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Standalone, Supplemental, and Embedded Microlearning Development Alternatives for Federal Programs during a Pandemic

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Standalone, Supplemental, and Embedded Microlearning Development Alternatives

for Federal Programs during a Pandemic

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Dedication

My senior capstone is dedicated to my wife Tracy and our three children: Owen, Audrey, and Ethan. They supported me through both years of my instructional design master's degree program. The last three semesters of my program occurred during the COVID-19 pandemic. There were many unexpected challenges during this time that we learned to navigate through as a family. For me, projects, papers, and weekly assignments became more difficult when I was no longer able to go the library or other open spaces. My family found ways to give me the space I needed in our home to do my coursework.

Abstract

Microlearning has been studied since the early 2000's. Comparisons of microlearning and eLearning are found throughout the research. Some research has presented developing microlearning as an alternative to developing eLearning courses. However, this action research paper is written in support of developing microlearning to be implemented alongside or as a component of eLearning. Microlearning benefits learners because it can be developed as standalone, supplemental, or embedded course content. A literature review and close examination of a series of microlearning videos developed for a federal program will highlight how microlearning can be developed as standalone or supplemental course content that can then be embedded into eLearning course content.

Keywords: microlearning; microlearning video; microlearning modules; eLearning; course formats; federal program; educational programming; learner outcomes; learner experience; types of learning; standalone learning module; supplemental learning module; millennials; learning ability; instructional design; adult education

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Introduction

This study explores the design and delivery of a microlearning video series developed for a federal program whose prior educational programming had been developed in eLearning course formats. For this study, that one instance of a federal program adopting microlearning serves as the backdrop for an action research study on literature in the field and current best practices for microlearning design.

Since the early 2000s, research regarding what was then called "distance education" has compared aspects of microlearning to aspects of eLearning (Freeman, 2016). Some researchers have sought to demonstrate that microlearning modules are a viable option for replacing eLearning courses. These researchers have focused on comparing learner outcomes and experiences with microlearning versus eLearning. While it was beneficial to establish microlearning as a viable option for developing eLearning courses, this research presented an either-or comparison that bypassed the real benefit of microlearning as a type of learning that can improve learning when used in conjunction with other types of learning.

Evidence that microlearning can improve learning when used in conjunction with other types of learning can be found throughout microlearning research published over the past ten years. This research has indicated that the true benefit of microlearning is not solely as a replacement for other types of learning, but rather in the ways microlearning can be paired with other types of learning to improve learner outcomes and experience. In fact, unlike other types of learning, microlearning can be deployed as a standalone learning module for a single learning topic, as supplemental learning modules for another type of learning, and/or as embedded learning modules in an eLearning or in-person course.

Microlearning also can be introduced before, during, or after another type of learning takes place, whether that be an eLearning course or in-person course. Additionally, microlearning modules can be developed initially as standalone learning modules that are later built into an eLearning course or made available to members of an in-person course. In fact, microlearning is unique in that the format does not seek or assume "completeness" or "closure." By comparison, in-person learning and eLearning most often are designed and developed as complete learning solutions, as closed learning systems.

The flexibility of microlearning, including all the available microlearning formats, has established microlearning as an alternative that should be part of education initiatives considered by all types of organizations, including federal programs. In fact, during the current COVID-19 pandemic, federal programs should consider microlearning as a viable option to include in their education initiatives because microlearning is so flexible.

In this action research paper, the research/designer examines microlearning through prior and current research with the goal of demonstrating that federal programs can develop microlearning modules to improve learner outcomes and experience. The research demonstrates that developing microlearning modules could provide federal programs flexibility in training initiatives because microlearning modules can be plugged in as any of the following:

- standalone learning modules for a single learning topic
- supplemental learning modules for another type of learning
- embedded learning modules in an eLearning or in-person course

The designer/researcher will provide an example of the flexibility of microlearning through discussion of a microlearning video series developed for a federal program. This microlearning video series was developed as an alternative to building an eLearning course. The microlearning video series also was developed as a supplement to a training toolkit document and presentation. Furthermore, each video in the federal program's microlearning series was developed as a standalone learning module on a single topic covered in the training toolkit. Additionally, the video series was designed in a way that, in the future, will enable other designers to embed the videos into an eLearning course.

Research into microlearning is still in its early stages when compared to research into eLearning. In fact, microlearning first started to appear as a topic of interest only in the early 2000s. During the last ten years, microlearning has become a topic of increasing interest in education and training. Additionally, microlearning is a frequent topic of interest in industry magazines and journals which identify best practices and present case studies. However, in academic research, studies of microlearning still appear with less frequency than studies regarding eLearning, traditional classroom education, and mLearning (mobile learning).

Academic research regarding microlearning appears more often in international journals than journals based in the United States. Furthermore, much of the academic research, while sound, still is not extensive in terms of design or the use of larger scale studies. While that also can be stated for many other topics in education research, it would seem to be more of an issue for microlearning, given the number of questions that arise regarding the usefulness of microlearning on a large scale and in many learning environments. However, there is also an increased level of interest in microlearning that is showing up in new research articles every month in response to the fact that education and training are changing to meet the learning

demands of millennials and younger generations—how they choose to learn and what education practices work best for them. There is significant emphasis throughout the literature placed on learning how microlearning should be implemented and for what purposes. The goal of this action research paper will be to show that the research presented supports the use of microlearning by federal programs, and particularly so in the context of projects of the kind described herein.

Research Context

The decision to develop full eLearning courses for federal programs often happens at the program level where learning needs are identified. While some eLearning initiatives may be created at the federal agency level, most are initiated within program offices where specific program level learning goals and learning objectives are identified. For the past 15 years, eLearning courses have frequently been developed as a way to save on in-person training costs, travel costs, and as a way to provide training for learners who are unable to attend in person training because of course availability, course location, or course cost. Over the years, eLearning has become the preferred model for many federal programs. However, several factors have raised questions regarding whether eLearning courses are the best training development option for many federal programs.

One factor that suggests federal agencies should consider microlearning design for educational programming is the inconsistency of eLearning course development. There also are access and availability issues. Many existing in-person courses are still not available as eLearning courses. Also, many eLearning courses are not hosted in a centralized location such as

a learning management system but rather are hosted across websites, Intranet sites, and through training course portals. This often leads to confusion regarding what eLearning courses are available and where learners can find them.

The COVID-19 pandemic has impacted federal budgets and funds available for training development. Training development budgets have been reduced while the need to revamp or develop new training remains. The specific program example discussed herein provides a case in point: A description of the program and programmatic training challenges reveals that the organization has identified eLearning course development as a training budget issue. Moreover, the program's eLearning courses have underperformed expectations in terms of rates of access and completion—both of which can be improved with microlearning, as will be shown in the research below.

Microlearning video modules arguably are a better option than eLearning courses for many organizations because video modules can be developed as stand-alone, topical learning units that do not require the completion of a full eLearning course. Additionally, eLearning content can be developed in the form of microlearning video modules that can be included in full eLearning courses. Providing eLearning content in the form of microlearning video modules will increase the findability of needed content for learners who are only looking to learn specific information or skills. Development of microlearning video modules may also lead to improved overall completion rates for eLearning course content because while many learners may not watch all of the microlearning video modules from an eLearning course, they may watch the videos that pertain to specific content of interest.

Many organizations seek to improve access to eLearning course content with the goal of improving completion rates for their eLearning courses. Too often organizations find that access

to their eLearning course content is limited due to several factors. One of the main factors is that core content is embedded into larger courses rather than being made more widely available in smaller chunks for those who are only looking to learn specific information or skills. This lack of rightsizing of eLearning content is a key reason for developing microlearning modules as an alternative to eLearning courses.

In the case of the federal program for which the designer/researcher developed the microlearning video series discussed in this study, additional factors contributed to the eLearning access issue including difficulty finding the federal program's eLearning courses on websites, Intranet sites, or through training course portals. Not all learners knew where to browse or search for eLearning courses. Many searches also were not successful in locating the right courses because course content was not always tagged (with meta description and keywords) such that learners were unable to locate the specific information or skills that they were seeking in their searches. These access issues contribute to decreased completion rates for eLearning courses. The net result has been that there are potential learners who do not access eLearning courses because they cannot find the specific eLearning content modules that match what they are interested in learning. There are also many potential learners who are not interested in completing full eLearning courses.

Microlearning modules can take many forms, including infographics (visual and interactive), PDFs (visual and interactive), eBooks, whiteboard animations, animated videos, explainer videos, mobile applications, games, simulations, branching scenarios, job aids, podcasts, webcasts, recorded webinars, and short videos (visual and interactive) (Pandey, 2018). This action research paper will not examine the use of each of these forms of microlearning modules as replacements for eLearning course content. It may be possible to revamp a full eLearning

course using a wide collection of the different types of microlearning modules. However, as will be shown in the research below, microlearning modules often work best when they are combined with other types of learning. This action paper will focus on the development of microlearning videos (short visual or interactive videos) as an alternative to the development of full eLearning courses.

