Using Microlearning to Teach Visual Design Principles to Educators

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Abstract

This is a mixed-methods study that sought to understand the impact of a microlearning-based eLearning module on a group of learners and to understand their experiences while using the module. The participants were educators in a vocational training center who needed to apply visual design principles in the creation of their classroom materials in order to boost client engagement and to improve the overall quality of their courses. The researcher asked about the impact of the eLearning module on the participants' understanding of applying visual design principles in various given scenarios and used pre- and post-assessments to measure the results. The researcher also investigated the reported experiences and impressions of the participants as they used the eLearning module and collected survey data with open- and closed-ended questions. Qualitative and quantitative data analysis techniques such as calculating mean growth scores and qualitative coding were used to arrive at the study results, which demonstrated both the participants' satisfaction with the experience as well as the module's effectiveness at teaching design principles. The study contributes to the nascent literature on microlearning as a viable instructional strategy by offering best practices for implementing microlearning in other contexts and suggestions for future research.

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Chapter 1: Introduction

Instructional Problem

Instructors who teach vocational skills to job seekers need to be able to apply visual design principles when creating course materials because they want to increase client satisfaction, performance, and job placements.

Research Topic

The topic of the study is the use of microlearning in an eLearning module about visual design principles. The topic is important to investigate because learners need to use visual design principles to be able to create engaging and effective learning materials. The research findings could show that microlearning is an effective instructional strategy for teaching visual design principles through eLearning courses.

Research Questions

Q1: What is the impact of microlearning on learners' understanding of visual design principles as measured by pre- and post-assessment?

Q2: How do learners describe their experience with the module's microlearning elements, such as the module's chunking and sequencing strategies?

Research Purpose

The purpose of the study is to investigate the impact of a microlearning-based eLearning module on learners' understanding of visual design principles and to explore their experience using the module.

Chapter 2: Literature Review

Introduction to the Literature Review

      A review of literature about the use of microlearning in training interventions was conducted. The literature review served to frame the current study in the context of the larger body of research on the effectiveness of microlearning as an instructional strategy. After reviewing the literature, three themes emerged that would guide the structure of the following literature review:

1. **Microlearning as an effective strategy for professional development**. Numerous case studies demonstrated the ways in which microlearning is well suited for organizations and educational institutions to deliver effective training interventions.

2. **Impact of microlearning-based instruction on outcomes.** Several studies highlighted the impact of microlearning-based eLearning on organizational goals and employee performance.

3. **Learner perceptions of microlearning.** Most studies reported how learners felt about the microlearning-based learning experience, including their engagement levels and preferences over more traditional instructional delivery methods.

Although additional themes emerged, such as gaps in the current literature about microlearning, microlearning and its relationship to competency-based learning, and best practices for successful implementation of microlearning, the three themes listed above were chosen because they are the most relevant to the research questions in the current study.

Microlearning as an effective strategy for professional development

Many researchers agree that "microlearning is particularly appropriate for modern workplaces" (Zhang, J. & West, R. E., 2020, p. 310). Microlearning uses effective chunking techniques to create short lessons no longer than fifteen minutes, which is ideal for busy professionals who need to study during breaks from their normal responsibilities. Effective microlearning lessons contain "only one measurable skill-based learning outcome, some form of digital-based instruction, and at least one quick assessment" (Zhang, J. & West, R. E., 2020, p. 310). This ensures that lessons are short enough to be completed on the job, yet still provide adequate means of assessment and skill building.

The ability for employees to complete short microlearning lessons and receive immediate feedback through assessments means that learners can receive individualized and targeted training that suits their specific needs. Emerson and Berge (2018) write that the ability to complete multiple mini-lessons "sets up a positive feedback loop that can accelerate staff development and increase employee retention by personalizing learning to build specific skill sets" (p. 127). Indeed, the on-demand nature of microlearning allows learners to complete lessons in an order of their particular choosing. Isibika et al. (2023) agree that "microlearning allows the professional development of faculty and students to be situated in a flexible way that can be integrated into everyday activities supporting individual learning aims and goals" (p. 3). Given the busy demands of the 21st century workplace, microlearning seems well suited to accommodate learner needs with regards to flexibility and individualization.

Many studies have highlighted the instances where microlearning has proven effective in many different real-life professional and educational contexts. Sankaranarayanan et al. (2023) found in their research that overall, microlearning proves to be "an effective instructional strategy or intervention in higher education (online, hybrid, and blended courses), corporate

training, and K-12 teacher professional development" (p. 268). The authors of a study in an Australian hospital found that a combination of "microlearning and experiential teaching methods can be harnessed to provide focussed and effective geriatric medicine training for busy junior doctors" (Thillainadesan et al., 2022, p. 591). Indeed, the literature is replete with studies that show the effectiveness of microlearning in healthcare settings (Iqbal et al., 2021; Roskowski et al., 2023; Theaux et al., 2024; Thillainadesan et al. 2022; Yıldırım Sozmen, E., 2022; Zarshenas et al. 2022).

Of particular interest to this present study is the use of microlearning in the professional development of educators. Microlearning is well suited to training teachers because it "helps teachers upskill themselves with tools that are already familiar to them in terms of access, curation, development and content" (Waldia et al., 2023, p. 75). Hanshaw and Henson (2019) studied teachers taking microlearning courses about instructional design and found that "using a combination of ML [microlearning] and SL [social learning], the respondents reported that this method was a viable way to develop practical skills immediately applicable in the workplace" (pp. 166-167). The authors of another study adopted a similar "blended" approach and found that a group of information communication technology (ICT) instructors at an Israeli university "seemed to feel confident in implementing the concepts and tools that they had learned during the TPD course in their classrooms" (Shamir-Inbal, T., & Blau, I., 2022, p. 13). Similarly, researchers in Sierra Leone write that a group of junior secondary school teachers found the microlearning format to be "crucial towards maintaining enthusiasm, avoiding burnout and ingraining a sense of professional fulfillment" (Allela et al., 2020, p. 395). This is because microlearning allowed them to engage in "flexible and personalised training, where teachers can choose what to learn and at what pace, according to their own requirements" (Allela et al., 2020,

p. 395). Indeed, the demand for teachers to constantly upskill in light of the current rapidly changing educational landscape lends itself to the microlearning format, which can provide "just-in-time" learning for specific purposes (Zhang, J. & West, R. E., 2020).

Impact of microlearning-based instruction on outcomes

The literature provides numerous examples where microlearning boosted performance outcomes when compared with traditional methods. In a review of several studies assessing the effectiveness of microlearning-based trainings, Taylor and Huang (2022) found that "eight of the 13 studies (62%) reported positive results on task-based performance objectives" (p. 381). A study of junior doctors receiving microlearning trainings found that this group "screened their patients for frailty and delirium more frequently" than those who did not receive the training (Thillainadesan et al., 2022, p. 591). A similar training for nurses found that "the traditional training method had no significant effect on nurses 'self-efficacy, while distance class using micro-learning contents had a significant effect on nurses' self-efficacy" (Zarshenas et al., 2022, p. 4). Indeed, as Isibika et al. (2023) point out in their review of the efficacy of microlearning versus traditional learning methods, the research literature "has shown a significant improvement and outperformance of employees when learning was performed using microlearning (p. 3). This finding was echoed by Waldia et al. (2023), who write that "the interactive and self-directed learning approaches, such as microlearning, can lead to higher learning outcomes compared to traditional classroom teaching" (p. 74). A survey of continuing medical education (CME) courses with and without microlearning components found that "the microlearning format saw as high as a 100-fold increase in participation compared with traditional eLearning (social media vs case study clinics)" (Bannister et al, 2020, p. 3). However, Rosowski et al. (2023) did not find microlearning approaches to be more effective in their study because "when comparing

knowledge outcomes between the microlearning and traditional method, there was no significant difference in scores in any of the three assessments" (p. 5). Judging from these studies, it is apparent that learning experiences that at least partially contain a microlearning element produce greater learning outcomes than those that are strictly traditional in their approach. However, there is a need for additional research to show tangible outcomes with more "quantitative and qualitative evidence to examine the effectiveness of microleaning for professional development in various industries." (Zhang, J. & West, R. E., 2020, p. 317).

Learner Perceptions of Microlearning

The literature shows that learners' attitudes are generally favorable towards microlearning as an instructional strategy. Learners' attitudes include their acceptance and perceived usefulness of microlearning as well as their overall satisfaction with the microlearning experience. For example, Taylor and Huang (2022) found in their research that "microlearning tended to receive above average satisfaction ratings and resulted in high utilization rates and high response rates" (p. 383). In a study providing professional development opportunities for librarians, it was found that "the positive influence of perceived usefulness and ease of use on the acceptance of microlearning strengthens the relevance of adopting microlearning as a didactic technology for librarians' training" (Isibika et al., 2023, p. 1). In a separate study that specifically measured the perceptions of medical residents on microlearning strategies, the "participants showed a high level of satisfaction with . . . microlearning environments" (Iqbal et al., 2021, p. 3). An especially high degree of satisfaction is found among younger learners, and Yıldırım Sozmen (2022) surmises that this increased level of satisfaction is due to the fact that "microlearning very well fits into the expectations of Millennial and Generation Z learners

defined as digital natives" (p. 41). Whatever the reason for the increase in preference for microlearning opportunities over traditional methods may be, the literature suggests that this preference is nearly universal.

The importance of learner perceptions on microlearning must not be overlooked because it influences how learners engage with the material. For example, in a study of a nurse preceptor training that used microlearning, Rosowski et al. (2023) found that "participants reported that microlearning was more engaging and efficient" than other methods (p. 1). Similarly, the importance of reported satisfaction for engagement was demonstrated by Hanshaw and Hanson (2019) when their study participants stated that the microlearning "instructional design increased their motivation to engage the content and that their skills improved" (p. 146). Indeed, if learners perceive an instructional method as engaging, they will be more likely to benefit from the learning experience.

Conclusion

I learned many things from the literature on microlearning that will inform my solution to the instructional problem stated above. The findings that will guide my solution are concerned with increasing engagement through specific instructional strategies used in many studies, as well as addressing gaps in the research literature. By incorporating these findings into my solution to the instructional problem, I will enhance the efficacy of the learning solution and the utility of my research.

Many of the studies I read employed personalization and gamification elements in order to increase the engagement levels of the study participants. Personalization offers unique learning pathways that are tailored to each learner's individual preferences and abilities. This can

be achieved through a pre-assessment and by offering learners a choice as to how they would like to complete the lessons. In addition to personalization, gamification elements such as awards can be incorporated into my learning solution in order to increase learner engagement.

The studies I explored exposed some gaps in the research literature with regard to concrete data on different types of assessments. "Because existing articles on microlearning lack discussion of assessment," noted Zhang and West (2020), "studies on how different types of assessment can impact microlearning experience and knowledge retention would be valuable" (p. 317). Therefore, my study could look at how different types of assessment (pre- and post-, as well as multiple-choice, application-based, and short answer) affect learner competency and retention of concepts learned.

Finally, also missing from the literature are studies that show the effectiveness of microlearning for teaching visual design principles. Although there are studies that explore teacher training using microlearning, the current literature does not explore the efficacy of specifically teaching visual design principles to teachers. With my study, I hope to address the advantages and challenges that microlearning-based learning experiences present for eLearning interventions about visual design principles. The insights gained from this study can help to inform future trainings on visual design.

Chapter 3: Research Methodology

Instructional Problem Overview

This problem was observed in a vocational training center for adults. The instructors taught many job-related skills to their clients throughout 8-week courses, which covered various topics such as cashiering, customer service, and computer literacy. Many of the instructors had master's degrees in teaching or related fields, but they did not necessarily have training in visual design principles. As a result, most instructors were not aware of how visual design principles could affect the overall efficacy of their learning materials. Since the instructors in the vocational center were responsible for creating their own classroom materials, which included handouts, worksheets and slideshow presentations, the researcher of the present study had seen multiple instructor-created materials that suffered from obvious design flaws. This meant that the materials they created had issues with readability, ineffective use of graphics and images, and/or poor organization of content. For their clients, this meant lower intelligibility, engagement, and visual appeal when using the materials, which lowered the overall efficacy of the materials as an aid to learning. If instructors received proper training on key visual design principles such as use of white space, alignment, and visual hierarchy, they could make their materials more useful and engaging for their clients, which would boost the overall quality of their courses. Therefore, the vocational training instructors need training on applying visual design principles in the creation of their learning materials because they need to enhance the quality and efficacy of their courses.

Potential Solutions

First Potential Solution

This solution uses a competency-based instructional strategy that utilizes self-paced microlearning modules accessible via an LMS system such as Canvas. Learners are first guided to complete a multiple-choice diagnostic pre-assessment that gauges their prior knowledge. After this, learners are allowed to access all of the course's four or five modules, each of which take no longer than 15 minutes to complete. The lesson material is delivered in an asynchronous format that allows for individualized learning pathways, meaning that the learners may choose the order and pacing in which they complete the microlearning modules. Materials and learning activities include videos, links to external articles, and readings, which provide multiple of means of engagement with the concepts taught. Formative quizzes at the end of each module measure how well learners have grasped the material and give opportunities for immediate feedback. After completing all of the modules, the learners are invited to complete a summative assessment. The summative assessment uses application-based multiple-choice questions to assess how learners would apply the visual design principles they learned in given instructional scenarios. The entire course takes one to two hours to complete, and learners can pause and resume on-demand.

