Microlearning: A Bite-Size Tech Professional Development Approach for Busy Teachers

Thesis Presented By

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Abstract

Majority of K-12 teachers across the nation participate in some professional development every year. This traditional training model is a one size fits all, sit and get session based on the assumption that teachers need direct instruction about how to improve skills and master new strategies. Despite this effort, many teachers find the top-down training model ineffective. Teachers' real challenges are time, implementation, ongoing training and support in their classrooms. This research explores microlearning, as a viable training methodology for professional teacher learning with an emphasis on technology integration. The goal is creating an e-learning product that teachers can use anytime, anywhere. The responsive design will feature courses that are broken down into bite-size segments, research-based instructional strategies, engaging activities, interspersed assessment to reinforce learning, and the inclusion of social communication so teachers can discuss their knowledge. Completing a microlearning lesson will help teachers build skills to integrate technology seamlessly into their classrooms.

Keywords: microlearning, bite-size, online learning, training, millennials, performance support

Acknowledgements

I dedicate this project to my daughter in the hopes that this endeavor will inspire her to pursue greater heights and have the grit to go beyond what is comfortable to accomplish something more. To my mom who unselfishly gave up her time to do housekeeping to enable me to work and concentrate on my study.

I would like to express my sincere gratitude and appreciation to the following people who made my research successful and assisted me at every step to cherish my goal:

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Lastly and most importantly, to God, without whom I was nothing.

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CHAPTER ONE

INTRODUCTION

The endorsement of the Common Core State Standards (CCSS) in 2010, raised the bar for students' accountability in grades K through 12. The CCSS were written to prepare students for college, the workforce, and a technology-rich society (Common Core State Standards Initiative, 2018). This sweeping reform is intended to move away teaching from rote memorization and help students to develop 21st-century skills - critical thinking, problem-solving, collaboration, and communication. The lofty expectation of the common core is the integration of technology to different content areas. To thrive in the digital age, the CCSS calls for students to develop digital media and technology skills. The effective implementation of the CCSS is contingent upon the quality and ongoing professional development (PD) that teachers receive as well as its application.

In a recent study, although 90 percent of U.S. teachers have participated in professional development, the majority of those teachers believe that training was ineffective (Darling-Hammond et al., 2009). The one-time day long workshop-style training was inadequate because it only focuses on teachers' lack of knowledge rather than how to implement new skills in the classroom (Gulamhussein, 2013) which teachers grappled. Other pressing issues mentioned by Gulamhussein (2013) include lack of teacher time to do PD and support during implementation. The National School Boards

Association's Center for Public Education proposed that effective PD should have the following characteristics: ongoing, the topic should be specific to each grade level, engaging activities, and, incorporating social learning to support skill implementation and transfer (Gulamhussein, 2013). To date, the traditional PD is morphing into a new system of the professional learning community (PLC). In PLC, a group of teachers meet together to discuss specific issues in their teaching and collaborate to make changes to improve student learning (Moir, 2013).

Instructional design (ID) and e-learning technology can mitigate barriers to the effective implementation of professional development. ID is a systematic approach to consistently creating education and training programs (Reiser & Dempsey, 2007). ID uses learning theories on the creation of materials and activities to ensure the quality of instruction and skill transfer on the part of the learners (Penn State University, 1996). E-learning is the use of electronic devices (computers, tablets, or phones) to deliver educational or training content to learners (Legault, 2015) synchronously or asynchronously. As a subset of e-learning, microlearning training approach is an excellent alternative to teacher PD.

Statement of Purpose

The reason for this research was to design and develop a responsive e-learning product utilizing the microlearning technique as it relates to teacher professional development. The problem addressed by this study was the ineffectiveness of the

traditional professional development that teachers receive. The one-time workshop-style training seldom worked because it is often too long and too much information for teachers to absorb. The lack of practice to teach the skill and implementation support compounded the problem in making a successful skill transfer in the classroom. Finding time for PD was a perennial issue due to the teachers' packed schedule. Microlearning methodology can address these training issues.

"Microlearning is a training method that presents lesson content in bite-sized pieces instead of long instruction sessions" (De Franco, 2014, p. 1). The lesson is usually 5-10 minutes or shorter, focuses on a specific learning outcome, accessible on the web anytime and runs on multiple devices. It provides learners control on what they are learning and just in time training to apply for the job. Microlearning also has the delivery capability to integrate social learning beneficial to the professional learning community. For busy and often overloaded teachers, this training method seems a good fit to learn new tech tools and use them to their teaching.

The proposed e-learning product features a series of courses based on the SAMR and TPACK models for technology integration. Each course highlights research-based instructional strategy paired with an app to increase student learning. The product can be used as stand-alone training or in tandem with the blended-learning type of training. The online format will give teachers access to materials 24/7, anywhere, so that they can revisit courses for re-learning at any time. The product will have a responsive design so

that teachers can use it on any computer or device with internet connection. The push and pull nature of the e-learning content gives teachers the flexibility to choose a skill to learn when they need it. Each course takes minutes to complete to accommodate teachers' busy schedule. A resource page is included to help teachers with teaching ideas that they can implement readily in their classrooms. The e-learning product is highly engaging, interactive, and uses a variety of media to aid in teachers' retention of knowledge. The social learning functionality enables teachers to discuss their learning with others.

Research Questions

The purpose of this research was to explore microlearning as a viable training methodology for ongoing teacher professional learning. It also examined the science behind bite-size learning as a new paradigm to help teachers learn and apply new strategies and digital tools relevant to their classrooms, at the moment of need. These were the questions that this research explored:

1. What are the characteristics of microlearning and how can these be used to aid in teacher professional learning?
2. What adult learning theories and strategies support microlearning training methodology?
3. How to create a microlearning course applying best practices in instructional design?

4. How can social learning be incorporated to support and mentor teachers in integrating technology in their classrooms?

Rationale

Technology is on a roll. The changes it brings impacted all aspects of life and education is no exception. With the looming demands of the common core and student accountability, teachers will need an ongoing professional development that works to help them teach 21st-century skills effectively. Microlearning is a suitable solution to bridge that gap. Microlearning is a training technique for delivering learning content in small chunks that are just enough information to achieve a learning goal. The frequency of material delivery can lead to faster learning and retention of knowledge.

Some learning theories support microlearning methodology. According to Miller's Information Processing theory, the brain can only hold roughly seven objects in working memory at a given time (Miller, 1956). Adequately designed microlearning lessons respect these cognitive limits, giving learners bite-size and focused content that is easy to understand and retrieve later (Grovo, 2017). Ebbinghaus' spaced repetition theory suggests reviewing the materials regularly at a set interval is better for learning and retaining information (as cited in Zambito, 2017). Microlearning is well suited to delivering content in short bursts and courses spaced out to help learners remember information. Research on, the modern learner, the increasing knowledge demands from employees, and advancement in science and technology raised the popularity of

microlearning. Tauber and Wang-Audia (2014) studied the way people learn in the modern workplace and concluded that most learners would not watch videos for 4 minutes, spend only 5-10 seconds when looking at web pages, work in different locations other than the office and very motivated to learn, but often overwhelmed with information. The essential point of this study was the evidence that modern learners demand shorter learning cycles, which makes a compelling case for microlearning opportunities in the workplace.

One of the main characteristics of a microlearning course is highly engaging and interactive. The course design needs to capture attention, motivate learners to action, and make learning stick (Grovo, 2017). This research project paves the way for a better training option for professional development for teachers. It hopes to inform school administrators and other stakeholders of the benefits of e-learning as it provides accessibility, affordability, up to date content, and individualized professional development that teachers can implement in their classrooms. This research contributes to the field of instructional design by finding out if microlearning methodology can indeed support ongoing professional learning for teachers.

Definition of Terms

The following terms are essential to understanding throughout this research.

Terms

Microlearning. Microlearning is short bursts of focused content to help people achieve a specific outcome (Tipton, 2017).

Professional development. Professional development is typically single-shot, one-size-fits-all workshops for teachers based on the expertise of the individuals delivering the session (Moir, 2013).

Professional Learning Community. Professional learning community, or PLC, is a group of educators "that meets regularly, shares expertise, and works collaboratively to improve teaching skills and the academic performance of students" (Great Schools Partnership, 2014, p.1).

Technology integration. It means using computers effectively and efficiently in the general content areas to allow teachers and students to learn how to apply computer skills in meaningful ways (Dockstader, 1999).

SAMR model. The SAMR (Substitution, Augmentation, Modification, Redefinition) model, created by Dr. Ruben Puentudura, guides the process of reflecting on how educators are integrating technology into their classrooms (Edutopia, 2007).

TPACK model. The TPACK (Technological Pedagogical Content Knowledge) framework lays out the knowledge that educators need to successfully integrate technology into their teaching (Edutopia, 2007).

E-learning. It means the use of electronic devices (computers, tablets, or phones) to deliver educational or training content to learners (Legault, 2015).

Assumptions and Limitations

In conducting this research, the following assumptions were made. It was assumed that:

1. The faculty at OLQA school needs an ongoing professional development in technology.
2. All faculty members have received professional development in basic computer use and knowledgeable in operating computers, iPads, and browse pages on the Internet.
3. The faculty have access to school provided Google email and Apple ID for use in downloading apps.

In conducting this research, the following limitations were identified:

1. This e-learning product was intended for faculty members at OLQA school.
2. Display of the e-learning product may appear differently depending on the user's browser and device type.
3. The social widget may not work if the faculty does not have a compatible social account like Twitter.
4. Push notification of the succeeding micro lessons are not included in this prototype.

Overview of the Remaining Chapters

This research consists of five chapters. In Chapter 2, the researcher provides an exhaustive review of literature which explains the conceptual framework of microlearning, theories and strategies that support microlearning, its design properties, impact on social learning and professional development. In Chapter 3, the researcher discusses the project description and the methodology which includes explanation of the research design, participants, target audience, instruments, procedures, and a brief data analysis. In Chapter 4, the researcher describes the instructional product which consists of task analysis and strategies, media selection, project description, personnel analysis, work plan, and project budget. Finally, in Chapter 5, the researcher writes about the findings, conclusions, and recommendations of the research particularly the impact of the instructional product based on the results of the evaluation. At the end of the chapters, are the references and appendices. The appendices include evaluation forms, data from the completed survey, IRB letter, abstract and letter with approval, email transcript sent to SME's asking for evaluations and optional items like screenshots of the finished project and a copy of the product on a DVD ROM.