Literature Review

There is a growing body of research exploring microlearning and how it can be utilized for training across all types of organizations, including higher education, corporate, government, and K–12 education. Additionally, researchers are exploring how microlearning can be applied through social networks, as mobile learning, and as a replacement for lessons in eLearning courses. In fact, microlearning can be developed to be delivered through social media or social networking in the form of videos or small interactive applications.

Existing and new research about microlearning generally covers the following categories, although interest in each specific topic area as expressed within the most recent research has not grown at a uniform pace:

1. microlearning embedded within eLearning

2. microlearning and millennials

3. microlearning and social media

4. microlearning and mobile learning

5. microlearning and learning ability

6. microlearning and brain science

7. microlearning and self-directed learning

8.   microlearning and competency-based education

9.   microlearning and technical training

The literature review conducted for this action research paper revealed that the most recent research covered the topic areas number one through five above: microlearning embedded within eLearning, microlearning and millennials, microlearning and social media, microlearning and mobile learning, and microlearning and learning ability. The discussion of the literature provided herein focuses relatively exclusively on studies regarding these five topics. These topics were also the most relevant for the research in terms of demonstrating how microlearning works with other types of learning, for younger generations, with learning through social media, and with technology across devices.

An increasing body of research has demonstrated that many organizations are looking towards microlearning as an alternative to developing eLearning and traditional training solutions. While more academic research into microlearning needs to take place, there is much interest in microlearning in higher education and across other organizations. In fact, there are many non-research articles, reviews, and blogs about microlearning on training websites and in corporate training magazines and education magazines. This level of interest, combined with the appeal of microlearning to millennials, should result in additional research in the coming years. Below are summaries of relevant research articles on microlearning that are pertinent to understanding why microlearning is a good choice for federal programs considering adopting alternatives to full eLearning courses.

Kapp and Defelice (2018), in *TD: Training and Development Journal*, defined microlearning as:

- focused on one to two learning objectives

- brief and typically between two and seven minutes (though this varies up to 15)

- action-oriented in the sense that there is a specific achievable purpose or goal (p. 28)

This definition is like other definitions of microlearning throughout the literature. However, the authors also define four primary uses for microlearning as "performance, persuasive, post-instruction, and preparation" (Kapp & Defelice, 2018, p. 28). The descriptions these researchers provide for the four primary uses of microlearning can be paraphrased, as follows:

- Performance-based microlearning is when the learner acquires information to complete a task

- Persuasive microlearning is designed with the goal of changing a learner's behavior

- Post-instruction microlearning are refreshers or learning boosters to be used after a larger course has been completed

- Preparation microlearning is provided as a module or series of modules designed to prepare or refresh learning before a larger course

(Kapp & Defelice, 2018).

Microlearning Embedded Within eLearning

Microlearning can be utilized to solve many of the issues with eLearning described above. Microlearning does not need to replace eLearning but can be developed either as a supplement to or as an embedded component of eLearning (Park & Kim, 2018). In fact, the dual use of microlearning as standalone learning and as an embedded component of an eLearning course creates unique design considerations. These design considerations arise during the design

of learning interventions that are intended to be delivered in-person, through eLearning, and even through mLearning (mobile learning), since content for each of these formats is developed as a complete learning solution. There also is evidence that microlearning can be deployed as part of a learning package in tandem with eLearning, in-person learning, and mLearning (mobile learning). It clearly can be a way to supplement the learning that occurs in a traditional classroom, in an eLearning course, or in an mLearning (mobile learning) course. It can also be utilized for training across all types of organizations, including higher education, corporate, government, and K–12 education.

Park and Kim (2018) argue that the novelty of eLearning has long worn off and that the effectiveness of eLearning as a medium for teaching has been in decline for many years. These researchers assert that changes are needed in eLearning and that these changes are best accomplished by introducing microlearning content into eLearning. They propose the development of microlearning within eLearning systems will improve eLearning and the outcomes students achieve through eLearning. Park and Kim (2018) differ from Giurgiu (2017) in this regard: Park and Kim (2018) seek to improve eLearning using microlearning lessons, whereas Giurgiu (2017) seeks to show that microlearning is fundamentally more effective than eLearning. However, the strength of microlearning for teaching individual lessons has been established in previous research. The Park and Kim (2018) article is important to demonstrating how microlearning can be used as either a supplement to or as an embedded component of eLearning – a twin approach to improving the overall training program for an organization. Microlearning modules do not have to be viewed as a replacement for eLearning courses. Microlearning modules can be utilized to improve the appeal, accessibility, and usability of eLearning.

A study conducted by Javorcik and Polasek (2018) utilizes a survey administered to students from the University of Ostrava in the Czech Republic to determine if those students prefer eLearning course content to be provided in smaller chunks (shorter modules). The researchers argue that even though only a small majority of students (53%) indicated a preference for shorter content, their university students do prefer eLearning courses that comprise smaller learning modules. They also found that eLearning was preferred by only 43% of their survey respondents. This finding supports their argument that current issues with eLearning are more a function of poor design and development than a function of learners' true dislike for eLearning. They contend that microlearning modules improve eLearning in ways that will also improve perceptions of eLearning among university students. It is important to explore and present the idea that some educators and learners perceive problems with both microlearning and eLearning, problems that in some cases might be overcome if eLearning is improved by embedding microlearning within eLearning courses.

Javorcik and Polasek continued their research into microlearning and eLearning with a second article (2019, November) that explores further ways that microlearning should be incorporated into eLearning courses to improve their design and quality. Their 2019 article demonstrates that developing microlearning modules within eLearning courses enhance the effectiveness and quality of teaching and learning. For their study, the authors developed two models (one for a shorter course and one for a longer course) to implement microlearning into eLearning courses. They found that regardless of the length of an eLearning course, students preferred course content that was broken into smaller chunks. The researchers demonstrate the usefulness of microlearning to improve eLearning courses regardless of the length of the eLearning course. Javorcik and Polasek ((2019) show that microlearning modules can be used as

a series to develop an eLearning course or can be paired with other learning resources to develop eLearning courses that are more effective in design and delivery. In combination with the Park and Kim (2018) article, the findings in Javorcik and Polasek (2019, November) demonstrate further that developing microlearning modules within eLearning courses can increase the effectiveness and quality of teaching and learning.

In yet a third article (2019, July), Javorcik and Polasek discuss how it is necessary to change perspective on both how eLearning course content will be developed and how the course will be constructed when microlearning modules are embedded into an eLearning course. They indicate that there are three levels of learning that occur when microlearning modules are added to an eLearning course: macro, meso, and micro (Javorcik & Polasek, 2019). The microlearning level encompasses the "individual educational objects"; the meso level includes the topics, sub-topics, and individual lessons; and the macro level is the course level (Javorcik & Polasek, 2019, p. 2). The researchers point out that microlearning modules must cover a topic at the lowest level, with the topic being encapsulated and requiring no further explanation (Javorcik & Polasek, 2019). They present two models for developing eLearning courses with microlearning modules. The first model is a complete eLearning course that maintains the original structure of the course at the macro level, but which changes at the meso level as microlearning modules are embedded into the individual lessons. (Javorcik & Polasek, 2019). The second model they suggest is best used for shorter or entry level courses in which microlearning modules are not sequenced with the course content but are included one after another throughout the course (Javorcik & Polasek, 2019). In the second model, microlearning modules are not tied to the course topics but are supplementary to the course content.

Winterford (2018), CEO of Ed Microlearning, provides 5 reasons why microlearning is now often being used to supplement eLearning. He indicates that eLearning has failed to advance because its core technology has stalled, there has been too much reliance on building one-size-fits-all courses, and course updates and overhauls to more engaging content have occurred at a slower place (Winterford, 2018). In contrast, microlearning, according to Winterford (2018), has gained in popularity because it reduces cognitive load, can be created and updated easily, can be accessed and completed on mobile devices, can be developed and deployed outside of learning management systems, and can be produced by almost anyone through video and interactive module templates which only require content updates.

Finding from the research regarding learning outcomes achieved through microlearning are encouraging. Presenting at the 2019 International Symposium on Educational Technology (ISET), Polasek and Javorcik (2019) discussed a study in which they found that students who completed a microlearning version of an eLearning course performed better on a post-test than students who only had access to the original eLearning course. The microlearning version of the course included microlearning modules and small quizzes that the learners could easily repeat after failed attempts or that learners could use to refresh learning (Polasek & Javorcik, 2019). Bae and Shin (2020), from Ulsan University, Korea Polytechnic University, and Yeongnam University, Korea, conducted a study in which they examined the effectiveness of using microlearning, eLearning, and handouts in combination. They found that students' highest satisfaction rates were in the use of microlearning (Bae & Shin, 2020). They also found that microlearning was most effective when all three types of learning were presented together (Bae & Shin, 2020).

