2023

EVALUATING MICROLEARNING STRATEGIES IN THE CORPORATE ENVIRONMENT: A COMPARATIVE MIXED METHODS STUDY USING THE KIRKPATRICK MODEL

Megan Laird Reynolds
University of Kentucky, megan.laird15@gmail.com
Author ORCID Identifier:
https://orcid.org/0009-0004-2560-3825
Digital Object Identifier: https://doi.org/10.13023/etd.2023.413

STUDENT AGREEMENT:

I represent that my thesis or dissertation and abstract are my original work. Proper attribution has been given to all outside sources. I understand that I am solely responsible for obtaining any needed copyright permissions. I have obtained needed written permission statement(s) from the owner(s) of each third-party copyrighted matter to be included in my work, allowing electronic distribution (if such use is not permitted by the fair use doctrine) which will be submitted to UKnowledge as Additional File.

I hereby grant to The University of Kentucky and its agents the irrevocable, non-exclusive, and royalty-free license to archive and make accessible my work in whole or in part in all forms of media, now or hereafter known. I agree that the document mentioned above may be made available immediately for worldwide access unless an embargo applies.

I retain all other ownership rights to the copyright of my work. I also retain the right to use in future works (such as articles or books) all or part of my work. I understand that I am free to register the copyright to my work.

REVIEW, APPROVAL AND ACCEPTANCE

The document mentioned above has been reviewed and accepted by the student's advisor, on behalf of the advisory committee, and by the Director of Graduate Studies (DGS), on behalf of the program; we verify that this is the final, approved version of the student's thesis including all changes required by the advisory committee. The undersigned agree to abide by the statements above.

Megan Laird Reynolds, Student

Dr. Kun Huang, Major Professor

Dr. Ryan Crowley, Director of Graduate Studies

EVALUATING MICROLEARNING STRATEGIES IN THE CORPORATE ENVIRONMENT: A COMPARATIVE MIXED METHODS STUDY USING THE KIRKPATRICK MODEL

DISSERTATION

A dissertation submitted in partial fulfillment of the
requirements for the degree of Doctor of Philosophy in the
College of Education
at the University of Kentucky

By
Megan Laird Reynolds
Lexington, Kentucky
Co- Directors: Dr. Kun Huang, Professor of Learning Design & Technology
and Dr. Gerry M. Swan, Professor of Instructional Technology

Lexington, Kentucky
2023

https://orcid.org/0009-0004-2560-3825

ABSTRACT OF DISSERTATION

EVALUATING MICROLEARNING STRATEGIES IN THE CORPORATE ENVIRONMENT: A COMPARATIVE MIXED METHODS STUDY USING THE KIRKPATRICK MODEL

Corporate training and development, despite their significance as primary learning strategies for adults, have received limited research attention. This study addresses this gap by evaluating and comparing the effectiveness of video-based and digital job aid procedural-based microlearning in a corporate setting, utilizing most of the Kirkpatrick Model: learner satisfaction, knowledge retention, and behavior change. Employing a mixed methods approach to gain a comprehensive understanding of microlearning's application and potential for improving business outcomes, the study incorporates pre- and post-tests, participant interviews, and self-reported questionnaires. Thirty participants completed the study, with equal representation (15 participants each) for both modalities, and interviews were conducted with 10 participants from each group. The results reveal that the type of microlearning treatment does not significantly impact knowledge retention, while the time elapsed since learning does influence retention. Additionally, the modality of the microlearning treatment may impact behavior change, although further investigations are necessary to examine the role of bias related to treatment preference and individual roles. Further findings indicate that participants favored a mixed modality microlearning approach for corporate training needs, involving initial training through videos and follow-up reference material through job aids. Furthermore, participants preferred knowledge evaluation methods such as quizzes or application-based assessments to apply and evaluate their understanding of the content.

Future research should explore the impact of microlearning strategies on Key Performance Indicators (KPIs) in a business context, as well as the relationship between application-based training and knowledge transfer. Additionally, investigating the influence of peers and supervisors on behavioral change, as well as the impact of content management on cognitive load, would be valuable. Ultimately, this research seeks to bridge the gap between educational theory and practical implementation for instructional or learning designers and training, development, and/or enablement leaders, empowering them to make informed decisions regarding business practices and learning modalities.

KEYWORDS: Microlearning, corporate training and development, content management, procedural learning, Kirkpatrick Model

Megan Laird Reynolds

(Name of Student)

September 15, 2023

(Date)

EVALUATING MICROLEARNING STRATEGIES IN THE CORPORATE ENVIRONMENT: A COMPARATIVE MIXED METHODS STUDY USING THE KIRKPATRICK MODEL

By
Megan Laird Reynolds

Dr. Kun Huang

Co-Director of Dissertation

Dr. Gerry M. Swan

Co-Director of Dissertation

Dr. Ryan Crowley

Director of Graduate Studies

September 15, 2023

Date

DEDICATION

To my husband, family, friends, and the many others who have encouraged me along the way.

ACKNOWLEDGMENTS

The following dissertation, while an individual work, benefited from the insights and direction of several people. I am profoundly grateful and honored to have the opportunity to acknowledge the remarkable individuals who have contributed to the completion of this dissertation. Their unwavering support, guidance, and encouragement have been invaluable throughout this journey.

First and foremost, I extend my deepest gratitude to Dr. Huang and Dr. Swan, my Co-Directors of Dissertation. Your exceptional mentorship, guidance, and leadership have been instrumental in shaping the direction and quality of this research. Dr. Huang, your dedication to my progress over the years, through countless one-on-one sessions and thoughtful discussions, has been truly transformative. Your insights and unwavering belief in my potential have propelled me to reach new heights, and for that, I am truly grateful.

To my beloved husband, wonderful family, and amazing friends: your constant encouragement, support, and boundless love have sustained me through the highs and lows of this academic pursuit. Your understanding and patience during late nights and countless hours of research are deeply appreciated. Your unwavering belief in my abilities has been a source of strength, and I am grateful beyond words for your presence in my life. I would also like to extend my heartfelt appreciation to my dear friends who proofread and provided feedback. Your dedication in reading every page of this study, providing invaluable feedback, and offering meticulous editorial reviews have elevated the quality of this work. Your commitment to my success is a testament to our enduring

friendship, and I am thankful for your guidance and support. Finally, I am indebted to the remarkable study participants who responded to my numerous requests and generously shared their time, insights, and experiences. Your willingness to engage in this research and provide valuable perspectives has enriched the depth and significance of this work. Your support and camaraderie along the way have been a constant source of motivation.

In closing, this dissertation would not have been possible without the collective efforts of these extraordinary individuals. Their contributions have shaped the trajectory of my academic journey and have left an indelible mark on my personal and professional growth. I am humbled and grateful for their unwavering support, and I look forward to carrying forward the knowledge and experiences gained during this endeavor.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER 1. INTRODUCTION

1.1 Background

Learning is a proven element of life. It is documented in stories, whether fact or fiction; from Newton learning about gravity from the fallen apple to Benjamin Franklin learning about electricity from the lightning bolt and his kite. Or on a more personal level, the moments that a child practices mathematical problems or when an adult realizes they mistakenly used salt instead of sugar for their baked goods. Over the years, our understanding of how people learn has evolved, as reflected in well-known theories such as behaviorism, cognitivism, and constructivism. These theories are now being further defined through concepts like connectivism or humanism, which emphasize the role of technology, networks, and the learning environment (Dunaway, 2011).

As technology advances, learners' needs evolve, compounded by the "abundance of resources in the open and social Web." This abundance has created unprecedented learning opportunities (Sangrá et al., 2019, p. 1620). Learners now have a wide range of choices for their learning experiences, further amplified by their environments. The shift from in-person to hybrid (blending in-person and remote) learning environments expands the available learning formats, including print, video, images, text, GIFs, and more (Sangrá et al., 2019). By accessing materials of various modalities, learners can create individualized learning paths and networks to achieve their self-defined learning goals.

They can now learn anytime and anywhere in the world (Sangrá et al., 2019; Dunaway, 2011).

While these formal and informal learning opportunities are readily available to adult learners, they are also consistent with the types of training methods and resources that are provided in a corporate training and development strategy. However, providing employees with a large number of resources on diverse topics can lead to cognitive overload, leaving them frustrated and unsure about where to start, what to do, and how to connect the information (Reed et al., 2017). This challenge is particularly pronounced when employees must assess the relevance and accuracy of the information (Reed et al., 2017). Moreover, the increase of millennial and subsequent generation employees, who are accustomed to accessing content on-demand, necessitates that training and development organizations adapt to remain relevant and meaningful (Dolasiniki & Reynolds, 2020). While some companies attempt to streamline information into well-designed courses or curricula, others adopt a model that offers learners shorter, more relevant, easily connected, and consumable learning content in the form of "bite-sized" modules known as microlearning (Torgerson & Iannone, 2020).

To meet evolving performance expectations with limited resources, time, and a dynamic corporate setting where content can become outdated quickly, organizations are embracing microlearning. Microlearning consists of short bursts of training, lasting no longer than 20 minutes in a single session, which can be integrated into employees' workflow (Dolansiniki & Reynolds, 2020). These experiences provide employees with just-in-time learning that aligns with their immediate needs and the adaptive nature of the

business (Dolansiniki & Reynolds, 2020). Despite the growing adoption of microlearning by many companies, there is limited academic research to support evidence-based practices, resulting in adoption inconsistencies and illogical fallacies (Dolansiniki & Reynolds, 2020).

Wen and Zhang (2015) conducted research on "micro-lectures" in the form of a microlecture mobile learning system (MMLS), demonstrating positive results. Similarly, Mohammed et al. (2018) found that microlearning had a significantly positive impact on learners, albeit in studies conducted with collegiate and primary students, respectively. These findings may not be directly applied to corporate learners due to their differing needs and backgrounds. The lack of visible research tailored to a similar population hampers the strategic deployment of microlearning training by corporate training and development organizations. Without such research, these organizations cannot be certain that microlearning content or strategies adequately address employees' needs and promote behavior change. This uncertainty is exemplified in the following story of a training and development organization seeking to change its learning strategy.

1.2 Statement of the Problem

The sales training team for Global Sellers United has grown exponentially in the past 10 years. While the team was originally organized directly under Human Resources (HR) in the first few years of growth, the business recognized the organization's impact on sales: higher productivity, increased revenue, increased job satisfaction, and reduced attrition rates. As the organization began to grow, so did the headcount and budget to create effective learning solutions.

Maeve, the Director of Sales Training at the organization, was recently hired into her role. She spent time auditing the current model of training and found that there are over 400 courses in the Sales Training catalog, and on average the courses are 5.25 hours long and are lower in satisfaction than she would have expected from her team's products. She continued to dive deeper into the surveys and saw trends in the feedback from the sellers:

- The courses are too long
- The information came too late
- There were no relevant or quick-to-read additional resources
- The resources were hard to find and organize
- The information was old

As the Director of Sales Training, Maeve then prioritized talking with the learning designers - *what data or feedback is driving the team to build these courses, which do not seem to be creating much value*, she thought. As Maeve conducted some initial interviews and focus groups with the designers, she recognized that many of them wanted to create shorter training that is more relevant and aligned with the seller's needs but are not quite sure how to do it efficiently or how it could be strategically deployed. In one of her calls, the newest Sales Training Manager, Raashid, shared that he recently received an email from the training and development professional group suggesting all members

register for a microlearning webinar and it might be worthwhile. He happily agreed to report back his findings to Maeve.

In this webinar, the host shared how their company adopted a microlearning strategy: the program goals, training learning objectives, the course sequence or curriculum, the design process, and overall learner satisfaction. The presenter shared they chose this strategy because they kept creating courses that were too long and irrelevant and it had to be stopped. This sparked joy in Raashid, as he was able to see how microlearning could potentially be the right fit for their problem. He connected with the speaker after the event to request the research they used as the foundation for their program; Raashid was in disbelief when the speaker said little to none, they were just asked to present based on their experience and personal ties to the training organization. After hearing Raashid's passion for microlearning, Maeve asked him to do more formal research that she could use to devise a strategy and provide designers with evidence-based practices they can use in this new model. She asked him to create an initial perspective for their organization:

- What educational or psychological theories and frameworks support microlearning?
- What are the types of microlearning?
- Where has microlearning been used in other companies?
- What were the results of these efforts?

- What could this look like for our learner personas and our company?
- How could we evaluate the training program(s) or microlearning moments?
- Is there a framework for development we could adopt and adapt for our team?

Despite his best efforts, Raashid came up short. He noticed limited research conducted in a corporate environment, as most of the studies for adult learners were conducted in a higher education environment. While these studies may have been conducted on adults, they are not always applicable, as corporate learners have unique characteristics that make designing quality learning and learning experiences much more complex such as time restraints, cultural relevance, personalized needs, role clarity and skilling, a variety of tools and processes, and many more. After scavenging through the industry professional development groups, he realized that blog posts and white papers highlight how some organizations have adopted microlearning, but they are superficial at best; the white papers may describe the method of delivery, but they lack clear articulation of the impact on the learners and even the business and sometimes feel like attempts to sell products rather than a strategy. Additionally, the papers only articulate immediate knowledge retention, leaving Raashid questioning if the knowledge sticks past the immediate course assessment or even changes their working behaviors.

He used the “search” function on multiple industry pages to find any relevant information on microlearning, and all he found was a series of repeated bloggers sharing the excitement of microlearning and how it could change the industry with relatively no data or formal research to support their claims. As he continued searching, he only found

a couple of formal studies that adopted Kirkpatrick's Model (Boring, 2020; Kirkpatrick Partners, LLC, 2022). Ultimately, it became evident that much of the research is not formally using valid research methods to evaluate learner satisfaction, knowledge retention, and behavior change, or quantifying return on investment. While initially scared to report his findings back to his director, he realized the opportunity the sales training team had in front of them. They could begin to shift their design efforts towards microlearning and formally evaluate the experiences based on the Kirkpatrick Model to better understand how microlearning can be created, deployed, and consumed. They aimed to answer the question: what is the impact of microlearning?

While this story may include fictional company names and characters, it is representative of the unique challenges the industry sees today. As the industry shifts to adopt more needs-based or microlearning training, few research studies provide insight into evidence-based practices in a corporate environment. Without these, training and development organizations continue to create training programs that may perform fairly well, but still fall short of their capabilities and can prove adverse to the satisfaction of the employee (learner). Ultimately this drives the continuous need to iterate on programs that are not meeting the needs of their learners, which in turn costs money, time, and still may not provide the return on investment initially hoped.

1.3 Purpose of the Study and Research Questions

The purpose of this study is to explore standalone microlearning experiences in the corporate environment and aim to understand their impact on employee (learner) satisfaction, behavior change, and knowledge retention, following the framework of the

Kirkpatrick Model for training evaluation (Kirkpatrick Partners, LLC, 2022). The origin of the research problem resides in the lack of empirical evidence in corporate environments using microlearning, which impacts the ability of learning (instructional) designers to craft meaningful and impactful microlearning experiences in the workplace. This study was designed to investigate further the impact of specific types of microlearning experiences in a sales organization for enablement operations to learn and use evidence-based practices in their environments.

1.3.1 Research Questions

This research was aimed at answering the question: to what extent do two modalities of microlearning – digital job aids and demonstration videos – compare regarding

- Learner satisfaction?
- Knowledge retention?
- Behavior change?

This study is situated within a sales company for sales representative training and development. Designed to evaluate the training based on three out of the four levels within the Kirkpatrick Model (learner satisfaction, knowledge retention, behavior change, business results), this research study uses the mixed methods case study approach to evaluate multiple dimensions and illustrate the influences of microlearning, treatment types, and the world around the population concerning their training satisfaction,

knowledge retention, and behavior change (Creswell & Plano Clark, 2017). This research takes place over three weeks, in which participants will experience a pretest, a microlearning learning treatment in the form of a digital job aid or demonstration video, followed by interviews to determine learner satisfaction, and additional post-tests (2). and behavior change self-evaluation (1).

1.4 Methods

As stated, this research was guided by a question with multiple parts to represent part of the Kirkpatrick Model. This study is conducted in a sales company for sales representative training and development. Designed to evaluate the training based on the levels of learner satisfaction, knowledge retention, and behavior change, this research study uses the mixed methods case study approach to evaluate multiple dimensions within a three-week timeframe using interviews, assessments, and self-reported questionnaires. Week one includes a pretest, treatment, and an immediate post-test (the same questions, but shuffled). Upon completion of post-test 1, participants were asked to attend an interview to detail their satisfaction with the training material. Between weeks 2 and 3, participants were requested to complete the final post-test and the behavior change questionnaire. The purposeful sampling model is used in this study to find individuals who do not have experience with the tool used in the microlearning training experience. However, these individuals were collected at random, as they are not required to participate in the study, thus invoking the nonprobabilistic sampling, or volunteer sampling, approach as well (Creswell & Plano Clark).

There are two treatments provided in this study: a digital job aid and a demonstration video outlining the process for the usage of an internal selling tool. This is a proprietary tool the company encourages sellers to use as they conduct discovery on their customers. They can use the app to select appropriate customer questions to uncover pain points and needs. Both treatments had the same learning objectives:

1. Describe the value of the internal selling tool and when it should be used.
2. Access the internal selling tool.
3. Navigate basic features: sales org connectivity and discovery question selection.
4. Identify the use cases for particular discovery question sets.

Furthermore, both the job aid and demonstration video are housed on internal business platforms that are cloud-based storage and readily accessible by the population.

The treatments were required to be designed through the rigorous SAM and participatory design approach, including review by specialists, to meet the needs of the diverse learners and increase reliability and validity. The treatments of this study have few requirements, but were in ordinance with the definition of microlearning; the microlearning experience, regardless of the modality, is defined as a standalone and passive training that is less than 10 minutes in length. This definition can be further expanded to include particular learning design principles identified by Clark and Mayer (2016):

- Avoid irrelevant videos, animations, music, or other sounds
- Use simple, relevant, and meaningful visuals

- Use cueing devices such as color, arrows, or otherwise to direct attention to visuals
- Write or speak in a conversational style
- Place text near the corresponding visual or graphic

The description of each treatment and its alignment with the design principles discussed in the literature review are elaborated upon in the subsequent chapters.

1.5 Limitations and Assumptions

1.5.1 Limitations

The study participants include varying degrees of company tenure. Furthermore, this study uses a variety of sales roles in the study, which may skew results on behavior change, as the content may not be relevant to their particular daily job functions. Of the sample population, many participants failed to complete the study, which may have affected the internal validity and reduced the sample size for this study. Therefore, results have only been evaluated from participants who completed the study in its entirety. Additionally, the test questions provided did not have an "unsure" option to select, therefore the study did not determine the impact on correct guesses within the pre- and post-assessments. Furthermore, behavior change is self-reported, which has "evidence showing that self-report scales are not the best tools for obtaining information from a significant minority of the population, named repressors" (Saeedi et al., 2020, p. 76). Finally, the study is limited to including only three out of four of Kirkpatrick's training evaluation measures due to time constraints and data collection methods.

1.5.2 Assumptions

The researcher also assumes that behavior change can be quantified through a self-evaluation, which has "evidence showing that self-report scales are not the best tools for obtaining information from a significant minority of the population, named repressors" (Saeedi et al., 2020, p. 76). The researcher assumes the sample size was large enough to detect statistically significant results and the sample population is unfamiliar with the tool discussed in the training program. Additionally, participant motivation can be assumed due to a $25.00 gift card and career skill building. Finally, the population of participants was assumed to fit within one of the operational units categorized in the demographic section. Despite these limitations and assumptions, a formal study of this nature is needed to drive evidence-based practices in corporate training and development programs, and measures were taken to reduce their impact, through mixed-methods design and data qualification.

1.6 Definitions of Key Terms

This study investigates the impact of two differing stand-alone microlearning experiences in the form of a digital job aid and a demonstration video. A *microlearning experience* can be defined as the moment of content involved in a microlearning strategy. This study limits the microlearning experience to one piece of content, but microlearning experiences can incorporate multiple pieces of content at varying points in time. A *digital job aid* is a performance enhancement tool created and disseminated digitally that may be used "in the moment" of the learner's workflow and includes a sequence of procedural

steps, instructions, or directions and related images conveyed through text (Google Docs, Word Doc, Quip doc, PDF, etc.). This is similar to a *demonstration video,* which describes the procedures or directions, but instead uses audio narration and highlights the tool using screencasting technology.

1.7 Significance of the Study

The available research on the impact of microlearning in a corporate environment has remained limited despite the celebration of its success. Much of the documentation being provided is shared by industry organizations as shortened white papers, case studies, and even blog posts. This level of research is insufficient, as it lacks deeper insights into documenting the desired training methods in correlation or causation with educational theory, such as microlearning for strategic training and development efforts. Only recently have dissertations published microlearning studies, but not frequently in the corporate setting. This research is derived from my interest in corporate learning and strategic training and development interests. This study provides a more accurate picture of microlearning's impact on corporate learners and their satisfaction with these types of experiences. The current research on learning is often limited to higher education or the medical community. While providing an adoptable framework to the corporate environment, these studies are conducted on differing population demographics and personas that may not be applicable.