CHAPTER TWO

REVIEW OF RELATED LITERATURE

This review of literature outlines the framework of how microlearning can be a significant approach to train classroom teachers who are limited in the amount of time they have available for professional learning in technology integration.

Conceptual Framework

The word micro came from the Greek word *mikro* which means small. Microlearning is small moments or episodes of learning related to a need. This learning moment can be in the form of everyday activities (Masie, 2006) such as following a cooking recipe, recharging a hybrid car battery, or using the wizard in setting up a new iPad. In learning and development, microlearning came to being in late 2000 alongside mobile learning and the use of smartphones (Lewis, 2016).

Gassler (2004) first introduced the idea of microlearning as small chunks of learning integrated into daily routines. He, along with Thug and Glahn (2004) developed a screen-saver system for a mobile device that shows review questions in language learning every time the phone goes idle. Users have to either answer or opt out to use the phone. Through this study, Gassler et al. (2004) found “75% of the users voluntarily answered the questions than opted out” (p.6). This event has shown microlearning provides high motivation to learners and affords them time to learn while doing their daily routines.

Mosel (2005) described microlearning processes as an activity derived from interacting with microcontent like browsing pages, posting on blogs, and social networking using the Internet. Masie (2006) and Hug and Friesen (2009) characterized microlearning as a concise (minutes long), and a learner-focused instance of learning. On the contrary, Langreiter and Bolka (2005) added that microlearning could bring about "fragmentation of both information sources and information units used for learning" (p.1), especially in areas which see rapid development and constant change.

The exponential growth of Internet technologies and web applications in the workplace trigger the need for new concepts and strategies to support lifelong learning. Buchem and Hammelman (2010) described microlearning as a pragmatic innovation to lifelong learning due to its capability to support flexible education. The authors illustrated how microlearning could bridge the gap between formal and informal learning. Buchem and Hammelman (2010) and Job and Ogalo (2012) agreed that microlearning was an innovative approach to professional development because the short nature of its content and online delivery provides workers just in time training to perform on the job.

Fast forward to the present, many training and development specialists agree that microlearning is a suitable training methodology for learners needing performance support in the modern world. Microlearning has the following characteristics: (a) bite-size lessons usually within minutes; (b) granular content and can stand alone; (c) highly engaging, self-paced, and flexible modality; (d) help learners at a point of need and close

a skill gap; (e) cost less and quicker to produce than traditional e-learning courses; and (f) multi-platform (Allencomm, 2015; Grovo, 2017; Malamed, 2015; Thallheimer, 2017; Tipton, 2017).

Microlearning methodology brings innovation to learning design by organizing content into bite-size pieces that learners can digest. The next section discusses the science and theories that support microlearning training technique.

Theories and Strategies that Support Microlearning

The recent popularity of microlearning grew out of research on the modern learner and cognitive science. In Meet the Modern Learner infographic, Tauber and Wang-Audia (2014) reported that modern learners are "overwhelmed, distracted, impatient, untethered, collaborative, and empowered" (pp. 4-6). Modern learners are internet savvy, heavy mobile phone users, and in-sync with the digital world. The authors also noted modern learners only "spend 1% of their time during the week in training and development" (p. 10) due to distractions at work. In a similar study, Overton (2016) profiled 2,000 office employees in the U.K. and found 80% investing their own time and resources learning online because training provided at work does not align with their need. Learners use Google search and rely on their colleagues for help at a point of need (Penfold, 2016). The crux of this report illustrates the constant and changing needs of the learners in a technologically evolving world. Organizations and training providers should

heed this call to make active learning solutions to support career aspirations of the modern workforce.

Information Processing Theory (IPT) and Cognitive Load Theory (CLT)

Cognitive science is the scientific study of how the mind works and affects behavior (Quinn, 2016). Educators and those in the teaching profession use this body of knowledge as a guide to how learning takes place and design relevant courses for learners. According to Miller's (1956) Information Processing Theory, a person's short-term memory is limited to processing small chunks of information. The mind can only retain "seven, plus or minus two" (p. 1) pieces of data at a time. For learning to take place, content should be broken down to the manageable size to make it easier to understand. Similarly, Sweller's (1988) cognitive load theory (CLT) suggest the use of schema or providing background knowledge to a lesson to ease the working memory processing information. Both theories emphasize the need to chunk information and give schemas to help learners understand and remember information. These theories validate why shorter and engaging content is essential to learning. However, Tipton (2017) cautioned that a chunked content is not a representative of a real microlearning lesson because chunking suggests one long program or course broken into bite-sized pieces. With microlearning, its content is designed to accomplish one objective or one concept and can stand alone.

The short and granular content of microlearning characteristics is significant factors in helping learners gain knowledge. However, like in many learning episodes, knowledge gained should be rehearsed periodically for learning to stick. Spaced repetition technique can help move that knowledge to long-term for easy retrieval of information.

Spaced Repetition

Spaced repetition is a learning technique of presenting the same materials multiple times with a pause in between. The break in between lectures provides stimuli in the brain that initiates production of proteins responsible for strengthening the synapse that triggers long-term memory (LTM) encoding (Kelly & Whatson, 2013). This theory uses the same principle as the forgetting curve which states that information is lost over time if you do not reinforce it (Ebbinghaus, 1964). The gray line in the graph below indicates how a person forgets information as soon as instruction ends. It steeps during training, which means information is retained then drops over time. The green line indicates a review of materials at a set interval stops the forgetting curve and repetition will eventually lead to knowledge retention.

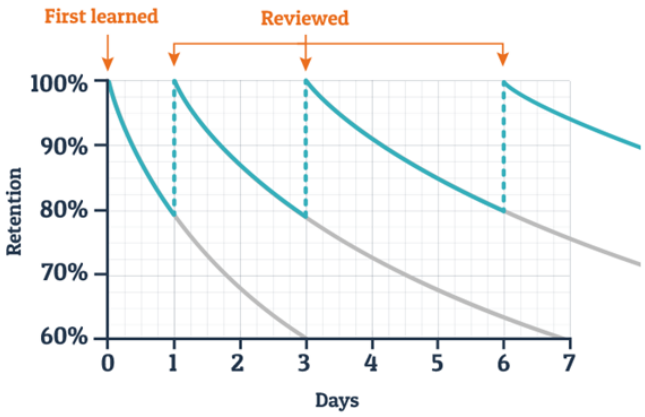

Figure 1. Forgetting Curve with Newly Learned Information, gray line shows forgetting curve while the green line shows information retained.*Wranx Blog*. Retrieved from https://cdn2.hubspot.net/hubfs/3314994/Imported_Blog_Media/ebbinghaus-diagram.png?t=1522142616050

The implication of this in microlearning is the use of mobile technology to send out notifications and reminders to encourage learners for continuous learning.

Andragogy

Andragogy is a theory about adult learning, and it details how they learn differently from children. One of Knowles' learning assumption about adult learners is that they are independent and self-directed individuals (as cited in Merriam & Bierema, 2013). This description is well suited for microlearning activities as it encourages autonomous or self-paced learning. Adults can choose a piece of learning nugget as they see fit. Clark and Meyer (2011) suggested people who operate with high degree of independence can benefit from learner control in navigation. The bite-size modules

inherent in microlearning can also boost motivation as adults prefer to learn faster and apply what they have learned immediately (Esaboyuna, 2016).

Design Properties of Microlearning

Microlearning design is not water down version of traditional e-learning courses. The short format, granularity, and interactive design are all intentional to support the learner at the moment of need. Gabrielli, Kimani, and Catarci (2006), analyzed the interaction design properties of microlearning and briefly discussed learning theories relevant to microlearning environment. The authors presented a list of requirements that support microlearning and suggested approaches for evaluation of microlearning concepts and scenarios. According to these authors, microlearning activities relied on access to learning resources which may happen at any time and any place in a learner's daily activities. For this reason, mobile and web learning environments were most appropriate to use with microlearning to enable seamless access to learning contents. These technologies also support both formal and informal education. Mobile and ubiquitous technologies share the same foundation as constructivism and connectivism. These learning theories should guide microlearning activities to include problem-solving, participating in social media, and promoting the acquisition of necessary skills in learners such as flexibility and adaptability in any work environment.

Gabrielli et al. (2006) and others (Buchem & Hammelman, 2010, Job & Ogalo, 2012) concurred that microlearning follows a set of didactical design which focuses on

pedagogical strategies and tools that facilitate co-creation and use of content. Microlearning provides learners with flexibility as they can learn anything on-demand using mobile and web technologies. It also gives learners control over what they learn. The differences in these three articles lie in the further study of microlearning design. In the first, the authors suggested further investigation in learner assessment because it is difficult to evaluate informal learning activities within everyday casual settings. In the second, the authors would like to investigate how Web 2.0 combined with microlearning can support formal learning. In the last article, the authors would like to study the design and creation of microlearning content further.

Moreover, in an e-book published by Allencomm (2015), suggested the following strategy when designing microlearning: assess needs and determine what behaviors need to change; evaluate learner's non-engagement in the course; develop the curriculum with wide-ranging applicability, and define budget and timeline.

Dillon (2017) offered a different approach in the design of a microlearning course. He touted microlearning as "learning that fits" (p. 1) the need of employees and building it requires two frameworks: (a) results-first (RF) model and (b) modern learning ecosystem (MLE) framework. RF model establishes the need for a microlearning course by starting with an end in mind. It helps organizations determine critical business goals to achieve, what behaviors employees need to do differently, and what knowledge is

required to enable the behavior. RF streamlines focus for a training solution and target only knowledge and behaviors required to reach the goal.

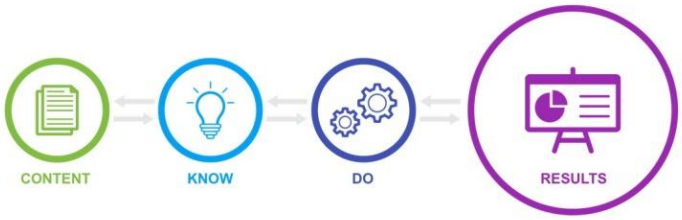

Figure 2. Results-First Model, outcome-focused approach to microlearning design. Learngeek (2017). *Results-first model*. Retrieved from http://www.learngeek.co/wp-content/uploads/2017/08/IMAGE-Outcome_Flow.jpg

MLE framework helps determine the right strategy and content to build based on the layers of context, criticality, complexity, and timeliness (Dillon, 2017). In MLE, foundational layers such as shared knowledge and performance support in the form of a demonstration video, job aid, email or phone help are always available to learners for support. The more complex and critical the topic to learn, the higher up one should decide to resort to formal training.