Some research has suggested that microlearning may not be a good fit for all learning situations. A study conducted by So et al. (2020) from Ewha Womans University, Korea and Sungshin Women's University, Korea found that there remains some question as to what content works best with eLearning and what content works best for microlearning. Short videos of 3-5 minutes were identified as best for microlearning (So et al., 2020). The research indicated that a key strength of microlearning was that it grows the reach, availability, and impact of informal learning (So et al., 2020). The researchers saw microlearning as necessary because education has become less and less confined to formal settings as mobile technology and websites have advanced to a point that makes informal learning robust and socially interactive (So et al., 2020). The researchers noted that microlearning has grown as learning has moved from "just-in-case learning to just-in-time learning," a format that meets the expectations of today's learners and organizations (So et al., 2020, p. 40). However, So et al. (2020) question whether microlearning results in only short-term retention of information or develops knowledge built and stored long term (2020). Redondo et al. (2020), researchers from the School of Telecommunications Engineering at the University of Vigo, Spain suggest that microlearning increases learners' levels of engagement with education because microlearning focuses on delivering only relevant information. Redondo et al. (2020) propose integrating microlearning with eLearning as a new solution.

Microlearning and Millennials

According to a study conducted by Hanshaw and Hanson (2018), the way that millennials and younger generations learn is different from the way older generations learned. Hanshaw and Hanson (2018), from Azusa Pacific University in Azusa, California state that "an estimated

seventy-five million millennials (those born from 1981 to 1997) are overtaking the baby boomers (born 1946 to 1964) as the United States' largest living generation" (p. 4). Hanshaw & Hanson (2018) indicate that microlearning and social learning through mobile devices seem to be a professional development strategy that appeals to millennials and meets their learning needs.

In a master's thesis in Curriculum and Instruction produced at the University of Texas, Freeman (2016) highlights the fact that microlearning had not been researched scientifically until the early 2000's. She notes that microlearning and technology are connected by the need to teach and deliver content in ways that are more direct and effective for today's learners. Microlearning enables educators to address learning needs directly in less time and with less content. Microlearning makes it possible to deliver learning in new ways that were not possible in the past and that are required to make learning work best both in the present day and for the future. Freeman (2016) develops a series of animated microlearning videos to demonstrate and explore the topics in the different areas of microlearning. Her article is unique in this research area because she provides YouTube links to the animated microlearning videos that she developed for her report (for example: https://youtu.be/DG4O26lgX-k).

Dolasinski and Reynolds (2020), from DePaul University, explore the use of microlearning in the hospitality industry. These researchers indicate that the industry is made up of many millennial and younger generational workers who need learning that can help them to adapt quickly to changes in the industry. The researchers note that, because of limited time for training and a lack of training resources, the average hospitality worker receives only 6.5 hours of training. Dolasinski and Reynolds (2020) argue that developing a microlearning training model for the industry is the best option for helping hospitality workers quickly obtain necessary training to adapt to changes on the job. The researchers explain that most of the training that

occurs in the hospitality industry can be delivered through single topic microlearning lessons. They provide the example of developing microlearning for safe food-handling single topics, rather than teaching a cluster of topics in a large traditional course. This article provides a specific example describing the process of how microlearning can be applied to address the training needs of millennials and other younger generations.

Posting within a Learning Blog in LinkedIn Learning, Petrone (2017) lists six positive characteristics and four potential negatives for microlearning. On the positive side Petrone (2017) notes that microlearning is a good fit for the way most people learn today; microlearning meets learners' expectations to learn exactly what they expected to learn, is available on demand when learners want to learn, can provide learners with authentic, trustworthy, reliable information rather than relying on learners to find information on their own, has high return on investment for low cost production, and provides a springboard into eLearning (Petrone, 2017). The negatives are that microlearning fixes small learning problems rather than providing a whole solution to larger learning issues, may promote the false belief that everything can be learned quickly in less than five minute increments, may result in merely adequate learning rather than mastery of topic areas, and seldom leads to continued learning for the sake of learning beyond what needs to be known in a given moment as a quick learning solution (Petrone, 2017).

In a dissertation for Capella University, Michele Moore (2020) raises the question of whether microlearning is more beneficial for some audiences than others. Specifically, she questions whether microlearning is more effective for millennials than for older adult learners (Moore, 2020). Moore discusses how, given the availability of on demand information, younger generations may feel less need to retain new information than older generations of learners (Moore, 2020).

Jomah et al. (2016), faculty members in the Department of Education at Azzaytuna University, in Baniwalid, Libya, support the idea that learning in the 21st Century cannot be tied to a system or approach but must be changed fundamentally to meet the needs of today's learners. They suggest that learning today must be provided in smaller, more specific chunks that they define as microlearning and that can be integrated into the courses and curriculum of learners. They emphasize the importance of understanding the brain science behind microlearning. Their study of phenomena in a higher education setting features interviews conducted to determine the extent of knowledge and awareness of microlearning among students and faculty. These interviews served both as a means of collecting data and of increasing awareness of microlearning. They found a lack of awareness of microlearning in a higher education setting that parallels the lack of awareness of microlearning found among the stakeholders of the microlearning project undertaken by a federal program, discussed herein. The Jomah et al. (2016) article corroborates the findings from the Javorcik and Polasek (2018) article that members of the higher education community lack awareness of microlearning. However, awareness about microlearning is growing in all sectors; future research that builds on the work of Jomah et al. (2016) may continue to demonstrate that microlearning can be used as either standalone learning modules or as modules embedded within eLearning courses.

Crue and Francis (2020), publishing in the *Journal of Business Continuity and Emergency Planning*, indicate that most modern learners will not watch an educational video that is longer than four minutes. They stress that today's learners are distracted by media and technology, overwhelmed at home and work, untethered (mobile), collaborative and engaged in learning informally more often than were older generations of learners, and are given to expect they will receive information on demand (Crue & Francis, 2020). According to Crue and Francis

(2020), microlearning works best for millennials and Generation Z learners who are frequently bored by long, formal, and traditional education. Microlearning has been used to make formal education more appealing to and a better fit for today's learners (Crue & Francis, 2020).

Microlearning and Social Media

Liao and Zhu (2012) indicate that microlearning can be developed to be shared through social media or social networking. They argue that the benefit of social media and social networking for microlearning is the relationship building, networking, and interacting with others that enables microlearning modules to be shared with others. They also argue that microlearning and social media and social networking provides a way to reach learners whose participation in eLearning courses and traditional classrooms has decreased. Surprisingly, not much research exists in this is one area. However, it could be argued that, until recently, social media and social networking were not viewed as learning mediums. That view is changing as social media and social networking are used more and more frequently as platforms for microlearning, as well as mediums for sharing microlearning.

Bannister et al. (2020), research from Liberum Independent Medical Education, London, United Kingdom, demonstrate that microlearning can improve learning participation and subsequent completion rates of evaluation surveys. They found that microlearning presented through social media had more reach, generated higher participation, and produced more responses to evaluation surveys than did eLearning (Bannister et al., 2020). In their study microlearning resulted in "as high as a 100-fold increase in participation" compared to eLearning (Bannister et al., 2020, p. 3).

The body of research on microlearning delivered through social media or social networking undoubtedly will grow as LinkedIn Learning, Facebook, and other social networks are used more for learning. Arguably, the trend in delivering microlearning across social media and social networks has arrived at a mature state, already. However, the scope and definition of microlearning through social media and social networks has not been fully identified. The literature review in this paper suggests that microlearning must be developed in a way that enables the content to be shared on a website, mobile devices, and through social media and social networks. Microlearning packages context at the perfect size for sharing that content across social media and social networks. This phenomena raises questions about how current practices may change. For example, one might ask, would people watch Ted Talks more frequently if the talks also were presented in microlearning form wherein specific video lessons could be extracted from the longer videos?

Microlearning and Mobile Learning

Microlearning and mobile learning can be viewed from two different perspectives: the use of mobile devices for microlearning and the design of microlearning for mobile devices. On one hand, a learner may have the experience of accessing a microlearning course on a mobile device. On the other hand, the learner may have the experience of launching a microlearning course that was specifically developed as a microlearning mobile application. Those two experiences are unique. However, it is important to remember that the design of the microlearning itself should be based on the designer taking a microlearning approach to the lesson development regardless of how the learner will access the microlearning. Thus, the

microlearning should be both mobile friendly and mobile responsive or should be designed as a microlearning mobile application that does not alter the original design of the microlearning.

Gassler et al. (2004), researchers from Studio eLearning Environments in Research Studios Austria, indicate that one of the issues with eLearning is the lack of daily interaction with or consistent use of eLearning environments. This lack of daily interactions the researchers compare to the manner in which people use their computers, smartphones, tablets, and other communication devices every day in other areas of their lives. The researchers argue that microlearning can be used to integrate learning into our lives on a more consistent basis by delivering learning through these devices that we access daily. They assert that by embedding microlearning into our communication devices rather than requiring us to log into eLearning systems, designers can make training and learning more repetitive, routine, and individual in our daily lives. Gassler et al. (2004) assert that microlearning through mobile devices is very possible regardless of how the delivery is designed because microlearning easily can be embedded into the communication devices we use in our daily lives.