Digital Tools for First Solution

Digital tools used to support the first solution include a PC or Mac, access to the Internet, a compatible Internet browser such as Chrome, and access to Canvas LMS.

Advantages and Challenges of First Solution

A great advantage of this eLearning solution is that the course can be completed entirely asynchronously. This means that learners can control the timing and pacing of their own learning. This asynchronous format works particularly well for adult learners, who prefer to learn on their own schedules. Moreover, for the type of learners described in the instructional problem scenario above, this format allows the instructors to fit short microlearning sessions into their busy work schedules at their own convenience.

A potential challenge of this eLearning solution is that, given the self-paced format of the course, it provides no opportunities for guidance from an instructor. Although some learners can manage a self-paced course with no help, other learners prefer to ask questions and receive feedback from an instructor. In order to address this challenge, the eLearning solution can provide ways for the learners to contact the instructor for help. For example, on the eLearning solution's main page, the instructor's contact info and office hours can be prominently displayed. This would ensure that learners have the option to receive one-on-one guidance to ask questions or clarify concepts with an instructor.

Second Potential Solution

This solution uses a problem-based learning (PBL) instructional strategy in which instructors guide the creation of a project that fulfills a given instructional need. At the beginning of the course, learners are presented with a realistic problem scenario that they will work to solve through formative projects that contribute to the completion of a final portfolio project. Given problem scenarios could include designing the layout for a textbook chapter or developing presentation slides for a series of lectures. Learners are given a choice of the visual design tools

they wish to use, which may include Canva or Microsoft Publisher. Instructor-led synchronous lectures delivered via Zoom offer a chance to present lesson material and concepts. During the Zoom lectures, there are also opportunities for instructors to answer learner questions and to provide formative guidance on the various parts of the portfolio project. Each week, students will receive a new assignment that requires application of visual design principles taught in the previous week. Weekly one-on-one videoconferencing calls between the instructor and individual learners provide opportunities for formative project feedback and to monitor learner progress. Learners will submit their work via email. The final portfolio assignment requires the learners to weave together their work on previous assignments into a single cohesive project demonstrating their solution to the given scenario problem. This summative portfolio will be graded by the instructor according to a rubric made available to learners beforehand and will assess the learners' application of the visual design principles taught. The entire course takes four to six weeks to complete.

Digital Tools for Second Solution

Digital tools used to support the second solution include a PC or Mac, access to the Internet, an email account, visual design tools such as Canva or Microsoft Publisher, a webcam, and Zoom videoconferencing software.

Advantages and Challenges of Second Solution

An advantage of the second eLearning solution is that learners can attend live instructor-led lectures and one-on-one sessions via Zoom. This enables the learners to ask questions of the instructor, which enhances their understanding of the material. It also allows learners to engage

in live discussions with their instructor and peers, which fosters a sense of collaboration and community. In addition, the one-on-one instructor visits via Zoom help to reinforce the material and provide formative guidance.

A potential challenge of this eLearning solution is that if a student misses a live Zoom lecture or one-on-one session, they will miss opportunities for learning. The synchronous format of this course requires that learners commit to attending the Zoom lectures at specific dates and times, which could be difficult for busy working professionals. A solution for this challenge would be to make recordings of the video lectures and to provide access to the slide presentations used. This would ensure that learners who were unable to attend could review the lectures and presentations on their own time. In addition, the instructors can provide flexible scheduling options to ensure that learners could attend the one-on-one Zoom sessions with their instructor.

Third Potential Solution

This solution uses a collaborative learning instructional strategy wherein learners work together to design solutions, discuss and critique each other's work, and design rubrics for peer evaluation and assessment. Learning materials are accessed through Google Classroom, where learners can view pre-recorded lectures that present lesson content. Learners complete various assignments as a group, and they are encouraged to use Google Workspace tools such as Docs and Slides because they allow for easy collaboration. Assignments require learners to apply visual design principles in various ways such as formatting given documents using effective visual design principles or evaluating the use of visual design concepts in given examples. Learners submit work to Google Classroom to receive formative feedback through peer critique and discussion. Discussion posts are assessed for quality of feedback and professional

communication according to a rubric using a Likert scale. Groups will create a final project, which serves as the course's summative assessment. The final project asks learners to create a presentation about applying visual design principles in an educational setting. The presentation is graded by peers according to each group's self-created rubric. In addition, each learner must complete and submit a self-assessment and reflection activity, which incorporates experiential learning elements. In this assignment, learners are asked to evaluate their own contributions to the group project, to reflect on what they learned, and to state how they will apply visual design principles in their current roles. The entire course takes four to six weeks to complete.

Digital Tools for Third Solution

Digital tools used to support the third solution include a PC or Mac, access to the Internet, a Google account, Google Classroom LMS, Google Workspace tools for collaboration (Docs, Slides, etc.), and Google Meet for videoconferencing.

Advantages and Challenges of Third Solution

An advantage of this eLearning solution is that the learners can complete projects in groups and evaluate each other's work, which provides opportunities to enhance their teamwork, collaboration, and professional communication skills. Indeed, an advantage of the collaborative learning instructional strategy is that it lets learners explore and test out new ideas together, which can be highly motivating and engaging for many learners. The opportunity to work together on assignments also mirrors real-life work settings, where employees are often expected to delegate tasks, communicate effectively, and contribute to the success of their teams.

A potential challenge of this eLearning solution is that many adult learners will have difficulty accommodating the scheduling demands of group projects, which often require learners to meet synchronously. Busy professionals juggle multiple responsibilities and life commitments, and they seldom have time to attend group meetings outside of their normal working hours. The course can mitigate these challenges by showing learners how to make use of Google Workspace's helpful collaboration features, which allow users to collaborate in asynchronous ways. For example, the course can teach learners how to leave comments and suggest edits in Google Slides. These comments and suggestions can be reviewed and modified at any time, allowing group members the flexibility to work on group projects whenever they choose. This can eliminate the need to schedule a live videoconferencing call. The course can also teach learners how to record and send video messages, which can enhance the sense of collaboration and community. As long as the course shows learners how to engage in asynchronous collaboration in this way, it will help to better accommodate the busy lifestyles of the adult learners.

Justification of the Chosen Solution

The first solution was chosen for the present study for a couple of reasons. First, the microlearning instructional strategy and entirely asynchronous format allows for the greatest flexibility and choice for the busy adult learners. The other two solutions have synchronous components such as Zoom meetings or group collaboration projects, which could pose scheduling conflicts for working professionals with minimal free time. Although steps could be taken to make these courses more accessible, such as providing recordings of the videoconferencing calls, the first solution assures that all learners will experience all of the

elements the course on their own terms because they will be able to pause and resume the course as they wish.

The second reason for choosing the first solution is that its diagnostic pre-assessment and summative post-assessment tests can consist of multiple-choice questions, which allow for the most objective assessment of skill gain and learning outcomes compared with the other solutions. The second and third solutions have assessments that are project- and collaborative-based, and since they do not provide for a pre-assessment, this would make it more difficult to assess for skill gain before and after the course. Although projects and collaborative peer activities could use grading rubrics that contain specific and measurable criteria for measuring competency, a set of identical multiple-choice pre- and post- tests like the ones proposed in the first solution would offer the most objective way to measure learning.

E-Learning Unit of Instruction Description

Components

- **Module Title**: *Visual Design for Educators*

- **Module Description**: The course is designed for educators who need to learn visual design principles to improve their self-created classroom materials. It uses Canvas LMS to guide learners through three modules that teach learners to identify basic design principles, apply visual hierarchy principles, and to apply best practices in the creation of classroom materials. Formative quizzes check that learners have understood lesson materials, and pre- and post-assessments measure student progress. The course's microlearning strategy uses short lessons and modules that take no longer than 15

minutes to complete. Throughout the lessons, learners interact with a variety of

multimedia, including videos, external articles, and graphics.

- **Target Audience**: Although the course could benefit educators in a variety of settings,

  the target audience for this course is a group of 10-15 instructors in a vocational training

  center. Since the target audience consists of busy professionals with little free time, the

  microlearning instructional strategy will be used to accommodate their schedules. All of

  the instructors are experts in their course subject matter and have bachelor's degrees or

  higher. They also have access to and are proficient with basic PC and Internet usage.

Learning Goal

Learners will apply visual design principles to improve the effectiveness of classroom

materials.

Learning Objectives

1. Learners will identify basic design principles

2. Learners will apply visual design principles to a given design

3. Learners will evaluate the design best practices used in a given design

Formative and Summative Assessments

The e-Learning course uses multiple choice questions at the end of each module to check

for understanding, monitor learner progress, and provide formative feedback. The questions align

with the learning objectives of each module, and they measure progress towards the objectives.

For example, the first learning objective is that learners will identify basic design principles, and

the question asks the learner to identify which design principle is being used in a particular design example. Another question asks, "The relative size and quantity of a design's elements refers to what design principle?" which correlates with the module's learning objectives.

In the second module, whose objective is for learners to apply visual design principles in a given design, application-based multiple-choice questions about visual are used. This means that learners are asked questions about applying visual design principles to various designs in order to increase their efficacy. For example, a formative question from this module asks, "What are three reasons why educators should establish a strong visual hierarchy in their designs? (Select three responses.)" Questions such as these ensure that learners understand how and why to apply the design principles.

In the third module, which states that learners will evaluate best practices in a given design, learners' understanding of design best practices is evaluated as they are asked questions about specific best practices used in designs. The questions also challenge learners to evaluate the efficacy of particular design examples. For instance, a question from this section shows two versions of a flyer and asks, "How were design principles applied in Design #2 to improve the flyer?" This question gauges whether learners can evaluate the two designs in light of the best practices taught in the module.

The summative assessment is a multiple-choice test that measures learners' understanding of all of the concepts taught in the course's three modules. It uses a combination of application-based and theory-based questions with visual examples. Being a summative assessment, it gauges learners' mastery of the learning objectives and of the overall learning goal by asking specific questions about applying visual design concepts in the creation of classroom materials. Most of the questions ask about design concepts used in given visual examples, which

learners must evaluate in order to choose the best responses. This assessment strategy aligns with the learning objectives of the course, which state that learners will use given examples to apply their understanding.

Learner Needs

The first learner need that could be encountered as the eLearning module is implemented is that learners may have different preferences as to how they engage with the content. Some learners may be discontented with text-based learning, for example, while others may prefer videos and more interactive activities. Therefore, learner preferences towards certain content mediums could affect the implementation of this eLearning module.

The second learner need that may be encountered is that some learners may have trouble using specific technologies. For instance, learners may have trouble navigating the LMS system, finding a particular lesson, or submitting quiz responses. In addition, learners may need help accessing external links. These challenges are due to specific learners' needs among learners who may be unfamiliar with the technologies used in the module.

Addressing Learner Needs

I plan to address the first potential learner need mentioned above by providing a wide variety of mediums to engage with the lesson content. The eLearning solution provides videos, images, graphics, and external articles about the concepts taught, and this offers multiple ways for learners to understand the lessons according to their own learning preferences. In addition, text transcripts of videos and alt-text captions are provided so that diverse learners can benefit even more from multiple means of content representation.

The second learner need, which stated that learners may have trouble navigating certain online technologies, will be addressed by providing support to the learners via email. The "Getting Started" introductory page contains instructor contact information so that if learners have trouble using a particular function within the LMS, for example, help can be easily accessed. In addition, the "Getting Started" page links to helpful tutorials and troubleshooting tips provided by Canvas LMS, which means that learners can access additional support with various other technology concerns that may arise.

E-Learning Tools and Justification of the Tools

The first tool used in the eLearning module is Canvas LMS. It is justified in accomplishing the learning goal because it makes it easy for learners to access lesson materials about visual design principles. Canvas LMS allows videos, images, and external articles to easily be shared and organized into succinct lessons and modules. In addition, Canvas LMS allows for learning goals, learner progress, and support channels to be clearly displayed within the module, which makes it easy for learners to monitor their progress. Finally, Canvas LMS' quizzes and test functions allow for assessments using a variety of question types and assignments, which ensures that learners' grasp of visual design concepts and their application to educational classroom materials is accurately measured. In sum, Canvas LMS is a robust tool that supports the learning goal of this course because of its ability to share materials, provide learner feedback, and measure progress toward understanding of visual design principles and their application(s).

The second tool is YouTube, the popular online video sharing platform. YouTube is a powerful learning technology because it allows learners to easily access videos related to lesson content. The eLearning solution provides embedded YouTube videos that guides viewers

through various aspects of visual design theory, including establishing a visual hierarchy and use of whitespace. In addition to being easily accessible and free, YouTube also allows for real-time captioning and transcription, as well as a comments section so that learners can engage with the learning content in multiple ways. Finally, YouTube is justified as a viable learning technology for this learning goal because it offers a variety of learning content from a wide range of perspectives, which can enhance learner understanding of visual design principles.