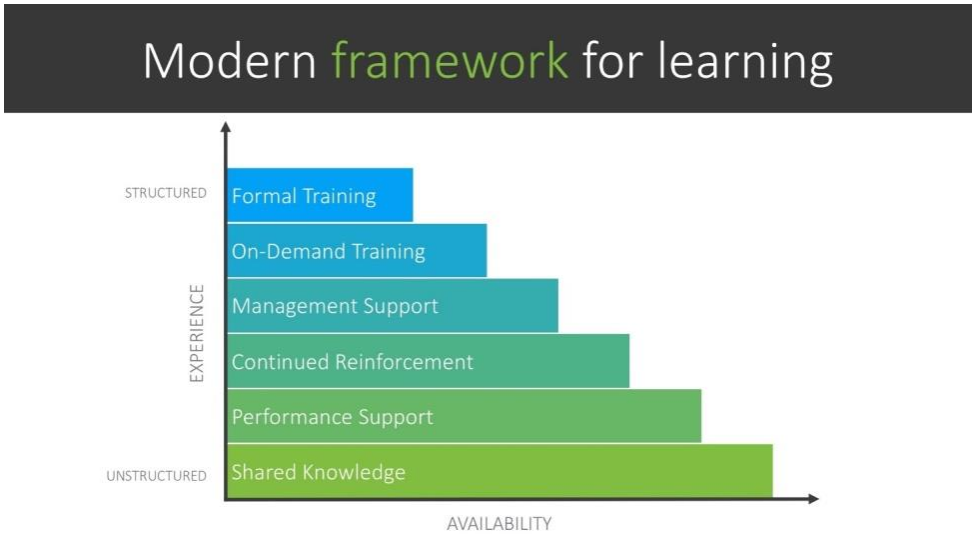

Figure 3. Modern Learning Ecosystem, applies layered approach to learning to provide the right amount of support to employees. Learngeek (2017). *The modern learning ecosystem framework.* Retrieved from http://www.learngeek.co/wp-content/uploads/2017/08/IMAGE-Modern_Framework.jpg

In contrast, Pappas (2016) pointed out complicated tasks, skills and processes are not suitable for microlearning because the content is more involved than doing tasks at the moment of need.

Mobile learning

The ubiquity of tablets and mobile devices powered by web technology have made it possible for people to work at any place and time. Microlearning is an excellent solution for people to learn new skills on the go because of its short format that is perfect for mobile learning.

Edge, Fitchett, Whitney, and Landay (2012), developed an adaptive flashcard system called MemReflex using the microlearning technique to aid students in language learning. Text, audio, and hand-gestures were incorporated into the app to make learning interesting for the users. The flashcard system runs on multiple devices and is adaptive to the learners' previous learning. Edge et al. (2012) selected spaced repetition and cued recall learning models to help students acquire knowledge in the most efficient way. To test the effectiveness of the flashcard system, the researchers recruited three groups of random testers to test the flashcard in 3 events. In the first test, they had subjects use MemReflex on the desktop for 10 minutes each day for 11 days, learning technology inventions using only audio cues. They ran a one-way repeated ANOVA analysis test and found a significant difference in the adaptive test. In the second trial, they recruited another 12 testers and had them use the flashcard on a Windows phone, learning animal lifespans while multi-tasking and walking in a busy place. Using the same statistical analysis, they did not find any significant difference which means learning did not occur when testers were using the flashcard and doing other things. In the last test, the researchers recruited 12 students learning Mandarin Chinese to demonstrate the microlearning motivation factor. They had them use the mobile app on a Windows phone to learn Chinese words for three weeks. The researchers ran a two-tailed paired sample t-tests between progressive and adaptive methods and found a significant difference with

the adaptive test. The essential point of this research is that microlearning is a viable method that can work across platforms.

In like manner, Bruck, Motiwalla, and Foerster (2012) developed a mobile app called Knowledge Pulse (KP) designed to deliver micro lessons for people to learn on the go. KP is a microlearning content delivery app that fits perfectly on mobile devices. The app contains interactive assessments like true or false, matching type and others that give instant feedback. In contrast with MemReflex by Edge et al. (2012), the researchers tested the KP system with real-world clients to measure its effectiveness. Their test subjects were students and government employees. Bruck et al. (2012) installed the KP system on both desktops and mobile devices and used their server log to track user logins. After a month of testing, users were given a survey to share their experience. In all three case studies, results revealed users were satisfied with the system and that it enabled them to learn on the go, and the bite-size format helped them retain information better. The result of this study paralleled that of Edge et al. (2012) because users expressed that microlearning method helped them learn and gave them the flexibility to do it anywhere. Both studies confirmed how microlearning is best suited for mobile learning.

Social media is widely used by individuals, applications such as Twitter support communication and allow opinions to be shared. Researchers such as Aitchanov, Satabaldiyev, and Latuta (2013) saw this as a learning opportunity for people to learn something new. In their study, Aitchanov et al. (2013) identified Twitter as a platform to

use for microlearning to learn Advanced Programming in C++. By design, the researchers tweeted students what they need to learn. Tweets consisted of engaging statements, links to a web page, and videos to extend learning. To measure the effectiveness of microlearning using Twitter, the researchers did a qualitative study by interviewing college students before and after using Twitter in the course. The result showed students and teachers spent an average 10-20 minutes on Twitter, students favored access to materials 24/7, and they liked the microcontent. The downside to this is the possible distraction students might experience given the social connections they have on Twitter outside class.

Simons, Foerster, Bruck, Motiwalla, and Jonker (2015), the same authors of the KP system, developed a mobile app for use with senior citizens to help them make healthy lifestyle choices. In their research, they wanted to find out if the mobile health quiz app has an added value when used by senior citizens to make healthy decisions within the service mix and whether its effect is long term. The researchers used the design cycle approach (Vaishnavi & Kuechler, 2009) and microlearning principles in creating the app. Simons et al. (2014) surveyed participants using the health behavior assessment followed by an app evaluation to determine its efficacy. This study showed users find the app helpful, engaging and motivated them to make healthy choices.

Social Learning Impact

One salient characteristic of microlearning strategy is the flexibility to integrate social learning. Buchem and Hamelmann (2010) explained that microlearning supported by social software like Twitter, Facebook, Youtube enables short, flexible formats and rapid delivery of content, but also social interactions based on that content. Social learning theory posits people learn best by observing and imitating others (Bandura, 1977). Learning takes place when people ask questions, share knowledge, and resources socially.

Meijs, Prinsen and De Laat (2016), conducted a study regarding Dutch teachers' perception of social learning in professional development. They surveyed 110 participants from kinder to higher education regarding their perception of social learning in training. Using the Cronbach's alpha (α) statistical analysis for reliability, study shows the teachers are social learning minded, like sharing knowledge with colleagues, and like the autonomy over their learning.

In a similar study, Moran (2011) sent an email survey to Pearson Learning Solutions customers who are teaching faculty from all disciplines in higher education in the United States, about faculty's awareness of social media and how they use it both personal and professional. Moran (2011) used the survey data to reveal most faculty members were aware of social media and that majority of faculty members were using it

for professional development to watch videos, podcasts, blogs, and wikis that are valuable for teaching.

In contrast, a study by Childs and Potter (2015) indicated that organizational leaders have a reservation in allowing the use of social media in the workplace due to concerns about security, privacy, employee productivity, and the cost of implementation. From the narrative discussed above, carefully designed microlearning combined with social learning can provide learners with an opportunity to learn from others, share knowledge, and create learning communities.

Effects on Professional Development

The study on the modern learner characterizes learners as busy, distracted and have very little time to train or learn new skills (Tauber & Wang-Audia, 2014). Learning and development specialists favor microlearning because of its short format, and focused objectives employees need to support their learning.

Tattersall, Beecroft, and Freeman (2013), demonstrated to healthcare professionals in Sheffield University in the U.K. that professional development is possible despite their busy schedules through bite-sized 20-minute training. Tattersall et al. (2013) followed an unorthodox way to recruit participants by gathering employees and telling them how the session works. Each session lasted 20 minutes long. The first part of the presentation was an interactive demo using a variety of technologies, and the last part was for question and answer. Refreshment was made available for attendees as an

incentive. Training schedules were disseminated using social media as Twitter feeds, and Google +. Training effectiveness was measured using a survey. The finding of this study suggested that participants learned a lot from the short session and they were engaged in learning throughout the session. The procedures used in this study, albeit, unconventional may be useful when organizing a professional development program within any organization. The quick and informal training fit right into any schedule.

Van der Meer, Berg, Smith, Gunn, and Anakin (2015), employed the use of microlearning to replace traditional face to face lecture method at a university in New Zealand so teachers can apply constructivist ideas in their practice. Van der Meer et al. (2015) would like to find out if there is a difference in students' learning given the change of delivery method and their perception of microlearning. The authors' method was purely experimental. Van der Meer et al. (2015) created microlearning courses patterned after Khan Academy style videos which were 2-4 minutes long and with an inset of the teacher's face in the video. Videos were uploaded to the university's LMS to ensure 24/7 access by students. These criteria were communicated to the teachers as a guide to creating their own. Experienced teachers created high-quality videos while others produced adequate videos. After 13 weeks of usage, students were given a questionnaire to evaluate the course experience, preference for videos and study behavior. Factor analysis data treatment revealed that there was no difference between

the lecture and microlearning delivery method. The only message they got from students was the preference towards brevity of the course. Students favored short lesson format.

In a similar study, Gray (2015) investigated the use of bite-sized learning for busy work-based learners (WBL) or vocational students in Scotland. He wants to find out if bite-size education makes a difference in learning over traditional method for very busy WBL's. Bite-size learning was selected underpinning three principles: (a) just in time learning, (b) learning through social interaction, and (c) attention span. The study was carried out in four stages, and each lesson was about 30 minutes or less. The researcher applied qualitative and quantitative methods to find out the effectiveness of the course, teaching method and a request for suggestions. The author used a thematic analysis of data to systematically gain knowledge about a person or interaction within a group. The finding of this study showed that bite-size learning promoted learning among WBL's. The result of this study seemed bias because of the use of thematic analysis, which in part was a subjective process.