1.8 Conclusion

Companies look to training and development organizations to enable, upskill, reskill, or train new concepts that have a high return on investment (ROI) (State of the Industry 2021, 2021). Despite the need to incorporate evidence-based practices to have high ROI, there is limited empirical evidence concluding these training methods work in the applied setting. Regardless if backed by theories from years prior, companies do not have a full understanding of how training and development frameworks, content, or programs impact their employees, which assumes a large risk (Baan, 2013). Therefore, this study aims to evaluate an increasingly common buzzword – microlearning – in a corporate setting using three out of four levels within the Kirkpatrick Evaluation Model as the framework for the mixed methods approach. Assessments, interviews, and questionnaires are used within a three-week duration to illustrate the full understanding of how diverse microlearning treatment modalities (videos and job aids) influence learner satisfaction, knowledge retention, and behavior change.

This study expands on the current research, discussed in the subsequent chapter, to provide valuable insights on if microlearning can be a sufficient form of training to impact knowledge retention and behavior change while satisfying learners in the corporate environment. Through this study, insight into corporate enablement or training and development organizations should be considered to more strategically create relevant, enjoyable, and impactful learning experiences that improve overall employee and company performance.

CHAPTER 2. LITERATURE REVIEW

The intention of this literature review is to situate the research study into the world of corporate training, microlearning, multimedia instruction, and their respective literature gaps. This chapter is organized into three sections: corporate training, microlearning for corporate training, and instructional multimedia. Each of these sections is crafted to provide an overview of the environment, learning context, and treatment styles to provide background knowledge for the purpose and intended goals of the research study.

2.1 Corporate Training

Corporate talent and development training has evolved rapidly over the past 20 years to address the gap between a CEO's strategy and the execution of such (Stancampiano & Lambert, 2016). Now more than ever before, companies are promoting work-place learning to achieve their strategic goals and priorities and support the development of their personnel. Prior to the impact of the COVID-19 pandemic on learning— the cause of the heightened digital-first initiatives for many companies— online learning was on the rise. According to a benchmark report published by Bob Little (2016), 45% of corporate training sessions were online, with 90% of organizations using e-learning content. In four years, this rapidly changed; traditional face-to-face training dropped to only 40% in 2019, and more than half of all learning hours are delivered with technology-based methods (State of the Industry 2020, 2020). Of these learning hours, content can be divided into three primary categories: managerial and supervisory,

mandatory and compliance, and profession- or industry-specific content (State of the Industry 2020, 2020). However, this change is not isolated in the development and utilization of training or learning experiences but is also seen in the rapid change of the workforce environment, job descriptions, and the diverse population.

In 2019, the World Economic Forum estimated that 1.37 million workers in the United States may be reskilled into different roles, meaning that these employees will be embarking on a new role and developing nearly entirely new skills, tasks, and concepts or frameworks to work from or within (World Economic Forum, 2019). Additionally, technology is changing rapidly, causing businesses to shift and new jobs to be added (The future of work: Technology, predictions, and preparing the workforce, 2019). The COVID-19 pandemic only exacerbated these changes and challenges, to the point that a leading CRM company, HubSpot, identified "adjusting to an uncertain post-COVID world" and "struggling productivity in the face of uncertainty" as two of their top six sales challenges facing salespeople in 2021 (Fuchs, 2021). Thus, not only are employees challenged by the potential of their role changing or adopting a novel role, they are challenged by mastering productivity in the transformation to a post-COVID world alongside the traditional challenges of the adult learner.

2.1.1 Characteristics of Corporate Learning Contexts

While corporate learning has historically included traditional training formats (classroom training), the COVID-19 pandemic has increased the need for diverse and virtual training formats (State of the Industry 2021, 2021). However, the need for training did not reduce, therefore other modalities of training had to be used (State of the Industry

2021, 2021). The percentage of formal learning hours of instructor-led classroom training dropped from ~41% to ~18% between 2019 and 2020 (State of the Industry 2021, 2021).

There are seven types of delivery methods commonly used in corporations: instructor-led classroom, instructor-led online, instructor-led remote, self-paced online, self-paced print, mobile, and other non-networked and non-connected technology (DVD, Audio CD, etc.) (State of the Industry 2021, 2021). These delivery methods are used to deliver a wide variety of content found in twelve identified content subcategories defined by the State of the Industry 2021 report: executive development, managerial and supervisory, sales, customer service, mandatory and compliance, processes and procedures, IT and systems, interpersonal skills, new employee orientation, basic skills, profession and industry-specific, and other including product knowledge. The subcategories can be organized into the three main categories aforementioned in the subsequent table.

Table 2.1 Categorization of Corporate Training Needs

Category	**Managerial and Supervisory**	**Mandatory and Compliance**	**Profession and Industry Specific**
Sub Categories	Executive Development	New Employee Orientation	Sales
	Managerial and Supervisory	Mandatory and Compliance (legal, confidentiality, HR)	Customer Service
		Process and Procedures	Process and Procedures
		Product	Product
		IT and Systems	Basic Skills
			IT and Systems
			Interpersonal Skills

As seen in the table, these skills may be mapped to one or many of the categories, as the definitions and purposes of the training topics are often left to the discretion of the company. While there are implications of these subcategories that lend themselves to be better suited for differing types of modalities (e-Learning, VILT, classroom training, etc.), there was no identifiable information in the State of the Industry Report that outlined that guidance. All of these training subcategories are geared towards a variety of employees with varying tenures, education experience, roles, and personal and professional needs depending on the company for whom they work.

2.1.2 Characteristics of Corporate Learners

Adult learners have been characterized and studied for many years, with a solid foundation of assumptions being developed in 1926 by Lindeman. Lindeman developed four assumptions about adult learners, that have laid the foundation of adult learning theory (Knowles et al., 2005; Lindeman, 1926):

1. Adults are motivated to learn if they learn based on needs and interests.
2. Adults' orientation to learning is life-centered.
3. Adult learning should be enriched in experience.
4. Adults have a strong desire to be self-directing.
5. Individual differences among people increase with age.

Knowles et al. (1998) added to these initial assumptions by noting that adults respond better to intrinsic motivators to learning than extrinsic ones, and adults need to know and agree with the reasoning or meaning behind learning concepts. While adult

learners are often studied as non-traditional university students, who have full-time employment, and are often 25 years or older (Yarbrough, 2018), the development and evolution of corporate training has expanded the definition of adult learner to adult corporate learner, with many more intricacies than a typical "adult learner." While motivation can be described as "what people desire, what they choose to do, and what they commit to do," corporate learners can challenge this theory because there are external factors that may influence motivation: compensation, status, influence, or otherwise (Keller, 2010, p. 3). Ultimately, the LinkedIn Workplace Learning Report (2022) identified three top reasons why employees learn:

1. It helps them stay updated in their field
2. It is personalized specifically for their interests and career goals
3. It helps them get another job internally, get promoted, or get closer to reaching their career goals

If companies are not in the business of supporting their employees' career goals, including internal career transitions and skill building, then companies are going to have an increasingly difficult time retaining employees (Hanson, 2021).

Corporate training can be crafted for a variety of purposes, many of which can be clustered into categories such as encouraging organizational commitment, improving employee performance and satisfaction, and supporting the business in handling internal and external challenges (Rafiq, 2015). Such challenges vary by company, but can be identified by basic labor statistics and characteristics of a corporate learner. The North American labor force, as identified in November 2021, is primarily made up of white

workers, which account for 77% of the population, followed by Black or African-American workers and Asian workers representing 13% of the population (U.S. Bureau of Labor Statistics, 2021). The employment-population ratio for Asian adult male workers and White adult male workers were above 60% each, while the ratio was only 58% for Blacks or African-American male workers (U.S. Bureau of Labor Statistics, 2021). These disparities are also recognized in their occupation, with Asian workers and White workers predominantly making up the management, professional, and related occupations, in contrast to Black and Hispanic or Latino worker populations, who primarily represent the production, transportation, and material moving occupations along with the natural resources, construction, and maintenance (U.S. Bureau of Labor Statistics, 2021). When looking more granularly at those with familial ties, fathers living with children under 18 were more likely to be in the labor force than mothers with children under 18, which signifies the dependency on women in the home (U.S. Bureau of Labor Statistics, 2021).

While the workforce is already a complex landscape, the COVID-19 pandemic only increased complexity, primarily for workplace conditions, and exposed the massive inequalities between gender, age, and racial populations. One newly emerging group in the workplace is "Generation Z." This group has been hit the hardest post-pandemic with nearly 39% of this population saying they lost their jobs, were furloughed or suffered a temporary layoff (Klein & Richardson, 2021). Women have also been challenged, with only 50% getting pay raises or bonuses (compared to 62% of men) and a significant increase in voluntarily "dropping out" of the workforce due to a variety of reasons (Klein

& Richardson, 2021). Because of these types of challenges, 85% of workers say they have had concerns about their job or financial security (Klein & Richardson, 2021). Despite these challenges, around half of the workforce is finding opportunity in working remotely or in a hybrid environment (Klein & Richardson, 2021). However, working in a hybrid environment poses additional challenges in formal and informal learning, as on-site training is not always feasible and there are limited social and team-building opportunities.

Online workplace learning is becoming increasingly common as companies potentially evolve to meet the demands of a work-from-anywhere environment, frequent shifts in business needs, and the need to retain employees to meet the goals of training and development efforts. The statistics, according to a 2018 LinkedIn Workplace Learning Report, explain the increased need for online professional development in the workplace:

- 93% of employees would stay at a company longer if it invested in their career
- 68% of employees prefer to learn at work
- 58% of employees prefer to learn at their own pace
- 49% of employees prefer to learn at the point of need

These needs alone demonstrate why it is critical for companies to invest in their personnel through on-the-job training that is self-paced and always available ("LinkedIn's 2018 Workplace Learning Report", n.d.).

Furthermore, the digital age has proven to show an overabundance of digital resources, which can prove difficult to maintain and house in information systems. Maas and Kowatsch (2012) recognize that because of this, content management can no longer go by the wayside since it has a significant impact on organizations. Even before the dawn of the technological age, individuals were recognizing the need for classification and organizational systems for productivity and understanding of the world around us, as seen by the likes of the Dewey Decimal System (Bachmann, 2009; Milet, 2003). Therefore, without having a true content or information management strategy in place, one that organizes information thoughtfully (using meta tagging and file structures built around the audience schema), reviews regularly for outdated, maintains necessary content, etc., businesses are taking a large risk to company productivity, customer satisfaction, business costs, and ultimately revenue (Baan, 2013; Maas & Kowatsch, 2012). Training materials provided for any employee should be evaluated to reduce those risks and aid in increased productivity.

Content management adds an additional layer of complexity when viewing the persona of a corporate worker as more specifically, a corporate learner. Many corporate learners have transitioned into using web-based training in order to obtain knowledge and do so in addition to their traditional job duties in a variety of formats: virtual instructor lead (VILT), e-learning, and informal learning (email, direct messages, blogs, etc.). While some companies are evaluating these training efforts, much of the industry keeps these results private and does not share the methods they use to evaluate their training. Despite

the privatization of this data, companies should invest in evaluating their training and could use frameworks to standardize their process (Rafiq, 2015; Willmore, 2019).

2.1.3 Corporate Learning Evaluation Methods

Companies have long adopted the idea of training and development for "improving, enhancing, and updating the skill, knowledge, and abilities to perform better" (Rafiq, 2015, p. 1). Corporate training is often completed once a year for compliance-related initiatives, such as a code of conduct or business ethics. However, there are other trainings that require more frequent dissemination and enhancements. Regardless of the frequency, there is a need to determine if the training is in fact meeting the aforementioned definition of training and development, especially since according to Training Magazine (2019), more than 100,000 companies in the United States spent an average of $1,286 on training per user, with the estimated average cost of video training to equate to $30,420 (Bouchrika, 2023; Brandon Hall Group, 2017). Formally evaluating the training can determine how to enhance the experience, and next steps, as well as determine if the training is in fact enhancing the skill, knowledge, and performance abilities, to determine true return on investment (ROI) (Rafiq, 2015; Willmore, 2019).

Training evaluation takes place in two forms - formative and summative (Willmore, 2019). Formative evaluation aims to "assess how well designed a solution is" (Willmore, 2019, p. 70); for instance, a learning designer asking a potential learner or other designers for ways the design can be improved upon. However, summative evaluation takes a deeper look at the training to determine how successful the training was in the reduction of performance problems, knowledge increase, behavior change, etc.

(Willmore, 2019). Summative evaluation happens post-implementation or dissemination of the training and can be a complex task, especially when there is training embedded into other training moments and one needs to determine the impact of a singular item (Willmore, 2019).

In the 1950s, Donald Kirkpatrick became credited with crafting the formal summative evaluation model titled "The Kirkpatrick Model," in which training is evaluated on four levels: reaction, learning, behavior, and results (Kirkpatrick Partners, LLC, 2022). While many models have been developed and deployed, the Kirkpatrick Model has withstood the test of time and has been widely adopted across all industries despite its limitations (Rafiq, 2015). This includes an extension of the model by Jack Philips, who crafted a fifth level of the model - Return on Investment (ROI) - which can be used by training and development department heads (leaders) who can justify their role in the company and determine programmatic next steps (Rafiq, 2015; Willmore, 2019).

Some researchers argue each level is influenced by the other, which is based on positivism (i.e. a person who enjoys the training may remember more and be more apt to change behavior) (Rafiq, 2015). Furthermore, it can be limited by the transparency of the findings by the companies; sometimes companies are more apt to showcase the positive results of the training instead of highlighting the gaps or "issues" that arose (Rafiq, 2015). Despite these limitations, many training and development organizations fall back on the original model because of its systematic procedure, simplicity, and clarity (Rafiq, 2015).

The level one term "reaction" relates to the learner's satisfaction, relevancy, and engagement of the learning experience (ATD, n.d.), or "its likeness and dislikeness of the trainees" (Rafiq, 2015, p. 6). This includes but is not limited to, the pace and sequence, the relevance of the content, interaction, materials, methods, registration process, facilitator knowledge, or environment (ATD, n.d.; Rafiq, 2015). The recommended timeline for evaluating this level is within one month or immediately following the training session (Rafiq, 2015). This information can be gathered through surveys, interviews, focus groups, or individual responses within the learning experience (if live) (ATD, n.d.)

The level two term, "learning," relates to the knowledge, skill, or attitude acquisition of the learner due to the learning experience (ATD, n.d.). It is important to distinguish this measures the outcome of learning, but not the outcome of job performance (Rafiq, 2015). This can be measured through pre-assessments and post-assessments, as well as assessments throughout the learning experience. They can be traditional assessments (tests or quizzes) or non-traditional assessment types (role play, case study, performance assessments) (ATD, n.d.). Learning can be measured at the time of the learning experience, or frequently evaluated post-experience to determine retention, especially if the learning experience takes place over a series of time.

Level three of the Kirkpatrick Model, identified as "behavior," measures how participants are applying what they learned through the learning experience on the job, or "what attitudinal changes" took place in the participants from the experience (ATD, n.d.; Rafiq, 2015, p. 6). The ultimate goal of performance training is to distinguish a change in

the behavior of the employee, what a person does in their role, because of the training (Rafiq, 2015). This should be measured between a week to a few months post-learning experience and can be done through surveys, interviews, questionnaires, checklists, or performance reviews and can be conducted on the job by managers, peers, or as a self-evaluation (ATD, n.d; Rafiq, 2015).

The fourth, and final evaluation level, is "results" which measures the achievement of the program or the level of contribution of the training in an organization' success (ATD, n.d.; Rafiq, 2015). While findings from this level are invaluable to companies, as they can be used to enhance training experiences or to decide when to retire training due to lack of results, level four information has been identified as the most difficult to obtain (Galloway, 20015; Arshavskiy, 2014). Some companies may adopt Jack Philip's fifth level to better support this by calculating the training's ROI to fully capture the effect on the organization (ATD, n.d.). However, this can be measured through other less detail-oriented tasks such as action plans, questionnaires, focus groups, and performance contracts, but should not be evaluated until at least 3 months to one year after a program's launch (ATD, n.d.).

This model has been used for many years across many different training programs to determine learning experience effectiveness and will continue to be the framework in which diverse training programs will be evaluated (Kirkpatrick Partners, LLC, 2022). Many of the reasons why it is used are because of its simplicity, sequentiality, visibility for external stakeholders, and its outcomes-driven nature (Rafiq, 2015). This learner-centric approach to training evaluation can help companies better meet the

evolving needs of their customers (learners) and understand how specific training does or does not meet those needs.

2.2 Microlearning for Corporate Training

"Micro," meaning very small, and "learning," the act or experience of one that learns (Marriam-Webster, n.d.) is only the foundational understanding of what microlearning means, how it is developed, or why it is used in the plethora of settings it can be found in today. Microlearning is currently being used in all educational environments but looks different depending on participant age, topic, context, and skill. While a kindergartener might experience microlearning during short drills to practice writing their name, a nurse could experience a five-minute refresher video on how to perform a minor procedure or a job aid is provided to a customer service representative reminding them of how to diffuse an angry customer. All of these prove the differing definitions of microlearning across all learning entities. This study situates microlearning into a corporate learning environment, as it can potentially address the needs of diverse corporate learners through the delivery of short training experiences that are either pushed or accessed just in time (eLogic Learning, 2018). Upon reviewing the literature on microlearning, the formal definition can be organized into four distinct facets: time, activity, type, and access method.

2.2.1 Defining Microlearning

Since the evolution of microlearning, there have been previous efforts to define the experience. It is valuable to have a baseline understanding of how microlearning is

being defined across the training and development profession prior to defining it for the purpose of this study. While the understanding is that microlearning is naturally designed to be “bite-sized” pieces of content that may get gradually more difficult and provide opportunities for low-risk failure, these definitions can range in time and activity level but often overlap to form some consistency across the industry.

2.2.1.2 Time

Carla Torgerson, the author of *The Microlearning Guide to Microlearning* (2016), defines microlearning as a very short piece of content that can be consumed in no more than five minutes (Torgerson, 2016). She furthers the definition in the book *What Works in Talent Development: Designing Microlearning* (2020) by explaining that microlearning is just-in-time content that can be consumed to meet a variety of goals and has a variety of time limits (Torgerson & Iannone, 2020). This includes preparation for a learning event, which should take five to ten minutes; follow-up to support a learning event, which should take one to five minutes depending on the type that was sent; stand-alone training, where up to eight minutes maximum is appropriate; and performance support, when thirty seconds to up to five minutes is ideal (Torgerson & Iannone, 2020).

While these definitions support short segments of learning engagement, Thalheimer defines microlearning as short engagements in learning-related activities, usually ranging from a few seconds to up to twenty minutes (Thalheimer, 2017). Furthermore, other authors recognize that the microlearning experience could take up to eighteen minutes (Dolasinski & Reynolds, 2020). Thus, the implication is that the

industry has merely set a framework for microlearning time, not a direct industry standard. Generally speaking, microlearning could take anywhere from thirty seconds up to twenty minutes for a learner to complete, depending on the learning goal of the activity.

2.2.1.3 Activity

While the industry seems to have mostly agreed that microlearning is not "chopping up an hour-long course into five-minute pieces and calling it microlearning" (Kapp & Defelice, 2019, p. 12), there seem to be industry differences when defining the potential activities that could take place during a microlearning event. For instance, Kapp and Defelice (2019) in *Microlearning Short and Sweet* recognize that a passive learning experience is not the desired activity for microlearning, as research suggests that activity leads to active engagement, which in turn leads to greater learning (p. 12).

However, Torgerson and Iannone define microlearning activities as anything that can be consumed in less than ten minutes, which includes "three to five pages of structured, well-spaced text, a five-to eight-minute e-learning module, a four minute video, a one-page infographic, or a five-minute podcast" (Torgerson & Iannone, 2020). Some of these activities are feasible formal or informal learning experiences where knowledge could be built or reinforced but also could be considered passive experiences. While the talent and development industry has not defined specific activity types for microlearning that are better than others, Kapp and Defelice (2019) may have explained microlearning design best when they wrote "the product's design should then help to facilitate that specific outcome" (p. 12-13). Whatever the chosen activity for the

experience is, it must be designed to improve performance both effectively and efficiently because “any piece of learning content that is just five minutes long but not useful to your learners is a waste of five minutes” (Morrison et al., 2019, p. 5; Torgerson & Iannone, 2020, p. 10).

2.2.1.4 Types

The time and activity design of microlearning is particularly dependent upon how the experience will be used (Torgerson & Iannone, 2020). While microlearning looks different across the industry in regards to type and time, there is a general consensus that the strategy for using microlearning can be one, or a combination of, four experiences: preparation before a learning event, follow-up to support a learning event, performance support, or stand-alone training (Torgerson & Iannone, 2020).