Luminiţa Giurgiu, a prolific researcher from the Land Forces Academy in Sibiu, Romania, has written extensively since 2006 on current topics in education related to the use of technology, eLearning, and microlearning. In Giurgiu (2017), she provides a table (included as Appendix *C* of this work) in which she compares microlearning and eLearning based on ten distinct points of comparison. Her study evaluates whether students were more successful at answering questions after completing microlearning or after completing eLearning courses. She reports better results for information retention in learners who completed microlearning. It will be interesting to present this research finding as evidence that learners have an easier time retaining content when the content is presented in smaller chunks. Giurgiu's article echoes

findings from Freeman's (2016) master's thesis since Giurgiu's (2017) results show the success of microlearning on information retention and her table highlights the key advantages of microlearning that Freeman demonstrates by providing examples of microlearning videos.

Jahnke et al. (2019), researchers from the University of Missouri's School of Information Science and Learning Technologies, have examined the design principles of mobile microlearning. They present 15 heuristics to ensure successful design of mobile microlearning. They state that "the design of mobile-microlearning platforms is shifting from a pure video watching approach to a more activity-based model of instruction in which the learner reads or watches something but then s/he has to be active to apply the new knowledge" (p. 610). Their findings indicate that mobile microlearning is a good fit for training individuals for work tasks but not a good match for deep learning or meaningful understanding of topics. This finding is important. The finding suggests microlearning is not suited for delivering course level knowledge but rather to provide a small chunk of knowledge or a building block that can contribute to learners' continued and higher level learning. The limitation of microlearning suggested by Jahnke et al. (2019) —that microlearning is incapable of providing a meaningful learning experience beyond completing simple tasks or learning basic knowledge -- challenges the popular assertion within the current literature that microlearning can be used to build knowledge more effectively than eLearning. However, arguably microlearning should not be viewed as a standalone replacement for full eLearning or mLearning (mobile learning) courses but rather as a component or module of those larger courses or as a vehicle for delivering a smaller, specific lesson. The Jahnke et al. (2019) article, like the Dolasinski and Reynolds (2020) article, asserts that microlearning works best for single topic learning.

Rettger (2017), in a dissertation for Arizona State University, covers the topic of microlearning with mobile devices. The research highlights the importance of developing microlearning that is both mobile friendly and mobile responsive. Rettger's (2017) article echoes the Jahnke (2019) article that presents 15 heuristics for developing mobile microlearning. However, Rettger conducts a full research study examining the quiz scores and reactions of students who have completed microlearning with mobile devices. The study finds students' reactions to microlearning are positive and that learners made positive gains (at what doing what?). The researcher urges further research into deploying microlearning for mobile devices, indicating that there is both a need for instructors to develop microlearning, and to learn to develop learning for mobile devices.

Behringer (2013), a researcher from Leeds Metropolitan University presenting at the MicroLearning Conference 7.0 (2013) in Stift Goettweig (Austria), indicated that microlearning requires the same attention to detail in defining learn objectives and planning learning outcomes required for successful eLearning design. He noted that when microlearning modules are added to eLearning courses, there is an increase in the number of course components resulting from the fact that the content is broken down into the smallest content units possible (Behringer, 2013). According to Behringer (2013), there also likely will be a large increase in the number of user interactions with content. He also raised questions about the interoperability of microlearning modules created with technologies outside of learning management systems and for use on mobile devices (Behringer, 2013).

Nikou and Economides (2017), researchers from the Interdepartmental Programme of Postgraduate Studies in Information Systems at the University of Macedonia, Greece, studied an instance in which high school students engaged in microlearning through mobile learning. The

researchers found that high school students in the study preferred microlearning through mobile learning for micro-assessments and homework assignments (Nikou & Economides, 2017). They note that microlearning through mobile learning also had positive psychological impacts on study participants. Students reported feeling more competent, feeling a greater sense of autonomy, and of connectedness (relatedness) to other learners (Nikou & Economides, 2017). At the end of the five-week study, participants showed improved post-test performance for factual knowledge over their pre-test scores (Nikou & Economides, 2017).

Microlearning and Learning Ability

Mohammed et al. (2018), publishing in the *International Journal of Educational Research Review*, present the findings of a study in which they compared data results, interview responses, questionnaires, and feedback responses from students in both in-person courses and microlearning courses. The study results show that learners who completed the microlearning courses demonstrated improved learning ability by up to 18% in comparison to students who completed traditional learning courses. Thus, the researchers conclude that the brain science behind microlearning can be directly related to increases in learning ability (Mohammed et al., 2018). Learning ability is a key factor to demonstrate that real learning can take place by learners who complete microlearning modules. It is important to demonstrate the effectiveness of microlearning in terms of learning ability. Leaders and learners will want to know that microlearning can deliver on the promise of learning, regardless of whether microlearning is a standalone module or embedded into an eLearning course.

Giurgiu (2017) states in the article *Microlearning: An Evolving eLearning Trend* that "recent studies indicate short content may increase information retention by 20 %" (p. 18). This finding supports an argument for microlearning. The finding is even more powerful when one considers that there is clear evidence that many generations of Americans (notably, Millennials), and learners from other countries, increasingly desire short content that is more readily available, easier to access, and a better fit for their busy work schedules (Fox, 2016). Making a similar argument, Liao and Zhu (2012), in their article *Micro-Learning Based on Social Networking*, argue that microlearning provides a way to reach learners whose participation in eLearning courses and traditional classrooms has decreased.

Aitchanov et al. (2012) indicate that another advantage of microlearning is that a learner can complete a short microlearning module and immediately start practicing or applying what was learned. The researchers highlight that when microlearning works best, it is because the developers have taken a large, complex subject and have broken it down to the smallest topic areas possible (Aitchanov et al., 2012). These researchers emphasize that designers of microlearning should include only the main, necessary information and should provide excellent examples to connect the information to the learning objectives (Aitchanov et al., 2012). They suggest that a learner who completes microlearning should learn enough about a topic to be able to participate successfully when later attending lectures that cover higher level information about that topic (Aitchanov et al., 2012).

Wang et al. (2020), from the School of Public Heath, at Imperial College London, United Kingdom, present a literature review of 26 articles, culled from a search of 1310 articles initially identified as studies potentially relevant to improving self-care capabilities through microlearning. The authors identify two microlearning paths: one in which microlearning is a

one-time event and another wherein microlearning occurs in a series of microlearning events (Wang et al., 2020). Their research indicates that -- at least in the case of microlearning used for learning self-care capabilities -- microlearning that occurs in a series of microlearning events can be more effective than microlearning that occurs as a one-time event (Wang et al., 2020).

Inker et al. (2020), researchers from the Department of Gerontology, Virginia Commonwealth University, Richmond, Virginia, conduct a pilot study on the development of a 52-week microlearning curriculum for patient care at nursing homes. Each weekly instance of the 52 microlearning modules averages 6 minutes long and consists of exercises and animated Powtoon videos with two quiz questions (Inker et al., 2020). Study participants reported satisfaction with microlearning, indicating they were able to apply what they had learned right away in their work (Inker et al., 2020). The researchers argue that the "microlearning format requires instructional designers to think carefully about what is most important in terms of content and the best way to compress complex information into brief, focused segments that most effectively impact practice" (Inker et al., 2020, p. 7). They note that reflection and critical thinking can be built into microlearning even without interactivity or in-person learning (Inker et al., 2020).

Filipe et al. (2020), while studying the impact of microlearning on the learning objectives of Portuguese ophthalmologist educators, found that traditional education has proven to be ineffective for continuing professional development. They indicate that microlearning modules work better for providing small learning updates to medical professionals (Filipe et al., 2020). They also discuss how microlearning works through connectivism, a conclusion they arrive at based on the fact that microlearning enables learners to create connections with smaller chunks of information (Filipe et al., 2020).

Boring (2020), in her dissertation at Robert Morris University, found that short microlearning YouTube videos can be used to boost retention at key points. Specifically, Boring (2020) notes that microlearning YouTube videos helped her study participants reduce the impact of Ebbinghaus's forgetting curve, a phenomenon in which seventy percent of what is learned is lost in the first twenty-four hours unless knowledge is reinforced. Boring notes most learners in her study, including those with limited attention spans, expressed overall satisfaction with microlearning (Boring, 2020). However, overall satisfaction with microlearning did not always translate into higher information retention after two weeks for all participants (Boring, 2020).

Gawlik et al. (2020), researchers from Ohio State University's School of Nursing, repurposed existing short wellness videos to support learners in their program through microlearning. The researchers found that including short microlearning videos in their nursing curriculum proved to be an effective approach to helping reduce stress and anxiety of both undergraduate and graduate nursing students. Their research demonstrates how existing microlearning videos can help meet specific learning objectives without the development of additional courses. According to these authors, nursing is an area in which microlearning videos have been used effectively to improve patient care (Gawlik et al., 2020).

