Volume 62 | Number 4

Article 1

11-16-2024

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Recommended Citation

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Abstract. This article explores the application of instructional design principles to enhance Extension e-learning programs. The growth of e-learning has led to its incorporation into many organizations, including extension programs, offering opportunities for expanded access to educational content. However, e-learning presents unique challenges, such as the need for self-regulation and the absence of social interaction. To address these challenges, the article proposes leveraging instructional design theories, including cognitive load theory, interactivity, and formative assessment.

INTRODUCTION

The field of e-learning has witnessed significant growth and adoption in recent years, with many Extension programs incorporating e-learning into their offerings. This article will explore the factors that contribute to e-learning program effectiveness and demonstrate how these findings can be applied to enhance e-learning programs. By empowering Extension e-learning practitioners with effective strategies and best practices, this article aims to strengthen Extension e-learning programs' ability to create more engaging and meaningful learning experiences.

THE E-LEARNING MODEL

Despite the growth of e-learning, there is little consensus among scholars and practitioners regarding its definition and how it differs from other forms of online learning (Moore et al., 2010). Therefore, we propose the following definition for e-learning within our context: E-learning is a specific, emerging type of online learning characterized by asynchronous, self-paced, automated delivery. Learners are not required to participate simultaneously or follow any set schedule. Instead, they can access the course at their convenience and proceed at their own speed. Unlike instructor-led training, e-learning is designed to be delivered with minimal teacher–student interaction.

So far, e-learning tends to be used in non-academic environments such as corporate training, professional development, continuing education, and lifelong learning. It has expanded into the public realm through platforms like Coursera and LinkedIn Learning. Extension programs have also embraced e-learning, offering courses for professional development, continuing education, and lifelong learning.

BENEFITS AND CHALLENGES

E-learning allows Extension to extend its educational reach to many more people than it previously has, including to new demographics. "With the widespread availability of the internet and digital devices, eLearning has transformed the way knowledge is accessed, opening doors to learners of all backgrounds and ages" (Niyugushimwa, 2023, p. 1). Extension programs can take advantage of the e-learning revolution to expand public access to their research-based educational content. Extension faculty can reach constituents across their state and beyond without the need

for physical classrooms or scheduled instructors. Learners can access course materials 24/7, allowing them to fit learning into their busy schedules.

Yet the very qualities that make e-learning beneficial also present challenges to learners. With self-paced environments it is up to learners to set and keep their own schedules and answer their own questions. Some learners are not equipped to self-regulate in this way. With asynchronous automated formats, there is no interaction with other students, so "social learning" is not available. Neither is there a teacher available for questions or explanations or for providing non-verbal cues.

This type of learning environment presents some daunting design challenges. Unlike instructor-led online courses, for which teachers can make adjustments as they go, these courses must be completely ready before the learner arrives. There must be a clear path through the course so that the learner can succeed without help. If navigation or instructions are not clear or the technology is not easy to use, learners will get frustrated and quit before they even begin to learn.

Perhaps the biggest challenge of all is designing engaging content for learning through a computer platform. Research on student engagement in online learning frequently identifies instructor presence and student collaboration as key elements for promoting engagement (Park & Lemoine, 2014), but e-learning courses typically lack these elements. The only significant interaction is between the learner and the content. It is all too common, however, to find passive learning designs in e-learning content. For example, a course that consists mainly of watching videos and taking quizzes is mostly passive, offering the learner few opportunities to interact with the content.

INSTRUCTIONAL DESIGN PRINCIPLES TO THE RESCUE

Because e-learners interact solely with the content, good content design is paramount to engagement and success. To address these challenges and enhance the effectiveness of e-learning programs, we can draw on instructional design theories and strategies. Three key theories are particularly relevant: cognitive load theory, interaction, and formative assessment.

COGNITIVE LOAD THEORY

Cognitive load theory suggests that to optimize learning, learning experiences should be designed based on human cognitive architecture (Chen et al., 2017). The theory posits that excessive cognitive load hampers learning and transfer (Swell et al., 2019). Scholars have identified many specific ways to reduce extraneous processing. Clark and Mayer's work (2016) is particularly helpful in improving course design. They offer a list of guidelines for multimedia learning based on cognitive load theory. To reduce cognitive load in e-learning environments, consider the following best practices:

- Remove distractions and extraneous options.
- Simplify course menus and organization.
- Use visuals to enhance learning.
- Present information in segments rather than in a continuous stream.

INTERACTIVITY

Researchers have confirmed that "online learners easily lose motivation and feel less satisfaction if courses do not stimulate their active participation and interaction." Three separate studies noted significant, positive relationships between interactivity and perceived engagement, learning, confidence, relevance, and student satisfaction (Croxton, 2018). Best practices for maximizing learner-content interactions in e-learning include:

- Use e-learning authoring tools to add interactive elements.
- Incorporate scenarios, reflective writing exercises, and simulations.

FORMATIVE ASSESSMENT

Formative assessment focuses on providing feedback to learners and teachers during the learning process, rather than just at the end. Research has established the value of formative assessment for all types of learning

environments (Boston, 2019). This is particularly valuable in an online environment, where "the embedding of formative assessments to monitor online learners' application of knowledge and skills can help support the other key facets that make up effective online adult and continuing education" (Luckritz Marquis, 2021, p. 51). New opportunities for formative assessment have come with interactive online learning tools. Best practices for using formative assessment in e-learning include:

- Embed knowledge checks into e-learning content.

- Provide immediate feedback to learners.

- Align knowledge checks with learning objectives.

CONCLUSION

E-learning exists in a very specific type of learning environment that is only now being examined through the lens of instructional design. Even though social interaction and teachers are absent in this environment, learner engagement can be improved through conscious content design. By considering and applying instructional design principles such as cognitive load, interactivity, and formative assessment, Extension e-learning practitioners can create more engaging and effective e-learning experiences. Ultimately, this will elevate our e-learning programs and help fulfill Extension's mission of providing educational opportunities to our communities.

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