Justification of the Module

The module is effective in addressing the instructional problem for the following three reasons:

1. **It asks learners to compare the effectiveness of applying visual design principles to different document layouts.** This means that the exercises encourage learners to think about effective visual communication strategies, which can improve their own designs. For example, a formative quiz question asks learners to compare two different layouts and asks which is more effective:

English Dialogue #9
A Sick Roommate

Awa: Are you feeling better?
Bintou: Yes, I am. Yesterday I was sick. But today I feel better.
Awa: What's wrong?
Bintou: I had a headache.
Awa: Did you go to the doctor?
Bintou: No, I stayed home and slept.
Awa: You need to drink more water. You get these headaches because you don't drink enough water!
Bintou: Maybe that's true.
Awa: Well, I'm glad you feel better.
Bintou: Yeah, thank God.

Awa: Mbaa yaa ngi tane?
Bintou: Waaw. Démb dama feebaroon. Waaye tey tane naa.
Awa: Lan moo lay metti?
Bintou: Sama bopp mooy metti.
Awa: Mbaa demoon nga seeti fajkat bi?
Bintou: Déedéet, dama toogoon ci kër gi ak di nelaw.
Awa: Da nga war a naan ndox bu baari. Sa bopp day metti ndaxte doo naan lu baari!
Bintou: Mën na nekk dëgg.
Awa: Baax na, bëgg naa ci nga tane!
Bintou: Waaw, sant Yalla.

Key Vocabulary

feel better	tane
What's wrong?	Lu laay metti? / Lan mooy metti?
slept	tëdd na
enough	bu doy
maybe	xanaa

Design #1

Design #2

Learners are prompted to compare the two designs, which enhances their understanding of visual design principles. In turn, this activity addresses the instructional problem because it deepens the instructors' understanding of applying visual design principles.

2.   **It asks learners to critique and suggest improvements for given designs.** This can enhance the self-assessment skills of the learners in the instructional problem setting, which will help them find ways to improve their own designs. For example, one formative quiz question asks learners to choose the best way that a given design could be improved:
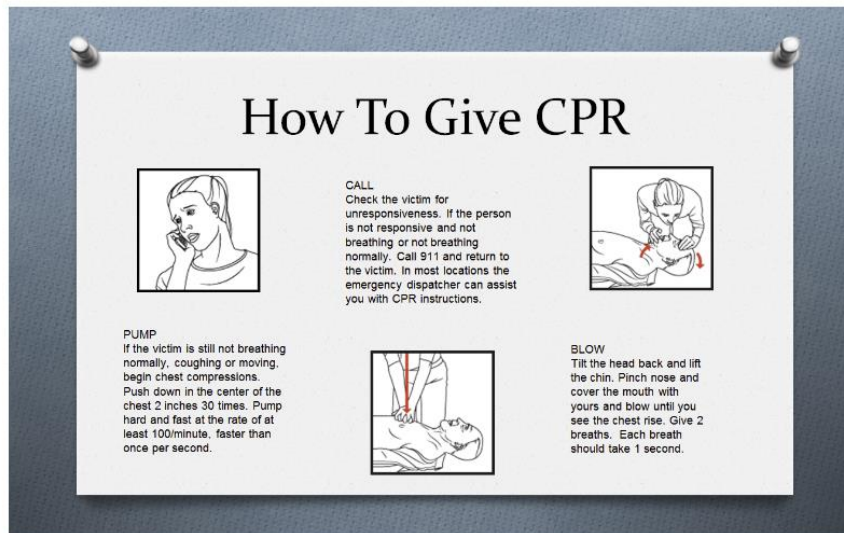
This type of activity encourages learners to see visual designs in a critical way, which challenges them to find ways to improve their own designs. Applying design principles to critique given designs is an activity that directly addresses the instructional problem because it can help them find ways to improve their designs in their current work.

3.   **It curates learning materials from a variety of sources and perspectives, which broadens understanding of design concepts and encourages further research.** The eLearning module addresses the instructional problem because it uses videos, graphics, and external articles about visual design principles, which provides the learner with multiple perspectives and resources for understanding visual design theory. Furthermore, the variety of materials gives learners examples of effective design that they

can apply to their own work. For example, *Lesson 2.2: How to Create a Visual Hierarchy* showcases examples of visual hierarchy with one video and ten images from seven different external sources. Through this lesson, learners are not only exposed to a wide range of perspectives, but they are also provided with resources for further study of the material. This encourages learners to think about visual design in various ways, which addresses the instructional problem of enhancing learners' knowledge of visual design principles.

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Research Methodology

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Method

Method: Type of Study

This study will be a *mixed methods* study because of its use of both quantitative and qualitative data. The rationale for choosing this study type will be explained below.

Method: Justification of Study Type

The study will be a *mixed methods* study because the research questions require both quantitative and qualitative data collection. For example, the first research question relies on the pre- and post-assessment scores of the participants: *What is the impact of microlearning on learners' understanding of visual design principles as measured by pre- and post-self-assessment?* The pre- and post- assessments in the eLearning module are exclusively point-based because a numerical point value is given depending on whether a question is answered correctly or not. The only way to collect and analyze this data will be via a quantitative means, where the researcher will analyze and interpret the numerical scores and their implications. In other words, the quantitative components of the research study seek to determine whether learners

demonstrated increased understanding of visual design principles by comparing the numerical scores of their pre- and post-tests, which is a quantitative evaluation.

In contrast to the quantitative elements of the study mentioned above, the study also requires some qualitative data collection and analysis in order to address the second research question: *How do learners describe their experience with the module's microlearning elements, such as the module's chunking and sequencing strategies?* The question asks how learners describe their experience, which requires asking the learners to reflect on their interactions with the eLearning module. This will be achieved using a *mixed questionnaire*. A questionnaire that is exclusively *quantitative* in nature would be insufficient for this particular research question because it would not provide opportunities for participants to describe their experiences in any great detail. Although some data about learners' experiences with the module will be collected in quantitative ways (e.g. using numerical Likert-scale questions), using closed-ended questions alone would not provide the descriptive data about learners' subjective experiences that open-ended questions would collect. Therefore, the study will use a *mixed questionnaire*, which contains both quantitative (closed-ended) and qualitative (open-ended) questions to address the research questions.

Given the rationale above, *mixed research* is best for this study because it would collect and interpret the most appropriate data types for each of the research questions. It provides opportunities for both qualitative and quantitative data, both of which are needed to address the particular research questions posed by the study.

Participants/Stakeholders

Participants Description

The participants for this study are instructors of vocational training courses in a non-profit training center for adults. The study will use 8 to 10 participants with ages ranging from 30 to 65. The job title of all the participants is "instructor." Participants are at least proficient in using desktop PCs to complete basic tasks related to their work. There are no reported special needs or learning challenges associated with any of the participants.

Participants Selection

Potential participants are co-workers of the researcher. Participants will be selected using "purposive" sampling to select participants that are most likely to provide useful data to the researcher. This will be determined based on the researcher's informal observations of the behaviors of the potential participants, which include their communication style, ability to follow instructions, and interest in learning new skills. Once the researcher has determined which co-workers best meet these criteria, the researcher will approach these co-workers during a face-to-face conversation and ask them to participate in the study. At this point, the researcher will also answer any questions that the potential participants may have. Those who expressed interest in participation will be provided with detailed written descriptions of the purpose of the research study and of participant roles, as well as information about study confidentiality and informed consent.

Stakeholder Identification

The research study is pertinent to the following identified stakeholders:

- **Program administrators.** This group can benefit from the research study because the results could inform future decisions about educational interventions for their staff. If microlearning is found to be an effective means of teaching visual design skills, it means that program administrators will be more likely to see the benefit of using microlearning in subsequent trainings. In addition, if participant feedback about microlearning strategies is positive, this could prompt program administrators to explore microlearning's potential for boosting engagement in the workplace.

- **Instructors.** Since the study asks how learners' knowledge of visual design principles is enhanced through microlearning experiences, the instructors themselves could be impacted by the findings. If microlearning is found to be a highly effective strategy for teaching visual design concepts, then the instructors will have increased their skills. Furthermore, instructors may be more likely to participate in and implement microlearning into their own curricula.

- **Instructional and curriculum designers.** If microlearning is found to be an effective means of teaching about visual design principles, it could encourage increased adoption of microlearning strategies in educational institutions. The results of the study could influence instructional and curriculum designers in their decisions about instructional strategies and course delivery methods.

Data Collection Instrument(s)

The first data collection instrument used in the study addresses the first research question: *What is the impact of microlearning on learners' understanding of visual design principles as*

measured by pre- and post-self-assessment? The instrument is a set of two identical multiple-choice tests that are delivered within the Canvas LMS system. The pre-assessment will be given before the learning intervention to measure learners' baseline knowledge of visual design principles. The second test will be administered after the learner has completed all of the modules in the eLearning solution. This is so that the researcher can determine whether learners demonstrated a better understanding of design principles as a result of finishing the eLearning solution. The ten closed-ended questions contained in the tests cover various aspects of visual design principles that are taught in the eLearning solution. The pre- and post-tests are administered directly within the eLearning module using Canvas LMS' robust assessment tools. Learner scores are collected by Canvas LMS and can be accessed by the researcher for analysis and interpretation purposes. Since the tests contain closed-ended multiple-choice questions, they offer opportunities for quantitative data collection and analysis because they provide a numerical score for each learner. The data collected will also show how learners performed on each individual question, which will provide further opportunities for analysis. This data aligns with the research questions because researchers can use the data to compare pre- and post-test results in their analysis of the impact of the eLearning solution on learners' understanding of visual design principles. The questions and answers for the pre- and post- tests are provided in **Appendix A** below.

The second data collection tool used in this study is a questionnaire that will be administered after the learners have completed all of the modules and the post-test. It contains closed- and open-ended questions that address the second research question: *How do learners describe their experience with the module's microlearning elements, such as the module's chunking and sequencing strategies?* The questionnaire contains 15 closed-ended questions that

ask about various aspects of the microlearning elements in the course. Many of the closed-ended questions ask learners to complete statements about given elements in the course. An example is below:

4. "The time it took to complete each module was _____."

(1) Too Short   (2) About the Right Amount   (3) Too Long

Other questions ask learners to indicate whether they agree or disagree with a statement about the course's microlearning elements:

6. "Lessons were short enough to fit into my daily schedule."

(1) Strongly Disagree (2) Disagree   (3) Neutral   (4) Agree   (5) Strongly Agree

This section of 15-closed ended questions will be useful to the researcher because it will reveal themes about the learners' experience with the course. In addition, since the data is based on a numerical score, the researcher will be able to extract further insights by looking for trends, calculating averages, and employing other quantitative data analysis techniques.

The second section of the questionnaire consists of three open-ended questions about the course's microlearning elements. Specifically, the questions seek to gather data about *how the learners describe their experience with the module's microlearning elements*. For example, one of the open-ended questions asks: *Please discuss how the* pacing *of the lessons and modules affected your learning.* These questions seek to collect qualitative data about the learners' experiences by asking learners to describe in their own words how they felt while using the course. These open-ended questions will give learners the freedom to express their own thoughts about the course's microlearning elements, which could reveal insights that could not be captured by the quantitative questions in the previous section. In addition, the researcher can use qualitative data for a variety of data analysis techniques that are not possible for strictly closed-

ended questions. The full list of questions and possible responses for the questionnaire is provided in **Appendix B** below.

Like the pre- and post-assessments described above, learners will access the questionnaire within Canvas LMS. They will indicate their responses to the closed-ended questions by selecting a number that corresponds to their response (1, 2, 3, or 1, 2, 3, 4, 5). After this, learners will type their responses to the open-ended questions in text boxes below each question. When the learner clicks "Submit," the questionnaire data is stored within Canvas LMS for the researcher to access at any time.

The researcher is justified in using this *mixed questionnaire* as a data collection tool because it collects data that directly addresses the second research question. It asks the learners to describe their experience with specific aspects of the course's microlearning elements, including the pacing and organization of lessons and modules. It also collects a mix of quantitative and qualitative data, which will provide multiple forms of evidence for the researcher to analyze and present. For the reasons stated above, the questionnaire will be an appropriate tool for collecting data that investigates the research questions in the present study.

Data Analysis Technique(s)

Given that this study will be a *mixed methods* study, both quantitative and qualitative data analysis techniques will be used. This dual process of analyzing the data collected from the participants will be described below:

Quantitative Data Analysis

The researcher will use descriptive statistics techniques to analyze the pre- and post-test data, as well as the quantitative "Likert-scale" portion of the questionnaire. The researcher will begin with the pre-test and find the mean score among all of the participants. They will do this by finding the sum of all of the pre-test scores and then dividing by the number of participants. With the mean pre-test score calculated, the researcher will do the same with the post-test scores. From there, the researcher will be able to compare the mean of the pre-test and the mean of the post-test, which will give the mean growth score. This is important for addressing the first research question, which asks how learners' understanding of visual design principles are impacted by the eLearning module. The researcher will also find the mean growth score for each test question to see how learners performed on individual questions. This information would show the researcher how well the learners performed on questions about particular visual design concepts, which could suggest areas for improvement in the course content and design.