Skalka and Drlik (2020), from the Department of Informatics, Faculty of Natural Sciences, Constantine the Philosopher University in Nitra, Slovakia, discuss how their research in computer programming education shows that student perceptions of microlearning were more positive than the actual improvements students made in their learning outcomes. The students survey responses indicate that students believed they were more prepared, understood content better, and had acquired information faster with microlearning (Skalka & Drlik, 2020). However, this research article demonstrates that perceptions of microlearning are often positive even when

there is not a significant improvement in learning outcomes. This finding supports other research which has indicated that many students prefer learning that involves smaller chunks of content. However, Skalka and Drlik (2020) propose that the value of microlearning to learning outcomes depends on several factors, including how well-designed and developed microlearning modules are, relative to the content to be learned.

Gross et al. (2020), researchers from the University Hospital LMU Munich, Germany, present a research study with two groups wherein one group watched a 5-minute demonstration video of a medical care process and another group watched a 5-minute lecture video on the same medical care process. The group that watched the demonstration video retained more knowledge and had higher information recall during a training simulation conducted two weeks later (Gross et al., 2020).

Overview of Other Areas of Microlearning Research

Kamilali and Sofianopoulou (2013), researchers from Harokopio University in Greece, discuss a new education approach that combines the theories of microlearning and self-directed learning (SDL). They present the table that compares microlearning to macrolearning that Giurgiu (2017) introduced in her research. The table shows that microlearning is often more effective in information retention than eLearning or traditional learning. Kamilali and Sofianopoulou (2013) also utilize Garrison's Model for the Self-Directed Learning (SDL) model of comparison. The researchers assert that microlearning works based on principles of self-directed learning, of self-management, of self-monitoring, and of self-motivation. Specifically, they suggest these principles describe some of the key reasons why learners benefit from

microlearning. This article proposes that microlearning can help learners achieve self-directed learning and can improve learner experiences, an area of research that has not been fully explored but one which should be examined because the level of success of any instance of microlearning can depend on learners' abilities to operate in ways that are self-directed, self-managed, self-monitoring, and self-motivated.

Zhang and West (2020), publishing with the Association for Educational Communications & Technology, present a thorough literature review of microlearning and competency-based education. The article is important because it explores how microlearning compares and contrasts with competency-based education that was developed in the 1960's and how it relates to the current micro credentialing and credentialing movements. Zhang and West (2020) indicate that competency-based education, micro credentialing, and credentialing overlap in the areas of personalized learning, skills based learning, and digital based learning. The article asserts that microlearning excels as a strategy for the teaching of competencies. This article is also relevant because it renews a focus on learning core competencies, key skills, and specific knowledge. However, microlearning should be viewed as more than one-off mini lessons. Individual microlearning modules also can be viewed as a lead in to the next microlearning module in a series of microlearning modules that make up an eLearning course.

Peterson (2017), in her dissertation for the University of Southern California, examined student perceptions of microlearning in technical training. Peterson's results indicate that microlearning worked in some cases but not others for learning technical skills. Her research is important because she is examining another area in which some learners and educators have assumed that technical skills cannot be learned unless taught in the traditional classroom. One logical extension of Peterson's (2017) conclusions would hold that faculty education about an

awareness of microlearning must increase before microlearning can be utilized to enhance the way that technical skills are taught to students.

Anatomy of a Microlearning Intervention

Current research covered in the literature review can be utilized to support new microlearning initiatives. Specifically, those proposing new microlearning initiatives can reference this work, and source best practices from the cited studies, relying on the examples provided to support decision making. This work can be utilized to demonstrate to stakeholders that decisions to utilize microlearning are justified by findings in a substantial and growing body of research and through current working examples. Working examples can be found within the studies cited in this report, but as well can be found through searches across federal government websites and other organization websites. Current working examples will serve to avoid building working prototypes since working prototypes already exist and are available for close examination, replication, and modification to meet specific needs and purposes.

Research provided in the literature review shows that the appeal of eLearning has declined in recent years. The review makes clear that microlearning can be utilized to solve many of the shortcomings identified with eLearning. Microlearning does not need to replace eLearning but can be developed either as a supplement to or as an embedded component of eLearning. In fact, the dual use of microlearning as standalone learning and as an embedded component of an eLearning course creates unique design considerations that do not arise during the design of learning interventions intended to be delivered in-person, through eLearning, and even through mLearning (mobile learning), since content for each of these formats is developed

as a complete learning solution. There is also evidence that microlearning can be deployed as part of a learning package in tandem with eLearning, in-person learning, and mLearning (mobile learning). Microlearning can supplement the learning that occurs in a traditional classroom, in an eLearning course, or in an mLearning (mobile learning) course. It can also be utilized for training across all types of organizations, including higher education, corporate, government, and K–12 education.

Background

Many federal agencies sponsor educational initiatives. Funding for federal educational initiatives has been directly impacted by the COVID-19 pandemic. Currently, the federal program for which the microlearning videos discussed in this research report were developed is not funding new full eLearning courses. The program also is not funding updates to existing eLearning courses. However, the program still has an organizational need to update existing training resources and to provide new training resources. This continuing need for training resources can be met through the development of less costly microlearning content.

Federal educational initiatives include a wide breadth of individual topics or lessons which can be developed in a microlearning format. The federal program for which the microlearning series of videos discussed above and throughout this study is no exception. An educational initiative was identified for development as an eLearning course. However, as part of the process, steps were also taken to explore developing the eLearning course content as a series of microlearning videos. And, for the purposes of this federal program's educational initiative,

the microlearning video series has proved to be flexible, scalable, and embeddable as supplemental materials.

At one time, most of the federal program's training was provided in person by a trainer who would teach much of the content that is found in the eLearning courses. However, web metrics showing low web traffic and low completion rates indicate that the eLearning courses have not been as effective as initially hoped. Additionally, the federal program's eLearning courses have become dated because content and design have not been updated in five years.

The goal to increase access and availability to the federal program's courses was initially accomplished through eLearning. However, the federal program's plan to reach more learners and to provide more training opportunities through eLearning has faltered over time. Furthermore, while some potential learners have found and utilized the eLearning courses, there has not been a tracked increase in the number of actual learners who both start and finish the eLearning courses.

Course completion records indicate that the courses are not completed but rather abandoned by many of the learners who access the courses. The high rate of abandonment of training after it has been accessed was not the case when training was offered in-person in a classroom setting. However, the approach of developing eLearning courses to replace classroom training was adopted because it was expected to have lower costs and higher numbers of learners who would access the training and complete it.

While more learners do have improved access to the training, the rate of completion is lower for the number of people who start the eLearning courses than it was for learners who started the in-person training courses. Furthermore, many learners seem to not want to complete

the full eLearning courses, but rather want direct access to smaller learning modules of the course content because they are only looking to learn specific information or skills. There is also some evidence of less demand for continuing education credits among learners who place more value on learning to meet their own learning needs or goals rather than for credentialing.

There has been some evidence gathered through web metrics that seems to indicate potential users have had difficulty in locating the eLearning courses. The designers of the microlearning video series have questioned whether the existing eLearning courses are accessible and findable for most learners. The designers also question whether learners know where to browse or search for the eLearning courses. The designers indicate that course content is not always tagged, titled, or described so that learners are able to locate the specific information or skills they are seeking in their searches. To some degree, these access issues have contributed to the decreased completion rates for eLearning courses. The access issues also contribute to the number of potential learners who do not complete eLearning course content because they cannot locate the relevant course content of interest. Many of these leaners, millennials for example, are not interested in completing a full eLearning course, but rather choose to search elsewhere for the knowledge.

As stated above, the current state of training for the federal program clearly suggests the need for a new approach that both will increase the number of people who utilize the eLearning course content, overall, and will increase the number of people who complete the eLearning course content, once they have started. However, the development of full eLearning courses with longer development times, higher costs, and more resources has not resulted in the hoped-for results. By contrast to these eLearning courses, microlearning projects have lower development

costs, the ability to quickly provide training in different formats, development in smaller chunks, and shorter development times.

Design

Design team members for the federal program for which the project under discussion was undertaken have perceived changes in the needs and wishes of learners who benefit from the federal program's educational offerings. The design team members also expressed interest and observed demand for training provided in smaller learning modules. As a result, the idea of developing new eLearning course content and repurposing current eLearning course content in the form of microlearning modules has been proposed. This new approach allows the federal program to fill training gaps faster and more successfully because the focus is not on the development of full courses but rather on the delivery of training content for specific information or skills that learners desire to learn. The microlearning video series developed by the program is the first example of this new educational approach.

Each video in the microlearning video series created for the federal program and discussed in this action research paper took into consideration the changing education demands of today's learners. The microlearning videos were designed to be five minutes or less in length because, as the research above indicates, that is the length of microlearning modules that works best for millennials and younger generations. Design team members also considered the fact that today's learners are looking for content that they can access outside of a learning management system. Today's learners also want learning content that can be accessed on mobile devices and on demand.

The microlearning videos developed by the federal program appeal to learners who practice self-directed learning through self-management, self-monitoring, and self-motivation. The idea was to develop videos that would not turn away learners who were motivated to watch any of the microlearning videos. The videos appeal to learners who are only seeking to gain knowledge in a single topic found in one of the microlearning videos. However, the videos also appeal to learners who are looking to develop competency and knowledge on the overall topic covered by the microlearning video series. Additionally, although the videos do not cover technical training, there are some steps covered that must be learned in a way analogous to the approaches necessary for learning the steps in a technical process.