Microlearning in the preparatory phase of a learning event “provides an opportunity to set up a series of planned learning initiatives to prepare for a larger learning event” (Kapp & Defelice, 2019, p. 51). With the most recent transition to virtual instructor-led training (VILT) due to the COVID-19 pandemic, this could be done for a webinar or webinar series. Additionally, it could be done for face-to-face or in-person experiences. The preparatory microlearning experience would set learners up with new content or a content “refresh” in the hours, days, or weeks leading up to the experience and could be done in a variety of aforementioned formats. Furthermore, providing this type of learner experience can enhance the face-to-face or webinar learning experience due to maximizing the rigor of content within the larger experience instead of spending a portion of the time with basic recall or explanations.

Hermann Ebbinghaus' Forgetting Curve is the tremendous foundation when discussing the value of microlearning as a follow-up to support learning. During his studies, in which he manipulated his own memories to determine memory loss, he determined that when he "reintroduced content at certain prescribed intervals, he could diminish the forgetting process" (Kapp & Defelice, 2019, p. 57). This research shows that 90% of what was learned in a learning experience has been forgotten after about one month (Denny, 2021). However, this can be drastically reduced if the content is reinforced at regularly spaced intervals, regardless of what the activity looks like. In the follow-up strategy of microlearning, continuous reinforcement of the main experience concepts are provided to learners to reduce the potential of forgotten content. This content can be designed as "supplemental, reinforcing, or augmenting" (Kapp & Defelice, 2019, p. 48).

The focus of performance microlearning is on immediate performance instead of traditional long-term education, as "performance-based microlearning represents just-in-time, point-of-need, or prompt support" (Kapp & Defelice, 2019, p. 45). This can be found in a variety of formats, such as job aids, infographics, videos, etc. to optimally perform their job and is often called "learning in the workflow" or "workflow learning" (Torgerson & Iannone, 2020, p. 70; Mosher & Gottfredson, 2011). Gottfredson and Mosher's *Five Moments of Need* details how quality performance-based microlearning provides a lasting impact on a company's employees. In fact, their research shows that classroom time could be cut in half and employees still reached competency twice as fast if good performance support was provided (Mosher & Gottfredson, 2011).

The final strategy for microlearning is disseminating content as stand-alone training. While some concepts are best for virtual instructor-led training or a longer form of learning experience, others can be created in shortened experiences. Thus, it is best to keep learners engaged and "use their time more efficiently by giving them just what they need and no more" and create shortened stand-alone training experiences (Torgerson & Iannone, 2020). While longer stand-alone training is consumed once and often forgotten, microlearning for stand-alone training provides the ability to consume the training multiple times, which would increase retention (Torgerson & Iannone, 2020). If the microlearning is procedural in nature, it is best to present the material via the most suitable modality for the task, and apply the concept in their daily function as quickly as possible to increase knowledge transfer (Lodge et al., 2016; Govaerts et al., 2018, Eiriksdottir & Catrambone, 2011; Ellis et al., 2996).

2.2.1.5 Access Method

These types of microlearning experiences can be organized into two categories based on how learners access the content, "push" or "pull." "Pull" learning can often be described as "workflow learning," where learning and support are embedded in the workflow to be accessed while doing the work (Ivec, 2021). This means the learning is available at the exact moment of application, and is just enough information needed to effectively perform the desired behavior (Ivec, 2021). When considering the relationship to learning theories, this could be considered under the "connectivist" realm, where learners are connected to a "node" that provides resources to review for support (Goldie, 2016, p. 1065). While Bob Mosher terms this "workflow learning" or "learning in the

workflow" other industry personnel call this "pull" learning, in contrast to "push" learning (Defelice, 2021). "Push" learning differs by having the content sent to the learner based on how and when the organization determined the need, such as mandatory and compliance training (Defelice, 2021). According to Defelice (2021), pull and push learning can be contrasted by this set of guidelines:

Table 2.2 Push versus Pull Learning According to Defelice (2021)

Push Learning	**Pull Learning**
Organization defines the learning goals	The learning goals are set by the learner, but usually with guidance from manager
Content is "pushed" to learner	The learner "pulls" the learning when they want or need it most
The organization defines how the content is structured and delivered	The learner defines how they will structure consuming the content
Organization brands content to ensure accuracy and consistent message	The learner may gather knowledge and content from coworkers or peers
The content is consistent in message and validated for accuracy	Learner creates their own learning environment
Organization determines the product type, which usually does not yield multiple products for a variety of learning preferences	Typically cost-effective, sometimes free if social learning is incorporated 100%
Organization budgets for these learning programs	The learner's content may not always be accurate, relevant, or credible

Any organized group who uses microlearning may employ one or all of these microlearning strategies in either a pushed or pulled deployment. While the official term "microlearning" has been increasingly more common in all adult education settings within the past 20 years, it has been known and acted upon in several attempted learning practices historically.

2.2.2 Microlearning Design Principles

As Sweller et al. (2011) recognized, "without knowledge of human cognitive processes, instructional design is blind" (Sweller et al., 2011, p. v). The basis of microlearning as an instructional design technique is one of the earliest foundational learning theories: cognitive load theory. Cognitive load theory attempts to identify how new information is obtained, processed, stored, and retrieved by the human processing system to "provide instructional design principles" (Kirschner et al., 2018; Sweller et al., 2011, p. vii) and explain "the allocation of working memory resources and the interaction between working memory and long-term memory" (Antonenko et al., n.d. p. 57). Cognitive load theory can be split into two main categories of discussion: the human cognitive architecture and cognitive load effects (Sweller et al., 2011). While the human cognitive architecture articulates how the brain obtains secondary information and processes such, cognitive load effects relate to how the brain manipulates the content for maximum understanding.

There are two types of cognitive load: intrinsic, where working memory is "imposed by the intrinsic nature of the information" (Sweller et al., 2011, p. 57), and extraneous, where working memory resources are imposed by "the manner in which the

information is presented or the activities in which learners must engage" (Sweller et al., 2011, p. 57). Both intrinsic and extrinsic cognitive load are "determined by element interactivity," (Sweller et al., 2011, p. 58), or "elements that must be processed simultaneously in working memory" (Sweller et al., 2011, p. 58). The higher the element interactivity, the more working memory resources are needed to understand the content (Sweller et al., 2011).

One way that microlearning aims at reducing the cognitive load of a learner is by decreasing the complexity of a concept for learners with low prior knowledge. By isolating the elements, or "chunking" the content into more digestible parts, complexity can be lowered (Sweller et al., 2011, p. 216). As task difficulty is not defined by the element interactivity, but defined by the number of items within the learning experience, it should be noted that the microlearning experience should be limited in time and sequential moments of learning to reduce said cognitive load (Sweller et al., 2011). By reducing cognitive load for learners and combining these efforts with more manageable, technologically delivered tasks, it can be seen how cognitive load theory is often associated with individualized, or personalized, learning (Kirschner et al., 2018), which is a foundational element of microlearning.

Reflecting the diversity of the human population, businesses are increasingly becoming diverse themselves, and research shows that businesses with more diverse workforce populations are more likely to "outperform less diverse peers on profitability" (Dixon-Fyle et al., 2021). With this in mind, companies need to develop their training and development around inclusion. Universal Design for Learning (UDL) is a commonly

known framework for developing learning and has been a way to “ensure that students effectively access and use information and demonstrate their knowledge” (Hromalik et al., 2019, p. 91) and ensure that “all students can be meaningfully engaged in learning that aligns with target outcomes and holds each student to high expectations” (Pacheco-Guffrey, 2019, p. 36). There are three guidelines for UDL: multiple means of engagement, multiple means of representation, and multiple means of action and expression (CAST, 2018), all of which relate to the core premise of microlearning.

The first guideline, providing multiple means of engagement, means to provide options for recruiting interest, pertaining to choice, value, and limiting distractions; sustaining effort and persistence, pertaining to optimizing challenge and increasing mastery-oriented feedback; and self-regulation: optimize motivation, develop self-assessment and reflection, and facilitating personal coping skills and strategies (CAST, 2018). By providing the opportunity for immediate feedback and learner autonomy, microlearning is naturally designed to include this UDL guideline. While “pull” microlearning is associated with more learner autonomy, as they get to choose specifically what information they would like to uncover, “pushed” content can be designed to promote interest as well if the learner can enroll in different microlearning experiences or if pushed content is related to their opportunities of growth. A prime example of microlearning providing multiple means of engagement would be an on-the-job resource hub, where learners watch videos or read infographics to support their on-the-job duties.

The second guideline, providing multiple means of representation, or the "what" of learning, means to provide opportunities for perception: customizing information displays and alternative visual or auditory information; language and symbols: clarifying vocabulary, decoding support, and multiple forms of media; and comprehension: maximizing transfer and generalization, highlighting big ideas, and activating or supplying background knowledge (CAST, 2018). To fulfill this guideline of UDL, microlearning must be intentionally designed to meet these criteria. However, one main focus of microlearning is identifying the "must know" information and simplifying it enough that it can be consumed in twenty minutes or less, thus the designer of the microlearning experience is highlighting the big ideas of the concepts. Additionally, microlearning is often used to activate or supply background knowledge for larger learning events, like formal in-person training.

The third guideline, providing multiple means of action and expression, relates to how the learning occurs, and means to provide options for physical action: varying the methods for response and navigation while optimizing tools and technologies; expression and communication by using multiple forms of media and building fluencies with graduated levels of support for practice and performance; and executive functions, where the learner is guided on appropriate goal-setting, provided support in planning and resource management, as well as an enhanced capacity for monitoring their progress (CAST, 2018). Microlearning can be structured to ensure graduated levels of support for knowledge acquisition, ensure monitoring of progress through assessments after the

learning experiences, and even provide support in resource management by providing just-in-time resources relevant to their role or workplace need.

2.2.3 Historical Attempts at Microlearning

The term “microlearning” has been coined in recent decades, but the underpinning of this newer learning trend has a solid foundation built on several widely known learning theories. Some note that the first official use of the term “microlearning” dates back to the mid-1900s by Hector Correra in the book “The Economics of Human Resources” (Aharon, 2020; e-Learning Feeds, 2019), but has increasingly become common educational vernacular, potentially from the emergence of digital devices and digital learning materials. However, while not officially called “microlearning,” these types of experiences have been present in educational theories, frameworks, and practices since the foundational understanding of how people learn.

The foundations of microlearning can be found in two popular learning efforts: self-directed learning and programmed instruction, which can be linked to executive functions like monitoring progress, managing information and resources, and setting goals (Brockett & Hiemstra, 1991). Each of these efforts have been historically evaluated but also evolved into current learning design approaches. For example, while self-directed learning is often found in the “pull” system of microlearning, where the learner directs themselves through a self-identified learning program, programmed instruction can be found as a “push” type of learning experience.

2.2.3.1 Self-Directed Learning

Self-directed learning (SDL), or what can also be called "self-direction in learning" (Brockett & Hiemstra, 1991, p. 24) can be defined in two parts: external and internal. The external characteristic of self-directed learning is "the process in which a learner has the primary responsibility for planning, implementing, and evaluating the learning process" (Brockett & Hiemstra, 1991, p. 24). Learner self-direction, or the "preference for assuming responsibility of learning," defines the internal characteristics of this instructional method (Brockett & Hiemstra, 1991, p. 24). One of the earlier definitions of SDL was defined by Knowles (1975) as "a process in which individuals take initiative, with or without the help of others in diagnosing their learning needs, formulating learning goals, identifying human and material resources for learning, choosing and implementing appropriate learning strategies, and evaluating learning outcomes" (p. 18).

This all-encompassing definition of this instructional method is part of the broader Flexible Learning Environment (FLE) (Brand-Gruwel et al., n.d). In a flexible learning environment, "learners are able to follow their own learning trajectory given the formal learning goals" (Brand-Gruwel et al., n.d., p. 363) and "get the support needed to create the most optimal learning path" (Brand-Gruwel et al., n.d., p. 363). In this case, using SDL would break the content into manageable pieces by the learner, thus reducing cognitive load, and fostering a personalized learning environment.

In a self-directed learning environment, there are roughly nine variables that a learner could control: identification of learning needs, learning goals, expected outcomes,

evaluation methods, documentation methods, learning experiences, variety of resources, optimal learning environment, and learning pace (Brockett & Hiemstra, 1991, p. 118-119). Based on the aforementioned definitions of microlearning, each variable can be found within formal and/or informal microlearning experiences. For instance, in microlearning experiences in which the learner chooses the content they wish to learn more about, or "pull" microlearning, can encompass all of these variables.

Consider a fictitious example of Sharon, a customer-service representative who is 6 months on the job, who forgets how to diffuse customer complaints and arguments. In this instance, she recognizes that she needs to remember the company's policy and strategy for doing such, so she sets the learning goal of diffusing her customer's complaints in a timely manner. She then chooses the resources and experiences that suit her specific situation by selecting a one-minute video and downloading the attached infographic to keep on her desktop. While there are more videos to watch that go deeper into the topic, she recognizes her time constraints and chooses to complete the rest at a later time.

In this example, Sharon chose her learning needs, goals, and outcomes, as well as identified her appropriate resources and experiences to complete her retraining at her own pace. Ultimately, she was able to "decide what news to be learned next and how their learning can be best accomplished" (Brand-Gruwel et al., n.d., p. 364). As seen in this example, one of the foundational principles of SDL is motivation - without such, Sharon would not be inclined to self-direct her learning (Govaerts et al., 2018). While self-directed learning (SDL) provides a foundational example of what microlearning

looks like in its truest form, it is not the only historical instructional method that is included in today's microlearning methods.

2.2.3.2 Programmed Instruction

Programmed instruction has been identified as one of the precursors to modern-day usage of instructional technology and online learning (McDonald et al., 2005). The foundation of programmed instruction is built on the notion that regular classroom teaching is flawed in the areas of passive engagement, feedback, reinforcement, and lack of personalization (Mukadam et al., 2014; Skinner, 2003). While the first known usage of program instruction dates back to Sidney Pressey creating an automated test assignment and scoring process, B.F. Skinner used his insights on conditioning and machine learning to launch the foundation of what we know today as programmed instruction (McDonald et al., 2005).

The concept of programmed instruction was to provide a series of "teaching and test items that carries the student gradually through the material" (Mukadam et al., 2014). According to Mukadam, Vyas, and Nayak (2014), Skinner's programmed instruction involves four main characteristics: learners are exposed to small amounts of information in a linear fashion, answer feedback is provided promptly, answer feedback provides rewards or corrections based on correct or incorrect answers, and the experience is self-paced (p. 145). Additionally, B.F. Skinner (2003) outlines other criteria with machine learning, or programmed instruction, by noting that "each step must be so small it can always be taken, yet in taking it the student moves somewhat closer to the fully competent behavior" (p. 35).

While instructional design has undergone shifts in theoretical thinking, much of Skinner's learning machine can be seen in various online instruction environments and the role that technology plays in today's instruction, including microlearning (McDonald et al., 2005). Microlearning can be designed for a "push" motion, where a set of content with predetermined objectives is provided to the learner to take at their own pace. Content is curated by an instructor of some level (designer, teacher, facilitator, etc.) and sent to a learner to complete in a linear, or prescribed, progression (Skinner, 2003): learners complete one level of learning, receive feedback, and move to the next until it is complete. Per the previously mentioned definitions of microlearning, each of these pieces of content is designed to be "bite-sized" or no more than twenty minutes in length, and build upon one another to build into fully competent behavior or understanding (Thalheimer, 2017; Skinner, 2003).

For example, a modern healthcare organization turned their standard, and negatively perceived, compliance training into a pushed microlearning experience (Hall, 2021). Users were sent a series of questions to answer independently, in which they received immediate feedback (Hall, 2021). As the learner answered the questions correctly, they progressed to the next question in the sequence until they answered the question incorrectly. Once the learner answered a question incorrectly, they were prompted to watch a short video, read a piece of text, or listen to an audio clip to re-learn the correct information (Hall, 2021). In this case, microlearning can follow the set of principles that defined programmed instruction, per the aforementioned definitions: the questions progressed in a predetermined sequence, and the content was short but

culminated in a developed "fully competent behavior" (Skinner, 2003), the learning provided immediate opportunities for feedback, and the feedback provided a correction when the question was answered incorrectly (Hall, 2021).

2.2.3 Current Usages and Impact of Microlearning on Corporate Learners

Microlearning has been coined "the learning of the future," as learning shifts to meet the needs of the modern learner (Callisen, 2016). As of 2016, the average time employees have to focus on training is around 1% (Callisen, 2016). However, businesses continuously need to meet the demands of their changing environments and employee needs and launch enablement or training to support them. With such high demand but so little time, microlearning can provide the right information at the right time to train the employees (Callisen, 2016). These are the stories of how some companies are using microlearning in their environments.

The aforementioned healthcare organization's use of stand-alone microlearning is an example of how corporations are currently using microlearning for compliance training. "Patient care is always evolving," thus the continuous need for updated compliance training to the standards of today's learners and learning environments, but healthcare professionals (nurses, doctors, hospitalists, etc.) have limited time to complete the training because they must be "boots on the ground" and "often have limited access to technology with strict time constraints" (Hall, 2021, p. 44). Therefore, this organization transformed its traditional compliance training into a microlearning experience. This transformation included a quiz-structured approach, where learners were given quiz questions to answer on their own time. If they answered the question correctly, it would

pass them to the next level of questions. However, if they answered incorrectly, they were provided a "one-minute microlearning asset" to learn the correct answer, then were retested again in four days (Hall, 2021, p. 45). Participant satisfaction was high for this experience, as the learners "liked the new modality and having access to learning on their mobile devices" (Hall, 2021, p. 47), and it was ultimately deemed a success by the organization (Hall, 2021).

Another organization, VMware, uses podcasts for its on-demand sales training (Martin, 2021). These podcasts can be downloaded prior to traveling to listen to while on the go and support other enablement training found in their traditional LMS or be stand-alone content (Martin, 2021). These experiences can range in time and content, meeting the varying needs of diverse learners and providing engagement to learners in a variety of locations (Martin, 2021). While Martin's article describes increased engagement through the use of podcasts, further inquiry is needed to investigate these claims and the overall effectiveness of the program.

Microlearning can be delivered in a variety of different ways, including email, which FICO used to align their organization while the business strategy was evolving quickly (Campbell, 2019). The company was shifting from on-premise software solutions to cloud-based solutions and needed to "educate and drive awareness of the corporate strategy and vision" in an impactful, quick consumption, and rapid development way (Campbell, 2019). Enter microlearning, where they used drip marketing to create a constant flow of learning material sent to their audience over a period of time (Campbell, 2019). After outlining the overall content needs and clustering them appropriately, they

created and bundled content together to release at various moments (Campbell, 2019). The company found that the learning experience was the "most popular and watched training in the history of the company" and found a boost in cloud-based business (Campbell, 2019). The company related this experience to the ability to achieve $1 billion in revenue for the first time in the company's history (Campbell, 2019). While the experience seems positive and impactful on the surface, further investigation is needed to determine the true Return on Investment (ROI), the change of behavior, and an accurate depiction of learner satisfaction, as metrics were not provided in this report.

As seen, these small learning experiences are idyllic for corporate learners who are on the go, busy employees or customers, and need to learn simplistic topics or ideas, as these are completed quickly enough they can continuously learn while in the flow of work (eLogic Learning, 2018). While the adoption of microlearning looks different depending on the company and training need, there is an expected growth of microlearning at a range rate of 12 - 15% between 2021 to 202, with the highest adoption rates happening in North America (Data Bridge Market Research, 2021; Mordor Intelligence, 2021). With the significant adoption of microlearning in the workplace, further investigation is needed on a variety of aspects: perception, development time and cost, effectiveness, delivery modalities, evidence-based practices, and many more. This study aims to evaluate a microlearning experience using a Kirkpatrick framework with emphasis on two differing types of instructional multimedia: demonstration video and a digital job aid.

2.3 Instructional Multimedia

All instructional programs should be built on a foundation of high-quality research that details when and how instructional multimedia should be implemented and how it is designed (Clark & Mayer, 2016). While using this technology-centered approach to training, it is common to place too much emphasis on the role of the technology and ignore the role of the learner (Clark & Mayer, 2016). Therefore, when crafting instructional multimedia, it is increasingly important that instructional design principles, rooted in cognitive sciences, are followed to ensure maximum effectiveness and quality for the learner, especially as companies transition to user-centered design from content-centered design approaches (Watzman, 2003). In short, there are three main goals when creating instructional multimedia: "minimize extraneous cognitive processing, manage essential processing, and foster generative processing" (Clark & Mayer, 2016, p. 49).

Instructional multimedia is instructional content that includes words and pictures to relay information digitally or printed (Mayer, n.d.) The multimedia principle rationalizes this method of delivery because people learn more from words and pictures than from words alone (Mayer, 2009). Each type of instructional media presents its own affordances, or capabilities, or "what a user can do with the object based on the user's capabilities" (The Interaction Design Foundation, n.d.), that may engage learners in differing ways. Similarly to a door, each media type has their own affordances with the users, or learners, who interact with them. When media, regardless of type, is produced well, a participant should be able to recognize how to interact or engage with it without

much thought; it should be natural. It is because of the rich affordances of media in instruction that it is becoming increasingly common to be included in instruction (Allen & Seaman, 2017).