The researcher will also calculate the mean scores for each "closed-ended" question on the questionnaire. The responses are quantitative in nature because they involve a numerical-based scale that is associated with particular responses (e.g. (1) Strongly Disagree, (2) Disagree, (3) Neutral, etc.). The quantitative nature of the data will allow the researchers to calculate the mean score for each closed-ended question. Knowing the mean score for each question will allow the researcher to spot trends and make inferences. For example, the researcher could calculate the mean response for the following question:

5. *The time it took to complete the entire course was _____.*

(1) Too Short (2) About the Right Amount   (3) Too Long

Knowing the mean response score for this question would indicate to the researcher whether the course was too long or too short. By analyzing the quantitative data in the questionnaire in this way, the researcher will gain insights into the aspects of the microlearning experience that resonated most with the participants—as well as those that did not—which are findings that directly address the second research question.

Qualitative Data Analysis

The study provides opportunities for qualitative data analysis through the "open-ended" questions contained in the questionnaire. The researcher will collect the responses to these questions and begin to look for common language. Responses that share similarities will become grouped into "codes," which will be labeled according to a color scheme in a spreadsheet file. The researcher will then look for patterns and trends in the data as they seek to organize the codes into "categories." The categories, which are the themes that emerge from the coding, will be used by the researchers to draw inferences from and to summarize the experiences of the learners while using the microlearning elements of the eLearning module. Although the qualitative analysis can be somewhat time consuming, it is an important part of the research study because the themes that it reveals could provide valuable insights about learner experiences with microlearning, which directly addresses the second research question.

Expected Timeline

The expected start date of the implementation of the eLearning module is July 1, 2024. Participants will be given two weeks to complete all of the activities in the module, which includes the pre- and post-tests and questionnaire. This means that the final day for participants

to complete the study and the last day of the eLearning module implementation phase will be on July 15, 2024. Data collection and analysis will begin soon after this date and could take up to two weeks.

Data Security and Confidentiality

There are a few security and confidentiality points to note that are related to the use of Canvas LMS as a delivery tool for the eLearning module. Although Canvas stores personal data such as the learners' names and email addresses, the service "only processes personal data to the extent necessary for the provision of user content and the operations of Canvas" (Institutions & Educators Privacy | FAQ, n.d.). The Canvas website also states that it "does not share personal data or user content with other companies that do not have permission to see or access the data" (Institutions & Educators Privacy | FAQ, n.d.). Canvas' parent company, Instructure, will also delete any learner data upon request, which means that the researchers will initiate the deletion of learner data from the LMS when it becomes necessary to do so.

The researcher will do their part to store the study data in a secure way. Upon retrieving assessment and questionnaire data from the LMS, the study data will be stripped of personal identifying information (PII), since it is not relevant to the study. Relevant data will be saved on a password-protected and encrypted external hard drive. The researcher will not create or keep hard (paper) copies of student data at any time. Only the researcher involved in the study will be allowed to access and view the data. Data will be stored for three years after the conclusion of the study, after which the researcher will destroy the data and request its deletion from Canvas LMS.

Conclusion

The researcher is conducting a *mixed study* because the research questions require both quantitative and qualitative data to be answered. Potential participants are instructors in a non-profit educational training center for adults. Participants will be selected using *purposive sampling* techniques, where the researcher will select 8 to 12 co-workers based on their perceived ability to follow directions and to describe their experiences clearly. Stakeholders who may be impacted by the findings include instructors, education administrators, and instructional designers who are considering using microlearning elements in their courses. The researcher will use Canvas LMS to implement the eLearning solution intervention, as well as to collect data about participant pre- and post-test scores, as well as questionnaires. Pre- and post-tests will provide quantitative data that can be used to assess learners' understanding of visual design principles before and after the intervention. A *mixed questionnaire* will provide both quantitative and qualitative data about learners' reported experiences with the module's microlearning elements. The researcher is justified in using these data collection tools because the data they provide will help to answer the two research questions in the study. The researcher will compare the average (mean) scores on the pre- and post-test scores to determine the mean growth score, and they will do the same for each question on the test. The researcher will also calculate the mean score for each "closed-ended" question on the questionnaire in order to spot trends in learner experiences. For the "open-ended" questions on the questionnaire, the researcher will use *coding* and *categorization* techniques to look for themes that emerge from the participants' responses. The researcher is justified in using these data analysis techniques because they will demonstrate the intervention's impact on learners' understanding of visual design principles (research question 1), as well as how learners perceived the microlearning elements of the e-

learning module (research question 2). The projected timeline for the implementation of the study is two weeks, from July 1, 2024 to July 15, 2024, during which participants will be given access to the eLearning module and its assessments and questionnaire. The researcher will strip data of personal identifying information and store it in a password-protected, encrypted external hard drive for a period of three years, after which it will be destroyed. Information stored in Canvas LMS will also be deleted at this time.

Chapter 4: Results

Summary of Research

Instructional Setting

The study took place in a vocational training center that provides courses in customer service, information technology, and cashiering to adult job seekers. Instructors who worked there needed to learn to apply visual design principles to enhance the efficacy of their handouts, slideshow presentations, and other classroom materials. It was hoped that by incorporating visual design principles into their instructional materials, they would be able to increase client satisfaction and job placement rates.

Research Topic

The purpose of the study was to understand the efficacy of using a microlearning-based eLearning module to teach visual design principles to educators. Specifically, the researchers asked how learners' understanding of visual design principles was impacted based on pre- and post-assessments (RQ1). In addition, the study investigated how learners described their experience using the eLearning module's microlearning elements (RQ2). The topic was important to research because educators need to use visual design principles to improve the efficacy of their classroom materials. It was hoped that the research findings could demonstrate microlearning's effectiveness as an instructional strategy for teaching visual design principles.

Participants and How They Were Involved

The study involved five participants who were selected using "purposive" sampling by the researcher. Since the researcher worked alongside the participants at the vocational training

center, participant selection was based on the perceived abilities to complete study tasks and to follow instructions as based on the researcher's previous interactions and experience with the participants. The chosen participant group were instructors ages 35 to 65 who had proficient skills in using desktop PCs. There were no learning challenges or special needs reported by the participants. The participants were required to complete an eLearning module that taught visual design principles, which included a pre- and post-assessment, formative quizzes, and an end-of-course survey questionnaire. The total time commitment required of the participants was between one and two hours.

Other Stakeholders and Their Roles

Besides the participants, additional study stakeholders included program administrators and curriculum designers. Although these stakeholders did not play an active role in the activities of the research study apart from granting approval to the researchers to perform the study at their worksite, the results of the study will surely inform their work, especially if microlearning is found to be an effective instructional strategy for teaching visual design principles. The researcher was also an important stakeholder, whose role was to select participants, inform them of the purpose and roles they would be fulfilling, obtain informed consent, assist participants in accessing and moving through the eLearning module, answering questions, and collecting and interpreting data.

Data Collection Methods

The study used two main methods of data collection, which were used to address the two research questions introduced in Chapter 1. The first method was a multiple choice pre- and post-

assessment that consisted of ten questions about applying visual design principles in various scenarios. Since the first method was based on multiple choice questions, the data collected was quantitative in nature. As soon as participants began the module in Canvas LMS, they were directed to complete the pre-assessment, which served as a diagnostic assessment to determine the participants' baseline knowledge of visual design principles before they proceeded through the course. Upon completion of the course, participants were directed to complete the post-assessment, which consisted of ten multiple choice questions similar to those found in the pre-assessment. All of the assessments were contained within Canvas LMS, which collected and stored the data until accessed by the researcher.

The second method of data collection used in the study was a post-intervention questionnaire survey, which was also accessed within Canvas LMS. The questionnaire sought to address the second research question, which asked about participants' experiences while using the eLearning intervention. For this reason, a *mixed methods* data collection tool was used, which contained 15 multiple choice questions and three open-ended questions. This *mixed methods* questionnaire allowed participants to rank certain aspects of their experience with the eLearning module on a Likert-scale, and the open-ended questions gave the participants opportunities write in more detail about their experiences. Similar to the pre- and post-assessments described above, the questionnaire survey was administered via Canvas LMS, which allowed for collection and storage of each participant's responses until it was collected by the researcher.

Summary of Results

The summary of results below includes data for the pre- and post-assessment scores (RQ1), as well as for the post-intervention survey questionnaire (RQ2).

Pre- and Post-Assessment Scores

With regard to the pre- and post-assessment scores of the five participants, the data shows that all the participants achieved a higher score on the post-assessment than on the pre-assessment. The average (mean) score among participants for the pre-assessment was 7.598 out of 10 possible points, and the average (mean) score among participants for the post-assessment was 10 out of ten possible points. In other words, all of the participants scored 10 out of 10 possible points on the final assessment, which is the highest score possible. The mean growth score, which is the difference between the pre- and post-assessment averages described above, is 2.402. Figure 1 below compares the averages between pre- and post-assessment scores among the five participants:

Figure 1

Participants' Total Average (Mean) Pre- and Post-Assessment Scores (n=5)
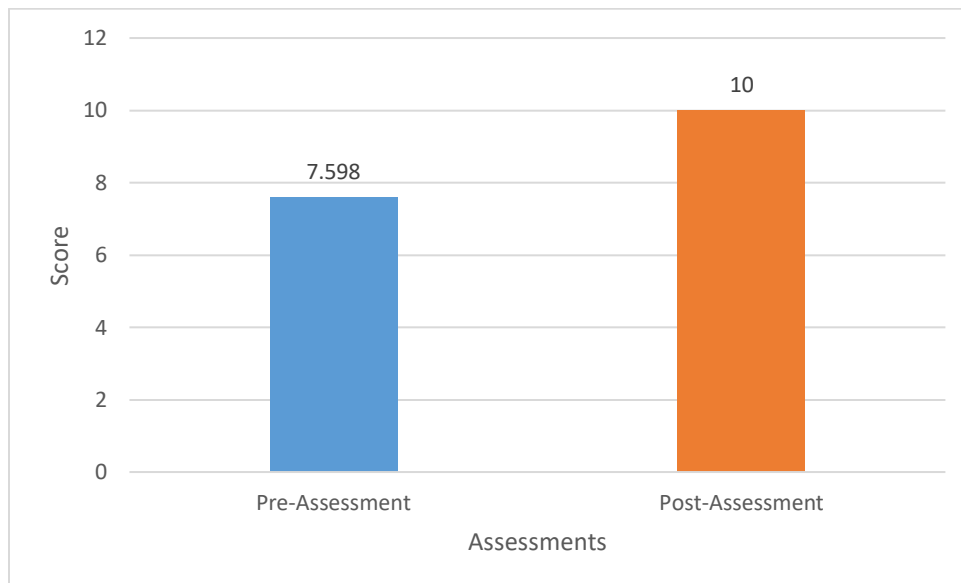
Note. Number of participants = 5, total *N* = 5.

Figure 2 below shows the pre- and post-assessment scores for each participant. It is consistent with the data above because it shows that all participants performed better on the post-assessment than on the pre-assessment. The average (mean) pre-assessment score among the five participants is 7.598:

Figure 2

Pre- and Post-Assessment Score Totals by Participant
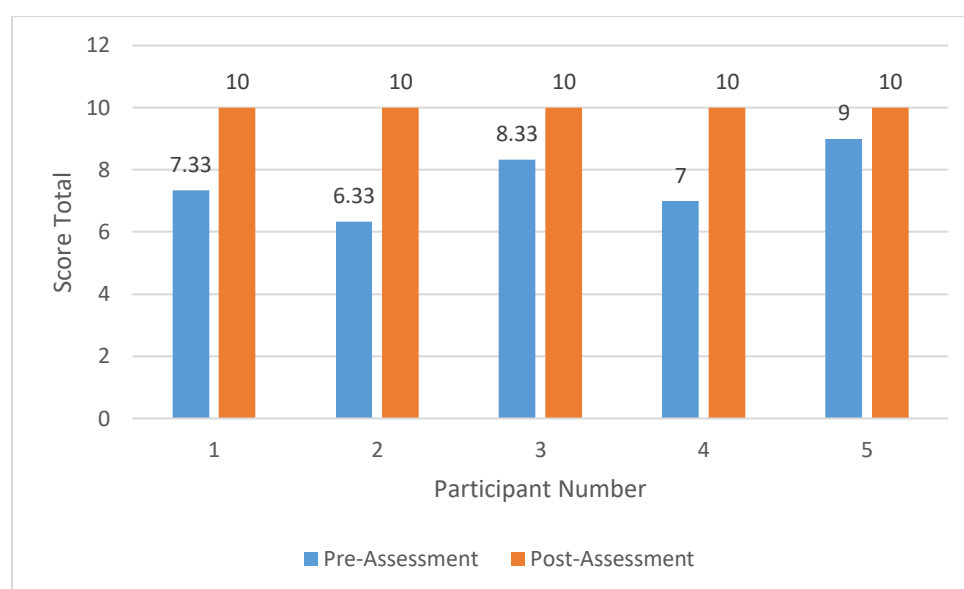