The federal program's microlearning videos were developed as MP4 videos that can be shared individually and in a video series playlist through the federal program's YouTube site. The videos were developed with dimensions and an aspect ratio that ensure they display correctly on smartphones, tablets, or computers. The videos can be embedded on any website with YouTube video embed code. The video URLs can also be shared through social media, social networking websites, messaging services, email, and accessed on mobile devices.

The content for the federal program's microlearning videos was developed as PowerPoint presentations which then were converted to videos. This PowerPoint to video conversion process was completed with PowerPoint Office 365. The PowerPoint to video conversion process is only available in the following versions of PowerPoint: 2010, 2016, or Office 365. Audio narration was also added to each PowerPoint presentation. Transitions (fade) between slides and animation edits to the audio were made to each slide before the conversion from PowerPoint to video. Narration audio for each slide was recorded separately using a laptop computer and stereo headphones with a microphone in a quiet home setting, a home-brew approach taken due to

office closure resulting from the COVID-19 pandemic. The narration videos were clipped and edited with effects for sound quality, noise reduction, and volume level with Adobe Audition 2020 software.

Each video in the microlearning videos series also has soft music layered under the narration which helps make the videos easy to listen to. The soft music was added as a separate track to the videos. Fade in and fade out were added with Adobe Premiere 2020to the beginning and end of music in the videos. The volume level of the videos was also adjusted in Adobe Premiere 2020. These editing steps were taken by the designers to ensure that learners were not distracted by the music when watching and listening to the videos. The videos were then exported from Adobe Premiere 2020 in an MP4 format designed for YouTube.

The short length of the microlearning videos helps ensure that learner attention is not lost or overloaded to optimize ease of learning. The length of each video also leaves room for an assessment at the end of the videos. Moreover, the design of each microlearning video in this series was developed so the content does not create cognitive overload with too much content or a difficult assessment. In fact, a decision was made to include an assessment video with eight to ten questions at the end of the video series rather than to include questions at the end of each video. Each question is narrated with the potential answers and then a pause before the correct answer is provided for reinforcement of the key points in the video series.

Captioning, transcripts, and audio description files were provided to meet accessibility requirements for each video. The text-only narration transcripts (meaning narration text minus text timings) were imported into the YouTube captioning tool which adds the text and the timings to captioning for each video. The captioning text timings were edited with the YouTube captioning tool. The final captioning edits for each video were saved to YouTube and exported in

an SRT (SubRip Subtitle) file. This file format provides a transcript with timings for each video.
The SRT transcript files were then saved as text files and uploaded to YouTube along with the
video files and the audio description files (which describe visual content changes, by scene,
throughout the video). Both the transcript file and the audio description file for each video are
downloadable.

Needs Analysis

The process of introducing the development of microlearning videos as an alternative
solution for a federal program should not be difficult. As demonstrated in the literature review
above and the microlearning video production process described in the previous section of this
report, there are reasons to believe interest in microlearning as an alternative to developing full
eLearning courses will increase. Part of this interest likely will be driven by the desire to reduce
the costs of developing eLearning courses, both in terms of time and resources. Moreover, it
seems likely interest in microlearning will expand as a function of the basic interest associated
with any new educational approach that shows potential promise. However, what must be
established first is an actual understanding of what microlearning is and what it is not.

The designers of the microlearning video series for the federal program discussed in this
action research paper found that most program staff were not knowledgeable about
microlearning. The designers developed a needs analysis assessment interview (included as
Appendix A of this work) with introductory statements and questions that can be adapted for use
by any federal program or organization to determine whether members of their own staff are
knowledgeable about microlearning. The survey can be used for in-person or virtual individual
interviews or can be repurposed as a survey to gather responses from all staff members.

The designers did not develop a separate needs analysis assessment for potential learners who may be interested in completing microlearning modules developed by the program. The designers determined that findings in the literature review and microlearning trends, combined with the positive outlook of staff members toward microlearning, justified the decision to move forward with a microlearning program. However, the needs analysis assessment interview developed for staff interviews can be redesigned for use by another federal program to serve as a needs analysis assessment instrument for potential learners. Additionally, the Sample of Level 1 (Reactions) Kirkpatrick Evaluation Strategy Microlearning Feedback survey (included as Appendix B of this work) will be used by the federal program which developed the microlearning videos. It can also be adapted and implemented with learners in other federal programs to gauge learner reactions after the learners have watched a microlearning videos series or have completed microlearning modules.

Best Practices

There are four best practices that were followed in the development of the program's microlearning videos:

- develop a communication document that defines and describes what microlearning is and what it is not.
- evaluate staff microlearning experience, knowledge, and development skills.
- develop best practices for the design of a microlearning video series document.
- develop a project management plan with a breakdown if the work structure.

The first best practice is the development of a communication document for staff that describes what microlearning is and what it is not. This communication document focuses on the

microlearning video format rather than presenting all forms of microlearning. This narrowed approach allowed the designers to avoid the question of why they chose not use other forms of microlearning. The primary reasons for choosing the microlearning videos approach were the lower cost, shorter development time, and the ability to develop the videos with knowledge and skills staff members had mastered already.

The "what microlearning is and what it is not" communication document also served the purpose of starting a discussion with key staff members about the knowledge and skills necessary to create the microlearning videos. This initial discussion also allowed the designers to determine whether content was already available or could be developed for conversion into microlearning videos. More importantly, the initial discussion allowed the designers time to make the case for developing the microlearning videos, in-house, based on the knowledge and skills already available among staff members.

As noted above, another best practice involves evaluating staff microlearning experience, knowledge, and development skills. To address this evaluation need, the designers did not conduct a knowledge and skills assessment but rather met to discuss what knowledge and development skills they each could bring to the microlearning videos project. As part of this process, the designers identified the following knowledge and skills as necessary: conduct a needs assessment, determine learning objectives, write content, review and approve final content, edit PowerPoint Office 365 presentations, convert PowerPoint Office 365 presentations to videos, edit audio narrations with Adobe Audition 2020, edit videos in Adobe Premiere 2020 to add a music track, write transcripts, narrate, upload videos to YouTube, caption videos with the YouTube captioning tool, and evaluate microlearning videos from both communication and an instructional design perspectives. It was determined that microlearning experience and

knowledge were low among staff, staff members did have the skills necessary to develop microlearning videos.

Although this federal program did not conduct a knowledge and skills assessment, other federal programs may want to conduct such an assessment. However, it will be necessary for the developers to know what knowledge and skills are required for developing microlearning videos. The list of knowledge and skills provided above can be used as a starting point. The results of providing staff with a microlearning needs assessment such as the assessment included as Appendix A can help an organization gauge staff knowledge and skills for developing microlearning. At a minimum, a federal program needs to use some mechanism or decision-making process to determine whether staff members have the necessary knowledge and skills, or whether outside developers and instructional designers will be necessary to develop microlearning.

Another important consideration made is whether staff members of an organization have the resources and time available to develop microlearning videos. In the case of the federal program for which the microlearning series discussed herein was developed, it was determined that the designers had the resources and time available to develop the microlearning videos series. The plan was to develop the microlearning video series in four months. However, due to changes in key staff availability during the COVID-19 pandemic, the total development time required eight months. These changes in the duration of the development time were communicated to the federal program staff.

A third best practice involves developing a best practices document for the design and development processes to be undertaken to produce a microlearning video series. The first step of the document drafting starts with identifying which content should be chosen for

microlearning. An excellent starting point for developing a best practices document for microlearning to be presented to all program staff is to review Giurgiu's (2017) comparison table of macrolearning and microlearning (included as Appendix *C* of this work). The table indicates that microlearning should be considered for learning that is informal, expected to be 15 minutes or less in duration, and delivered as self-contained, single topics (Giurgiu, 2017). In comparison, macrolearning which is represented by in-person learning classes, eLearning, and in some cases through mLearning (mobile learning) is formal education that takes several hours or days to complete and is presented as complete courses that cover multiple topics (Giurgiu, 2017).

An instructional designer or someone with a background in education, should be consulted to ensure that the microlearning videos are developed in a way that is suitable for the intended audience, and that clear learning goals and learning objectives are identified. It is important to note that best practices documents be developed once then abandoned but instead should be referenced and revised throughout the process as developers learn hone their skills and discover new ways to streamline processes. For example, best practices were captured by the designers of the federal program's microlearning videos for the following processes: conduct a needs assessment, determine learning objectives, write content, clear content, edit PowerPoint Office 365 presentations, convert PowerPoint Office 365 presentations to videos, edit audio narrations with Adobe Audition 2020, edit videos in Adobe Premiere 2020 to add a music track, write transcripts, narrate, upload videos to YouTube, caption videos with YouTube captioning tool, and evaluate microlearning videos from both communication and instructional design perspectives. Best practices for the development of microlearning videos can be documented in the form of either job aids or microlearning videos that can be shared with other staff members.