While instructional multimedia can be defined by a variety of types: video, e-learning, graphics, audio, text, etc., this study is limited to two particular multimedia types: digital job aids and demonstration videos. With these two types of instructional media in the corporate setting, learners have the ability to access information needed to conduct their business in a short and digestible manner. Each of these instructional media types comes with its own affordances, design principles, and even learner impact, which will be explored in the subsequent sections.

2.3.1 Types of Instructional Multimedia: Demonstration Videos

While videos meet the need for microlearning experiences, they are also ideal for corporations to use in training and development because they are easy to create and share with learners (Haskin, 2013). Because they have become drastically easier to produce and polish, they have become a key component of many training programs (Haskin, 2013). Despite the use of video as the sole source of information or as a small component of a larger training, videos should be engaging, informative, and motivating in order for learners to be encouraged to apply the information (Haskin, 2013). While there are five genres of video (educational, promotional, informational, documentary, entertainment), there are six sub-types in the educational genre: lecture, screencast, micro, explainer, scenarios, and how-to (demonstration) (Karel, 2020).

How-to (referred to as demonstration videos in this study) features step-by-step instructions on how to perform a particular task (Karel, 2020). While the average individual is familiar with these types of videos on YouTube, the corporate learner can often find these videos in company repositories demonstrating how to use particular tools they may interact with to conduct their daily business. These videos can be created by screencasting the tool and conducting a walk-through of how to do a particular task. While this may seem relatively easy to orchestrate, there are a variety of best practices to consider as they are designed and developed to ensure they are meeting the needs of the learner.

2.3.1.1 Affordances

Stemming from the methods in which video content is produced and disseminated, it holds a variety of different affordances for designers and participants. While there are traditionally minimal opportunities for viewer interactivity, there are a plethora of affordances that make video content valuable for learners and those who design or utilize it in their instructional systems, such as instructors or facilitators (Rahman et al., 2020). There are a variety of overarching themes to educational videos but the themes to be discussed in this section vary between content, experience, design, and logistics, particularly pertaining to screencast, or demonstration, videos.

While videos are beneficial in disseminating introductory content or feedback, their role in the learning process is dependent on the learner, as they are more beneficial to those that are more self-regulated (Sharma et al., 2007). Videos permit learners to play, pause, rewatch, and “scrub” through content, enabling self-regulated learners to have

content at their own pace (Rahman et al., 2020; Costley et al., 2021; Ruffini, 2012). Furthermore, they allow viewers to skim, watch without sound, or listen while engaged in other activities (Kaltura, 2019). Along with permitting students to engage with the information at their own pace, videos also allow learners to determine the time and location for which they engage with the content (Griffin et al., 2009), especially as cloud storage has evolved (Séror, 2012).

Demonstration videos often require screencasting of the tool or procedure to follow. Because screencasting can showcase the performance of highly complex activities, they simulate auditory and visual sensory modalities, proving to be superior to lecture-style videos (Ali, 2016). Watching demonstration videos of another user interacting with a tool allows the learners to participate in "comparative reflection" (Zhang et al., 2011, p. 457) where they can learn what to avoid just as much as what to do.

Since learners can choose where and when they participate in the learning experience, this means all the learners do not have to be in the same environment at the same time. Because of this, videos, when presented in an online forum, have the possibility of reaching a globally diverse audience at any time (Palis & Quiros, 2014). Since these videos can replace the need for in-person facilitators of instruction across the globe, creating educational videos can also be relatively inexpensive compared to traditional methods of instruction (Palis & Quiros, 2014). Additionally, cloud storage and computing technology reduces the complexity of crafting and storing videos for easy access (Séror, 2012) and when the appropriate technology is adopted, permits tracking of

those who have watched the video (Mullamphy et al., 2010). Furthermore, tutorial videos can be reused until the procedure or tool imagery is no longer accurate, which reduces the potential for repeated explanations by tool owners or enablers (Mullamphy et al., 2010).

2.3.1.2 Design Principles

As a technology-centered approach to learning can increase the complexity of learning materials, it is imperative that design principles, rooted in neuro and informational sciences are understood and used to increase effectiveness (Clark & Mayer, 2016). This is of utmost importance for demonstration videos, as visual and audio are used and learners can actively process very few pieces of information in each of those channels at one time (Clark & Mayer, 2016). For instance, videos should use audio to describe complex visuals, be segmented, and add relevant visuals to support learners in managing the cognitive load (Clark & Mayer, 2016).

To elaborate, demonstration videos should be kept short in length, therefore the learner can focus on a singular topic or procedure instead of a complex system, which reduces cognitive load (Oehrli et al., 2011). If clear instructional design principles are followed (direct linkage to text and visuals), the scope of the video can be decreased and provide more clarity and succinct training (Oehrli, et al., 2011; Séror, 2012). Demonstration videos, especially used for microlearning purposes, should be no longer than 10 minutes in order to maximize learner interest (Keane et al., 2017).

Similar to in-person demonstration, the video curator should identify the topic and learning goal prior to creating a script or outline (including relative screenshots) and then recording the video (Ruffini, 2012). Within the video, the creator should provide an

overview or introduction to what is being demonstrated, clarifying what is being demonstrated and how it is used in their context, followed by the demonstration (Sugar, Brown, & Luterbach, 2010). Overall, the design of the video should minimize extraneous processing by "removing unneeded words, sounds, or graphics," manage essential processing by using audio, and foster generative processing by using conventional styles and presenting graphics and words rather than words alone (Clark & Mayer, 2016, p. 57).

Throughout the demonstration, the creator should use visual cues such as color change, graphics, zoom features (in and out), icons, etc. to highlight important information (Kharishma, 2020). The usage of visual cues with combined audio ensures that learners can identify the most important information to immediately apply (Kharishma, 2020). Furthermore, the developer of the video should include subtitles or closed captions to accompany any audio narration to accommodate the needs of diverse learners and increase video accessibility (Kharishma, 2020).

As design principles are adopted to create video learning materials, it is imperative they are continuously evaluated to ensure maximum effectiveness and evaluate the impact on the learner. Some industries have adopted formal evaluation, like higher education or medical communities, to test the effectiveness of varying aspects of video learning. The subsequent section details how some reports have articulated the impact of video learning compared to other methods of instruction.

2.3.1.3 Learner Impact

Research of modality on learning can be seen as early as the 1960s when Lumsdaine and May (1965) investigated the impacts of using audio-visual technology in

the face-to-face classroom. However, newer studies testing the perceived learning and actual learning of video-based instruction have been more common, as the inclusion of video in an online educational setting has increased. Recent studies, both qualitative and quantitative in nature, have shown that video-based instructional content provides greater feelings of perceived learning, higher levels of actual learning, and a higher level of instructor credibility, thus increasing the argument for the inclusion of videos in an online learning experience (Downs et al., 2011; Limperos et al., 2015). In fact, one study showed that users who had the least amount of prior knowledge and accessed information using a video received higher scores on knowledge retention assessments in a higher education setting (Green, Pinder-Grover, & Millunchick, 2012).

Downs et al. (2011) conducted an experiment including 119 participants to test the effects of dual-modality multimedia instruction (audio, audio/text, and audio/video) using iPods and computers. After each participant arrived, they were randomly assigned to one of the six experimental conditions, resulting from "the three modality combinations (audio, audio/text, and audio/visual) and the two form-factors (iPod screen vs. computer screen) (Downs et al., 2011, p. 191). Participants were then exposed to a seventeen-minute lecture regarding "basic descriptive statistics… and properties of distributions," and then provided a cognitive test including multiple choice and matching questions to determine retention (Downs et al., 2011, p. 192). Upon review of the results, Downs et al. (2011) determined that those who processed information using multiple modes (audio/text or audio/visual) scored higher on the knowledge test than those who only received single modality instructional content (audio) (p. 193). Thus, negating the

argument for audio-only delivery and affirming the impact of the modality effect in the cognitive load theory of learning that articulates multiple modes of information improves retention over a singular delivery mode of information when the multiple sources are related (Downs et al., 2011; Sweller et al., 2011).

Limperos et al. (2015) furthered this research by retesting actual learning, but also conducting a study that determines perceived learning as well. This study does differ slightly, as it pertains to text and audio and text modalities. The 259 participants of the study received a "15-minute lecture focusing on a popular communication theory," followed by a nine-question multiple choice quiz (p. 4-5). The results indicated that participants who received audio and text lectures had greater feelings of perceived learning (Limperos et al., 2015). Furthermore, the study confirmed the study conducted by Downs et al. (2011) because they also found that participants who received the dual modality lecture scored higher on the quiz, thus demonstrating actual learning is greater for that subset (Limperos et al., 2015). This study is consistent with the qualitative rationale of using multimedia in learning that words and pictures "can complement one another and that human understanding occurs when learners are able to mentally integrate corresponding pictorial and verbal representations (Mayer, 2009, p. 7).

In summation, demonstration videos provide corporate learners the ability to consume meaningful information from anywhere thanks to cloud storage and their ability to be succinct. While they offer a self-paced learning experience, they continue to enhance personalized learning experiences through their many affordances such as stop and replay, screencasting tools and materials, and coherent design. These types of

learning experiences are achievable at a relatively lower cost for corporations, while maximizing results through higher perceived learning and actual learning.

2.3.2 Types of Instructional Multimedia: Digital Job Aids

A job aid is an inexpensive and often quick and easy way to improve performance quickly (Boyd, 2005). While often called performance aids, flowcharts, checklists, reference guides, cheat sheets, or otherwise, this study will use the general term of "job aid" and define them in three parts: (1) storage of information or instruction external to a user; (2) a guide for the user to perform a task correctly; and (3) used during the performance of the task when the user needs to know information or a procedure (Boyd, 2005; Russell, 2000). This information may be presented in a variety of formats: sign, checklist, chart, or other document, and can be delivered in print or digital modalities (Russell, 2000). While this is used to help perform the task, it is not the actual tool in which the task is conducted (Russell, 2000). While job aids look different to match different task needs, the particular focus of this study pertains to job aids with step-by-step procedures. This format "presents information and directions in a specific sequence" (Russell, 2000, p. 4)

For companies, there are several benefits to creating and using job aids: timeliness, cost-effectiveness, transferability, maintenance, and improved recall (Russell, 2000). Boyd (20005) identifies additional value in the areas of providing consistency, reduction in information overload, communicating updates to learners or system users, and supplying just-in-time information. These types of learning documents are often ideal for microlearning because they should be relatively short to digest in quick moments.

2.3.2.1 Affordances

Learners of all ages are now encountering texts used for learning in both print and digital formats despite learners having specific preferences from which they prefer to learn (Sullivan & Puntambekar, 2015). While many online courses utilize digital textbooks or other digitally written content because of the rising cost of textbooks, corporations often create customized digital texts used to disseminate specific information to their participants (Acker, 2008). While limitations of digital text can include inaccessibility, there are plenty of affordances of digital text that promote the use of this medium in an online environment (Acker, 2008), particularly when narrowing the scope to job aids. For instance, according to Elsenheimer (1998), these types of learning resources (job aids) are "well suited for tasks characterized by: low frequency, high complexity, frequent changes, high cost of error, and low budget" (p. 33). These are only perpetuated by the general affordances of digital texts and the cloud-based storage systems the world is using today.

Digital texts, such as a job aid, often provide learners some autonomy in the learning process through the use of font size manipulation, search features, dictionary usage, translation, text-to-speech functionality, and sometimes note-taking features (Larson, 2010; Railean, 2015; Schunk, 2001). Furthermore, highlighting or marking up passages or sections is more possible in digital texts because they can be copied into private folders and used for their own personalized learning (O'Brien & Voss, 2011). Additionally, these types of texts also have additional digital features, such as hyperlinks, embedded video and graphics, and others that allow learners to gain additional context or

go deeper into the content if they choose to do so, which provides additional self-regulation (Hicks, 2013; Jha et al., 2010). Digital job aids including additional digital features allow the learners to find other multimodal materials related to the concept, which could extend or continue their learning path (O'Brien & Voss, 2011). Promoting this level of self-regulation in online learning can increase motivation for the learners and provide access to those who may be challenged with visual or other impairments (Schunk, 2001).

Job aids allow large quantities of information to be condensed into more usable and digestible content, which reduces the training time required for a particular task (Elsenheimer, 1998). In turn, motivation from "building confidence in performance" can increase due to the reduction of performance errors and quick "ramp time" of the employee (Elsenheimer, 1998). For companies, job aids provide a reduced dependence on coaches, mentors, managers, or other skilled workers who must assist novices (Elsenheimer, 1998). Thus, they are "an efficient and cost-effective solution to a wide range of performance issues" (Elsenheimer, 1998, p. 35).

Many of the access and storage affordances that relate to demonstration videos relate to digital job aids as well. For instance, as with demonstration videos, digital job aids can also be easily accessed through cloud-based systems in a variety of settings, including laptops, cellphones, and tablets, allowing learners to consume the information at their preferred location and time (Thoermer & Williams, 2012). These types of performance improvement tools allow learners to get the support they need to do a job at the moment of need (Elsenheimer, 1998), particularly when organized appropriately in a

cloud storage system. Because job aids can be readily available, their flexibility allows them to be adapted to any work environment (Elsenheimer, 1998). Because of the portability of the information, it can also reach a global audience on their own time, despite cultural or language barriers (Railean, 2015).

2.3.2.2 Design Principles

Much of the cognitive science found in supporting high-quality video creation can also be used to effectively design digital job aids. Digital job aids, while only offering written text and visuals, can cause cognitive overload for learners if not designed appropriately. Effectively designing digital job aids includes a systematic approach to determining the format and medium, outlining the job aid, and finally developing and delivering the job aid (Russell, 2000). As the creator develops the resource, they should include only relevant and necessary information while keeping it simple and digestible (Boyd, 2005; Russell, 2000).

Digital job aids are an ideal source of information for novice learners, as they can "include graphics to accompany text" (Clark & Mayer, 2016; Eriksdottir & Catrambone, 2011). These visual elements, such as drawings or graphics, should be used to clarify information and provide visual cues while being placed near corresponding text or instructions (Boyd, 2005; Clark & Mayer, 2016; Russell, 2000). Especially with the use of limited graphics, they should be meaningful and relevant to the learning at hand to minimize extraneous processing (Clark & Mayer, 2016). The visual elements should be consistently used throughout the document (i.e. only one form of visual cue should be used at a time) and can be accompanied by other visual cues such as text changes (format

and color) (Boyd, 2005; Clark & Mayer, 2016; Russell, 2000; Eiriksdottir & Catrambone, 2011).

However, using a font type and size that is readable with sufficient white space and identifiable heading and subheading structure is ideal to follow visual design principles (Boyd, 2005). Language should be inclusive, thus excluding jargon, unfamiliar words and phrases, and irrelevant information (jokes, tips, additional insights, etc.) (Russell, 2000), but also be conversational (or informal) and "lean" to foster generative processing and limit extraneous processing (Clark & Mayer, 2016, p. 56).

Despite the efforts to ensure that instructional multimedia uses design principles to create effective learning material, all materials should continuously be evaluated for their effectiveness and then revised to reflect the dynamic nature of the corporate environment (Russell, 2000). If the materials are out of date, images and text become irrelevant quickly, which begins to increase cognitive load and processing complexity (Clark & Mayer, 2016). Without an understanding of the effectiveness, or learner impact, the job aid may have been a waste of time for the developer, the learner, and ultimately a waste of time, money, and resources for the company.

2.3.2.3 Learner Impact

The process of learning through digital text holds similar elements to that of traditional text (character decoding, word recognition, sentence comprehension, etc.), but reading digital text adds a layer of complexity (Shapiro & Niederhauser, 2004). Some of this layer of complexity is due to a lack of recognition of where the reader is in the text or understanding of text structure (Dillon & Jobst, 2005; Sung & Mayer, 2012). Jin (2013)

conducted a study using 141 participants to determine the impact of using visual design principles in digital text. This quantitative study included a pre-test, to determine prior comprehension of the written content, followed by 20 minutes of reviewing the written material, and concluding with a structure test, comprehension test, and usability test of the material in the final 20 minutes of the study. The results indicated that comprehension of the digital text that used visual design principles was higher than participants who had digital text that did not follow the guidelines (Jin, 2013). Thus, in order to increase the potential for understanding a digital text, "designing the text visually" must be applied (Jin, 2013, p. 256).

Despite the many similarities in reading printed text and digital text, the major differences "are not cognitive, but are metacognitive" (Ackerman & Goldsmith, 2011, p. 18). Since some studies have found subjective differences such as reading digital texts may be slower, less accurate, or more fatiguing (Dillon et al., 1988), determining the metacognitive perspective was important for Ackerman and Goldsmith (2011), as they studied ~70 participants to test if the on-screen learning (OSL) and on-paper learning (OPL) underlie objective differences in learning performance. The researchers provided the participants with six expository texts of varying topics, and they were given seven minutes to read each text. They then were provided a 10 question, multiple-choice test "requiring both memory of details and higher order comprehension" (Ackerman & Goldsmith, 2011 p. 22). Ultimately, this study found that there was greater overconfidence and lower actual performance in on-screen learning than on-paper learning during self-regulated study time (Ackerman & Goldsmith, 2011).

Lauren Singer and Patricia Alexander (2016) set off to validate the effects of reading digital and print texts on reading comprehension by studying ninety undergraduate students. In this study, participants were provided a topic knowledge assessment, a medium preference survey, a medium-usage questionnaire, and a comprehension assessment. After being provided the demographics survey, topic knowledge measure, and medium preference survey - all digitally - participants were provided multiple reading passages in either print or digital format, then presented with the reading comprehension task in the same format as the passage was provided (i.e., digital or print) (Singer & Alexander, 2016). The majority of participants preferred to read digital texts, which aligns with the age range and the description of being "digital natives," or those that spent a quantifiable amount of time with digital materials (video games, e-mails, instant messages, cell phones, TVs, etc.) before they become college-aged individuals (Prensky, 2001). However, further research is needed to determine the perceptions of older individuals relating to digital or printed text preferences.

While affordances of each media type bring researchers and other learning professionals closer to understanding why to choose specific media types, it fails to completely answer the question by itself. One must understand the impact each media type has on the participants in order to determine the best method of learning content to proceed with for the learning experience. These studies represent general research regarding videos and digital job aids related to knowledge retention and learner preference. However, further investigation is needed for highly qualified research on

demonstration videos and job aids as they pertain to learner satisfaction, behavior change, and knowledge retention in a corporate environment. This study aims to validate the studies focusing on actual learning while using Kirkpatrick's Evaluation Model to also obtain insight into learner satisfaction and behavior change for demonstration videos and job aids in a corporate setting.

2.3.3 Using Videos and Digital Job Aids in Corporate Training

The use of digital media has gone far beyond the use of cell phones to search for a frequently asked question or find a long-lost piece of music. Digital instructional multimedia has found its way into the corporate setting to provide training materials to upskill or re-skill workers of all levels, including the use of VR, AR, e-learning, job aids, or video (Schiffeler et al., 2018). While digital media promotes flexibility in the delivery, pace, and distribution of learning material, it often does not address flexibility in learning preferences unless multiple modalities are provided in the learning experience (Macpherson et al., 2004). Macpherson (2004) also notes a study by Dobbs (2000) and Angel (2000) that questions the quality of the learning material in the areas of feedback and creativity. An additional drawback of digital media in a corporate training environment is that the learning experience and technological capabilities are linked, as students become distracted and anxious if the digital learning did not respond promptly (Horwath, 1999). To cause even greater frustration, the technology age has caused fast development of large quantities of web-based resources that need to be housed from multiple sources (Wu et al., 2014). According to a study conducted by Grimes (2008), around 80% of organizational data, such as this, is in unstructured form, which means

there is an additional challenge of constructing meaning from such a large pool of resources (Kobayashi et al., 2018). We can deduce that such complex information systems cause great barriers to productivity and high frustration, which means technology-based resources (i.e. training materials) have yet another obstacle to becoming the ideal training mechanism.

Despite the challenges that digital-based training creates for the consumer, these technological additions to corporate training and development have provided a naturally self-directed learning experience that "enables adults to access learning in a just-in-time… format," promoting "the complete self-directed learning experience" (Knowles et al., 2005, p. 237), meeting the needs of the ever-evolving workplace, thus being adopted in organizations worldwide. Now more than ever, as seen in the subsequent sections, corporations are adopting asynchronous digital training methods to support global populations and rapid development to meet the ever-evolving needs of their employees. This section intends to articulate how demonstration videos and job aids in particular are currently being used in a corporate environment and point to any relevant formal research to support this study.

2.3.3.1 Corporate Learning Case Studies

Many of today's use cases for microlearning have been documented in talent and development organizations as "case studies" or limited versions of white papers to highlight how microlearning is being used in a corporation and simplify their findings around perception and behavior change. A review of the Association for Talent Development's case studies found a limited amount of studies on the use of

microlearning in particular to job aids and videos. This section highlights the studies publicly available for use.