Table 1 below shows the pre- and post-assessment total scores as in **Figure 2** above, but it includes a column for the mean growth score of each participant:

Table 1

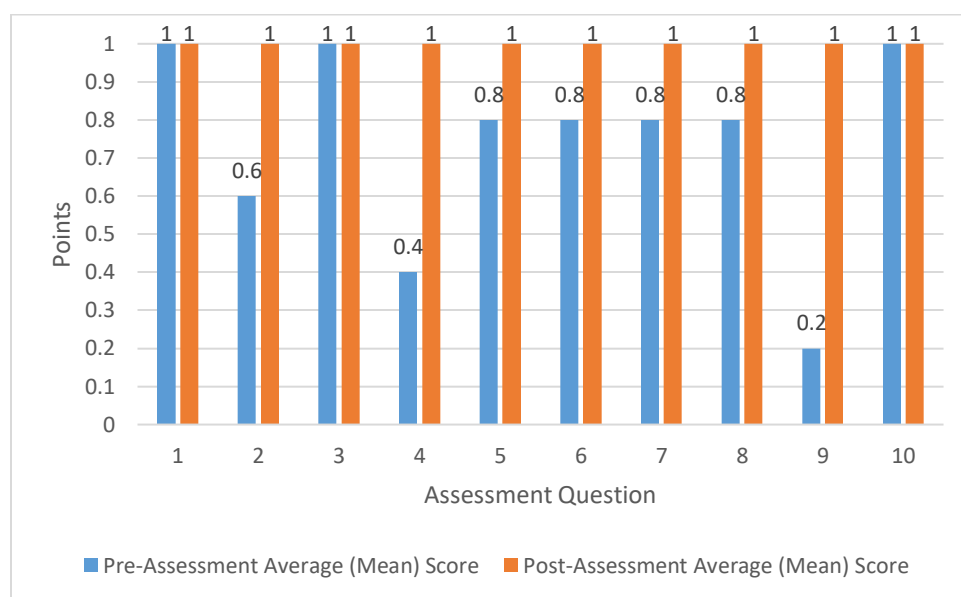*Pre-Assessment and Post-Assessment Scores Comparison by Participant*

Participant Number	Pre-Assessment	Post-Assessment	Mean Growth Score
1	7.33	10	2.67
2	6.33	10	3.67

3	8.33	10	1.67
4	7	10	3
5	9	10	1
Average (Mean)	7.598	10	2.402

Figure 3 below shows the average (mean) points scored on each question by all participants on the pre- and post-assessments. A score between 0 and 1 indicates that a participant's response was only partially correct:

Figure 3

Average (Mean) Pre-Assessment and Post-Assessment Scores by Question (n=5)

Note. Number of participants = 5, total *N* = 5.

Table 2 below shows the average (mean) pre- and post-assessments scores for each question as in **Figure 3** above, but it includes a column for the mean growth score of each assessment question:

Table 2

Average (Mean) Pre-Assessment and Post-Assessment Scores by Question (n=5)

Assessment Question	Pre-Assessment Average (Mean) Score	Post-Assessment Average (Mean) Score	Mean Growth Score
1	1	1	0
2	0.6	1	0.4
3	1	1	0
4	0.4	1	0.6
5	0.8	1	0.2
6	0.8	1	0.2
7	0.8	1	0.2
8	0.8	1	0.2
9	0.2	1	0.8
10	1	1	0
Average (Mean)	0.74	1	0.26

Note. Number of participants = 5, total N = 5.

There are a few important points to consider about this data. First, 100 percent of the participants demonstrated a score increase between the pre- and post-assessments. Another way of considering this is that the data shows that all of the participants received scores of less than what they scored on the post-assessment. Especially noteworthy is that all of the participants received the maximum 10 out of 10 possible points correct on the post-assessment. It is also important to note that there were no major outliers in the scores of the participants on the pre-assessment, with the lowest score being 6.33 and the highest being 9. When considering the average scores for each question (**Figure 3**), the increase of scores between the pre- and post-assessments are consistent with the average overall score increases noted in **Figures 1** and **2**. Interestingly, the data also shows that all of the participants answered questions 1, 3, and 10 correctly on both the pre- and post-assessments. The question that showed the lowest scores on

the pre-assessment was on question 9, which asked learners about typographic principles for legibility. Overall, this data from the pre- and post-assessments is consistent with the expectations and observations of the researcher, and it presents an accurate snapshot of the quantitative data collected to assess differences in pre- and post-assessment scores.

Survey Questionnaire

Table 3 below shows the results of the "closed-ended" question portion of the survey questionnaire for each participant. The numerical value of each response corresponds to the Likert scale values assigned to each response as specified next to each question. The table also shows the average (mean) score for each question:

Table 3

Responses for "Closed-Ended" Survey Questionnaire Questions with Average (Mean)

| Question	Participant 1	Participant 2	Participant 3	Participant 4	Participant 5	Average (Mean)
1. The amount of content in each lesson was _____. (1) Too Little (2) About the Right Amount (3) Too Much	2	2	2	2	2	2
2. The time it took to complete each lesson was _____. (1) Too Short (2) About the Right Amount (3) Too Long	2	2	2	2	2	2
3. The number of lessons in each module was _____. (1) Too Few (2) About the Right Number (3) Too Many	2	2	2	2	2	2
4. The time it took to complete each module was _____. (1) Too Short (2) About the Right Amount (3) Too Long	2	2	2	2	2	2
5. The time it took to complete the entire course was _____. (1) Too Short (2) About the Right Amount (3) Too Long	2	2	2	2	1	1.8
6. Lessons were short enough to fit into my daily schedule. (1) Strongly Disagree (2) Disagree (3) Neutral (4) Agree (5) Strongly Agree	5	5	4	4	4	4.4
7. The entire course was organized in a way that made sense. (1) Strongly Disagree (2) Disagree (3) Neutral (4) Agree (5) Strongly Agree	5	5	4	4	5	4.6
8. The concepts I learned in one lesson prepared me for the concepts I learned in the next. (1) Strongly Disagree (2) Disagree (3) Neutral (4) Agree (5) Strongly Agree	4	5	4	4	2	3.8
9. I felt free to complete the lessons at my own pace. (1) Strongly Disagree (2) Disagree (3) Neutral (4) Agree (5) Strongly Agree	5	5	4	4	5	4.6

10. The ability to move through the lessons at my own pace helped me learn. (1) Strongly Disagree (2) Disagree (3) Neutral (4) Agree (5) Strongly Agree	5	5	4	4	3	4.2
11. I felt free to complete the lessons in any order I wanted. (1) Strongly Disagree (2) Disagree (3) Neutral (4) Agree (5) Strongly Agree	5	4	4	3	2	3.6
12. Taking a quiz after each module helped me learn. (1) Strongly Disagree (2) Disagree (3) Neutral (4) Agree (5) Strongly Agree	5	5	4	4	3	4.2
13. The feedback I received during the quizzes helped me learn. (1) Strongly Disagree (2) Disagree (3) Neutral (4) Agree (5) Strongly Agree	5	5	4	4	2	4
14. The lesson content prepared me for the final assessment. (1) Strongly Disagree (2) Disagree (3) Neutral (4) Agree (5) Strongly Agree	5	5	4	4	3	4.2
15. The quizzes after each module prepared me for the final assessment. (1) Strongly Disagree (2) Disagree (3) Neutral (4) Agree (5) Strongly Agree	5	5	4	4	4	4.4

Note. Number of participants = 5, total N = 5.

Figure 4 below shows the responses from each participant for survey questions 6 through 15, as well as the average (mean) value for each:

Figure 4

Participant Responses for Survey Questionnaire Questions 6 through 15 with Average (Mean)
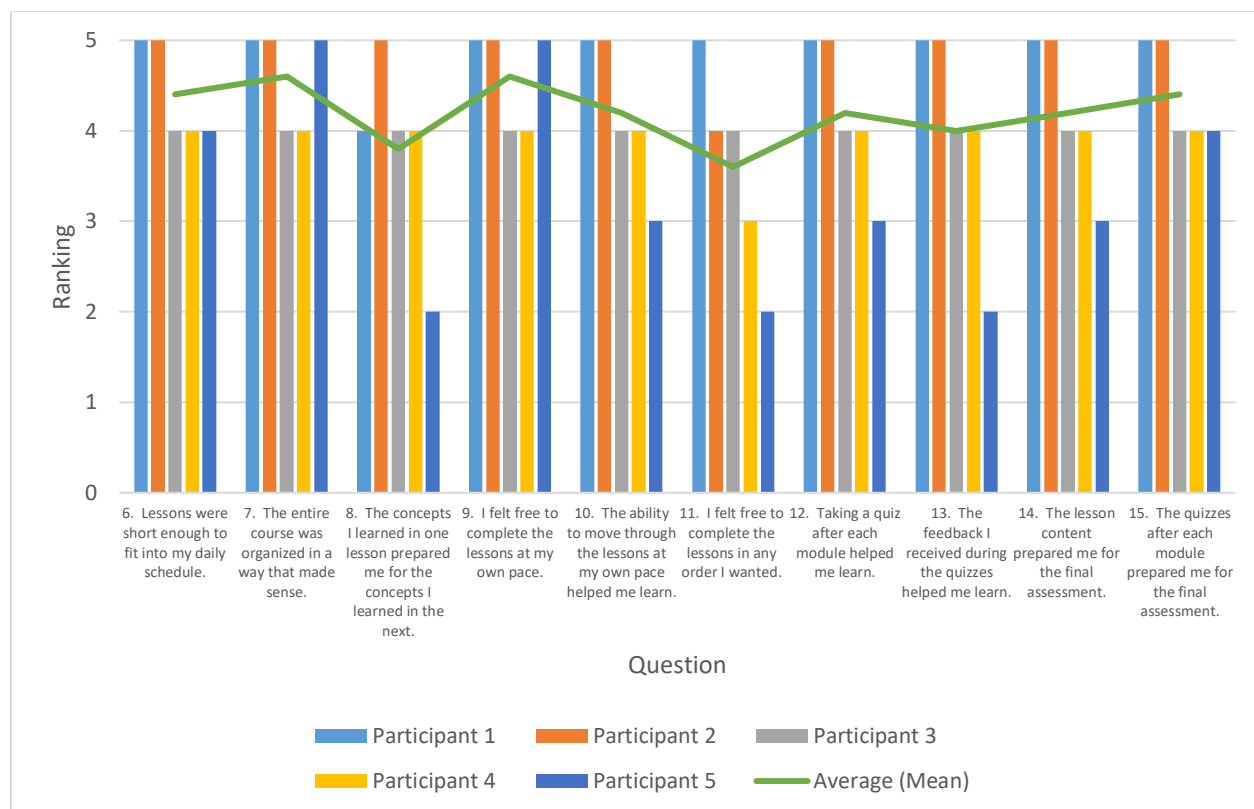
Note. Ranking values (y-axis) correspond to the following Likert scale values for each response:

(1) Strongly Disagree (2) Disagree (3) Neutral (4) Agree (5) Strongly Agree.

The survey also contains three "open-ended" questions that served to collect qualitative

data about the experiences of the participants while using the eLearning course. The responses to

each question by each of the participants is illustrated in **Table 4** below:

Table 4

Participant Responses for Survey Questionnaire Questions 16 through 18.

Question	Participant 1	Participant 2	Participant 3	Participant 4	Participant 5
16. Please discuss how the pacing of the lessons and	Having my own time to do the training on my pace was	The pacing made sense - it was easy to	The paces of the lessons was well-organized to	The short lessens made the information	The pacing was fine. My only problem was that I

modules affected your learning.	important. At the same time the videos was just about the right length, so I could do all at once, and didn't have to stop, having a continually learning process.	work through short modules.	be able to complete the lessons efficiently.	more accessible.	wasn't informed what pace was preferred. For example, ideally this course should be completed in one hour.
17. Please discuss how the organization of the lessons and modules affected your learning.	The organization of the lesson, especially the quiz, was crucial in the learning process. The repeating questions the quiz helped me understand the concepts of visual design better and analyze the errors in the images throughout the lessons.	It was easy to follow the topics and examples. They were well-organized.	The lessons were organized well to be able to efficiently complete in a timely manner.	The content was organized but felt a bit repetitious.	The organization was fine. However, any more than three concepts need to be broken up into a separate series of lessons. For example, there was one course with ten new design concepts. I'm not truly going to remember all ten. I would suggest considering how much new data an average person can load into short-term memory. I would recommend three per lesson.
18. How can this course be improved?	The course was great. And having quizzes was really effective in my learning process. Other than this, I don't have anything to add.	It might be fun to add a final project where a design could be improved and submitted for instructor or peer feedback.	More visuals and bigger text would be helpful.	The lessons need to be connected to education and learning materials that a teacher would produce.	Breaking newer concepts down into smaller lessons, and possibly a 'check on understanding' quiz after each to cement the lesson in the student's mind.

					Fantastic job overall!