Discussion

The plethora of literature discussed on this paper shows microlearning as a formidable training methodology learner needs in a technology-rich society. Microlearning seems a good fit for training any workforce because of the changing workplace brought about by the speed of technological change. Microlearning have these characteristics favored by learners: (a) requires short training time, (b) leverages the use

of mobile technologies for learning anytime, anywhere, (c) engaging content, (d) granular topic that can reduce cognitive load, (e) provides just in time learning, (g) self-paced learning, and (f) encourages social learning. Although, microlearning is a promising training method there is still so much to discover for future research. One area is the need for more research studies to validate its effectiveness. Since microlearning is also learning at the moment, how can one measure informal learning? The second area to look at would be the effect of "learning fragments" (Malamed, 2015, p. 1) due to the short-nature and distribution of content. Can one translate that learning to long-term? In any case, microlearning is here to stay and will change as the technology landscape changes.

Overview of the Remaining Chapters

In Chapter 3, the researcher discusses the project description and the methodology which includes explanation of the research design, participants, target audience, instruments, procedures, and a brief data analysis. In Chapter 4, the researcher describes the instructional product which consists of task analysis and strategies, media selection, project description, personnel analysis, work plan, and project budget. Finally, in Chapter 5, the researcher writes about the findings, conclusions, and recommendations of the research particularly the impact of the instructional product based on the results of the evaluation. At the end of the chapters, are the references and appendices. The appendices include evaluation forms, data from the completed survey, IRB letter, abstract and letter

with approval, email transcript sent to SME's asking for evaluations and optional items like screenshots of the finished project and a copy of the product on a DVD ROM.

CHAPTER THREE

PROJECT DESCRIPTION AND METHODOLOGY

This project intends to create an e-learning product using the microlearning training technique to help teachers augment ongoing professional learning in technology integration at the moment of need. Infusion of digital skills into the curriculum is critical to fulfilling the requirements of the common core standards to prepare students for work in the future. Common core's success is contingent upon well-trained teachers in the classroom. Microlearning framework differs from traditional e-learning in the sense that lessons are shorter in length like 10 minutes or less depending on the objectives. These lessons have focused objectives that help teachers acquire knowledge and enable them to apply it immediately.

Research Design

The e-learning product titled "Bite-Size Tech, Professional Learning Anytime, Anywhere," is responsive e-learning that offers elementary teachers training in research-based instructional strategies combined with an iOS app to enhance student learning. The instructional approach such as compare and contrast, summary, note-taking, and vocabulary were chosen based on the work of educational researchers such as Marzano, Pickering, and Pollack (2001) that impact student learning. Each micro lesson targets a specific objective that teachers can focus on, learn, and apply in teaching. The video

tutorials and apps guide the teachers on how to use those resources with an example in their classrooms.

On this project, the following instructional design and data models were used to answer the research questions: (a) Results-First and Modern Learning Ecosystem (Dillon, 2017), (b) ADDIE, and (c) quantitative data analysis. As mentioned earlier, microlearning is a shortened approach to training based on immediate needs of learners in organizations. To build a practical microlearning course, the researcher utilized two frameworks from Dillon (2017). The Results-First Model is a framework for establishing the need for a learning intervention and identifying the intended result (Dillon, 2017). The researcher used this model to answer critical questions such as measurable goals that the school wants to achieve, what teachers need to do differently and what knowledge is required to change this behavior. The researcher used this model in combination with ADDIE model to establish the need for e-learning and set goals before deciding on the solution (Castagnolo, 2011). The Modern Learning Ecosystem (MLE) model was used to determine the strategies to apply and what content to build based on the layers of context, criticality, complexity, and timeliness (Dillon, 2017). In MLE, foundational layers such as shared knowledge and performance support in the form of a demonstration video, job aid, email or phone help are always available to learners for support. The more complex and critical the topic to learn, the higher up one should decide to resort to formal training. In the case of elementary teachers needing ongoing support for technology integration,

the shared knowledge and performance support layers strengthen the overall learning strategy.

This project applied the quantitative approach with both closed format and open format questions to gather data about the e-learning product (Walliman, 2011). It utilized a 5-point Likert scale survey to capture specific levels of agreement or disagreement towards a particular statement about the learning object. The non-probability convenience sampling method was used in this study due to the participants' availability to the researcher.

Subject Matter Experts (SMEs)

Select educators from the researcher's school site were chosen to evaluate the e-learning product. The invitation was given to 31 faculty members representing grade levels K-8 and were all using an iPad for instruction. Some participants were resource teachers in reading and math intervention, and differentiation. The ages of these teachers ranged from 20 to 59 plus years old. Out of the 18 who responded, 8 have master's degree and 2 with a doctorate in education. Please refer to Table 1 below for more information about the SMEs.

The SMEs were emailed regarding the purpose of evaluating the product as well as the microlearning training format. They were all provided with an internet link to the e-learning as well as a link to the evaluation form. One SME sent an email to the

researcher inquiring about the requirement to use an iPad to do the learning activities. All SME's accessed the e-learning via the internet.

Table 1

Demographics of Subject Matter Experts

Descriptor	*n*	*%*
Gender		
Male	3	16.7
Female	15	83.3
Age		
20-29	2	11.1
30-39	6	33.3
40-49	7	38.9
50-59	3	16.7
Ethnicity		
White	13	72.2
Hispanic or Latino	2	11.1
Asian / Pacific Islander	3	16.7
Educational Level		
Bachelor's degree	8	44.4
Master's degree	8	44.4
Doctorate degree	2	11.1
Years of Teaching Experience		
1-5 years	3	16.7
6-10 years	5	27.8
11-15 year	6	33.3
16+	4	22.2

Instructional Design Experts (IDEs)

The researcher sought help from her professor to connect her to prospective IDEs to evaluate the product. These IDEs were graduates of the MSIDT program at University of California, Fullerton. Out of the 3 IDEs invited, only one responded. Please refer to Table 2 below for more information about the IDE.

The researcher reached out to the IDEs, the same way as the SMEs. An email invitation was sent containing internet links to the e-learning product and evaluation form. The IDE emailed the researcher that she did not use Twitter as part of the learning activity. IDE accessed the e-learning via the internet.

Before the invitation to evaluate the e-learning product, the researcher wrote a letter to the MSIDT office requesting an exemption of the review process from the CSUF institutional review board (IRB). In the written message, the researcher explained that quantitative data collection method was necessary to gather feedback and use of that improves the e-learning product. The results of the evaluation will only appear in the researcher's master's project and as such will not be generalizable to other situations.

Table 2

Demographics of Instructional Design Expert

Descriptor	*n*	*%*
Gender		
Female	1	100
Age		
20-29	1	100
Ethnicity		
African American or Black	1	100
Educational Level		
Master's degree	1	100
Years of Instructional Design Experience		
1-5 years	1	100

Target Audience

The target audience for this e-learning course consists of K-8 teachers at the researcher's school site. These teachers used mobile devices (iPad) for teaching in the classroom. They were adult professionals with varying degree and skill in integrating technology into their teaching. Recently hired teachers, age mid 20's to 30's, were adept in the use of technology while longtime teachers in the school use technology sporadically in the classroom. Many of these teachers lack the time and resources to engage in meaningful professional learning because they were busy with administrative school work. Often, they need just in time resources on how to use an application to enhance teaching. They were willing to learn but need access to resources to help them

start. The faculty was the primary beneficiary of the proposed e-learning product to support ongoing professional learning in technology integration.

Instruments

As mentioned in the research design, this study took a quantitative approach to gather data to improve the e-learning product. “Quantitative analysis deals with data that uses mathematical operations to investigate the properties” of the e-learning product (Walliman, 2011, p. 113). The online survey consists of “closed format questions (with a fixed set of choices) and open format questions (open-ended)” (p. 97-98) to gather the opinion of the SMEs and IDE about the product design. There were two sections in the survey: (a) participants demographics, and (b) e-learning product design. The evaluation questions were adapted from Alessi and Trollip’s (2001) work with modification and omission of non-pertinent items. The researcher supplemented this evaluation tool with Pappas’ (2017) post e-learning evaluation instrument. Survey questions focused on the e-learning product’s content, interface, navigation, multimedia, interactivity, assessment, and overall satisfaction. Open-ended questions were added to each section to help qualify respondents’ answer.

Google Form was used to create a 5-point Likert scale so respondents can rank product design quality from low to high or agree or disagree on certain aspects of the design. The odd-numbered choices allow for simplicity and provide a mid-point appealing to respondents (Losby & Wetmore, 2012). The mid-point comes in the form of

"Uncertain." The scale has numeric values assigned to allow for statistical analysis. IBM SPSS software was used to analyze the data. A sample evaluation form was provided in Appendix D.

Procedures

The e-learning product resides on the server owned by the researcher. Respondents can access the e-learning on any computer, tablet, and mobile phone with Internet connectivity. It was distributed via an email link. The following steps were performed in administering the survey:

1. The researcher wrote a letter inviting respondents to evaluate the e-learning prototype. The letter included an overview of the prototype, instructions, web links to the e-learning and survey, and the timeframe respondents were expected to complete it.
2. The researcher secured permission from the school principal before disseminating the invitation to the SMEs to evaluate the prototype. At the same time, the researcher reached out to her professor via email to asked for resource IDEs to evaluate the project.
3. When permission was granted and email contacts of IDEs were received, the researcher sent the letter and survey information to both SMEs and IDEs via email.

4. The researcher sent a thank you note to all those who responded and evaluated the e-learning product.
5. After a week, the researcher sent another email to follow-up those who have not responded yet to ensure timely collection of data.
6. When the survey cut-off date has expired, the researcher sent a thank you note once again to those who responded.
7. The researcher began the process of data analysis using IBM SPSS software to find out the strengths and weaknesses of the design and use those feedback for improvement.

Data Analysis

A parametric descriptive statistical analysis was used to "reveal the shape of the data in the sense of how the values of a variable are distributed" (Walliman, 2011, p. 116). In finding out the demographics or profile of the respondents, the researcher used IBM SPSS software to generate descriptive statistics for both SMEs and IDE data. Fifty-eight percent of the total SMEs responded to the survey compared to only 32% for IDE. Eighty-three percent of the SMEs were female, and 17% were males. The lone IDE respondent was a female. Half of the SMEs had master's degree in education and two with a doctorate. The IDE had a master's degree as well. Most of the respondents were Whites, followed by Asian Americans, Hispanics and an African-American. Fifty five percent of the SMEs have been teaching for more than 11 years while 45% were teaching

between 1-10 years. The IDE respondent has been in the instructional design field for 1-5 years. This data reveals how valuable the respondents' insights were considering their knowledge and experience in the field of education and instructional design.