Intuit, a global financial software company, employed a microlearning experience utilizing the likes of video training to teach their employees about the organization's values. These videos included both animation-type and real-life, or "point-of-view" videos, where individuals were recorded via webcam (Intuit, 2018). The overall results were positive, as employees were more likely to be able to recall and define the values clearly (Intuit, 2018). They learned that by using videos in a microlearning experience, their learners could be more self-directed and effective while being produced at a reasonable cost (Intuit, 2018). Further and more structured investigation is needed to determine learner satisfaction in the experience particularly pertaining to the modality and the results of the training program following the Kirkpatrick Model.

N2 Publishing documented their experience using video-based learning for training a remote sales force in an ATD Case Study. Their ultimate goal was to "provide area directors with a resource they could access at any time" to support their in-role duties (ATD Case Study Team, 2019). They utilized screen recording capabilities to record step-by-step tutorials on particular performance tasks that followed microlearning time guidelines (2-7 minutes in length) (ATD Case Study Team, 2019). N2 reported an average phone call length decrease from 60 minutes to 20 minutes after the implementation of this program, while also reporting an increase in average commission (ATD Case Study Team, 2019). Despite these surface-level positive results, the case study only indicates positive results in the areas of behavior change and program results;

further investigation is needed to formally evaluate learner's knowledge retention and satisfaction with the program.

A recent review of the Association for Talent Development (ATD) website found no case studies related to how job aids (print or digital) are being used in a corporate setting. Furthermore, in a review of Training Magazine's resources catalog, no resources were found when searching the terms: job aids, corporate job aids, or tutorial. Additionally, in a review of a research catalog hosted by The University of Kentucky Libraries, research on job aids was primarily limited to medical or hospital training, books detailing how to create job aids, and other limited insights. This further indicates a significant need in the industry to review how job aids are being used in a corporate environment and detail their effectiveness.

2.3.3.2 Empirical Studies

Studies in a variety of disciplines have been historically conducted to determine the impact a delivery method of information has on learning, perceived learning, cognition, and otherwise. Since most educational studies have been conducted in the areas of online instructional planning, time management, learning styles (preferences), assessment, and pedagogy, "it is important to understand how variations in teaching strategy and technological affordances in online courses impact student success" (Limperos et al., 2015). There are a variety of instructional modes used in online and face-to-face learning experiences, and having a deeper understanding on their impact on participant experience and online learning provides insight into effective instructional design for online learning experiences (Limperos et al., 2015).

Demonstration videos have become a primary source of training for software companies as they attempt to ramp up users on foundational software knowledge and new features (van der Meij et al., 2018). The study conducted by van der Meij, van der Meij, Voerman, & Duipmans (2018) was done to investigate the effectiveness of video tutorials (demonstrations) for software training with 65 participants from elementary school classrooms. In this study, they provided a series of videos no more than 3 minutes in length after taking a pre-assessment. Once the users completed the video, they were allowed to practice the newly acquired skill independently and subsequently followed by a transfer test one week later (van der Meij et al., 2018). Results indicated that video tutorials enhanced learning motivation and had moderate lasting effects on learning (van der Meij et al., 2018). One identifiable gap in this research is the lack of follow-up study for long-lasting effects (more than one week). Additionally, while educational psychology articulates a relationship between how children and adults learn, the adoption of this research should be validated with an adult population in relation to knowledge retention and behavior change.

Formal evaluation of the usage of job aids in a corporate environment is a significant gap in current research databases. However, the medical community has more commonly evaluated the impact of performance-based tools such as job aids and checklists for their training purposes that can be applied to this study. A study conducted in Zambia aimed to evaluate the impact of "job aid and job aid-plus-training" on clinical health workers' performance on malaria testing (Harvey et al., 2008, p. 2). The job aid was designed using participant and SAM design methodology, where clinical health

workers identified difficult steps and how to overcome the difficulties (Harvey et al., 2008). The study found that the clinical health workers using the job aid performed the malaria rapid diagnostic testing with 80% accuracy and job-aid-plus-training conducted them at 90% accuracy, while only using the manufacturer's instructions was at 57% (Harvey et al., 2008). Their conclusions articulate the value of training programs, but the impact of the reduced cost of job aid performance tools (Harvey et al., 2008). This study indicates that job aids as a performance tool are valuable behavior change tools and achieve a high return on investment (high results with relatively low cost). While the study indicates behavior change, the study is limited in its quantitative nature, as qualitative research such as post-implementation focus groups or long answer surveys could have been conducted to evaluate the clinical health workers' perception and satisfaction of the tool(s) given.

Despite the need for formal evaluation of training experiences and materials, much of corporate training "best practices" material is coming out of blog posts, limited white papers, or conference presentations from training and development organizations. A recent review of the Association for Talent Development publication catalog, which is an industry leading organization, noted there are 0 reports with the keyword "job aid" and only 9 hits for "video," with only 1 of those being a formal research report out of 869 possible publications. Additionally, a search within the university's online library only included 82 results after searching "microlearning corporate," including 56 articles, 19 magazine articles, four conference proceedings, two books, and one dissertation. Thus there is an alarming gap of formally published studies surrounding adult learning in a

corporate training environment, particularly in the areas of multimedia usage, that craft evidence-based guidelines for corporate training and development.

2.4 Summary

Based on this literature, corporate microlearning is defined as a piece of content that is less than 20 minutes in length with varying interactivity levels and can be distributed by the company or accessed by learners freely to be consumed at various stages of the learning experience. While some companies may employ the usage of Kirkpatrick's Four Levels of Training Evaluation, formal research using this model is limited, particularly in a corporate sales enablement organization, with much of the stories of microlearning being disseminated by industry blog posts. Previous research efforts to compare video-based demonstrations to paper-based tutorials have been mixed in results: while some indicate positive paper-based results, others indicate positive video-based results, and another large quantity finds no differences between the two modalities (van der Meij et al., 2018). Further investigation is needed to determine if this is aligned with video-based and digital job aid tutorials, particularly in a corporate training environment and following the traditional approach of corporate training evaluation (Kirkpatrick's Four Levels of Training Evaluation).

A deeper understanding of how multimedia impacts corporate learners is necessary, as much of corporate training and development is gravitating towards e-learning content and other multimedia learning experiences (State of the Industry 2020, 2020). While there are specific agencies geared towards studying this particular area of learning (e.g. the Association for Talent Development, Training Magazine), publicly

available and reliable studies are needed to promote evidence-based guidelines in the corporate learning environment.

CHAPTER 3. METHODS

Chapter 3 of the dissertation describes the methodology of this mixed methods case study. The organization of this chapter includes the purpose of the study, research design, followed by the target population and sample. Next, a description of the context and setting is followed by an explanation of the treatment, data sources, and procedures. Then an explanation of the data analysis is provided to articulate how the results were finalized.

3.1 Purpose of the Study

The purpose of this study is to explore different types of microlearning experiences in the corporate environment and aim to understand their impact on employee (learner) satisfaction, behavior change, and knowledge retention, following three out of four levels of the Kirkpatrick Model evaluation framework (Kirkpatrick Partners, LLC, 2022). The origin of the research problem resides in a lack of empirical evidence of microlearning experiences applied to corporate environments, which impacts the ability of learning (instructional) designers to craft meaningful and impactful microlearning experiences in the workplace. This study was designed to further investigate the impact of specific types of microlearning experiences in a sales

organization for enablement operations to learn and use evidence-based practices in their environments.

3.2 Research Design

This research was guided by a question with multiple parts to evaluate learner satisfaction, knowledge retention, and behavior change within a 3 week time period. This research was aimed at answering the question: to what extent do two modalities of microlearning – digital job aids and demonstration videos – compare regarding

- Learner satisfaction?
- Knowledge retention?
- Behavior change?

This study was conducted in a sales company for sales representative training and development. Designed to evaluate the training based on Kirkpatrick's Evaluation Model, this research study uses the mixed methods case study approach to evaluate multiple dimensions.

The case study research approach is used in a variety of disciplines, but primarily in the social sciences because it allows the research to take place in a real-life, or "natural," setting and can "yield powerful insights" (Crowe et al., 2011, pp. 1, 8). According to Yin (2009), "the case study method allows investigators to retain the holistic and meaningful characteristics of real-life events," which allows a researcher to understand "complex social phenomena" (p. 4). Furthermore, the case study approach is

appropriate, as this research study is situated within a particular company and the information is designed to address how the topic affects a particular group of people (Crowe et al., 2011; Stake, 1995). The goal of this particular study was to investigate microlearning in the context of corporate learning, or within a real-life context for individuals (workplace learning), and deepen the understanding of differing perspectives of the learning initiative (Doolin, 1998; Stake, 1995; Yin, 2009).

A case study is not limited to qualitative data, despite its recognition as a qualitative research choice, and can include quantitative evidence (Creswell, 2007; Yin, 2009). This case study includes both qualitative and quantitative data to allow an "in-depth, multi-faceted exploration of complex issues in their real-life settings" (Crowe et al., 2011, p. 1). A mixed methods approach, layered with informed consent and anonymity, will bring greater validity and ethical measures to the case study and shed light on the challenges the participant population faces (i.e. illustrative case study) (Crowe et al., 2011).

Using a mixed methods approach allows the researcher to compare and contrast the qualitative data with the quantitative data for "corroboration and validation purposes" (Creswell & Plano Clark, 2011, p. 77). These studies also allow for the limitations of one type of research to be offset by the other, thus bridging the divide between those who conduct only qualitative or quantitative research (Creswell & Plano Clark, 2011). For instance, quantitative research is limited in context, but can be counterbalanced by including qualitative data; qualitative data may be open to personal interpretations, but quantitative data provides statistical data to strengthen the qualitatively formed arguments

(Creswell & Plano Clark, 2011). A study conducted by Hurmerinta-Peltkomaki and Nummela (2006) reviewed published mixed method studies to find that a mixed method study adds value by "increasing validity in the findings, informing the collection of a second data source, and assisting with knowledge creation" (McKim, 2017, p. 3; Hurmerinta-Peltomaki & Nummela, 2006).

The mixed methods case study design is used in studies "where both qualitative and quantitative data collection, results, and integration are used to provide in-depth evidence for a case" like in an organization (Creswell & Plano Clark, 2017, p. 116; Stake, 1995; Yin, 2014). This is commonly used with a constructivist approach, as this philosophy supports that a diverse set of perspectives are available and should be heard to "fully describe the complexity of the case" (Creswell & Plano Clark, 2017, p. 117). By using this particular design, an in-depth perspective of the microlearning experience in its totality (knowledge retention, behavior change, and satisfaction) can be articulated and provide a realistic picture for other talent and development organizations to apply (Creswell & Plano Clark, 2017). The overall design of the study related to the method type, Kirkpatrick Evaluation Model, and data collection method can be seen in the subsequent table below.

Table 3.1 Research Questions and Data Collection Methods

Research Question	**Method Type**	**Kirkpatrick Model Levels**	**Data Collection Method**
1a Learner Satisfaction	Qualitative	Level 1	Interviews
1b Knowledge	Quantitative	Level 2	Assessment (pretest/post-test 1/

Retention			post-test 2)
1c Behavior Change	Quantitative	Level 3	Behavior Self-Evaluation

3.2.1 Hypotheses

RQ1b: Knowledge Retention

- H_0 - Modality has no effect on knowledge retention.
- H_1 - Modality has an effect on knowledge retention.

RQ1c: Behavior Change

- H_0 - Modality has no effect on behavior change.
- H_1 - Modality has an effect on behavior change.

3.2.2 The Role of the Researcher

The investigator of this study is a former learning experience designer at the company with 8 years of instructional design experience. As a learning experience designer, it is necessary they take calculated risks and challenge the status quo by strategizing and implementing new design approaches based on learner feedback. It is also necessary that the learning experience designer listens and implements feedback from the learners (participants), regardless of their own biases and understandings. The researcher is an outsider to the population the study aims to investigate, but an insider to the company within which the study is situated; this provides the access to data to fully understand the research problem (Creswell & Plano Clark 2017). The goal of the researcher in this study is to develop an understanding of participant perceptions and achievement in order to strategize future designs of training content.

3.3 Participants and Setting

The context of this study is a corporate technology sales company with multiple global office locations. The company is a large enterprise sized company with over 1,000 employees and annual revenue of over $1 billion.

3.3.1 Population Sampling

This section articulates the population and sample selected for this research. The population was new sales representatives within the sales organization.

3.3.1.1 Population

The overall population stemmed from a global representation of tenured and newly hired sales representatives for a large organization. This population ranges in age above the age of 18, experience, gender, race, location, and educational background. While company data related to experience, race, location, and educational background, are undisclosed, the global employee gender representation is identified as ~36% women, 64% men, and 0.2% non-binary/other. Comparatively, the United States-specific race and ethnicity report finds that roughly 56% of the population is white, 26% is Asian, 5% Hispanic or Latinx, ~5% is black or African American, 3% multiracial, and 5% is undisclosed.

3.3.1.2 Participant Selection and Informed Consent

The purposeful sampling model was used in this study to find individuals who do not have experience with the tool used in the microlearning training experience.

However, these individuals were collected at random, as they are not required to participate in the study, thus invoking the nonprobabilistic sampling, or volunteer sampling, approach as well (Creswell & Plano Clark). The researcher used an internal business communication tool for initial outreach of the population utilizing the invitation found in Appendix A. Interested participants were then given a subsequent communication outlining more details of the study and a consent FAQ document through additional communication (Appendix A: Communication 2). Those that did not wish to participate were prompted to opt out of the study by the start date. Once all participants were identified, data collection began. Upon completion of the study, participants were given a gift card for their time.

3.3.1.3 Sample

A sample of the population was collected through an internal report that identifies new hires and their current stage of the onboarding process, and various communication efforts to the business. New hires were chosen as a desired sample population due to their current lack of awareness of the tool used in the learning experience. Furthermore, random outreach was provided via the internal business communication tool to request voluntary participation from experienced representatives that were unfamiliar with the tool. Participants were randomly assigned into two treatment groups: A (digital job aid) and B (demonstration video).

The sample size for this study includes 30 individuals, which is a small sample but is generally sufficient for some researchers, as it should be no fewer than 30 (Altunışık et al., 2004, Cohen et al., 2000, p. 93). The goal of the sample was to obtain

similar metrics to the global population in relation to gender: ~36% women, 64% men, and 0.2% non-binary/other; this would equate to 18 women, 32 men, and 10 non-binary/other.

3.3.2 Training Design and Development Process

The training and development process at this company varies by department, but each department has a highly systematic approach including the one in which this study is situated. For instance, the department that designs and develops the training has adopted the SAM2 development framework and uses participatory design to develop the materials. This section aims to articulate how the treatments for this study were created to provide context on their description and use cases.

The SAM approach to instructional design promotes collaboration, efficiency, and flexibility, while allowing projects to be "completed within time and budget expectations, predict the impact of in-process changes, and produce a product that meets established criteria for quality" (Allen, 2012, p. 33). There are two primary structures of the SAM model: SAM1 and SAM2. Both SAM approaches follow a common event cycle: evaluate, design, and develop. While SAM1 is best suited for smaller projects, as this cycle is typically complete after three "rounds," SAM2 is a much more extensive process, where the cycle is completed numerous times (Allen, 2012).

The SAM2 model is broken into 3 phases: preparation, iterative design phase, and iterative development phase (Allen, 2012). The SAM1 design cycle is completed within the iterative design and iterative development phases, which allows for continuous design and development iteration (Allen, 2012). While the preparation phase is used to gather

background information such as current program information, available content and materials, constraints, needs and wants of the learning experience (from all stakeholders), and otherwise, the iterative design and development stages are used to craft the learning experience and evolutionize it based on feedback from all stakeholders - primarily the intended audience of the learning experience (Allen, 2012). Traditionally, the iterative design phase allows instructional designers to develop prototypes of the experience through storyboards, specifications, descriptions, or other examples. These prototypes are then "socialized" to stakeholders, including learners, to get targeted feedback to advance toward the development phase (Allen, 2012).

Because the SAM process provides frequent opportunities for feedback and pivots, this framework is highly correlated with aspects of design thinking and participatory design. Stakeholder involvement is posed throughout each phase of the process. For instance, former and future learners should be included in the preparation phase when determining applicable content for the experience, as well as ideal learning activities (Allen, 2012), whether that be interviews, focus groups, or previous learning experience feedback. Additionally, the traditional Savvy Start, a project kick-off meeting to begin prototyping the learning experience (Allen, 2012), should have a variety of stakeholders involved, including potential learners, recent learners, and those who know the content (SMEs or learners) (Allen, 2012).

Furthermore, treatment participants (learners) are continuously involved in the design and development process, where prototypes are created, reviewed, and frequently revisited before the launch of the entire learning experience (Allen, 2012). The SAM

framework for instructional systems design includes participatory design while promoting innovation and collaboration, which are foundational elements of design thinking. While instructional designers typically get their information, or feedback, from the current business initiatives or the company's technology limitations or affordances, "combining the expertise of different stakeholders can improve the quality of the instructional design process and the resulting learning environments" (Könings et al., 2014, p. 1). To create meaningful, memorable, and motivational learning experiences that achieve measurable results, learners must be involved throughout the design process and often in multiple ways. According to Druin (2002), there are four primary roles a learner can take within the design process:

1. User - can be observed
2. Tester - can be observed and asked for direct feedback or comments
3. Informant - provides feedback and input in the design and development
4. Design partner - an equal stakeholder in the design process

A *user* of the learning experience or resources can be observed as they navigate the experience or resources. In these settings, a designer watches the learner participate in the experience and challenges their designs based on what is seen (Druin, 2002). A *tester* of the learning or resources then provides feedback as they use the experience, similar to that of user experience testing (UX testing) seen in engineering or technology development (Druin, 2002). By conducting user (learner) experience testing, a designer can obtain real-time and actionable feedback, as well as gain a deeper understanding of

their audience by recognizing the learning patterns (clicks, feedback, questions, and otherwise).

While having learner input at the end of the development process is valuable, it does not allow the design of the experience to be impacted by learner participation to the fullest extent. Having the learner participate as an *informant* or a *co-designer* strengthens the initial designs of learning experiences, perhaps increasing designer's time efficiency and the quality of the output. *Informants* provide feedback on prototypes or the initial design of the learning or resources in order to guide the next phase of design iterations, whereas a *design partner*, or *co-designer*, participates in the design and development process as an equal stakeholder; they collaborate with the learning experience designer or instructional designer to create the materials (Druin, 2002). The treatments and instruments of this study included participatory design, utilizing each of the four roles, from individuals who had the same characteristics as the population.

3.4 Treatments

There were two treatments provided in this study: a digital job aid and a demonstration video outlining the process for the usage of an internal selling tool. This is a proprietary tool the company encourages sellers to use as they conduct discovery on their customers' needs and challenges. They are able to use the app to select appropriate customer questions to uncover pain points and needs. Both treatments had the same learning objectives:

1. Describe the value of the internal selling tool and when it should be used.
2. Access the internal selling tool.

3. Navigate basic features: sales org connectivity and discovery question selection.
4. Identify the use cases for particular discovery question sets.

Furthermore, both the job aid and demonstration video were housed on internal, cloud-based business platforms, and were readily accessible by the population. Each treatment is outlined in significant detail in Appendix B.

The treatments were designed through the rigorous SAM and participatory design approach, including review by specialists, to meet the needs of the diverse learners and increase reliability and validity. The treatments of this study have few requirements, but were in ordinance with the definition of microlearning; the microlearning experience, regardless of the modality, is defined as a stand-alone and passive training that is less than 10 minutes in length. This definition can be further expanded to include particular learning design principles identified by Clark and Mayer (2016):

- Avoid irrelevant videos, animations, music, or other sounds
- Use simple, relevant, and meaningful visuals
- Use cueing devices such as color, arrows, or otherwise to direct attention in visuals
- Write or speak in a conversational style
- Place text near the corresponding visual or graphic

The description of each treatment and its alignment to the design principles discussed in the literature review are elaborated upon in the subsequent sections.

3.4.1 Job Aid

The digital job aid for this study was distributed via Quip: a digital collaboration tool, similar to that of Google Documents. The document had a total of 2,279 words, which equates to around 9 minutes of reading, according to the English as a first language silent reading average (238 words per minute) (Brysbaert, 2019). This document had four main components: Getting Started, Planning your Discovery, Running your Discovery, and Analyzing your Discovery. Each section had less than 250 words of content and included relevant screenshots of the tool to correlate with the text. The job aid followed key design principles outlined in Chapter 2, detailed in this section.

Richard Mayer (2016) identifies three particular design principles relating to using graphics in multimedia learning:

- Graphics are used to clarify information and provide visual clues
- Graphics are placed near corresponding text
- Graphics are relevant and meaningful to the learning content
- Graphics are used consistently throughout the document

In this job aid, only one type of graphic (images) were used throughout to provide visual clues and to clarify textual information. For example, each step in the process had a corresponding image to demonstrate the procedural step and was accompanied by strategic text formatting changes (bolding of words or color contrasts). This image was found near the corresponding text to attach relevancy and minimize extraneous processing (Mayer, 2016). To continue, all graphics included in this job aid were the same kind: screenshots or images of the tool being demonstrated. This is seen in Image 1

where an image is directly below the text, indicating its relevance, and includes bolding of keywords such as open, discovery, and insert, so a learner knows they should open a document, find the discovery app, and select “insert.”