This mix of qualitative and quantitative data collected from the survey questionnaire was helpful to the researcher because it offered opportunities for quantitative analysis and visualization as well as qualitative descriptions of the participants' experiences. For instance, the use of a numerical scale assigned to questions 1 through 15 allowed the researcher to visualize the questions that elicited favorable responses and the questions that elicited more negative ones. This helped the researcher to identify which elements of the eLearning module were perceived less favorably by the participants, which would help to improve future iterations of the learning intervention. The question that scored the lowest was question number 11, which asked participants to rank whether they agreed that they felt free to complete lessons in any order of their choosing. In addition to the quantitative data, the data offered descriptive qualitative information, which will not only help researchers with their subsequent iterations, but it will also inform best practices for other researchers and educators who are looking to implement microlearning into their own educational strategies.

Interpretation of Data

After analyzing the data, the researcher arrived at the following implications and findings:

1. **All participants demonstrated increased understanding of applying visual design principles as evidenced by pre- and post-assessment scores.** The mean growth score of 2.402 between pre- and post-assessment score results indicates that participants' knowledge of visual design principles increased as a result of the eLearning intervention.

2. **Participants brought previous knowledge to the eLearning experience that could have made some aspects of the course seem irrelevant or superfluous.** The mean growth scores for participant scores on questions 1, 3, and 10 were all zero because all of the participants answered these questions correctly on both the pre- and post-assessments. This implies that the participants were already familiar with the concepts assessed by those questions. This could indicate that some of the content in the eLearning module was unnecessary and did not suit the needs of the learners. This finding could inform future iterations of the eLearning module.

3. **Participants' collective understanding of the visual design principles of proximity and typography especially improved as a result of the intervention.** The participants scored the lowest on the pre-assessment questions about visual proximity and typography, as evidenced by the mean scores on questions 4 and 9, respectively. The participants' knowledge of these specific concepts increased the most as a result of the eLearning intervention, since the mean growth scores for those questions (0.6 and 0.8) were the highest. This implies that the eLearning module was effective at teaching concepts about which learners had little to no prior knowledge.

4. **Participants were generally very satisfied with the timing and pacing of the eLearning module.** Questionnaire survey questions 1 through 5 asked participants about aspects related to the timing and chunking strategies of the course, and the mean response for questions 1 through 4 was 2, which indicated that they were universally satisfied with these aspects of the course. The responses to Question 5, which asked about the total time required to complete the course, received a mean score of 1.8, showed that the course duration was adequate for all but one participant. Participants offered helpful feedback in

the survey questionnaire that will be used to inform future iterations of the eLearning solution.

5. **The response to the organization and sequencing of the course was generally favorable, with some exceptions.** Questionnaire questions 6 through 15 mostly asked about the course's organization and sequencing elements, such as whether the course was organized in a way that made sense (Question 7). **Figure 4** above shows that the questions to which participants responded least favorably were whether the concepts learned in one lesson prepared learners for the concepts learned in the next (Question 8) and whether participants felt free to complete lessons in any order of their choosing (Question 11). A textual analysis of the open-ended survey question responses also showed that respondents were generally pleased with the pacing (Question 16) and organization (Question 17) of the modules. These findings as well as the feedback provided by participants offer important implications for future refinements of the eLearning solution.

Recognizing and Minimizing Bias in Analysis and Interpretation of Data

Steps were taken by the researcher to recognize and minimize bias in the analysis of data. One way that bias can occur at this stage is through *wording bias*, where a researcher paraphrases or even adds extra information to data that supports a certain preconceived hypothesis (Sarniak, 2022). The researcher recognized that this was occurring while coding qualitative data. They soon realized that certain data coding techniques were creating new data that was not initially there. As such, extra precaution was taken to rely on analysis techniques

that did not involve paraphrasing of participant responses. In addition, the researchers tried to let the data speak for itself, and no re-wording of qualitative data was performed.

Another type of bias that could occur during the data analysis phase is *confirmation bias*, where a researcher analyzes and presents data in an effort to support a particular hypothesis (Sarniak, 2022). The researcher avoided this type of bias in the analysis phase by adopting a strategy to "continually reevaluate impressions of respondents and challenge preexisting assumptions and hypotheses" (Sarniak, 2022). For example, the researcher sought to continually challenge the notion that microlearning is an effective means of teaching visual design concepts by letting the participants' responses about microlearning speak for themselves.

Proposed Iteration(s) of E-Learning Solution

Evaluation of E-Learning Solution

The eLearning solution is effective on the solution to the instructional problem because participants demonstrated objective and quantifiable evidence of learning. This was evidenced by comparing the results of the pre- and post-assessments, which asked questions about applying specific visual design concepts. Since the instructional problem was that educators in a vocational training school needed to apply visual design principles in the creation of their classroom materials, the results of the assessments showed that all of the participants who participated in the eLearning intervention improved their understanding of visual design principles. Importantly, the participants and setting of this study were aligned with the instructional problem and research questions. In other words, the participants and setting of the study mirrored what was described in the instructional problem statements, which included information about learner needs and educational context. This was important to prove that the

eLearning solution and the study methodology directly addressed the research questions. In addition to the fact that participants demonstrated skill gains through their pre- and post-assessment scores, the eLearning solution was met with a generally favorable response from participants and stakeholders, which further bolsters the acceptance and credibility of the eLearning solution within this particular learner group and setting.

E-Learning Redesign and Justification Based on Feedback and Research

Although the initial design of the eLearning solution proved to be effective in addressing the instructional problem and research questions of the study, modifications to the eLearning solution would enhance its overall effectiveness in future iterations of the study. Based on the analysis and interpretation of the data, the researcher proposed the following two modifications below:

1. **Increase the relevance of learning materials to educational contexts.**

    The eLearning module should include more examples of visual designs that might be used in an educational setting. Many of the examples in the current course iteration are relevant to advertising or website design contexts, and while these examples illustrate design concepts that could be of interest to educators, they do not directly correspond to the experiences of a teacher or instructor. For example, the eLearning module contains the following quiz question, which seeks to elicit ways that the design of a community flyer about recycling can be improved:

Image Credit: Napier City Council via Infonews.

Although educators could learn about design principles from the flyer, it would make more sense to replace the flyer image with an example of learning material that a teacher or instructor would create, such as a worksheet or a slide from a slideshow presentation. The quizzes and pre- and post-assessments contain numerous such examples that could be modified to better suit the needs of educators. This refinement would increase the relevance of the course for educators, which is the specific population that the study seeks to examine. Therefore, the refinement would improve the alignment of the eLearning intervention with the specific instructional problem and research questions outlined in the study.

This refinement is supported by participant feedback gathered from the end-of-course questionnaire as well as by outside research. One participant wrote that "the lessons need to be connected to education and learning materials that a teacher would

produce." The research on andragogy also supports this sentiment. For example, Jennings (2021) writes that "new information needs to be connected to prior learning and the adult learner needs to understand why a concept should be learned" (p. 43). By connecting the examples in the eLearning module to the knowledge and experience of the instructor participants, the research could better target the needs of the particular learner group.

2. **Divide lessons with a large number of concepts into smaller, more digestible microlessons.**

Some lessons in the eLearning solution contain multiple new concepts. One participant wrote the following about a particularly long lesson in the course:

> *There was one course with ten new design concepts. I'm not truly going to remember all ten. I would suggest considering how much new data an average person can load into short-term memory. I would recommend three per lesson.*

The participant was referring to Lesson 2.2 in the eLearning module, which taught ten different visual design principles in a single lesson. In future iterations of this eLearning module, this lesson should be divided up into multiple lessons with each lesson containing no more than four design principles. Dividing longer lessons into smaller ones is a typical instructional strategy of microlearning, and the research on microlearning and cognitive load supports this modification. For instance, Dong et. al (2020) write that "if teachers take advantage of technology to explain complicated concept and assign small unit task in learning, students will have lower level cognitive load and lead to better learning engagement" (p. 7). The research of Dong. et al (2020) says that smaller tasks help to decrease cognitive load, which is a crucial component of microlearning.

Therefore, Lesson 2.2 will be divided up into three smaller lessons in future iterations so as to decrease the cognitive load expected of the learners.

New Methodology

The proposed changes to the eLearning solution would not require a change to the overall methodology of the study. This is because the proposed refinements to the eLearning module would make minor improvements to the existing design as opposed to a complete redesign of entire module elements. This means that the study would remain a *mixed methods* study, since it would retain its quantitative and qualitative elements. Although the number of microlessons would change, the data gathering tools and methods would remain largely the same. The only proposed modifications for the assessments would make questions more relevant to educators as opposed to marketing or publishing professionals by replacing some images and scenarios. Therefore, the methodology of the study would remain the same even after the proposed refinements, since the eLearning module would teach the same concepts, and the data collection tools would collect similar types of data (quantitative and qualitative) using closed- and open-ended questions.

Data Collection Tools Refinements and Improved Quality of Data

The data collection tools, which consist of the pre- and post-assessments as well as the survey questionnaire, will be refined in the following ways. First, pre- and post-assessment questions 1, 3, and 10 should be modified to cover other topics. This is because all of the participants answered each of these questions correctly, which indicates that they were already familiar with the material. It would also indicate that the questions were too easy and did not

adequately assess the participants' ability to apply visual design principles to a given scenario. For example, Question 3 reads: "The relative size and quantity of a design's elements refers to what design principle?" However, by changing the question to propose a scenario where the learner must apply principles that affect the relative size and quantity of a design's elements, the question might be more challenging. This refinement would improve the representativeness and trustworthiness of the data because it would better assess learners' abilities to *apply* visual design skills, which was the stated purpose of the learning intervention. In addition, this refinement would help the researcher better assess the ability of the eLearning solution to teach visual design principles. This is because a more challenging scenario would provide more opportunities for the participants to demonstrate improvement between pre- and post-assessments.

The second way in which the quality of data could be improved through refinements to the data collection tools would be to make the responses for questions 1 through 5 on the "closed-ended" survey questionnaire the same as those for questions 6 through 15. Table 5 below shows that the possible responses for questions 1 through 5 lack a consistency of structure:

Table 5

Responses for "Closed-Ended" Survey Questionnaire Questions with Average (Mean)

Question	Participant 1	Participant 2	Participant 3	Participant 4	Participant 5	Average (Mean)
1. The amount of content in each lesson was _____. (1) Too Little (2) About the Right Amount (3) Too Much	2	2	2	2	2	2
2. The time it took to complete each lesson was _____. (1) Too Short (2) About the Right Amount (3) Too Long	2	2	2	2	2	2
3. The number of lessons in each module was _____. (1) Too Few (2) About the Right Number (3) Too Many	2	2	2	2	2	2
4. The time it took to complete each module was _____. (1) Too Short (2) About the Right Amount (3) Too Long	2	2	2	2	2	2
5. The time it took to complete the entire course was _____. (1) Too Short (2) About the Right Amount (3) Too Long	2	2	2	2	1	1.8

Note. Number of participants = 5, total *N* = 5.

The number of possible responses for these questions should match those of questions 6 through 15 in quantity (five possible choices) and they should follow the same corresponding Likert scale values for each response: (1) Strongly Disagree (2) Disagree (3) Neutral (4) Agree (5) Strongly Agree. In order for this to make sense, it will be necessary for the questions to be rewritten so as to gauge whether the participants agree or disagree with a given statement. This will improve the trustworthiness of the data because participants will be more likely to give accurate responses to survey questions that follow a consistency of question structure. If questions change format and response options frequently during a single survey, participants may be less likely to provide useful data about their experiences.

To summarize, the researcher proposed changes to questions 1, 3, and 10 of the pre- and post-assessments that would better gauge the participants' application of visual design concepts, as well as changes to the first five "closed-ended" questions in the survey questionnaire to improve consistency of response options. These changes would make the data collected more trustworthy and reliable. This is because the changes to the pre- and post-assessments would better gauge the effectiveness of the eLearning solution to achieve the instructional goal of getting educators to apply visual design principles, and the changes to the survey questions would provide the participants with more consistent response options, which would increase the quality of their responses. If these changes are implemented, the quality of the data will surely increase.

Chapter 5: Discussion

Conclusion(s) Based on Results

This mixed-methods study investigated the impact of microlearning on educators' understanding of visual design principles and explored their impressions and experience while using the eLearning module. The topic was important to study because educators in a vocational training school needed to improve the quality and efficacy of their programs by applying visual design principles to the creation of their classroom materials.

The first research question, *What is the impact of microlearning on learners' understanding of visual design principles as measured by pre- and post-assessment?,* was addressed by comparing the results of pre- and post-assessment scores of five instructors at the vocational training school who participated in the study. After analyzing and interpreting the data collected during the study, the researcher concluded that the microlearning-based eLearning intervention positively impacted the participants' understanding of visual design principles. By comparing the pre- and post-assessment results, the researcher found that participants showed improvements in their ability to understand and apply visual design principles in various scenarios as a result of the information and activities presented in the eLearning intervention. This increase in ability was evidenced by a mean growth score of 2.402 between pre- and post-assessment scores. The results also showed that the participants' understanding of the visual design principles of proximity and typography especially improved as a result of the intervention, since the mean growth scores for those questions (0.6 and 0.8) were the highest. Given these results, the researcher concluded that knowledge of visual design principles had increased upon completion of the microlearning intervention. These findings therefore suggest

that microlearning is a viable instructional strategy for teaching visual design principles to educators.