A final best practice involves creating a project management plan for the development of microlearning videos. Creating a project management plan may seem unnecessary to some degree. However, creating a project charter which provides the organizational background for the project, sets the goals and scope of the project, and lists key stakeholders helps project team members get on the same page at the initiation of the project. For some microlearning development projects what may be most important is for the design team to create a work breakdown structure (outlining tasks assigned to each staff), schedule baseline (expected time for each project task on schedule), and resource management plan with a project organization chart (indicating staff assigned to project). These three documents outline who will be completing tasks in the project, which order the tasks will be completed to keep the project on schedule, and who has primary or secondary responsibility for tasks being completed in the project. Other important project management planning documents that should be included are the risk response plan, communications matrix, and quality standards plan. These additional three documents list risks to the project being completed on time, agreed upon plans for communicating between team members, plans for communicating with stakeholders, a list of how often and when team members will meet, and quality criteria for all elements of the microlearning videos.

Conclusion

The literature reviewed above regarding embedding microlearning within eLearning strongly suggests that a major consideration for the development of microlearning should be how microlearning can be developed to be included in an eLearning course. The designers of the federal program's learning intervention discussed herein considered the need to embed microlearning within a future eLearning course when developing the microlearning video series

reviewed above. By design, the videos that were created can be placed into an eLearning course at a later point. Given the degree to which research findings demonstrate that microlearning works best when paired or embedded with other types of learning, federal programs should consider the 'embeddability' of microlearning assets as a key factor when developing microlearning modules.

The microlearning video series developed for the federal program discussed in this action research paper instantiates the primary reasons why microlearning should be considered as a viable option for federal programs undertaking education initiatives. As demonstrated through the literature review and the example provided of one federal program's development of a microlearning video series, microlearning provides a new way to develop learning content to meet the education needs of a federal program. Microlearning of the type developed for the microlearning video series discussed herein provides a degree of flexibility and scalability, and options for embedding and supplementing that are not found in other types of learning.

Implications for Further Study

This action research study demonstrates that microlearning should be considered as an option for federal programs because microlearning can be developed as standalone, supplemental, or embedded course content. The literature review revealed that most recent research into microlearning covers five main topic areas: microlearning embedded within eLearning, microlearning and millennials, microlearning and social media, microlearning and mobile learning, and microlearning and learning ability. These research areas provide information on how microlearning works with eLearning and with other types of learning, and how it works for

younger generations, how it can function as learning through social media, and how microlearning can leverage technology across a range of devices.

The research area of most relevance to this action research paper provides findings regarding the practices and outcomes associated with embedding microlearning within eLearning. The research regarding embedding microlearning within eLearning strongly suggests that a major consideration for the development of microlearning should be how microlearning can be developed to be included in an eLearning course. The goal of microlearning should not be to replace eLearning but rather microlearning should be developed either as a supplement to or as an embedded component of eLearning. In fact, the dual use of microlearning as standalone learning and as an embedded component of an eLearning course creates unique design considerations that do not arise during the design of learning interventions intended to be delivered in-person, through eLearning, and even through mLearning (mobile learning), since content for each of these formats is developed as a complete learning solution.

Future research on the use of microlearning in eLearning courses should examine the outcomes of embedding into eLearning courses microlearning videos or microlearning modules which were first developed as standalone or supplemental course content. As the embedded microlearning approach is implemented, developers, instructional designers, and researchers should share their findings and best practices. Future research should also examine the use of other microlearning forms in eLearning courses, including infographics (visual and interactive), PDFs (visual and interactive), eBooks, whiteboard animations, animated videos, explainer videos, mobile applications, games, simulations, branching scenarios, job aids, podcasts, webcasts, recorded webinars, and short videos (visual and interactive).

References

Aitchanov, B., Nussipbekov, A., & Zhaparov, M. (2012). Microlearning of web fundamentals based on mobile learning. *International Journal of Computer Science Issues (IJCSI)*, *9*(6), 148–150.

Bae, J. H., & Shin, H. Y. (2020). The effect of micro-learning on learning satisfaction and effectiveness of learning. *Journal of the Korea Convergence Society*, *11*(7), 369-376.

Bannister, J., Neve, M., & Kolanko, C. (2020). Increased educational reach through a Microlearning Approach: Can Higher Participation Translate to Improved Outcomes? *Journal of European CME, 9*(1), 1–5.

Behringer, R. (2013, September). Interoperability standards for microlearning. In *MicroLearning Conference* (Vol. 7, No. 10).

Boring, C. (2020). Microlearning: An andragogical case study on knowledge retention, learner satisfaction, and behavior change (Doctoral dissertation, Robert Morris University). Available from ProQuest Dissertations and Theses database. (UMI No. 27744159)

Crue, C., & Francis, K. L. (2020). As the field of emergency management evolves, is it time to enhance its training methods? *Journal of Business Continuity & Emergency Planning, 14*(1), 65–74.

Dolasinski, M. J., & Reynolds, J. (2020). Microlearning: a new learning model. *Journal of Hospitality & Tourism Research*, *44*(3), 551–561.

Filipe P. H., Paton, M., Tipping, J., Schneeweiss, S., & Mack, H. G. (2020). Microlearning to improve CPD learning objectives. *The Clinical Teacher, 7*, 1–5.

Fox, A. (2016). Microlearning for effective performance management. *TD Magazine*, *70*(4), 116-117.

Freeman, L. E. (2016). *Microlearning, a video series: A sequence of videos exploring the definition, affordances, and history of microlearning* (Unpublished master's thesis). University of Texas, Austin.

Gassler, G., Hug, T., & Glahn, C. (2004). Integrated micro learning–An outline of the basic method and first results. *Interactive Computer Aided Learning*, *4*, 1–7.

Gawlik, K., Guo, J., Tan, A., & Overcash, J. (2020). Incorporating a microlearning wellness intervention into nursing student curricula. *Nurse Educator, Publish Ahead of Print*, Nurse educator, 2020-05-15, Vol.Publish Ahead of Print.

Giurgiu, L. (2017). Microlearning an evolving elearning trend. *Scientific Bulletin*, *22*(1), 18–23.

Gross, B., Rusin, L., Kiesewetter, J., Zottmann, J. M., Fischer, M. R., Prückner, S., & Zech, A. (2019). Microlearning for patient safety: Crew resource management training in 15-minutes. *PloS One, 14*(3), 1-20.

Hanshaw, G., & Hanson, J. (2018). A mixed methods study of leaders' perceptions of microlearning for professional development on the job. *International Journal of Learning and Development, 8*(3), 1.

Inker, J., Jensen, C., Barsness, S., & Stewart, M.M.. (2020). Implementing microlearning in nursing homes: implications for policy and practice in person-centered dementia care. *Journal of Applied Gerontology,* 073346482092983-733464820929832.

Jahnke, I., Lee, Y. M., Pham, M., He, H., & Austin, L. (2019). Unpacking the inherent design principles of mobile microlearning. *Technology, Knowledge and Learning*, 1–35.

Javorcik, T., & Polasek, R. (2019, November). Practical application of microlearning in education of future teachers. In *ECEL 2019 18th European Conference on eLearning* (pp. 254–259). Academic Conferences and publishing limited.

Javorcik, T., & Polasek, R. (2018, November). The basis for choosing microlearning within the terms of elearning in the context of student preferences. In *2018 16th international conference on emerging elearning technologies and applications (ICETA)*, Stary Smokovec, Slovakia (pp. 237–244). IEEE.

Javorcik, T., & Polasek, R. (2019, July). Transformation of eLearning into microlearning: New approach to course design. In *AIP Conference Proceedings* (Vol. 2116, No. 1, pp. 1–4). AIP Publishing LLC.

Jomah, O., Masoud, A. K., Kishore, X. P., & Aurelia, S. (2016). Micro learning: A modernized education system. *BRAIN. Broad Research in Artificial Intelligence and Neuroscience*, *7*(1), 103–110.

Kamilali, D., & Sofianopoulou, C. (2013, July). Lifelong learning and web 2.0: microlearning and self-directed learning. In *Proceedings of EDULEARN13 Conference (5th International Conference on Education and New Learning Technologies)*, Barcelona Spain (pp. 0361–0366).

Kapp, K., & Defelice, R. (2018). Elephant-sized impact. *TD Talent Development*, *72*(7), 26-30.

Liao, S., & Zhu, C. (2012, December). Micro-learning based on social networking. *Proceedings of 2012 2nd International Conference on Computer Science and Network Technology*, 1163-1166.

Major, A., & Calandrino, T. (2018). Beyond chunking: Microlearning secrets for effective online design. *Distance Learning*, *15*(2), 27–30.

Mohammed, G. S., Wakil, K., & Nawroly, S. S. (2018). The effectiveness of microlearning to improve students' learning ability. *International Journal of Educational Research Review*, *3*(3), 32–38.

Moore, M. L. (2020). *Qualitative Exploration of Instructional Designers' Use of Microlearning for Formal Workplace Training* (Doctoral dissertation, Capella University). Available from ProQuest Dissertations and Theses database. (UMI No. 28092811)

Nikou, S. A., & Economides, A. A. (2018). Mobile-based micro-learning and assessment: impact on learning performance and motivation of high school students. *Journal of Computer Assisted Learning*, *34*(3), 269–278.