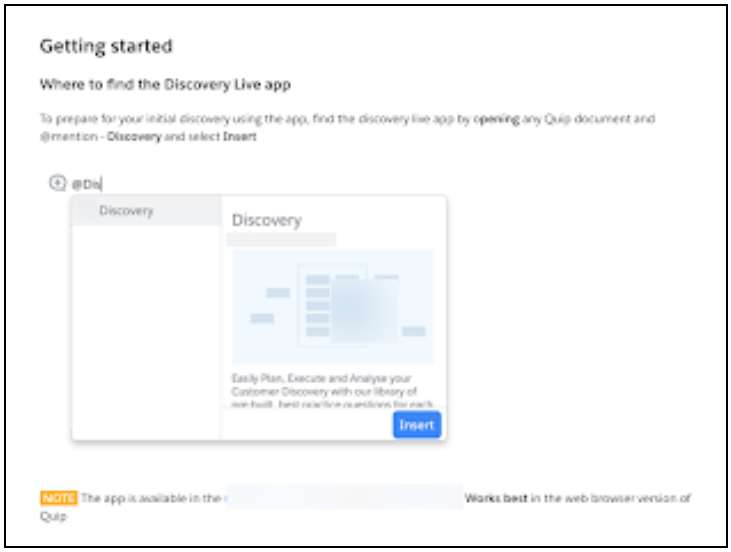


Figure 3.1 Meaningful Images in the Job Aid

Mayer (2016) also notes the importance of fonts and language usage for cognitive load and processing. He, as well as others, note that language should be inclusive and concise while maintaining a conversational tone to foster generative processing (Mayer, 2016, Russell, 2000). This is demonstrated in several phrases found within the job aid, one particular instance being depicted in the subsequent image. This image highlights the inclusive language of avoiding gender-specific pronouns (by using “you”) and includes words like “awesome.”

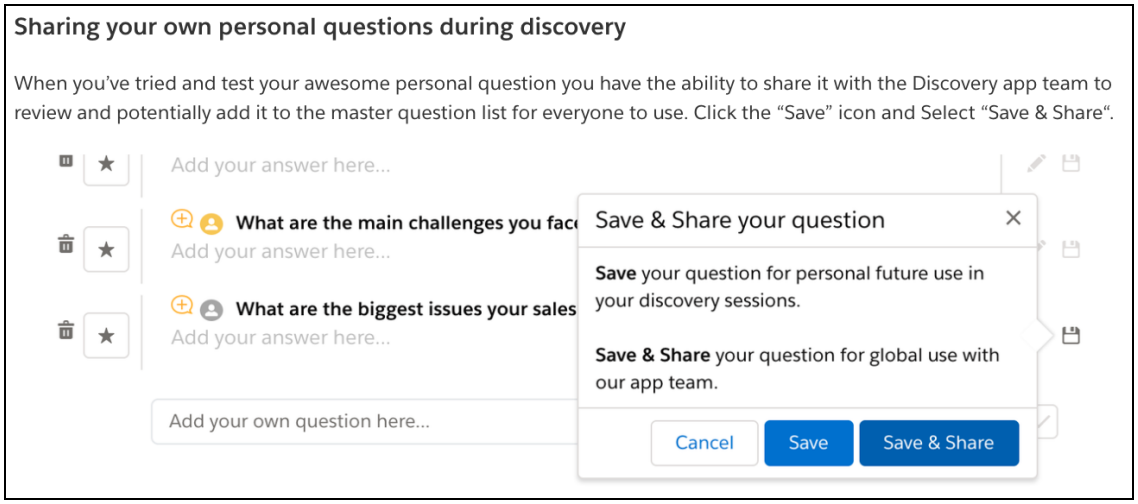


Figure 3.2 Inclusive Language in the Job Aid

Furthermore, the font type and size should be readable with sufficient white space and clear heading and subheading structures (Boyd, 2005). The job aid followed these design principles by having a structured heading sequence that met Web Content Accessibility Guidelines (WCAG) accessibility standards - there is only one Heading 1 (the title), each subsequent section is indicated by Heading 2, followed by the subsections within each section indicated by Heading 3, and finally, the normal text is used. This can be seen in image 3, in which heading 2 (Analysing your Discovery) is larger than heading 3 (Filtering your Discovery Questions), which is larger and bolder than the paragraph of text.

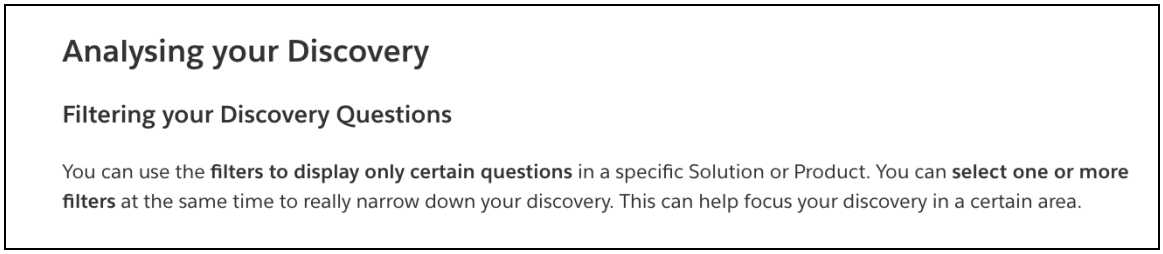


Figure 3.3 Heading Structures in the Job Aid

By adhering to design principles set forth by Mayer and others, the risk of confounding variables was reduced; we can ensure that cognitive overload has limited involvement in the relationship with learner satisfaction, knowledge retention, and behavior change. Furthermore, by having multiple stakeholders review and interact with the job aid prior to the study, the design was iterated upon to increase clarity, decrease scope, and maximize effectiveness.

3.4.2 Demonstration Video

The demonstration video was housed in Vidyard, an online business platform for videos. The same language and screenshots found in the job aid were used in the video to promote consistency across learning experiences. The video also followed the same structure of the job aid and adhered to the design principles outlined in Chapter 2.

The first design principle that aligns with this learning experience is the length and topic scope, considering it also must adhere to the definition of microlearning. To ensure scope compliance, learning objectives and a script were crafted prior to video creation, in alignment with the design process principle identified by Ruffini (2012) in chapter 2. Furthermore, this video provided clarity through an overview of what the tool is and how it is used in the learner's role, followed by the demonstration (Sugar, Brown, & Luterbach, 2010). The demonstration was then segmented into the four primary sections aforementioned: Getting Started, Planning your Discovery, Running your Discovery, and Analyzing your Discovery; this aids in the management of the learner's cognitive load (Mayer, 2016). The recommendation is that the video is short in length

(less than 10 minutes) and is limited to a singular topic or procedure (Keane et al., 2017; Oehrli et al., 2011). This video was ~10 minutes long and is focused on one particular tool sellers use to conduct research in their role.

The video limited the use of unnecessary words, sounds, or graphics by limiting background music to the introduction and outroduction "bumpers." Using features such as arrows or transparent shapes (circles or squares) and zoom in/out provided visual cueing to highlight information, while using audio to highlight complex visuals (such as steps or procedures), as seen in Figure 3.4 Visual Cues in the Video Treatment (Kharishma, 2020; Mayer, 2016). In addition, the use of synchronous closed captioning was provided to ensure the learning material is accessible to diverse learners (Kharishma, 2020).

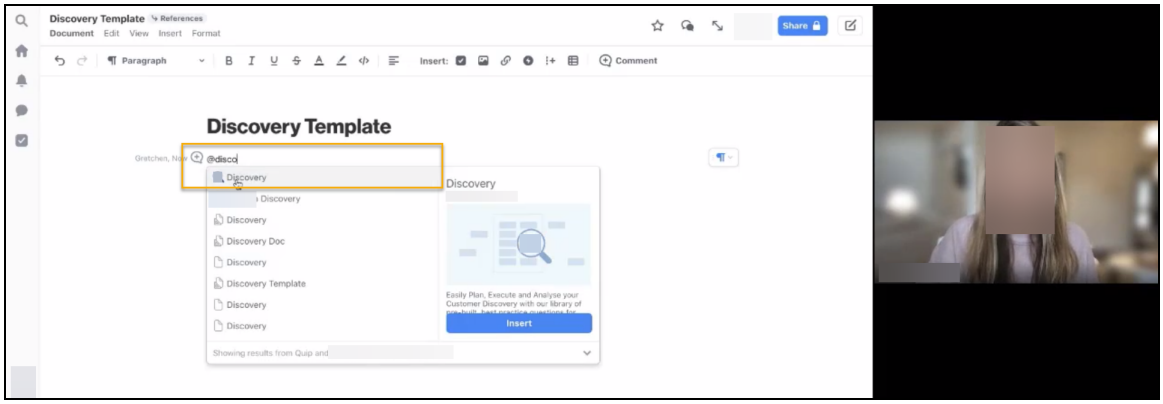


Figure 3.4 Visual Cues in the Video Treatment

Like the job aid, adhering to design principles set forth by Mayer and others reduced the risk of confounding variables, thus we can ensure that cognitive overload has limited involvement in the relationship with learner satisfaction, knowledge retention, and behavior change. Furthermore, by having multiple stakeholders review and interact

with the demonstration video prior to the study, the design was iterated upon to increase clarity, decrease scope, and maximize effectiveness.

3.5 Data Sources

The data sources used in this study were crafted to meet the needs of three particular Kirkpatrick levels: learner satisfaction, knowledge retention, and behavior change. Both qualitative and quantitative collection methods were included, such as interviews, pretests and post-tests, and behavior questionnaires. This section was organized by data sources in relation to the intended research question it aims to answer.

Instrumentation design was conducted using frequent feedback from other individuals to ensure content alignment, business alignment (e.g. voice and tone), and reliability and validity. All data sources were initially designed by the researcher, with guidance from other research studies, reviewed by other learning designers and learning design managers, then validated and revised by a psychometrician during a pilot study.

3.5.1 RQ1a: Learner Satisfaction Interviews

Interviews were used to gain qualitative insight into the perceptions or degree of satisfaction of the study participants as it pertains to microlearning. The moderator (the researcher) used a predetermined set of questions, scripts, and established a permissive environment. Interview methods for developing questions, moderating the group, and analyzing the data are informed by Krueger and Casey (2000) and Creswell and Plano Clark (2017). There is a set protocol that keeps the researcher organized and provides a deeper record of the event (Creswell & Plano Clark, 2017). This protocol can be found in

Appendix C and includes an introductory script (welcoming and providing context to the event), moderator and assistant moderator tasks, participant introductions (to establish rapport), open-ended questions in a particular format, and a closing statement. All interview questions were open-ended, in which the participants were able to "provide the information based on questions that do not restrict their options" (Creswell & Plano Clark, 2017, p. 179).

The questions crafted for this study were developed based on a foundation set by Rajabalee and Stanally (2020), who evaluated learner satisfaction, engagement, and performance in an online module. This study adopted a mixed methods approach of obtaining quantitative feedback in the area of performance, and qualitative feedback around learner satisfaction and perceptions of their online engagement through an end of module open response questionnaire (Rajabalee and Stanally, 2020). Like this study, theirs aimed at using qualitative research to better understand the audience's relation to the learning environment and process (Rajabalee & Stannally, 2020). While Rajabalee and Stanally's study includes 5 primary questions, this study is limited to primarily using aspects of one question related to overall satisfaction, and minor aspects of others. For instance, Rajabalee and Stanally's questionnaire includes 27 probing questions, 3 of which are to be adopted and modified for this study. The modified versions are seen below:

1. Describe your level of satisfaction with this particular learning experience (defined as the video or the job aid).

2. What difficulties, if any, did you have with the learning experience (defined as the video or job aid)?
3. In what ways do you think the learning experience (defined as the video or job aid) can be improved?

A similar study conducted by Christine Boring (2020) used a semi-structured interview to evaluate learner satisfaction in microlearning of adult learners. Boring's (2020) questions range in topics from satisfaction, current usage of microlearning in a daily context, and knowledge retention. The researcher focused their microlearning efforts on video-specific training, so the questions used in this research must also be adopted and modified to be related to this study. The questions adopted and modified for this study include

1. For you, what are the main benefits or drawbacks of using this type of learning experience (defined as the video or job aid)?
2. Do you feel that you remember more from this type of learning experience (defined as the video or job aid) compared to others?
3. Generally, how satisfied are you with this type of learning experience (defined as general video or job aid) for training?

According to Mohammad Zohrabi (2013), "one of the main requirements of any research process is the reliability of the data and findings" (p. 259). Kirk and Miller (1986) recognize that for reliability to be calculated in case study research, the procedures of the study, from initiation through analysis, should be documented by the researcher. The Yin methodology of case study design was followed and reported to increase the

reliability of the study. This method includes the design of the case study, conducting the case study research, analyzing the evidence, and developing conclusions, recommendations, and implications (Yin, 1994). Furthermore, by using questions found in other studies and validated with psychometricians and other academic personnel, the study aimed to create replicable qualitative procedures, which can support the expansion of these study's findings in the future.

3.5.2 RQ1b: Knowledge Retention Assessment

The data collection method used to answer this question through performance assessments, known as a pretest and post-test. These assessments are eight questions based on the learning objectives of the microlearning content, seen in the table below.

Table 3.2 Evaluation Questions Aligned to Learning Objectives

Learning Objective	**Question**
Describe the value of the discovery live app and when it should be used.	Select two: What value does the discovery live app bring to your selling habits?
	When should the discovery live app be first used by sellers in the selling process?
Access the discovery live app.	How do you access the discovery live app?
	What is one proposed strategy for easy duplication of the discovery live app?
Navigate basic features: sales org connectivity and discovery question selection.	True or False: Once you create your discovery questions, you cannot change the linked opportunity in the document.

	Select the two best ways you can link an opportunity in the org.
Identify the use cases for particular discovery question sets.	True or False: You must only use one type of questions per discovery document.
	Select the two that apply to complete the sentence: An easy way to focus the priorities of your customers is to ____.

While the questions were the same from pretest to subsequent post-tests, the order in which they appeared was “shuffled” to reduce the possibility of question order and answer memorization. These assessments were designed in alignment with many of the 31 suggested guidelines to increase multiple-choice item validity (Haladyna et al., 2002, p. 314), seen in the bullets below:

- The assessment evaluates only important content; important is defined as the procedural task and its relevance to the seller's role.
- The assessment avoids opinions, as the question stems are often replicated from what is found directly in the video script or digital job aid.
- Simple vocabulary is used such as avoiding jargon and unnecessary information.
- Prior to the launch of the assessment, editorial staff edited and proofread the assessment to ensure correct grammar and clear directions.
- To minimize reading, questions have concise stems with central ideas and are limited to a maximum of four options with the correct answer having varied locations.

- Each question uses positive language and avoids *none* or *all of the above* options.

Furthermore, evaluation questions were reviewed by other learning designers in relation to the content and finalized with the support of a psychometrician to further increase reliability and validity.

3.5.3 RQ1c: Behavior Change Self-Evaluation

A self-reported questionnaire was designed and implemented to track participants' behavior change after the microlearning treatment was administered. These types of questionnaires are more efficient tools for surveying large samples of respondents, especially at a variety of locations, and were disseminated using email (Nardi, 2018). Because these questionnaires are self-reported, the researchers have a lesser chance of impacting the outcome of the survey results (Nardi, 2018).

These questions can be found in Appendix C, but are modeled after the research documented by Christine Boring (2020); the behavior change surveys have three closed-ended questions and were developed to promote accurate and consistent answers (Creswell & Plano Clark, 2017; Nardi, 2018). The language used to craft these questions reflected the educational level of the participants and avoided jargon, acronyms, technical terms, and obscure phrases, per the suggested guidance outlined by Nardi (2018). The responses to the questions were organized in a Likert Scale for more simplistic data analysis:

- Always - 100%
- Very Frequently - 80%
- Occasionally - 60%
- Rarely - 40%
- Very Rarely - 20%

- Never - 0%

3.6 Procedures

Procedures for this study can be categorized into two distinguishable groups: prior to the research period and during the research period. Prior to the research period included the creation of the treatment and instrumentation, piloting of the content, and iteration of the materials. The research period included participant selection, informed consent, dissemination of the microlearning treatments and follow-up experiences, data collection, and data analysis.

3.6.1 Prior to the Study

Prior to the launch of the research study, the microlearning treatments and data sources were crafted and piloted to test the accuracy of the information, collection of data, and the research study procedures. The pilot consisted of 20 participants from varying populations to include a diverse range of feedback. These included sales representatives, other learning designers, and sales enablement personnel. Pilot feedback was provided by individuals in a document to be actioned on by the researcher and updated before the official launch. Once the pilot ended, iterations on the content and instrumentation were made to increase the reliability and validity of the study and launched according to the procedures outlined in the subsequent section.

3.6.2 During The Study

The launch of the study was inaugurated through an outreach, identified in Appendix A, via email or by social channels inside the internal business communication

tool Slack by the researcher to the target audience at the beginning of Week 1. These correspondences were used in an A/B format; 50% of the target audience was given an email with a direct link to enter the research study focusing on the digital job aid, while the other 50% were given a direct link to enter the research focusing on the demonstration video. These direct experience links take the participant to an informed consent page where they agree to participate in the study by selecting “I agree” or “I disagree” to the following questions:

- I know I can leave the study at any time.
- I know the researcher will keep my information confidential to the extent possible by law.
- I know my participation or lack thereof will not promote or hinder my job performance or status within the company and is completely voluntary.
- I know I can skip demographic or focus group/interview questions as desired.

For those who do not start the study, a subsequent email was sent as a final chance to volunteer their time in the middle of the week. Once all potential participants are identified, the data collection process of the study begins to unfold; the totality of the experience (consent, pretest, content, post-test, and behavior change) should be no longer than 20 minutes in one sitting.

The assessment was used to evaluate pre-existing knowledge and knowledge retention at several points: prior to the treatment, immediately after the treatment, and two weeks after the treatment to evaluate knowledge retention over a three-week duration. A behavior self-evaluation was provided at week 3 to track the implementation

of content and/or behavior change. This is aligned with the idea that behavior questionnaires should be provided within a "reasonable time frame in which the typical behavior occurred" to ensure participants could recall the impact of the microlearning treatment and their behavior shifts (Nardi, 2018, p. 89).

Participants for virtual (online) interviews were identified after week 1 of the study and conducted during week 2; there are two distinct groupings of interviews-digital job aid users and demonstration video users. Multiple interviews per content type were shared with participants using a virtual meeting platform for thirty minutes to one hour each. Furthermore, each interview was recorded to allow the researcher to accurately transcribe the experience and views portrayed during such (Sugar & Luterbach, 2016). In total, the study is a three-week study duration for the research participants. These procedures are more clearly outlined in the subsequent table.

Table 3.3 Schedule of the Research Study

Week Number	**Event**
Week 1 of Study	Informed Consent, Knowledge Retention Assessment (pretest), Treatment, Knowledge Retention Assessment B (Post-Test 1)
Week 2 of Study	Learner Satisfaction Interviews
Week 3 of Study	Knowledge Retention Assessment C (Post-Test 2) Behavior Self-Evaluation 1a

3.7 Data Analysis

A variety of strategies were used to analyze data from this mixed methods case study. This section aims to articulate the variety of strategies, tools, and procedures planned to analyze data obtained both quantitatively and qualitatively, articulated below by the type of data collection method used per research question.

3.7.1 RQ1a: Learner Satisfaction

Interview transcriptions were conducted immediately following the events and followed the guidance outlined in Krueger and Casey's *Focus Groups: A Practical Guide for Applied Research* 3rd Edition (2000): identifying moderator statements, refraining from typing filler words or verbal pauses, and identifying "special or unusual" sounds that could support the overall analysis (p. 142). Identifiable markers, such as name or manager names were removed during the transcription process to provide participants anonymity. Following Krueger and Casey's strategy of "using the computer to help manage the data," all data was analyzed by the researcher through Word processing - using color coding, cut/copy/paste to combine similar ideas, comments, or phrases.

The categories set by the researcher reflected the purpose of the study and pertaining to the particular research question of "learner satisfaction." After initial reports in a question-by-question format with direct quotes are created, a set of categories identified during the process was identified in an additional appendix at the completion of the study. Findings from all data sources were triangulated with the literature to identify

commonalities and inconsistencies. A blended approach of inductive and deductive (abducted) coding was used to create the categories (Graebner et al, 2012; Alvesson and Kärreman, 2007). By doing this, the research can stay "attuned to existing theories" but "remain[s] open to surprises in the data" (Skjott Linneberg & Korsgaard, 2019). Deductive codes include onboarding, time, affordances, and affect/preferences. Inductive categories include engagement, persona/role, organization, and application/relevancy.