The second research question, *How do learners describe their experience with the module's microlearning elements, such as the module's chunking and sequencing strategies?*, was addressed by administering a survey questionnaire to each of the study participants after completion of the eLearning module and post-assessment. The survey collected quantitative and qualitative data using a mix of Likert scale-based "closed-ended" questions and "open-ended" prompts. Upon analyzing and interpreting the quantitative data, the researcher found that the participants were generally very satisfied with their experiences of using the eLearning module. For instance, the mean response for questions 1 through 4 was 2, which indicated that participants were satisfied with timing and chunking strategies of the module. Similar results were found when reviewing the data for questions 6 through 15, which found that participants were generally satisfied with the organization and sequencing of the course. The results revealed some notable exceptions to the overall satisfaction toward the course's organization, with two participants expressing that some lessons were too long. These quantitative findings were corroborated by the "open-ended" questions at the end of the survey, which the researcher analyzed using qualitative data analysis techniques. Most participants expressed that they were pleased with the experience, with many praising the use of formative assessment as an aid to learning as well as the scaffolding of progressively more advanced concepts. However, some wrote that one lesson needed to be divided into smaller ones because it contained too many new concepts. As a result of these findings, the researcher concluded that the eLearning module and its microlearning elements were generally well received by the participants, and that they could use the knowledge gained in the course to apply visual design principles to their work in the

vocational training center. The researcher also found that the participants viewed the chunking and sequencing strategies of the eLearning module favorably, and many participants offered suggestions for improvement of future course iterations.

Limitations

Although the study provided useful data to assess the effectiveness of microlearning on teaching visual design principles to educators, certain constraints and limitations in the research methodology should be noted. These are as follows:

1. **Insufficient sample size.** The sample size of five participants was sufficient for a preliminary assessment of the eLearning module's overall impact and capabilities, but too small for intricate data analysis and interpretation. The small sample size made it difficult to draw meaningful correlations from the quantitative data, and the low number of open-ended survey responses made drawing conclusions from qualitative data difficult. An ideal sample size of at least 12 is recommended for similar studies in the future.

2. **Data collection instruments and techniques.** The pre- and post-assessments provided a baseline measurement that demonstrated skill gain of the participants after using the eLearning module. However, participants noted that the assessment questions did not always mirror real-world scenarios that an educator would experience. Moreover, some participants answered many questions correctly on the pre-assessment, which made measuring skill gain impossible for the questions which they already knew. Finally, the closed-ended survey questions about the participants' experience with using the module did not follow a consistent format throughout, which could have made the questions harder to interpret and answer. Future research on this topic should ensure that these and

similar precautions are taken to ensure the trustworthiness of data collection instruments and techniques.

3. **Bias.** Although the study presents findings that seem promising for educators looking to incorporate microlearning strategies into their teaching, the researcher brought their own biases into the study design and interpretation of data. For instance, the researcher was employed at the same vocational training school as the participants and they selected the participants according to their own working relationships, which could have skewed the results of the study. Future research should ensure that participant sampling is done in a more impartial manner and not influenced by the researcher's prior relationships. It is possible therefore that the study results—and particularly the participants' responses to survey questions—were subject to acquiescence bias, where "a respondent demonstrates a tendency to agree with and be positive about whatever the moderator presents" so as not to affect professional relationships (Sarniak, 2022). Aside from bias inherent in the working relationship of the researcher and the participants, bias could have also occurred in the interpretation of the data, such as confirmation bias (Sarniak, 2022).

Practitioners and researchers who are looking to undertake similar research into the effectiveness of microlearning would do well to consider the above limitations of the present study, since they could have affected the results in unforeseen ways.

Implications of Research on Educational Practice

Design Principles

The study results and their interpretation led the researcher to generate the following design principles for educators and other practitioners who are looking to implement microlearning-based eLearning as an instructional strategy:

1. **Align the eLearning module's elements, including its learning materials and assessments, with real-life situations that the target learner group would encounter.** The study results showed that participants preferred examples and scenarios that mirrored their real-life work. This aligns with adult learning theories, which state that learners must understand the relevance of educational materials to their own lives (Jennings, 2021, p. 43). If a design fails to include enough elements that make the material relatable, then the eLearning solution risks losing the engagement of the participants.

2. **Minimize the number of new concepts introduced in each microlesson.** The study demonstrated that if lessons contained too many new concepts, learners would express dissatisfaction with their experience of the eLearning module. The researcher suggests breaking longer lessons into smaller "chunks" in order to decrease cognitive load, especially for learner groups with time constraints and busy schedules.

3. **Clearly state the estimated time to complete lessons and modules.** Participant feedback showed that some learners were unsure of how much time the lessons would take. By clearly stating the approximate time to complete each lesson, adult learners with time constraints can better plan their routines and schedules around the requirements of the eLearning module.

4. **Provide opportunities for customized learning pathways when possible.** Many of the study participants demonstrated knowledge of some concepts before beginning the eLearning module. Educators who implement eLearning modules should provide opportunities for learners to bypass lessons that they don't need.

Implications and Applications

The findings of this study could not only inform educators who seek to implement microlearning as an instructional strategy, but they could also inform the development of educational policies and contribute to best practices in a variety of educational settings and contexts. Two key implications and applications that emerged from the results of the study are as follows:

1. **Microlearning is an effective instructional strategy for teaching adult learners who have busy work schedules.** The study showed that busy adult learners express satisfaction with short microlessons because they can easily fit them into their work schedules. The study also supports evidence that adult learners prefer lessons that contain a limited number of new concepts in each so as to decrease cognitive load. In settings where microlearning is feasible to implement, instructional strategies with microlearning elements have been shown to satisfy adult learner needs. Future research in this area should compare the effectiveness of microlearning with that of other instructional strategies (e.g. problem-based learning) in order to assess whether microlearning produces superior results.

2. **eLearning-based microlearning produces positive outcomes when teaching visual design principles to educators.** The study found that educators who completed an

eLearning module about applying visual design principles demonstrated increased

competence and skill in the topic area. These gains were evidenced by an increase in

overall scores on pre- and post-assessments. The study results therefore demonstrate

microlearning's effectiveness as an instructional strategy for teaching design-related

concepts. In addition, these findings imply that microlearning could be useful for

teaching not only visual design principles, but other subjects as well. Future research on

microlearning could explore its applications and effectiveness within other educational

contexts and on other instructional problems.

In summary, the study was successful because it demonstrated the effectiveness of

microlearning on the instructional problem among educators at a vocational training center. In

addition, it produced best practices for the implementation of microlearning in other contexts,

and generated implications and applications for the use of microlearning as a viable instructional

strategy. Finally, the study was fruitful because it contributed to the nascent research literature on

microlearning, and it suggested possibilities for future research on the subject.

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Appendix A

E-Learning Module Description

- **E-Learning Solution Title**: *Visual Design for Educators*

- **E-Learning Solution Description**: The course is designed for educators who need to
  learn visual design principles to improve their self-created classroom materials. It uses
  Canvas LMS to guide learners through three modules that teach learners to identify basic
  design principles, apply visual hierarchy principles, and to apply best practices in the
  creation of classroom materials. Formative quizzes check that learners have understood
  lesson materials, and pre- and post-assessments measure student progress. The course's
  microlearning strategy uses short lessons and modules that take no longer than 15
  minutes to complete. Throughout the lessons, learners interact with a variety of
  multimedia, including videos, external articles, and graphics.

- **Learning Goal**: Learners will apply visual design principles to improve the effectiveness
  of classroom materials.

- **Learning Objectives**:

  4. Learners will identify basic design principles

  5. Learners will apply visual design principles to a given design

  6. Learners will evaluate the design best practices used in a given design

- **Detailed E-Learning Solution Description**:

  This solution uses a competency-based instructional strategy that utilizes self-paced

microlearning modules accessible via an LMS system such as Canvas. Learners are first guided

to complete a multiple-choice diagnostic pre-assessment that gauges their prior knowledge. After

this, learners are allowed to access all of the course's four or five modules, each of which take no

longer than 15 minutes to complete. The lesson material is delivered in an asynchronous format that allows for individualized learning pathways, meaning that the learners may choose the order and pacing in which they complete the microlearning modules. Materials and learning activities include videos, links to external articles, and readings, which provide multiple of means of engagement with the concepts taught. Formative quizzes at the end of each module measure how well learners have grasped the material and give opportunities for immediate feedback. After completing all of the modules, the learners are invited to complete a summative assessment. The summative assessment uses application-based multiple-choice questions to assess how learners would apply the visual design principles they learned in given instructional scenarios. The entire course takes one to two hours to complete, and learners can pause and resume on-demand. Digital tools used to support this solution include a PC or Mac, access to the Internet, a compatible Internet browser such as Chrome, and access to Canvas LMS.

A great advantage of this eLearning solution is that the course can be completed entirely asynchronously. This means that learners can control the timing and pacing of their own learning. This asynchronous format works particularly well for adult learners, who prefer to learn on their own schedules. Moreover, for the type of learners described in the instructional problem scenario above, this format allows the instructors to fit short microlearning sessions into their busy work schedules at their own convenience.

A potential challenge of this eLearning solution is that, given the self-paced format of the course, it provides no opportunities for guidance from an instructor. Although some learners can manage a self-paced course with no help, other learners prefer to ask questions and receive feedback from an instructor. In order to address this challenge, the eLearning solution can provide ways for the learners to contact the instructor for help. For example, on the eLearning

solution's main page, the instructor's contact info and office hours can be prominently displayed. This would ensure that learners have the option to receive one-on-one guidance to ask questions or clarify concepts with an instructor.

This solution was chosen for the present study for a couple of reasons. First, the microlearning instructional strategy and entirely asynchronous format allows for the greatest flexibility and choice for the busy adult learners. The other two solutions have synchronous components such as Zoom meetings or group collaboration projects, which could pose scheduling conflicts for working professionals with minimal free time. Although steps could be taken to make these courses more accessible, such as providing recordings of the videoconferencing calls, the first solution assures that all learners will experience all of the elements the course on their own terms because they will be able to pause and resume the course as they wish.

The second reason for choosing this solution is that its diagnostic pre-assessment and summative post-assessment tests can consist of multiple-choice questions, which allow for the most objective assessment of skill gain and learning outcomes compared with the other solutions. The second and third solutions have assessments that are project- and collaborative-based, and since they do not provide for a pre-assessment, this would make it more difficult to assess for skill gain before and after the course. Although projects and collaborative peer activities could use grading rubrics that contain specific and measurable criteria for measuring competency, a set of identical multiple-choice pre- and post- tests like the ones proposed in the first solution would offer the most objective way to measure learning.

This eLearning course uses multiple choice questions at the end of each module to check for understanding, monitor learner progress, and provide formative feedback. The questions align

with the learning objectives of each module, and they measure progress towards the objectives. For example, the first learning objective is that learners will identify basic design principles, and the question asks the learner to identify which design principle is being used in a particular design example. Another question asks, "The relative size and quantity of a design's elements refers to what design principle?" which correlates with the module's learning objectives.

In the second module, whose objective is for learners to apply visual design principles in a given design, application-based multiple-choice questions about visual are used. This means that learners are asked questions about applying visual design principles to various designs in order to increase their efficacy. For example, a formative question from this module asks, "What are three reasons why educators should establish a strong visual hierarchy in their designs? (Select three responses.)" Questions such as these ensure that learners understand how and why to apply the design principles.

In the third module, which states that learners will evaluate best practices in a given design, learners' understanding of design best practices is evaluated as they are asked questions about specific best practices used in designs. The questions also challenge learners to evaluate the efficacy of particular design examples. For instance, a question from this section shows two versions of a flyer and asks, "How were design principles applied in Design #2 to improve the flyer?" This question gauges whether learners can evaluate the two designs in light of the best practices taught in the module.

The summative assessment is a multiple-choice test that measures learners' understanding of all of the concepts taught in the course's three modules. It uses a combination of application-based and theory-based questions with visual examples. Being a summative assessment, it gauges learners' mastery of the learning objectives and of the overall learning goal

by asking specific questions about applying visual design concepts in the creation of classroom

materials. Most of the questions ask about design concepts used in given visual examples, which

learners must evaluate in order to choose the best responses. This assessment strategy aligns with

the learning objectives of the course, which state that learners will use given examples to apply

their understanding.

Appendix B

Pre- and Post-Assessment

This 10-question multiple-choice assessment will be used to measure learners' knowledge of

visual design principles before and after the completion of the eLearning module.

Question 1:
A teacher is exploring two different page designs:

Design #1   Design #2

The elements in Design #1 are centered along the page's x-axis, but the elements in Design #2 are positioned along the page's left margin. The teacher is exploring which of the following design principles?