Pandey, A. (2018, March). 15 types of microlearning for formal and informal learning in the workplace. Retrieved from https://elearningindustry.com/types-of-microlearning-formal-informal-learning-workplace-15

Park, Y., & Kim, Y. (2018). A design and development of micro-learning content in eLearning system. *International Journal on Advanced Science, Engineering, and Information Technology*, *8*(1), 56–61.

Paull, M., Whitsed, C., & Girardi, A. (2016). Applying the kirkpatrick model: Evaluating an interaction for learning framework curriculum intervention. *Issues in Educational Research*, *26*(3), 490–507.

Peterson, W. (2017). *Learners' perceptions of the microlearning format for the delivery of technical training: An evaluation study* (Doctoral dissertation, University of Southern California). Available from ProQuest Dissertations and Theses database. (UMI No. 10802043)

Petrone, P. (2017, July 10). What's good and what's bad about microlearning. Retrieved from https://learning.linkedin.com/blog/learning-thought-leadership/what_s-good-and-whats-bad-about-microlearning

Polasek, R., & Javorcik, T. (2019). Results of pilot study into the application of microlearning in teaching the subject computer architecture and operating system basics. *2019 International Symposium on Educational Technology (ISET),* 196–201.

Redondo, R. P. D., Rodríguez, M. C., Escobar, J. J. L., & Vilas, A. F. (2020). Integrating micro-learning content in traditional eLearning platforms. *Multimedia Tools and Applications*, 1-31.

Rettger, E. (2017). *Microlearning with mobile devices: Effects of distributed presentation learning and the testing effect on mobile devices* (Doctoral dissertation, Arizona State University). Available from ProQuest Dissertations and Theses database. (UMI No. 10275312)

Skalka, J., & Drlik, M. (2020). Automated assessment and microlearning units as predictors of at-risk students and students' outcomes in the introductory programming courses. *Applied Sciences, 10*(13), 4566.

So, H. J., Leea, H., & Rohb, S. Z. (2020). Examining the design of microlearning for korean adult learners. Computer-based Learning in Context, 2(1), 40–53.

Wang, C, Bakhet, M, Roberts, D, Gnani, S, & El-Osta, A. (2020). The efficacy of microlearning in improving self-care capability: A systematic review of the literature. *Public Health (London), 186*, 286-296.

Winterford, D. (2018). 5 reasons why boring training courses are being killed by microlearning. *CIO*. Retrieved from: https://www.cio.com/article/3493735/5-reasons-why-boring-training-courses-are-being-killed-by-microlearning.html

Zhang, J., & West, R. E. (2020). Designing microlearning instruction for professional development through a competency-based approach. *TechTrends*, *64*(2), 310–318

Appendix A
Needs Assessment Interview: Introduction Statements and Questions

Web traffic and course completion rates for our current eLearning courses have been decreasing over the past ten years. There were many good reasons for creating the eLearning courses when they replaced our old in-person classroom courses, including increasing access and availability of our courses to more learners. Currently, we are looking for ways to reduce cost, make more efficient use of resources, decrease development time, improve access to eLearning course content, increase the number of learners who view eLearning course content, and to increase completion rates for eLearning course content.

- Would you be interested in changing our current approach to eLearning to increase web traffic and completion rates for our eLearning course content?

- Would you support a new approach that features small eLearning course modules rather than full eLearning courses?

- Would you support a new approach that is less focused on continuing education credits or that eliminates continuing education credits completely?

- What do you think is missing from our current eLearning courses that was present in our in-person classes?

- Did you know that in-person classes had higher completion rates than our eLearning courses amongst learners who registered and started the courses? *Please note that less people took the in-person courses and there was limited availability of the courses.*

- Do you believe that you could help develop more eLearning course modules for relevant topics if there was not the requirement to include these modules in a full eLearning course*?*

Research has shown that learners and workers have changed a lot over the last few decades. Workers have less time for training. Many learners have expressed an interest in learning that is more direct, presented in smaller chunks, and provided in different formats. Millennials are looking for course content in short form that is easily accessed, findable, and readily available.

- Can you describe the current learners who typically start and complete our eLearning courses?

- Can you describe the current learners who typically start but do not complete our eLearning courses?

- Do you think our current eLearning courses appeal to today's workers and learners?

- Do you think our current eLearning courses are findable?

- Do you think there are learning modules within our current eLearning courses that learners would like to complete without having to complete the full courses?

- Do you think the learning modules within our current eLearning courses are easily found or hidden from learners who may be just looking for that specific eLearning course content?

Microlearning is a form of eLearning that features small, self-contained course modules that are usually 2 to 6 minutes in length. Each microlearning course covers a single topic. Microlearning courses can be presented in different formats but are frequently developed provided in short video format. Microlearning courses can also be in the form of PowerPoint presentations that are turned into PowerPoint videos with audio narration added or in the form of short slide visualizations, interactive infographics, or animations. The benefits of microlearning are lower development costs, the ability to quickly provide training in different formats, development in smaller chunks, and shorter development time.

- What knowledge do you have of microlearning?

- Do you have experience with completing a microlearning course?

- What did you like or not like about the microlearning course that you completed?

- Do you have experience developing a microlearning course?

- Do any of your eLearning courses have small learning modules or videos that could be re-purposed or redesigned as microlearning courses?

- Do you have any ideas on how you would like to use microlearning for your current or new course content?

- Are you willing to participate in a planning committee or focus group about microlearning content development?

- Do you think learners are more likely to complete microlearning modules which are stand-alone learning modules that do not require the completion of a full eLearning course?

- Do you believe that providing eLearning content modules in the form of microlearning modules will increase the findability for learners who are only looking to learn specific information or skills?

- Do you believe that overall completion rates for eLearning course content will improve even if learners are only completing microlearning modules for the specific content that is of interest to them?

- Do you believe that microlearning modules can be shared more easily and posted to social media/video sharing websites like Facebook, LinkedIn, and YouTube?

Appendix B
Sample of Level 1 (Reactions) Kirkpatrick Evaluation Strategy
Microlearning Feedback

Please circle your response to each of the statements below:

I was satisfied with the microlearning module overall. (Scale: 1- Strongly Disagree, 2- Disagree,

3- Neither Agree or Disagree, 4- Somewhat Agree, 5- Strongly Agree)

This microlearning module enhanced my knowledge of the topic (replace with actual topic).

(Scale: 1- Strongly Disagree, 2- Disagree, 3- Neither Agree or Disagree, 4- Somewhat Agree, 5-

Strongly Agree)

The microlearning module was relevant to what I might be expected to know about this topic

(replace with actual topic) at my school. (Scale: 1- Strongly Disagree, 2- Disagree, 3- Neither

Agree or Disagree, 4- Somewhat Agree, 5- Strongly Agree)

I would recommend this microlearning module to others. (Scale: 1- Strongly Disagree, 2-

Disagree, 3- Neither Agree or Disagree, 4- Somewhat Agree, 5- Strongly Agree)

Please circle Yes or No for the questions below:

Do you think the microlearning was an effective use of your time? Yes or No

Did the microlearning fit into your work schedule? Yes or No

Do you think the microlearning was the right length? Yes or No

Did the microlearning cover enough material? Yes or No

Did the short length of the microlearning work for you? Yes or No

Was the pace, narration, and visual content of the microlearning effective for you? Yes or No

Will you continue onto the next microlearning in this topic series? Yes or No

Did you find yourself distracted during the microlearning module? Yes or No

Appendix C

Table Comparing Macrolearning and Microlearning (Giurgiu, 2017, p. 23)

	Macrolearning	Microlearning
Learning context	formal learning	informal learning
Time spent	several hours	a few seconds up to about 15 minutes
Content type	learning modules, comprising and structuring a broader range of ideas or topics and combining learning objects	microcontent as small chunks of information, focusing on a single definable idea or topic
Content creation	content created by subject matter experts, usually with authoring tools	content co-created by learners with Web 2.0 and rapid e-learning tools
Content aggregation and fragmentation	learning objects usually need to be combined with other learning objects to enable full understanding; content can be easily split for re-use and restructuring	microcontent units are self-contained as they can be understood without any additional information: microcontent cannot be divided into smaller pieces without the loss of meaning
Content retrieval	courses or topics retrievable through a unique URL, however single learning objects are not addressable	microcontent has a unique URL (permalink), which make even small chunks of information retrievable
Structure of the learning cycle	hierarchic, sequential, pre-planned structures consisting of a number units or lessons, each combining a number of learning objects, such as texts, images. audio, video	dynamic, flexible structures created by learners in the process of learning through syndication, aggregation and modification, based on such data as social tags and bookmarks
Target group	learners aiming at gaining an insight into topics defined by domain experts	learners aiming at exploring concepts or solving practical problems
Learner's role	learners as consumers of content, attempting to build mental structures similar to those of experts	learners as prosumers of content, building own mental structures through exploration and social interaction

Learner participation	focuses on learner-content interactions	focuses on social interactions between learners