In like manner, the same descriptive statistics were used to analyze respondents' view of the e-learning product design. A quick analysis of the responses revealed respondents favored the short format of the course, training format can very well fit in their schedules, the content was an exceptional resource on learning how to infuse technology into teaching, and videos were helpful in learning a concept. On the downside, a majority of the respondents find the use of graphics background too busy and white text hard to read. Assessments were confusing to some respondents and lacking feedback to inform the learners if they were successful or not. Mixed reviews emerged regarding navigation and course objectives. SMEs expressed satisfaction with navigation while the IDE commented some buttons disappeared that made it hard to navigate. SMEs commented that lesson objectives were clear and measurable, but the IDE thought few objectives need specificity and tell how learners understand the lesson through feedback. Responses to open-ended questions were analyzed based on similarities of opinion. The researcher coded similar response to a category and then summarized it. A detailed explanation of the finding was discussed in Chapter 5.

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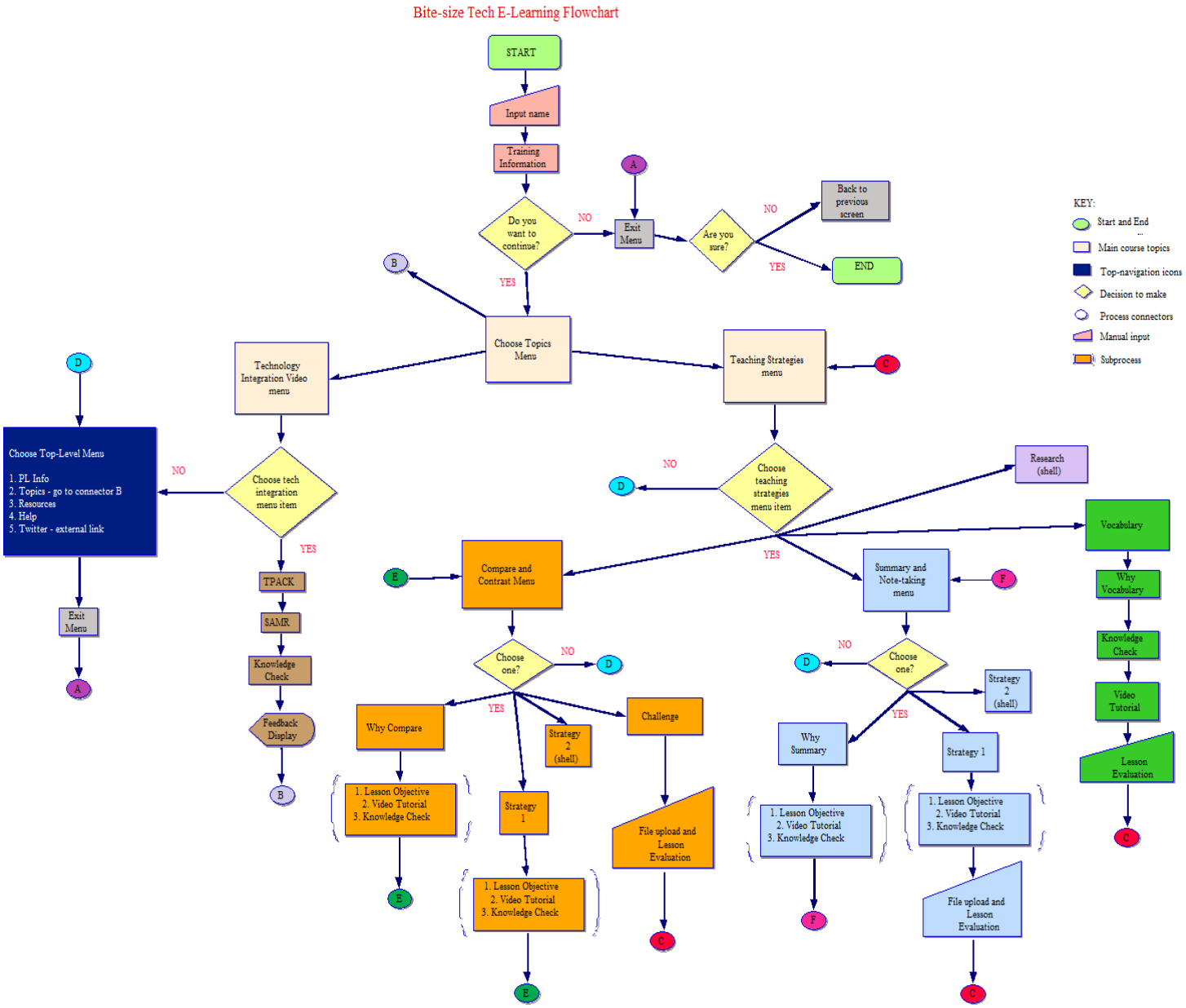
Appendices