3.7.2 RQ1b: Knowledge Retention

The pretest and post-test evaluations (found in Appendix C) were designed to test knowledge prior to the study and knowledge retention after the study immediately after the treatment and in week three. Traditional data analysis such as mean, median, and mode for the post-test was conducted for each evaluation moment, followed by a comparison analysis conducted to determine the rate of change in the post-test scores (pretest to immediate post-test, post-test in week 1 to week 3). Additionally, scores on an individual level were viewed to gain insight into potential additional factors (region, experience level, education level, etc.) based on the demographic questionnaire. Once initial analysis was conducted on each treatment (job aid and demonstration video) an Analysis of Variance (ANOVA) test was used to compare the two groups across multiple measurement points (Knapp, 2017).

3.7.3 RQ1c: Behavior Change Self-Evaluation

The behavior self-evaluation questions were designed using a Likert scale. Therefore, traditional data analysis such as determining the mean, median, and mode for

the evaluation moment (week 3) is appropriate. A simple t-test was used to determine the difference in video and job aid treatment participants' behavior change self-evaluation scores.

3.8 Assumptions, Biases, and Limitations

3.8.1 Assumptions

The researcher assumed the sample size was large enough to detect statistically significant results and the sample population is unfamiliar with the tool discussed in the training program. Additionally, the population of participants was assumed to fit within one of the operational units categorized in the demographic section. Furthermore, participant motivation can be assumed due to a $25.00 gift card and career skill building. Finally, the researcher assumed that behavior change was zero if a participant did not know the tool discussed within the treatment and it could be quantified through a self-evaluation.

3.8.2 Biases

The researcher currently works in the corporate environment and crafts learning experiences for the training and development team, such as these. To limit bias, the treatment and instruments were crafted in coordination with other learning experience designers. While the research was conducted using the researcher's professional network, no direct reports, family members, or closely tied coworkers were used in the study.

Because the study is not required for the sales representatives, there is participant self-selection bias.

3.8.3 Limitations

There are several limitations to this study, including demographic information, retention rates, roles, assessment questions, and evaluation techniques. Demographic information is limited to gender, age, general business unit, and years of relevant work experience due to the company's legal requirements to not inquire about ethnicity or race. Additionally, the initial study aimed to evaluate knowledge retention over 5 weeks time to deepen the understanding of modality against Ebbinghaus' Forgetting Curve. However, participant dropouts were exceptionally high after three weeks, therefore the study is limited to data within that timeframe. Of the sample population, many participants failed to complete the study, which may have affected the internal validity and reduced the sample size for this study. Therefore, results have only been evaluated from participants who completed the three-week duration of the study in its entirety within certain parameters, discussed in Chapter 4.

The study participants included varying degrees of company tenure. Furthermore, this study used a variety of sales roles in the study, which may skew results on behavior change, as the content may not be relevant to their particular daily job functions. Additionally, the test questions provided did not have an "unsure" option to select, therefore the study did not determine the impact on correct guesses within the pre- and post-assessments. Furthermore, behavior change was self-reported, which has "evidence showing that self-report scales are not the best tools for obtaining information from a

significant minority of the population, named repressors" (Saeedi et al., 2020, p. 76). The Kirkpatrick Model includes a fourth level (business results), but this study does not include this data due to time constraints and insufficient data collection methods.

3.9 Summary

Chapter three provided details of the methods and procedures regarding the study. This study was designed as a mixed methods case study to evaluate microlearning's impact on knowledge retention, behavior change, and learner satisfaction in a corporate environment. This study was conducted over 3 weeks, following the convergent design of a core mixed methods approach: data collection and analysis was merged and compared to cultivate a final interpretation (Creswell & Plano Clark, 2017). Participants were given differing treatments: a demonstration video or a digital job aid, followed by interviews, performance assessments, and questionnaires to evaluate learner satisfaction, knowledge retention, and behavior change, respectively. Each treatment and data source was crafted by the researcher and reviewed by other stakeholders (learning designers, a psychometrician, and potential learners) during a pilot to evaluate the accuracy, clarity, and achievement of the design principles. Each data source has its own data analysis procedures to be used to create a final analysis. While quantitative methods will include a basic comparison analysis along with mean, median, and modes, qualitative data was analyzed through color coding and quote clustering. All surveys, evaluations, communications, and the interview protocol can be found in the appendices.

CHAPTER 4. RESULTS

This research study aims to explore the impact of different types of microlearning experiences on employee satisfaction, behavior change, and knowledge retention in a corporate environment. The study addresses the lack of empirical evidence in corporate settings regarding the effectiveness of microlearning experiences, which hinders the ability of instructional or learning designers to create meaningful and impactful learning experiences. Specifically, the study focuses on the enablement operations of a sales organization, aiming to use evidence-based practices to enhance training in this context.

The research design is guided by the Kirkpatrick Model and employs a mixed methods case study approach. This approach allows for a comprehensive evaluation of multiple dimensions and provides valuable insights in a real-life setting through the incorporation of both qualitative and quantitative data, ensuring an in-depth exploration of complex issues within the context of microlearning. By using a mixed methods approach, the researcher can compare and validate findings, bridging the gap between qualitative and quantitative research methodologies. This design contributes to increasing the validity of the study's findings and supports knowledge creation in the field of microlearning.

Overall, this research study adopts a constructivist approach, acknowledging the diverse perspectives and complexities of the microlearning experience (Creswell & Plano Clark, 2017). The goal is to provide a realistic and comprehensive understanding of knowledge retention, behavior change, and satisfaction in microlearning. The findings from this study can inform talent and development or enablement organizations in their

application of microlearning strategies and contribute to the advancement of effective training practices.

This chapter outlines both the quantitative and qualitative results of the study outlined in Chapter 3 as it relates to the theoretical frameworks identified in Chapter 2. The chapter begins with an overview of the participant demographics notably including age, industry experience, role, and gender, followed by an overview and summary of the quantitative and qualitative findings, respectively. Deeper conclusions, implications for organizations, and suggestions for future research based on these results are found in the subsequent, and final, chapter.

4.1 Participant Demographics

Due to the high dropout rate of the proposed study, specific qualification criteria needed to be defined in order to have similar treatment sample sizes. Qualification criteria for the study includes

- Completion of the pre-treatment and post-treatment assessment.
- Completion of the second post-assessment no fewer than 3 weeks and no greater than 4 weeks after the initial post-test.
- Completion of the behavior change questionnaire no fewer than 3 weeks and no greater than 4 weeks after the initial post-test.

Of the possible 53 participants, only 30 qualified for this section of the study, as there was a large dropout or failure to respond promptly. Therefore, the study had a total of 30 participants; 15 of which participated in video-based microlearning and 15 participated in written microlearning in the form of a job aid. Figure 4.1 shows the overall demographic

information in a complete visualization for this study. As seen in the following figures and tables, most participants were Account Executives (43.33%), specializing in Small Business (43.33%), were male (53.33%), and were 25-34 years old (53.33%).

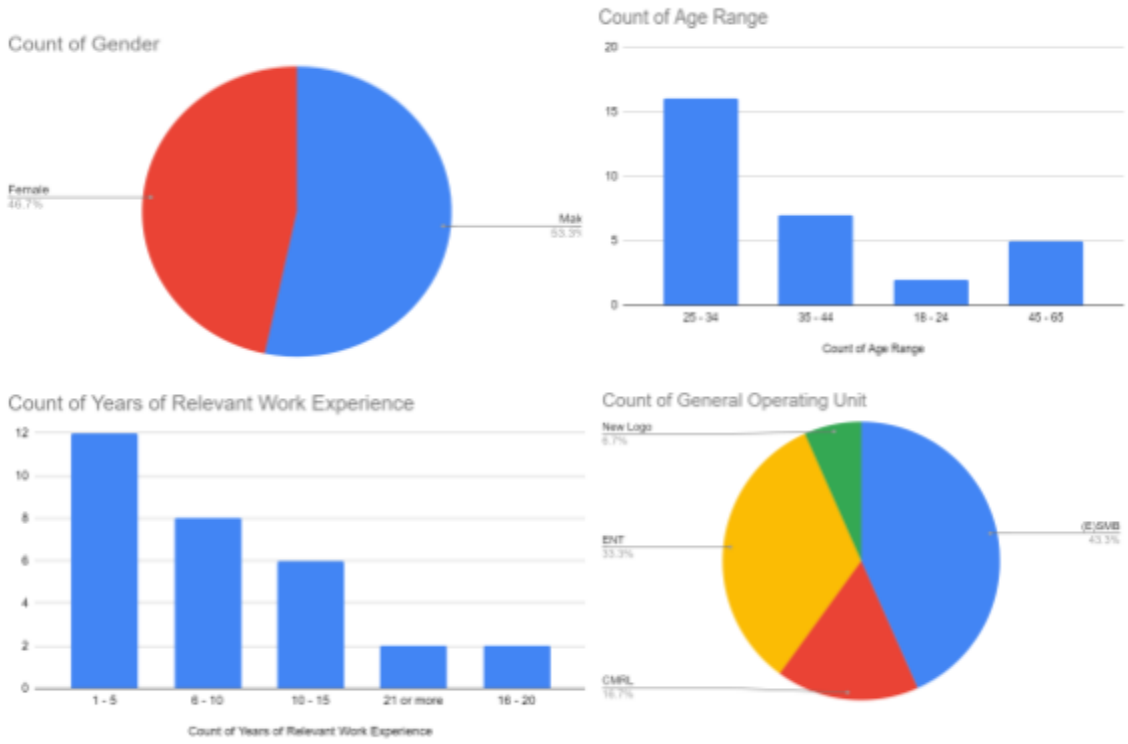


Figure 4.1 Demographic Visualization

This is further broken down in the subsequent table (Table 4.1), which also correlates this information with treatment modality.

Table 4.1 Overall Demographic Information

Characteristic	Title	Video	Job Aid	*n*	%
Gender	Male	7	9	16	53.33
	Female	8	6	14	46.67
Operating Unit	Small Business [(E)SMB]	8	5	13	43.33
	Mid Size [CMRL]	0	5	5	16.67
	Enterprise [ENT]	5	5	10	33.33
	New Accounts	2	0	2	6.67
Relevant Work Experience	1 - 5	6	6	12	40
	6 - 10	6	2	8	26.67
	10 - 15	2	4	6	20
	16 - 20	0	2	2	6.67
	21 or more	1	1	2	6.67
Role	Account Executive	7	6	13	43.33
	Solutions Engineer	5	5	10	33.33
	Business Development Representative	0	3	3	10
	Sales Development Representative	1	0	1	3.33
	Customer Success Manager	0	1	1	3.33
	Technical Account Manager	2	0	2	6.67
Age Range	18 - 24	1	1	2	6.67
	25 - 34	9	7	16	53.33
	35 - 44	1	6	7	23.33
	45 - 65	4	1	5	16.67
	65 or older	0	0	0	0

4.2 Qualitative Results (RQ1a)

The goal of this section is aimed to answer the question: to what extent do two modalities of microlearning – digital job aids and demonstration videos – compare regarding learner satisfaction? While this section describes the general results and themes of the qualitative portion of the study, the subsequent chapter will correlate the study results with theoretical frameworks and persona-based research presented in Chapter 2.

Following the quantitative portion of the study, participants who had completed phase 1 of the study were invited to participate in a virtual interview via Google Meet to articulate their satisfaction levels with the training intervention. Twenty of those individuals responded and participated in the virtual interview. Noticeable demographics included most being between the ages of 25 - 34, half being male, and most being Account Executives.

Many of these individuals reflected on both professional and personal learning experiences that provide context and nurturing of their preferred methods of learning, as well as self-identified with Attention-deficit/hyperactivity disorder (ADHD), citing preferences based on their innate attention span and the challenges they face with the disorder. They all cited role- and industry-specific challenges to support their learning preferences and levels of satisfaction with this particular treatment.

4.2.1 Research Question 1a Results

This information was obtained via participant interviews. Each interview took 30 minutes to 1 hour to complete, was transcribed, and analyzed for themes to ultimately

determine learner satisfaction with this particular intervention, and as it relates to their general training and development (enablement) needs. Initial codes are outlined in Table 4.2

Table 4.2 Qualitative Code

Initial Code	***n*** **Video**	***n*** **Job Aid**	**Sample Excerpt**
Persona	8	5	*"And to me it's just a huge timespan, especially like an SDR. It's a very high volume role. So if we have required training or something, the quicker we can get those done and get back to working, the better it is for us. So anything over 10 minutes, I'm like there's probably information that I need from this, but I'm probably better off trying to figure it out myself than wasting over 10 minutes watching a couple videos on something that may or may not help me."*
Time	10	10	*"I'm still wanting less than five minutes, I feel like you can't tell me what it does, how to best use it and where the pitfalls are in five minutes, that's a super complex topic."*
Engagement	10	5	*I think it's just the engagement, like you said, like, it's, it's, if I have a video, maybe it's my simple brain, but I'm a little bit more engaged in, in that because there's movement, there's someone else's voice in my head, there's me following along, like I'm doing an action while they're speaking at me. Versus like, reading I read. And then I'd have to stop, digest, turn, do the action, go back to the document. Right. And it's like, I think that's been hard for me."*
Affordances	10	10	Video: Transcripts → *"That'd be great for keyword search, writing and to get me right to where I needed to go. So having that capability, I think would be nice…"* Video: Speed → *"I speed up typically, maybe not 1.5, but like 1.25, almost every video."*

Initial Code	***n*** **Video**	***n*** **Job Aid**	**Sample Excerpt**
			Job Aid: Search → *"So if there's long content, you know, the Ctrl F can support, you know, in… a job aid or a technical support sheet or something like that."*
Organization	10	7	*"Across the board it's overwhelming; where to find things here. Like the courses do a really good job of, you know, structuring training. But even in those it's like, download this form. And I never do. I never saved that. There's too many of them. And it's hard to keep track of where they are. So that's why I go to Slack. Like if there's something that pops up in my head, that I know I need to do something. I'll just search for it. But we have a lot of content at this company. And it never slows."* *"[having a] table of contents like it would be helpful just because like if there's information that you don't necessarily need, you can just jump to the part where that you're looking for, rather than having to like scroll through the entire document"*
Application/ Relevance	10	8	*"Because I think too, it was like at the end of January, so it was already a mess. So if it was something that was relevant to me, and my position, which a lot of the training we have is … not many kinds of deal with my role in my realm. Right? So then it is more difficult to follow or really get in touch with the context of the training."* *"I like being able to go in and practice what you've been learning."* *"For me, just like I said, a long video on irrelevant content I'll skip [it]..."*

Initial Code	***n*** **Video**	***n*** **Job Aid**	**Sample Excerpt**
Affect/ Preferences	10	10	*If it's a short video, though, going over like a workflow. I don't mind just watching that. I think it would depend on how long the video is. Even if it's short, I'm fine watching it. If it's longer, maybe being broken up into a quick…document that maybe has bullet points of the main points of the video or something like that.* *"Five minutes. Three to five minutes if I could get everything done, and then do some reading that supports it."*
Learning Experience	8	7	*"I think I would get the most out of an in person, instructor-led training, for several reasons, one, I just think it's going to be the most engaging, and I'm going to be the most present, knowing that I want to be, you know, present in an in person training. And two, I just think you're going to get more out of the actual peer networking, relationship building side as well, by being brought in with other peers that are in a similar position as you going through a similar training."*

Codes have been grouped to form themes for the chapter, outlined in Table 4.3, and subsequently expounded. While theme 1 (Bite Sized is Best) answers research question 1a, the additional themes are emergent findings from the interviews (There is an Ocean of Knowledge and The Keys to Procedural Learning Success).

Table 4.3 Qualitative Codes Clustered into Themes

Matching Theme	**Qualitative Codes**	**General Related Phrases and Feelings**
Bite Sized is Best	Persona Time Engagement Content Affordances	Less than 10 minutes Less than 5 minutes Quick and simple Relief it was shorter than anticipated Prioritization in a busy schedule
There is an Ocean of Knowledge	Persona Content Organization Affordances	Too many places to find lots of information I'm new, I'm just going to my peers Document structure is important: table of contents, quick links, playlists Overwhelm / Anxiety / Stress Annoyance (if information is old, wrong, irrelevant)
The Keys to Procedural Learning Success	Persona Time Engagement Content Affordances Application/Relevance Learning Experience	I need hands-on training I like to practice or play I like to watch a video, then read I like to follow along with a document while I do the task Documents are easier to reference later

4.2.1.1 Theme: “Bite Sized is Best”

The first question of the qualitative section of this study was “describe the level of your satisfaction with this training.” This question, while very generalized, is where many video and job aid treatment participants took the opportunity to articulate their surprise and delight at the length of training consumption time. Participants shared their preference for microlearning approaches, which deliver information in short, focused bursts rather than lengthy, comprehensive sessions. This preference for shorter, targeted learning experiences indicates that employees appreciate the ability to engage with training materials without feeling overwhelmed to prioritize lengthy training over their already busy schedules.

All participants noted they would like a video to be no longer than 10 minutes (with 5 minutes being the ideal time), and a job aid to be no longer than 2-3 pages when asked. Ultimately, it should be short enough to watch or review in between customer calls without too much thought or time to apply. Keeping videos to a short time allows for flexibility in the learning moment: they have time to rewatch it all if the technology fails, watch it in between customer calls, and even rewatch the video. One participant noted that they would prefer bookmarks or chapters to segment long videos because “with short videos, I’ll rewatch the whole thing. Greater than 5 minutes I’ll rewatch certain sections. Longer videos need bookmarks or if they’re covering different topics then I can use the bookmark to jump to different sections.” Customer-facing roles, particularly high volume

such as a Business Development Representative, have to prioritize their time based on need and time. Ultimately, anything over 10 minutes has to be a commitment, with one account executive mentioning a 15-minute marker being the notification to "let me go block out some time. And commit to that, then come back and doing it." Similarly, written training is preferred for step-by-step procedures that can be quickly consumed at a high level and applied quickly. One participant noted that breaking documents into steps with images "make it a little bit more sticky than… [when they] give you 18 paragraphs, even though it's really really great information." This indicates that no matter how relevant the content is, it feels less relevant and applicable than documents that fit within the definition of microlearning if it is lengthy and difficult to consume quickly.

Videos (regardless of length) that also include transcripts allow for a more skimmable experience that can speed up the consumption process, even if they are already increasing the speed, which many participants noted is a common occurrence. One participant noted they "speed up typically, maybe not 1.5, but 1.25, almost every video." Short videos with transcripts allow flexibility of modality, such as "if I don't want to watch the video, I can just read it." Some participants said they even prefer transcripts for longer videos (longer than 10 minutes) because "I don't want to watch this whole hour-long video, I don't have time. I'm just going to look at the transcript and Control F and find what I want." However, all participants who discussed the job aid treatment, and even those in the video treatment group mentioning the use of transcripts, discussed that ultimately any text based training can often be the most skimmable by using the search functionality using Control + F. Sellers, particularly those short on time to find and apply

what they need to close a deal, use this feature to get what they need quickly. One seller even self-identified as “the biggest fan of control find,” so in any training they want they want you to give them whatever they’re looking for, and then they can find and read that section to move forward, despite the length of the document.

Despite participants noting that using this feature (Control + F) is a key affordance for them, regardless of document length, six participants described the value of a summary portion or a table of contents in the written document to highlight key concepts and details in a more digestible manner that highlights what the user should know immediately. One participant particularly noted the importance of the concepts being hyperlinked to specific sections in the document: “even if on the main document you highlighted… click on these five or four subsections. And these are the absolute minimum things you need to know to be successful with this tool.”

A summary is a valuable tool for all sized documents, but participants explained the challenges of the typical document creation style (lengthy and limited whitespace) and recognized 2-3 pages is ideal for reading and bookmarking for later use without wanting to control + F the entire document and miss important information:

> “I still think like three pages is probably like the sweet spot. Anything more than that, you're risking people just leaving. Or if you get lucky, people who control F will just do that instead, which they'll probably miss key pieces of other information, right? Like, when you control+ F a document, you're never going to get the whole picture.”

Regardless of modality, all participants struggled with the amount of information in a company such as this and recognized the need for a training content management strategy. While the length of the training is valuable on how and when it is consumed, participants cannot activate training "in the flow of work" if they are unsure where to find it or if it is accurate. Several participants noted credibility of content being important to them, and related credibility to a few themes: who is delivering or creating it, how it is branded, and when it was last updated. Proper branding and delivery of resources is important, but if it is outdated or inaccessible, then it is useless. One participant even noted upwards of seven places to find materials, while others simply said that if their teams do not have it bookmarked or it is easy to find in the system, then they will go to their peers or managers to get an answer. The following section articulates in graver detail the challenges the population is facing as it relates to content organization and management.

4.2.1.2 Theme: "There is an Ocean of Knowledge"

Of all the subjective information obtained in the qualitative section of the study, the second resounding theme is the information overload that our society and companies often bring upon individuals. Twelve participants of this portion outlined the difficulty in finding accurate, relevant, and useful information in the digital age and note that document and video organization can contribute to cognitive overload, and some resources are better for quick retrieval later "in the flow" of work.