Proportion

Contrast

Emphasis

Alignment **[Correct Answer]**

Question 2:

What are *three* benefits of using whitespace effectively? **(Select 3 responses.)**

Reduces overcrowding and clutter **[Correct Answer]**

Emphasizes one or more elements **[Correct Answer]**

Improves readability **[Correct Answer]**

Builds a pattern **[Correct Answer]**

Question 3:

The relative size and quantity of a design's elements refers to what design principle?

Balance

Proportion [**Correct Answer**]

Alignment

Movement

Question 4:

This design groups related elements using which of the following visual hierarchy principles?
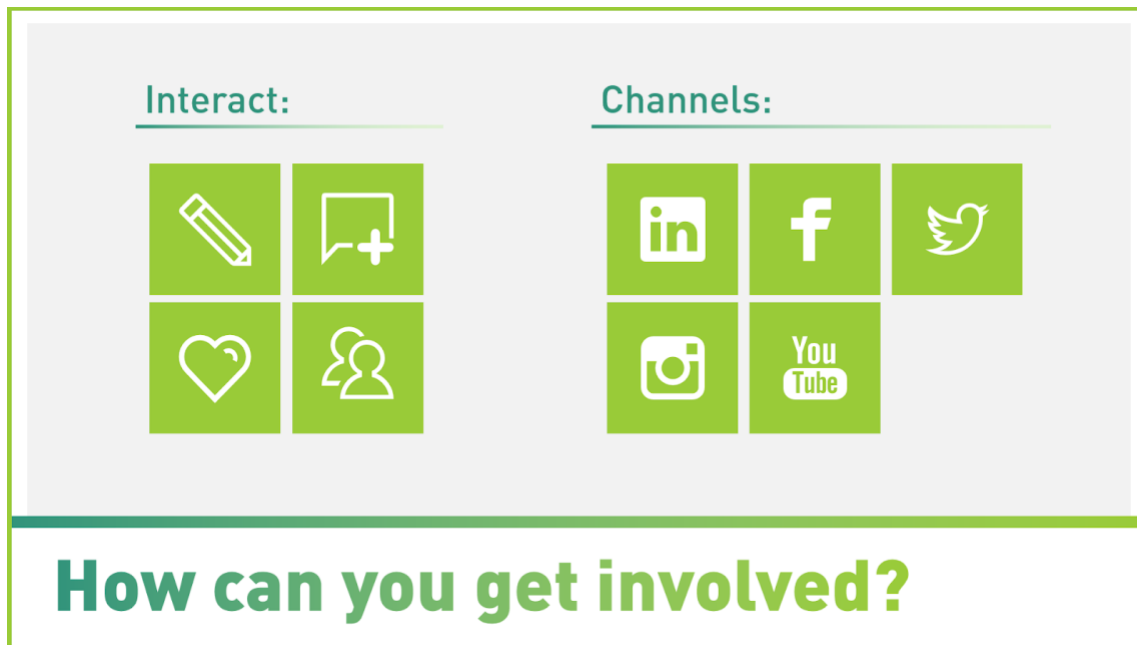
Image Credit: Bright Carbon

Contrast

Alignment

Typography

Proximity **[Correct Answer]**

Question 5:
The image below best demonstrates which of the following visual hierarchy principles?
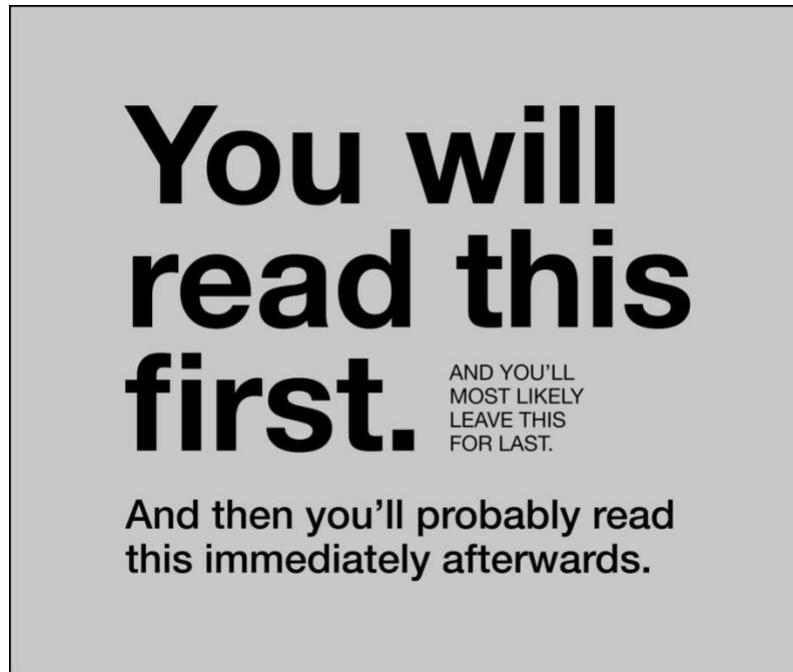
Image Credit: CreatorFuel

Perspective

Size and Scale **[Correct Answer]**

Proximity

Rule of Odds

Question 6:
What are three reasons why educators should establish a strong visual hierarchy in their designs? **(Select three responses.)**

To emphasize important information **[Correct Answer]**

To guide and direct learners **[Correct Answer]**

To organize concepts **[Correct Answer]**

To increase cognitive load

Question 7:
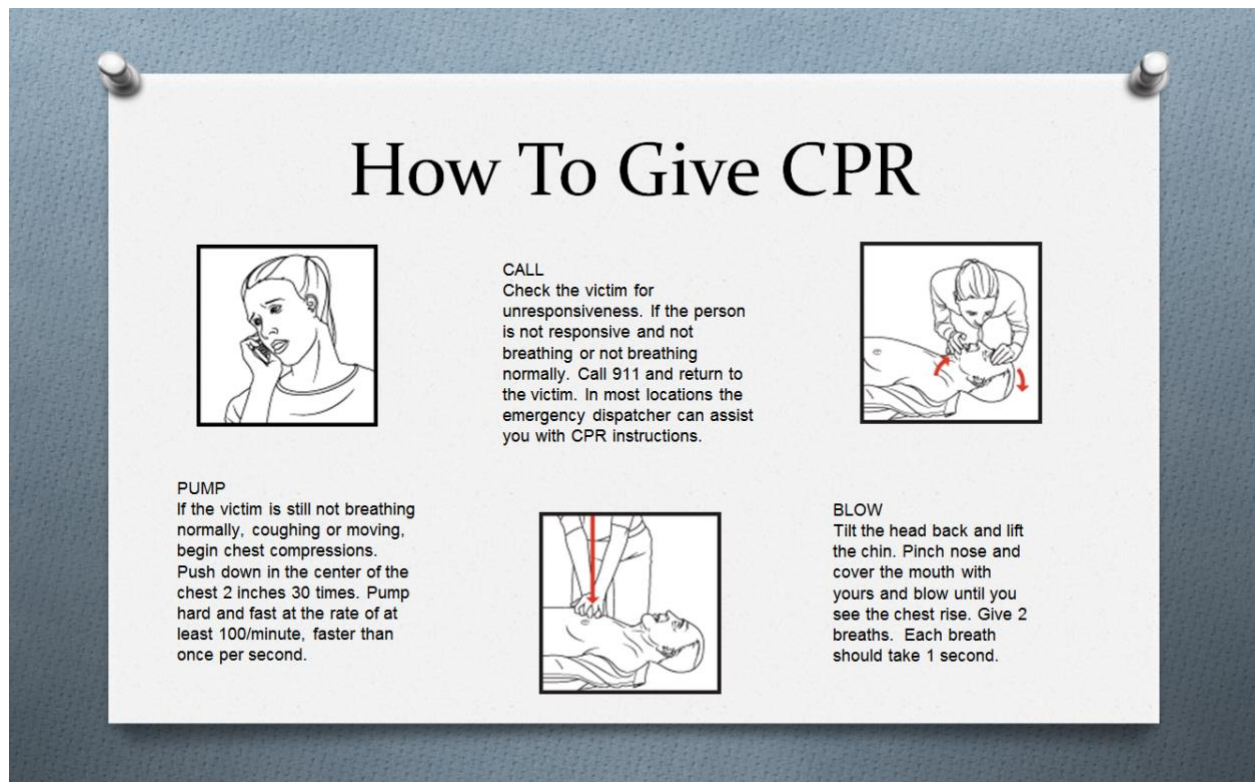Learners complained that this slide from a presentation was confusing. How can it be improved?

Image Credit: Cheryl Cxe via Emaze

Use high contrast colors to enhance legibility

Decrease whitespace to enhance readability

Use proper proximity and alignment to better organize elements **[Correct Answer]**

Increase text leading to improve organization

Question 8:
How can this design be improved?

Image Credit: Napier City Council via Infonews

Use no more than two or three different font styles

Increase negative space to reduce clutter and enhance readability

Use high contrast colors to increase legibility

All of the above **[Correct Answer]**

Question 9:
The image below illustrates effective use of which typographic principle for readability?

Image Credit: Digital Ink

Text scaling

Text alignment

Text kerning

Text leading **[Correct Answer]**

Question 10:
How were design principles applied in Design #2 to improve the flyer?

Design #1   Design #2

Image Credit: Nela Dunato

Whitespace was increased by shrinking the body text and enlarging the margins.

Text hierarchy was improved by using effective scaling and bold typefaces to highlight the most important information. **[Correct Answer]**

Proximity was effectively applied to improve grouping of related information.

Balance and symmetry was achieved by increasing the text size of the title.

Questionnaire

This 17-question mixed questionnaire will be used to capture the learners' thoughts and

experience using the microlearning elements of the eLearning module after the completion of the

final assessment.

1. The amount of content in each lesson was _____.

(1) Too Little (2) About the Right Amount (3) Too Much

2. The time it took to complete each lesson was _____.

(1) Too Short (2) About the Right Amount (3) Too Long

3. The number of lessons in each module was _____.

(1) Too Few   (2) About the Right Number (3) Too Many

4. The time it took to complete each module was _____.

(1) Too Short (2) About the Right Amount (3) Too Long

5. The time it took to complete the entire course was _____.

(1) Too Short (2) About the Right Amount (3) Too Long

6. Lessons were short enough to fit into my daily schedule.

(1) Strongly Disagree (2) Disagree   (3) Neutral   (4) Agree   (5) Strongly Agree

7. The entire course was organized in a way that made sense.

(1) Strongly Disagree (2) Disagree   (3) Neutral   (4) Agree   (5) Strongly Agree

8. The concepts I learned in one lesson prepared me for the concepts I learned in the next.

(1) Strongly Disagree (2) Disagree   (3) Neutral   (4) Agree   (5) Strongly Agree

9. I felt free to complete the lessons at my own pace.

(1) Strongly Disagree (2) Disagree   (3) Neutral   (4) Agree   (5) Strongly Agree

10. The ability to move through the lessons at my own pace helped me learn.

(1) Strongly Disagree (2) Disagree   (3) Neutral   (4) Agree   (5) Strongly Agree

11. I felt free to complete the lessons in any order I wanted.

(1) Strongly Disagree (2) Disagree   (3) Neutral   (4) Agree   (5) Strongly Agree

12. Taking a quiz after each module helped me learn.

(1) Strongly Disagree (2) Disagree   (3) Neutral   (4) Agree   (5) Strongly Agree

13. The feedback I received during the quizzes helped me learn.

(1) Strongly Disagree (2) Disagree   (3) Neutral   (4) Agree   (5) Strongly Agree

14. The lesson content prepared me for the final assessment.

(1) Strongly Disagree (2) Disagree   (3) Neutral   (4) Agree   (5) Strongly Agree

15. The quizzes after each module prepared me for the final assessment.

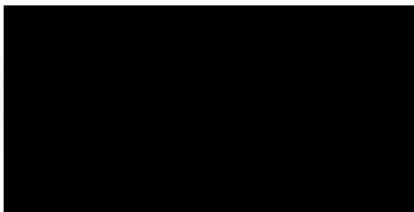(1) Strongly Disagree (2) Disagree   (3) Neutral   (4) Agree   (5) Strongly Agree

Please discuss how the *pacing* of the lessons and modules affected your learning.

Please discuss how the *organization* of the lessons and modules affected your learning.

How can this course be improved?

Appendix C

Evidence of site permission.

June 24, 2024

Dear Geoffrey:

███████████████████ leadership has reviewed your Capstone Research request for study, titled *Using Microlearning to Teach Visual Design Principles to Educators*, and we agree to support collaboration efforts towards your collection of data in accordance with your description:

The purpose of the study is to investigate the impact of a microlearning-based eLearning module on learners' understanding of visual design principles and to explore their experience using the module. The topic is pertinent to the instructors, curriculum specialists, and administrators in this setting because understanding visual design principles enables educators to create more engaging and effective learning materials for their students. Using Canvas LMS, an online learning management system, the study participants will be asked to complete an eLearning module, pre- and post-assessments, and a questionnaire about their experiences. The total estimated time commitment required of each participant is one to two hours.

The extended invitation to conduct the above-described study will occur between **July 1** and **July 15, 2024**.

Sincerely,