Appendix B

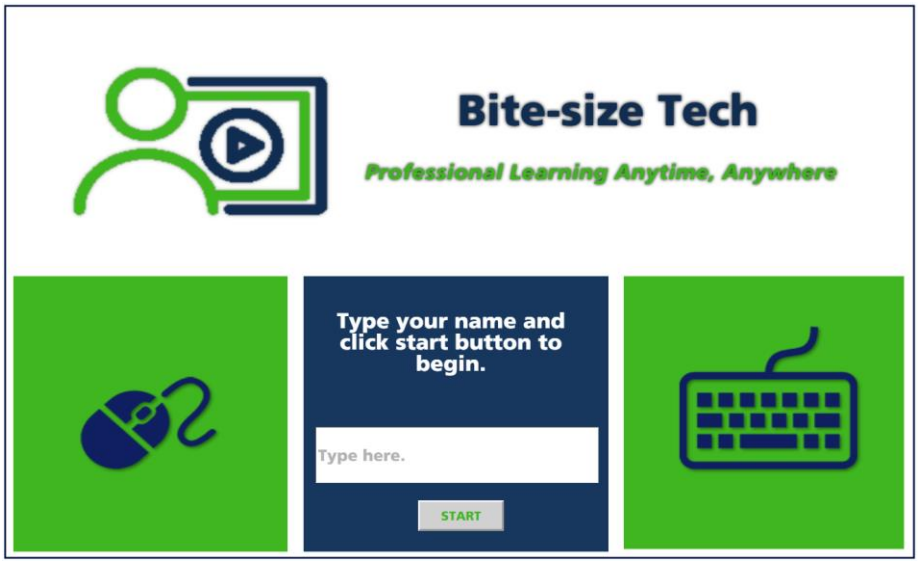
Bite-size Tech Flowchart



Appendix I

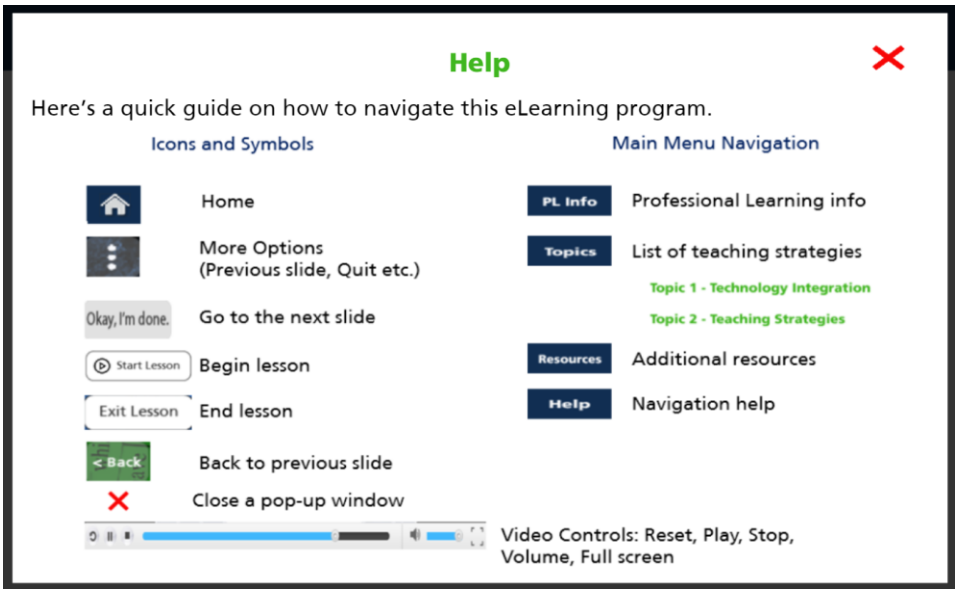
BITE-SIZE TECH E-LEARNING SCREENSHOT

Title Screen

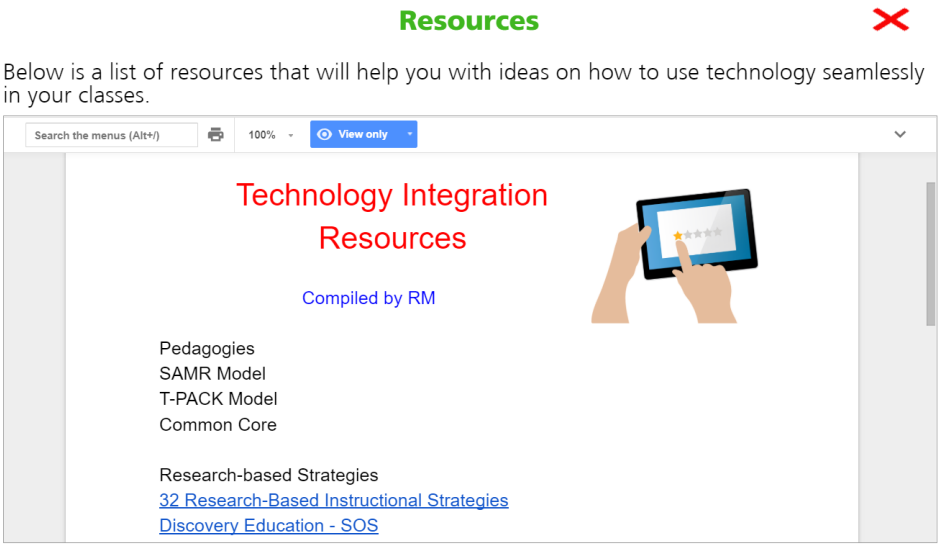


Auxiliary Information – PL Information

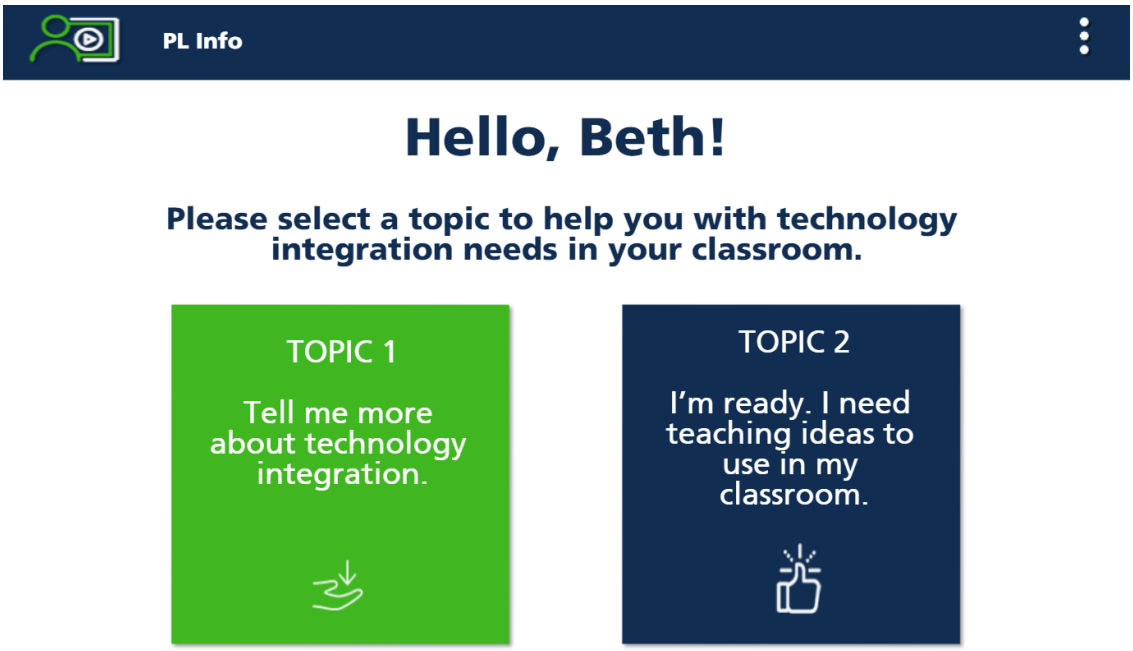
Auxiliary Information – Help Page



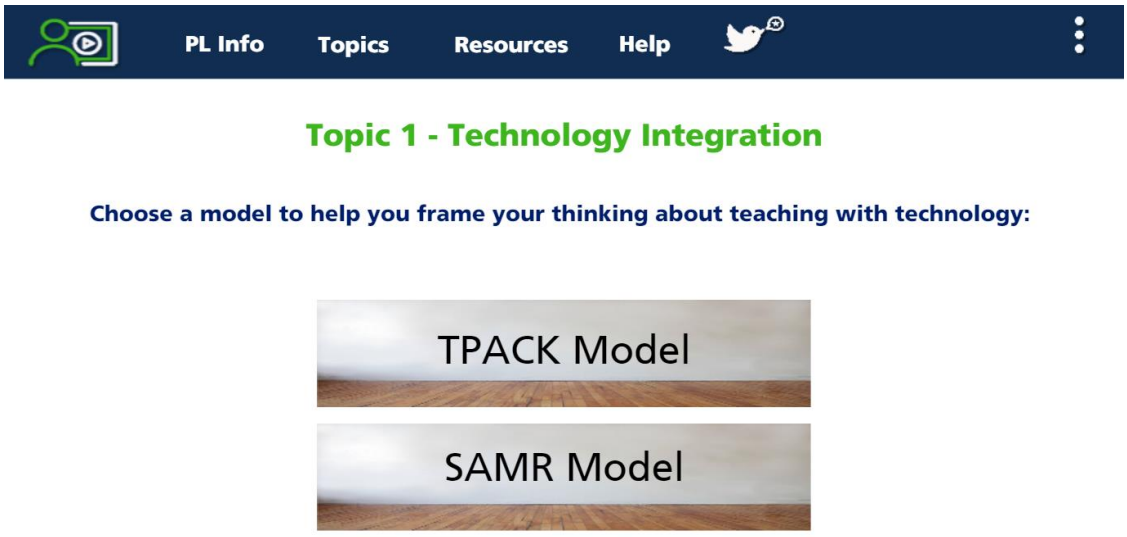
Auxiliary Information – Resources Page



