is comprehension knowledge, followed by analysis, application, and advanced level of evaluation synthesis. Create objectives that give information, give a problem, and provide evaluation. (Birnbrauer, 1986)

E-learning with interactive multimedia must be created on solid instructional design principles because quality and thoroughness of the design and delivery are the foundation for providing positive e-learning experience. Therefore, the use of the instructional design ADDIE model is applicable here.

Consistency in objectives, don’t added flashy animation unless it contributes to the objectives. Multimedia technologies must be congruent with the organizations learning model and actual teaching practices as well as with students’ expectations and capabilities for autonomy and self-direction. (Mishra & Ramesh, 2005)

Self-motivation on the part of the learner makes e-learning work. To be truly successful, learners have to have a clear understanding of the benefits their online training program will have on their career. Therefore, clear and attainable goals must be established in the course introduction (McNally, 2003).

Evaluation of the learners is needed as well as of instructors, developers and managers. Evaluating all learner responses is essential in determining the value and merit of an e-learning delivery system and interactive multimedia. Training should align with corporate goals and mission to instill a purpose. Training should match organizational goals as well as current issues facing the company (Bassoppo-Moyo, 2006; Dolasinski, 2004).

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