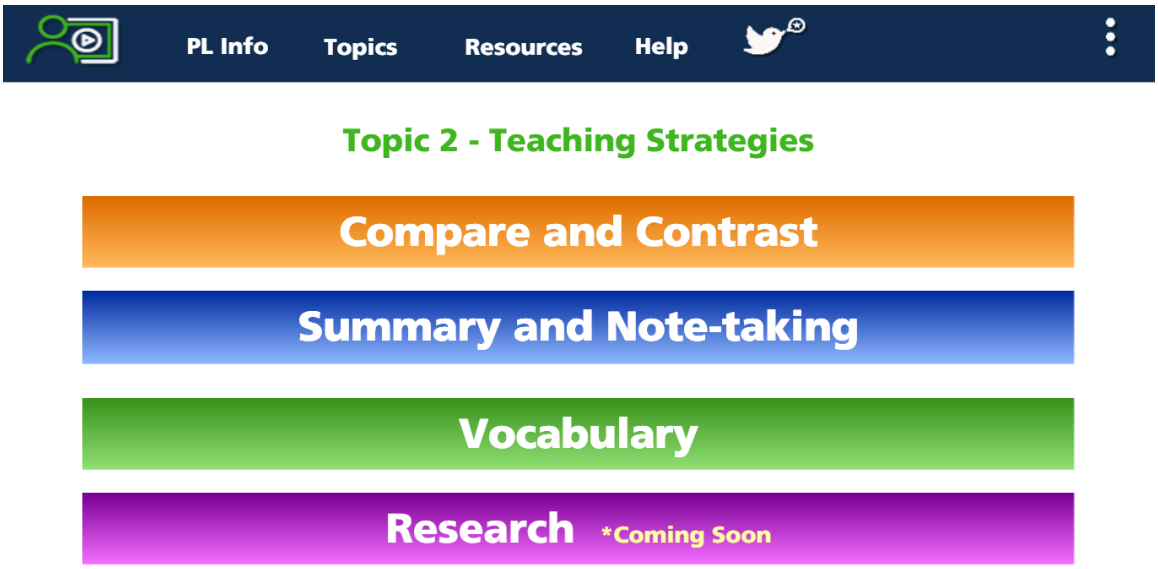
Main Menu



Topic 1 Menu

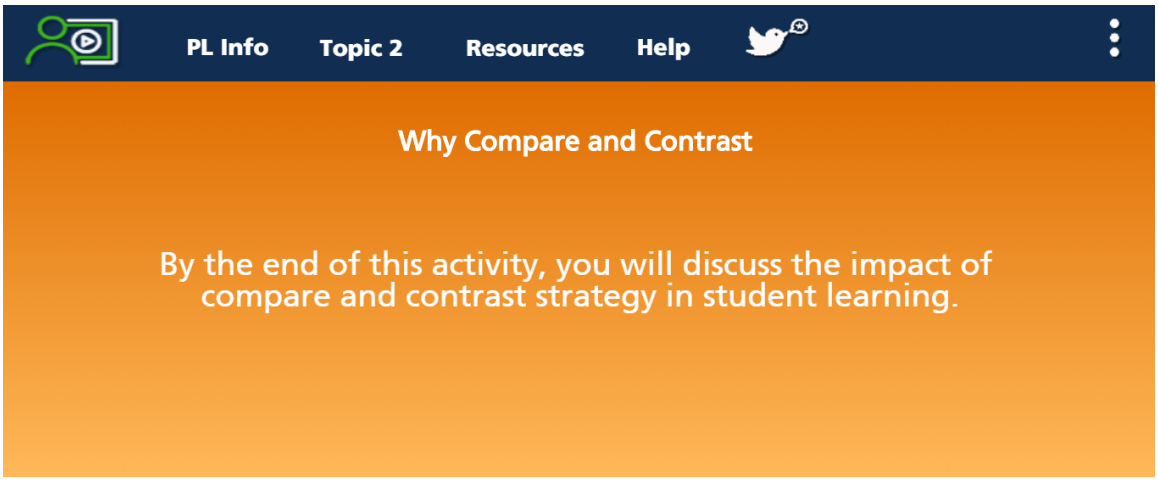


Topic 2 Menu

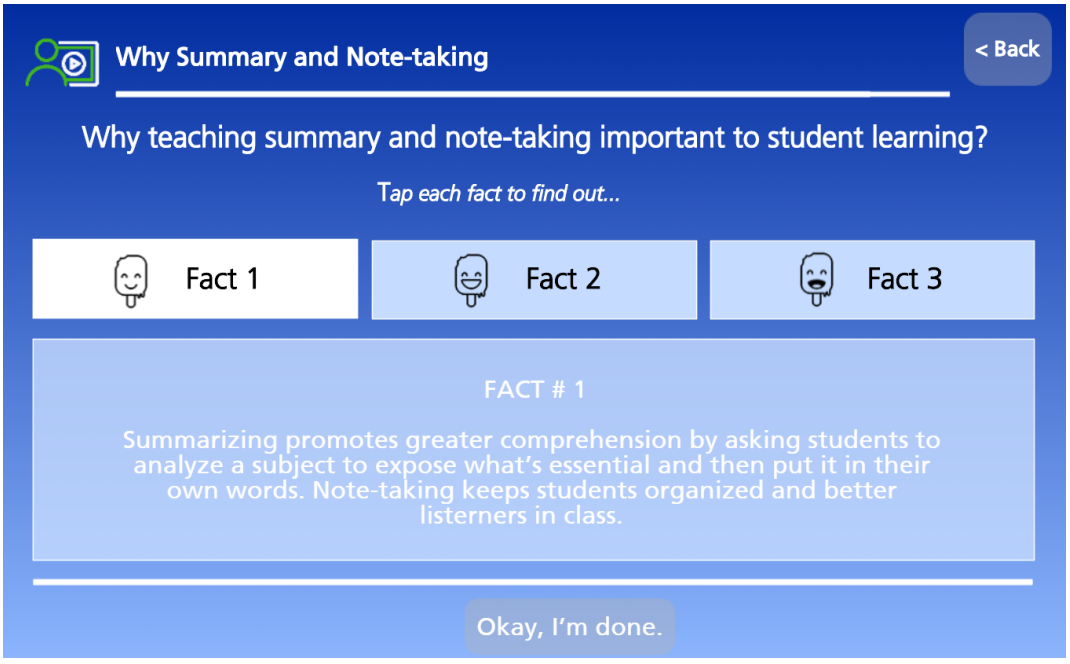


Topic 2 Lesson Contents

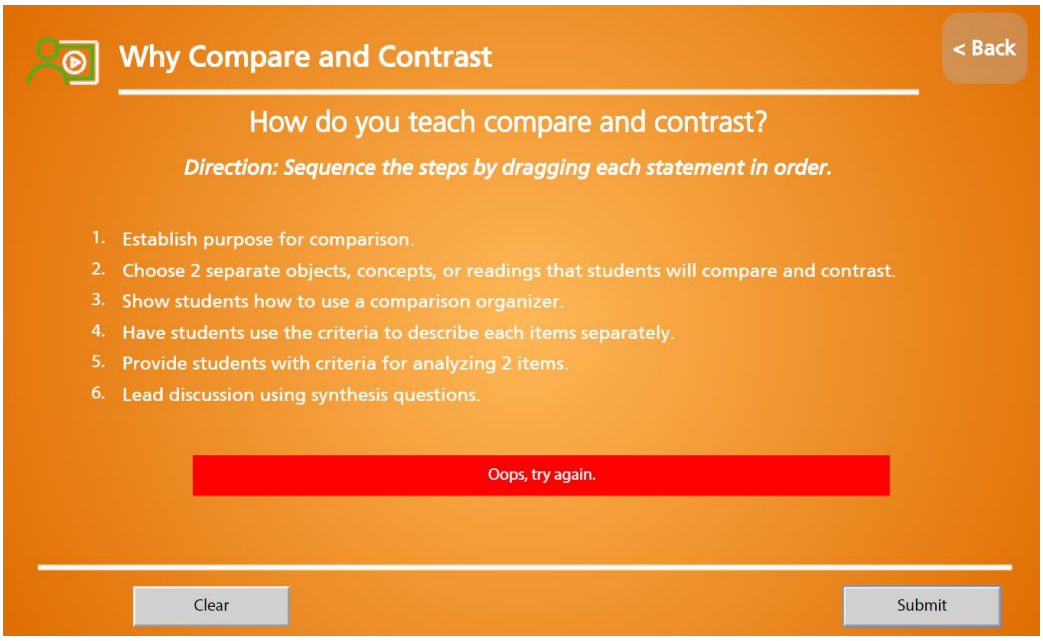
Lesson Objective



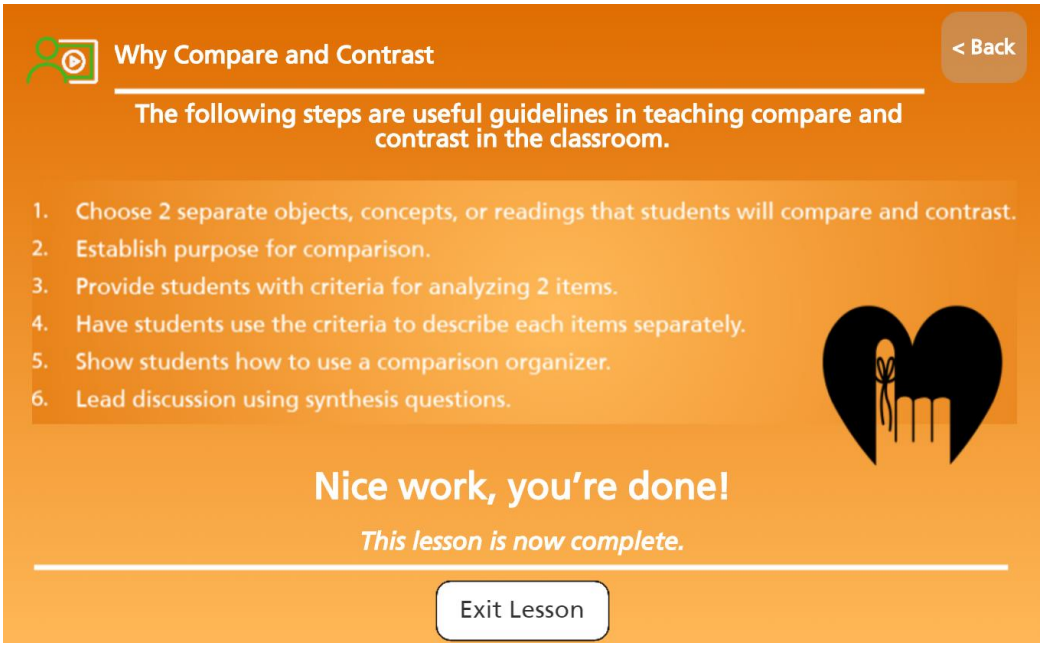
Instructional Interactivity – Click Reveal



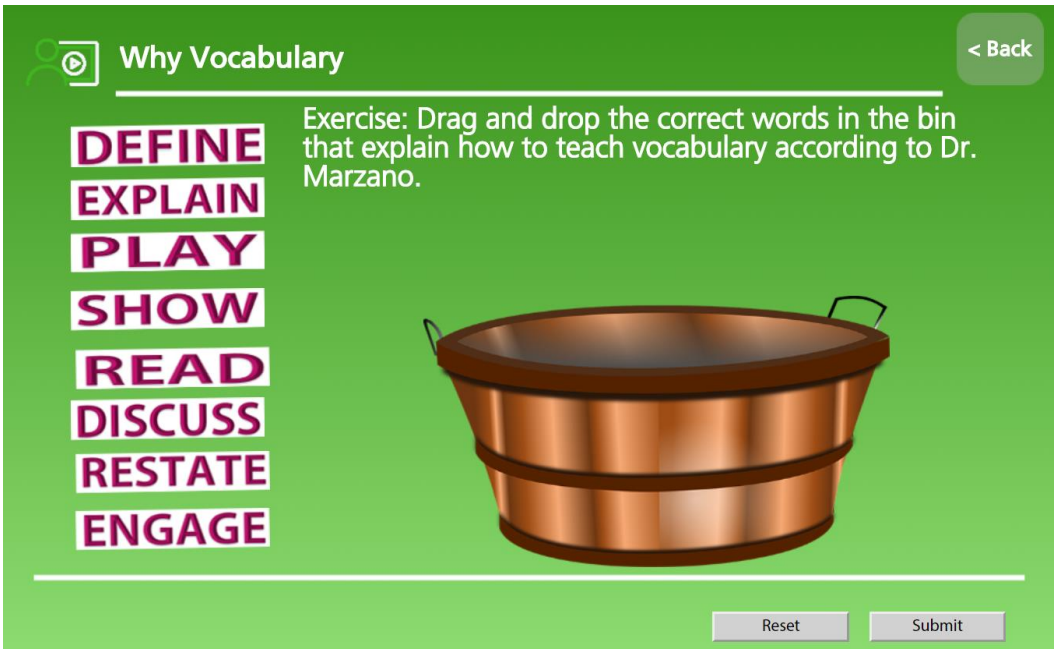
Instructional Interactivity – Sequencing



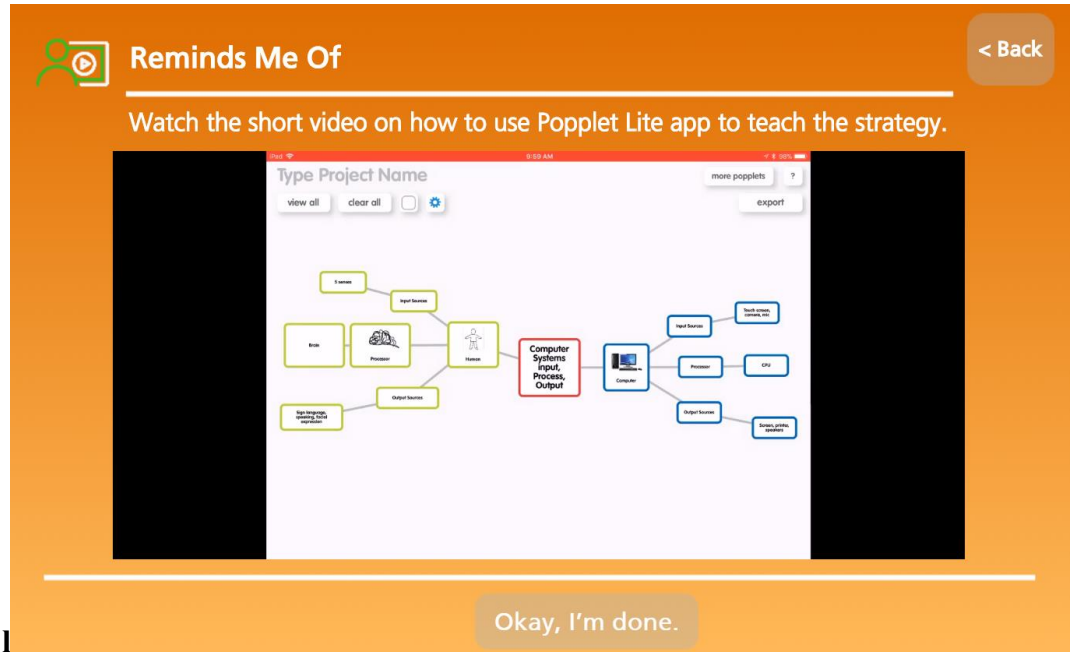
Sequencing Feedback



Instructional Interactivity – Drag and Drop



Video Tutorial



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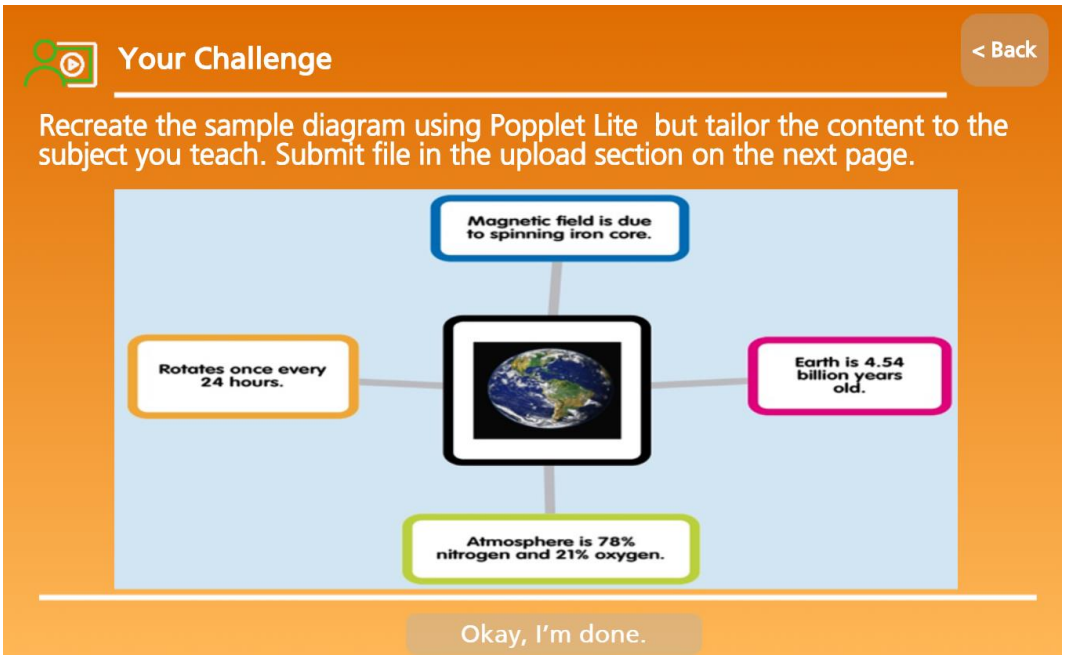
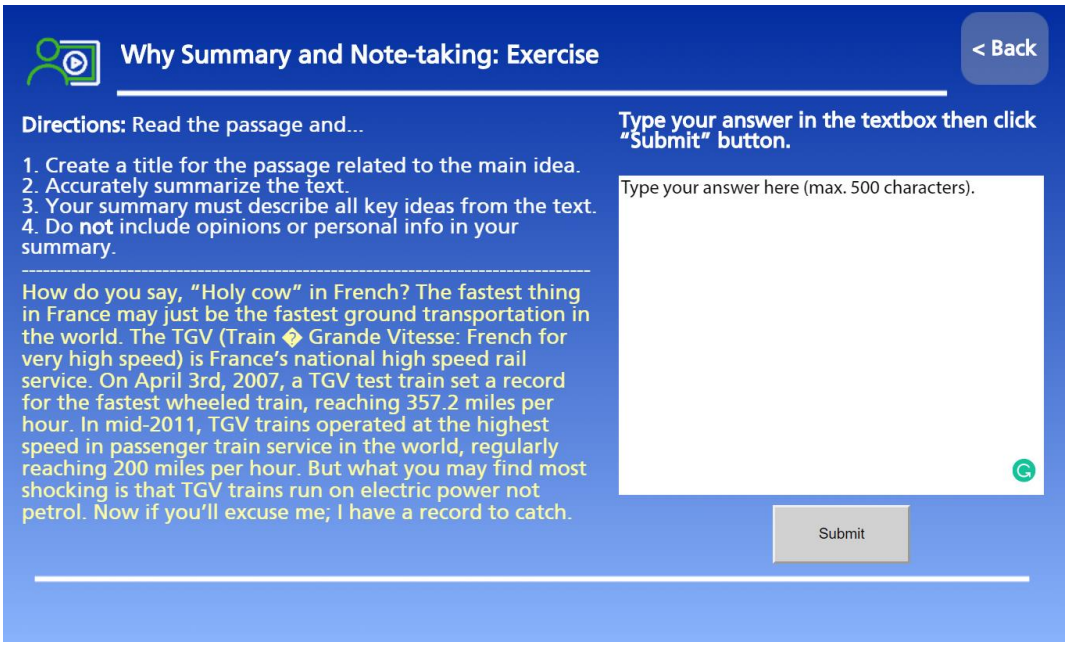
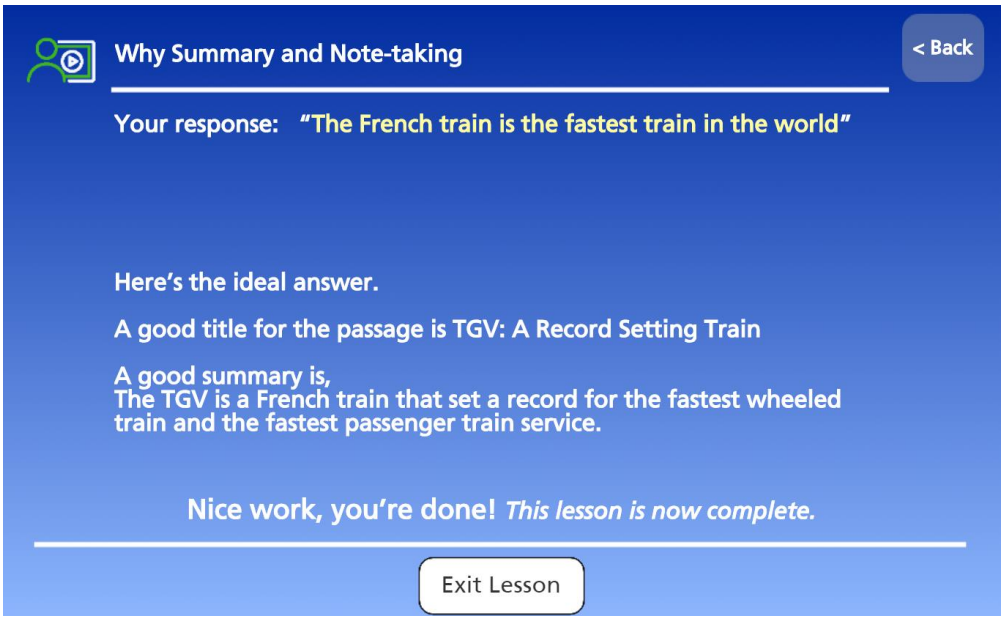
Skill Application Exercise - Popplet Lite Practice



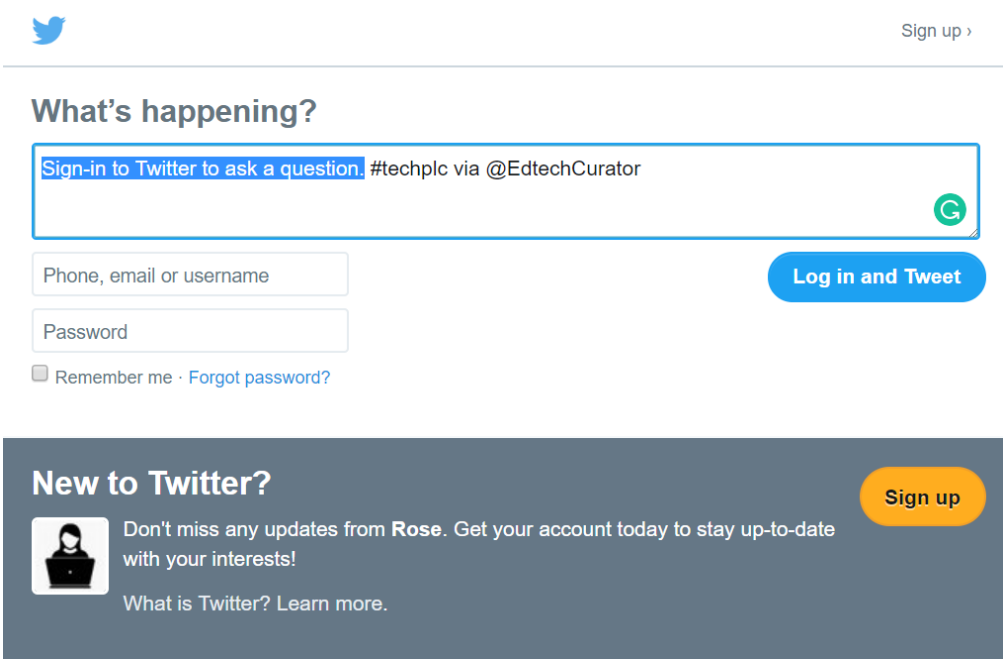
Skill Application Exercise – Writing a Summary



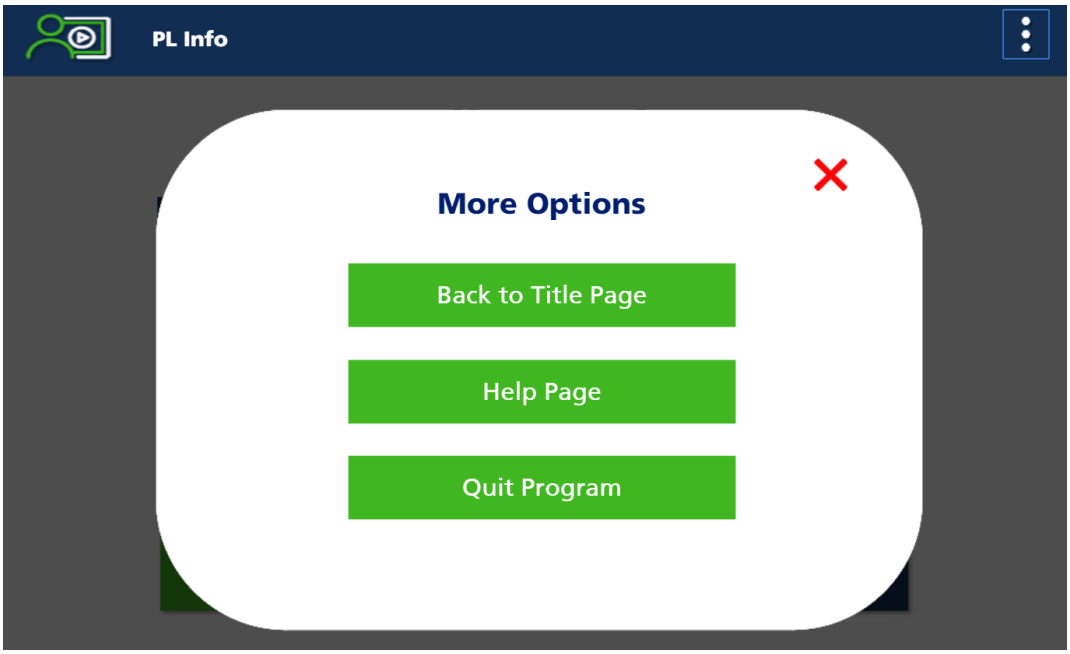
Skill Application Exercise – Summary Feedback



Twitter Discussion (Optional)



Pop-up Navigation



System Exit Option