Finding accurate, relevant, and useful content was one of the most discussed challenges of the study population. One participant even noted that finding information

"just in time" was related to a "fight or flight" context: they needed to get scrappy and find it fast, so that is what they did. Having content that is updated is meaningful for the treatment participant, and provides credibility, but also allows this audience to move faster in their role instead of scrubbing many resources. As one participant noted, "this is a problem of everyday work life. Now we have access to so much information and data all the time; new content is being updated and added" so it is of utmost importance that content is being kept relevant so the audience can vet the content because if not they "end up quitting, and [I] won't move forward with it." Another participant noted that the company gives, "...you all the resources to be successful. You just have to really put in the time to like, find… and you know manipulate your time to be able to navigate those resources actually." This was elaborated on by another participant who then said it's "tough because you have to even know what you want to do to be able to keyword something," so newer employees have an increasingly difficult time finding the right or accurate content because they are unsure of the correct terminology or timeframe to search for content.

While companies may spend hundreds or thousands of dollars to create or outsource the creation of video-based training (Brandon Hall Group, 2017), fewer participants were found to bookmark videos for later use, compared to most saying they typically only bookmark documents. When asked, participants noted a variety of reasons why (too many videos, outdated content, lack of time to re-watch, and even usability when working on procedural tasks), but ultimately it seems as if documents are primarily bookmarked, with one participant noting, "I bookmark a ton of templates. So slide decks,

especially, I'm more likely to bookmark three or four slides on the tool, and I am to actually bookmark the video," and others noting they only bookmark videos as a reminder to watch it later or for customer reference material such as product demos or customer stories. However, several participants noted the challenge of where to find information and having too much information to reference. As one participant noted,

> "there's a lot of places - I don't know if I have all of it done because there's tons of info being thrown at you to save. So many bookmarks that there's no way I can figure them all out." and that it is of utmost importance to "having it more consolidated and identifying where people can learn where to look for things."

In fact, participants mentioned upwards of five to eight places to look for information (company information database, content management system, general communication platform/channels, team communication platform/channels procedural information hub, LMS or LAS, video content management system, Google Drive, and other collaboration tool hubs). Even when elaborating on the current content management system, one participant noted "it's very overwhelming once you get in there" but they found it easier to bookmark their organizational pages than all the bookmarks individually. However, they also noted that these pages house documents that hyperlink to a variety of other places to find more content or resources to support their needs and it "can be very difficult" to understand where to navigate and one extremely tenured tech seller noted "they haven't figured it out yet" despite being in the industry for several years.

While content management is one of the biggest challenges companies face, especially larger companies with more resources, products, or processes, material/content

organization and credibility can help provide a vetting or scrubbing process when needed. Content (both document and video) structure and credibility were both of notable importance for finding and using information from either modality for on the job support or in customer conversations. Document organization is so important to the field that one participant noted that "compartmentalization and organization of content is most important to me" of all the concepts discussed in the session, while others visibly showed documents that had meaning to them and why, by outlining items like the document's table of contents, collapsable or sortable nature, and important channels or emails listed at the top of the document. These types of resources are important to the participants because having a clear structure with headings and subheadings helps them quickly locate the information they need to be successful faster. Moreover, the desire for multimodal learning experiences was expressed through sentiment expressing they learn best when they can see visuals and read or listen along with the content. Without these, participants noted they can get overwhelmed and lost in the information, only to realize they may not have needed all of it after all.

In summation, all content should have a clearly defined content organization and management strategy, as it aids in reducing cognitive load and increasing credibility; video based training is best up front to increase credibility and understand overall value or use case, but written documentation with both visual and written cues is the ideal content strategy for workflow-based learning or knowledge retrieval at the moment because, according to participants, they're easier to store and scrub for content needs than videos.

4.2.1.3 Theme: The Keys to Procedural Learning Success

This treatment was considered introductory procedural content to highlight how to use the productivity tool in their role. Both treatment participant types answered questions related to learning preferences (modality, length/time, sequencing) and both treatment types had several members self-identified as video-preferenced learners (19 participants). Regardless of preferring videos for asynchronous training, many indicated the ideal experience including dual modalities (video and job aid) for accessibility and content management purposes. Furthermore, both treatment groups were similar in positive feelings towards quizzes, gamified learning, and learning experience sequence.

To elaborate, most participants outlined the ideal strategy for consuming content including a dual-modality strategy (video and written material); one participant shared that "if I can read something, and then have a video or have a video and then read something, the stuff sticks in my brain way better." Which relates clearly to repetition theories. However, others note their preference for dual-modality is simply out of engagement and satisfaction, identifying "the mix of videos and text content is a good mix," or if they are looking for a specific type of content like a use case or "how to" documentation: "if I want to know what great looks like, I'd watch one of these videos if I want to know how to do something a documents much more helpful."

Dual-modality was definitely the preference when discussing onboarding versus in-role enablement needs. For instance, many participants noted that in-person or video-based training is preferred for their onboarding experience, while documents are helpful afterward "because I won't use it until I have to use it. We get trained on all these

things and I'll remember the basics, but I'll have to go back to it when I actually use it." However, more tenured sellers recognize that providing an overview and use cases via video, then following it up in a document is sufficient for their busy schedules.

Additionally, participants noted the increased importance of quizzes or knowledge checks, and a gamified experience of the training to confirm they have learned the material and know the key takeaways. One participant noted they believe "...they're very useful," but they also believe "there could be more variations of the type of quizzes rather than just multiple choice…" in training programs. Similarly, others noted the need for hands-on exercises over question-and-answer assessments for applied skills. Aligning with the sales persona, several participants noted their competitive nature, with one clearly stating, "the more I can get shiny badges on my profile, the better; I love it." Many participants noted a large preference for live training due to their social nature and the experience's innate system of accountability, but ultimately say that if they have to learn "from a computer, it might as well be videos or follow up with a quiz. If it's live, then a quiz or game is fine too."

Several participants particularly enjoyed the pre-test/post-test strategy because they were able to confirm their knowledge before the session and after, showing growth and awareness of the key concepts:

> "And with knowing what the questions were, it helped me hone in on what to pay attention to in the documents like things. I was just guessing that for the first quiz, when I read the documents, like oh, you go into quip… create to add, I got that answer. Totally wrong before I went into the document. So knowing that going

into the document, knowing the questions helped me focus on things like the ‘aha moments’ for what I was learning.”

One participant noted the similarity to a Red Cross First Aid training where they were able to test out based on their pretest answers and highlight the value of that strategy so they can focus on the efforts they need versus spending time on unnecessary training:

> “And so what was nice is that they actually had you do a pre-quiz. And it said, like, you know, you know enough about this particular section that you've actually like, tested out of it. But you were weak in these spots, let's go into that training. And so I kind of liked having that piece that gave me some credit for what I was already familiar with and already comfortable with. And then, you know, allowing the coursework to cater to that experience, and then focus on where I did need additional enablement.”

While there was consistency in these responses, there were distinct differences in experiential learning preferences among the various personas. Roles with higher volumes (BDR) leaned more towards quick, more digestible, and “to the point” materials:

> “the quicker we can get those done and get back to working, the better it is for us. So anything over 10 minutes, I'm like there's probably information that I need from this, but I'm probably better off trying to figure it out myself than wasting over 10 minutes watching a couple videos on something that may or may not help me.”

Regardless, they would prefer to learn or re-learn the tool in the flow of need. However, the more technical roles enjoy hands-on practice and proficiency confirmation

of their skills, as seen by one technical specialist who quickly noted, "...my background is technical. So I like to try and solve it on my own versus just either giving up or sending a ticket into someone. So I try and go back and, like, try it again, and two or three times…I learned personally by doing." Other technical sellers articulated that they are "very much more of…a hands-on learner" and they "need to…do a step-by-step example," with one participant notably equating it to the children's toys, LEGOs:

> "I love hands-on workshops. I, you know, again, give me a stack of Legos and a little bit of a little bit of direction of what you want. And let me figure out how to do it. That's how I learned most effectively…"

Several technical individuals referenced the use of a particular company's external training platform as a model for tool or procedural based learning, as it provides the content in manageable sizes or "chunks", and creates the opportunity for hands-on practice and real-time feedback to evaluate the performance of skills, processes, and tasks, while also working towards micro-credentials using badges and points.

Participants also consistently emphasized the importance of content relevance, expressing a strong desire for training materials that directly address their specific roles and challenges. One employee emphasized, "I would say that the training that I've been kind of searching for is like role-based training." This customer success seller said, "the company does a great job at globally required learning… but I don't sell…so taking sales specific training... took time away from other things." They elaborated that certain training sessions have brought a deeper understanding to the conversations they are having with their selling-focused teammates and help them listen more intentionally to

the customer, but having a more well-rounded role-based content strategy for all roles would have had a higher return on investment. This feedback highlights the need for tailored or specific content that aligns with learners' needs and facilitates practical application. Providing scenarios is not enough, as participants expressed difficulty relating to scenarios that often did not mirror the real-world challenges they encountered. By incorporating realistic and relevant scenarios, training materials can better resonate with sellers and enhance their learning experience.

The analyzed transcripts shed light on several major themes related to content relevance, length and time, document organization/structure, learning preferences, and content organization challenges within a company environment. These insights emphasize the importance of providing relevant, concise content, organizing documents effectively, catering to diverse learning preferences, and implementing robust knowledge management systems.

Ultimately, the qualitative portion of this study indicates a consensus among participants about the ideal procedural-based microlearning enablement experience. Participants relatively agreed that the time (<10 minutes) was ideal, the video or job aid was pleasurable and easy to consume, and they were very satisfied. They emphasized the need for a comprehensive approach that may include a pre-test but includes introductory video training, written technical documentation (checklist or "how-to" document with specific instructions), use case examples, and a post-test. Furthermore, participants stressed the importance of relevant, segmented, reinforced, and applied learning to effectively change behavior and achieve mastery. By providing a holistic and varied

learning experience, organized effectively in a thoughtful content management and curriculum strategy (introduction, application, and reinforcement), organizations can better support skill development and practical application through optimized content delivery, enhanced employee engagement, and drive overall productivity and success.

4.3 Quantitative Results (RQ1b & c)

The goal of this section is aimed to evaluate how microlearning modalities influence knowledge retention (RQ1b) and behavior change (RQ1c). While this section outlines overall results, the subsequent chapter will correlate the study results with theoretical frameworks and persona-based research presented in Chapter 2.

4.3.1 Research Question 1b Results

Research question 1b aims to answer *to what extent do two modalities of microlearning – digital job aids and demonstration videos – compare regarding knowledge retention?*

To answer this particular question, all participants participated in a pre-test and an immediate post-test, then a subsequent post-test the following week to evaluate the impacts on treatment groups as it relates to knowledge retention. Mean, median, mode, and standard deviation relating to overall familiarity of the tool prior to the treatment have been calculated and shown in the following table (Table 4.4), then t-tests were conducted to evaluate the significance between pretest and post-test 1, post-test 1 and post-test 2, and pretest to post-test 2 (Table 4.5).

Table 4.4 Overall Knowledge Retention Comparison Data

Type	Details	Pre-Test	Post-Test 1	Post-Test 2	Total or Average
Job Aid	**Count**	15	15	15	45
	Sum	71	88	91	250
	Mean	4.73	5.87	6.07	5.56
	Variance	3.07	2.27	2.21	2.75
Video	**Count**	15	15	15	45
	Sum	64	95	92	251
	Mean	4.27	6.33	6.13	5.58
	Variance	2.50	2.10	1.98	2.98
Total	**Count**	30	30	30	
	Sum	135	183	183	
	Mean	4.5	6.1	6.1	
	Variance	2.74	2.16	2.02	

Table 4.5 Knowledge Retention T-Test Between Assessment Instances

Modality	Pretest to Post 1	Post 1 to Post 2	Pretest to Post 2
Job aid	0.07	0.72	0.14
Video	0.001	0.70	0.002

Table 4.4 indicates that job aid participants had a slight increase from pretest to post test-1 and another slight increase from post-test 1 to post-test 2 (on average). The score increase from post-test 1 to post-test 2 after two weeks was intriguing. Based on the qualitative insights, it could be hypothesized that users of the job aid bookmarked it for

future use and referenced it again prior to the final assessment since most individuals preferred to reference a job aid rather than a video after they have initially learned it, thus the increase in scores. However, further inquiry is needed to confirm that conclusion. Comparatively, video participants had a slight increase from pretest to post-test 1, but a decrease from post-test 1 to post-test 2 (on average). The variances of each assessment indicate there was less variance at each assessment point. With these results, we may be able to assume that job aids indicate better knowledge retention over time.

Table 4.5 indicates preliminary results that job aid microlearning had a significant impact from pretest to post-test 1, but not a significant impact from post-test 1 to post-test 2 or pretest to post-test 2. However, video microlearning had a significant impact between pretest to post-test 1 and pretest to post-test 2, but not for post-test 1 to post-test 2. This would indicate that videos have a stronger correlation to knowledge retention over time. However, an ANOVA test was used to analyze the effect of modality and knowledge retention over time (test time) shown in Table 4.6 to more deeply evaluate these results across all three assessments.

Table 4.6 ANOVA Two-Factor with Replication Results

Source of Variation	***SS***	***df***	***MS***	***F***	***P-value***	***F crit***
Modality (Sample)	0.01	1	0.01	0.01	0.95	3.96
Test Time (Columns)	51.2	2	25.6	10.88	6.271E-05	3.11
Interaction	3.29	2	1.64	0.70	0.50	3.11
Within	197.6	84	2.35			

Total	252.1	89

The ANOVA test indicates there was not a statistically significant interaction between modality and test time (F = .70, p = .50). Additionally, simple main effects analysis showed that modality did not have a statistically significant effect on knowledge retention (p = .95), but test time did have a statistically significant effect on knowledge retention (p = 6.271E-05).

4.3.2 Research Question 1c Results

Research question 1c is aimed to answer the question *to what extent do two modalities of microlearning – digital job aids and demonstration videos – compare regarding behavior change?* To answer this question, participants were asked at the front of the study their level of familiarity with the tool using a true/false question, "True or False: I am unfamiliar with the [insert tool name here]." To progress in the study, participants had to be unfamiliar with the tool so the no behaviors could be assumed. Upon completion of the study, participants were asked to then rank their behavior on the following questions using a Likert scale (Never - 0, Very Rarely - 1, Rarely - 2, Occasionally - 3, Very Frequently - 4, Always - 5)

- I use the [insert tool name here] to prepare for my customer calls
- I use the [insert tool name here] during my customer calls.
- I am able to connect the [insert tool name here] with my opportunities in Org62.
- I am able to initially select the most valuable subset of questions I intend to use with a customer.

An overall comparison across all treatment types was conducted to create a preliminary understanding, which is found in Table 4.7.

Table 4.7 Overall Behavior Change Comparison Data

Behavior Change	**Video**	**Job Aid**	**Overall**
n	**15**	**15**	**30**
Mean	2.65	2.45	2.55
Median	3	2	2.625
Mode	2.5	2	4
Standard Deviation	1.45	1.21	1.32
P-value			0.69

Ultimately, we see that the behavior change mean is higher using video-treatment than job aid treatment, but the p-value is insignificant. Many interviews indicated that certain roles may use the tool described in the treatments less than others or not at all; thus results can be skewed and results should be evaluated also against the role distribution. Upon this revelation, further analysis was conducted to potentially uncover the effect of the role on behavior change.

Table 4.8 Behavior Change Means by Role

Role	**Count**	**Mean**	***n* Video**	***n* Job Aid**	**Likeliness for Tool Usage**
Account Executive	13	2.92	7	6	High
Solutions Engineer	10	2.55	4	6	High
Business Development Representative	3	2.25	0	3	Low
Sales Development Representative	1	0.25	1	0	Low to None
Customer Success Manager	1	3.5	0	1	Medium

Role	Count	Mean	*n* Video	*n* Job Aid	Likeliness for Tool Usage
Technical Account Manager	2	1.25	2	0	Low to None

Comparatively, the two roles who have a higher likelihood of using the tool based on interviews, account executives and solutions engineers, have a behavior change mean greater than or equal to the total mean. However, roles that indicated they have a lower or low to no use for the tool have behavior change means lower than the total mean.

The mean of each behavior change question was then evaluated against the role and information presented in Table 4.8. As a reminder, the following questions were asked:

1. I use the discovery live app to prepare for my customer calls.
2. I use the discovery live app during my customer calls.
3. I am able to connect the discovery live app with my opportunities in the org.
4. I am able to initially select the most valuable subset of questions I intend to use with a customer.

Table 4.9 Role Influence on Behavior Change Questions

Role Against Questions	Question 1	Question 2	Question 3	Question 4
Account Executive	2.54	2.46	3.46	3.231
Solutions Engineer	1.4	1.5	3.3	4
Business Development Representative	1.67	1.33	3	3
Sales Development Representative	1	0	0	0
Customer Success Manager	3	3	4	4
Technical Account Manager	0	0	2.5	2.5

All participants came into the study unfamiliar with the tool described in the treatment. This table represents that after the treatments were provided, Account Executives, Solutions Engineers, Business Development Representatives, and Customer Success Managers had a higher rate of using the tool to prepare for and during their customer calls than the assumed score of 0 prior to the study. Comparatively, Sales Development Representatives and Technical Account Managers did not. Therefore, this shows there is a possibility of role influence on the desired behavior of training material; as a Technical Account Manager may never use this tool to prepare or conduct customer calls, but can successfully use it, whereas an Account Executive or Customer Success Manager would use the tool to complete behaviors identified in questions 1 and 2.

Additional analysis was done to determine the mean of each question against the operating unit, which may influence in-role behaviors because of the extended team members they work with and the general nature of their business (call volume or customer size).

Table 4.10 Operating Unit Influence on Behavior Change

OU Against Questions	***n***	**Question 1**	**Question 2**	**Question 3**	**Question 4**
(E)SMB (small business)	13	1.85	1.77	3.15	3.38
CMRL (commercial)	5	3.6	3.4	4	4.2
ENT (enterprise)	10	1.3	1.4	3	3
New Logo	2	0.5	0	2.5	2.5

Table 4.10 indicates that Operating Units (OU) may influence role behavior, because if the tool they learn in the treatment l is something they use, then there is a potential for

changing behavior. This table also shows that the study, regardless if they use the tool in their role or not, does show confidence in tool basics of connecting their app within another system and selecting the appropriate questions. However, since there are not equal participants by role, an ANOVA test to determine the statistical significance of role influence on behavior change could not be conducted, thus we can only assume there is a correlation. Further research is needed to understand how behavior changes over time, including how it is influenced by role nuances, individual motivation, and using a full 360 evaluation (manager, peers, otherwise).

4.4 Synthesis and Summary

Qualitatively speaking, the study population encourages a multi-modality enablement experience in which they are introduced to a procedural concept via video or live training, then reinforced with documentation on the steps to success, and knowledge checks in a variety of formats to assess their understanding. The digital age poses a greater challenge to content management, relevancy, and accuracy, and only complexifies as the company grows in size. The participants highlight the need for smaller amounts of training with high impact through relevancy (creation date, role, and experience), tactical actions to take, and fun (games, quizzes, etc.). These two particular treatments were found to be equally satisfactory, as they were short and provided knowledge checks at the beginning and end of the experience to test understanding.

The quantitative portion of this mixed methods research aimed to determine the impact on modality on knowledge retention and behavior change. Job aid participants had a mean increase between all three assessments, but video participants had an increase

from pre-test to post-test 1 and a decrease between post-test 1 and post-test 2. The ANOVA test concludes that modality did not have an impact on knowledge retention, but time did, as the study took place over 3 weeks and there was roughly a 10 minute time difference between the pre-test and post-test 1, and a 2-3 week difference between post-test 1 and post-test 2.

The second question the quantitative portion aims to answer is how modality influences behavior change. Behavior change was self-evaluated, thus may increase bias, but results indicate there is a differentiation between treatment types and behavior change, with videos averaging higher than job aids. However, further research is needed to indicate the overall impact the role plays in the behavior change, as some roles may use the tool more than others, thus the results can be deemed inconclusive.

Overall, participants indicated their satisfaction with microlearning, as defined in Chapter 2, was high. Many prefer videos over text-based training initially, but indicate the need for text-based training such as job aids to reference post-training or find while "in the flow of work." An alarming challenge this sample identified was content management, which is a heavy need for microlearning experiences, particularly when they are dual-modality, due to the nature of microlearning having a robust number of resources associated with one concept or skill. Despite their preference for video training, there was no impact on modality and knowledge retention, but the time did affect their knowledge retention. Because the means indicate that there is a differentiation between treatment types and behavior change and the p-value does not, further analysis determining the effects on tool usage/roles and behavior change should be conducted to

draw conclusions. While this chapter certainly highlights the results of the study, the following chapter correlates these results with the theoretical frameworks discussed in the Chapter 2 Literature Review as they may create implications for training and development organizations.

CHAPTER 5. DISCUSSION

This final chapter includes a summary of the study and the final findings, correlating specific themes from the quantitative and qualitative analysis with research and outlining potential limitations of the study. Those sections are followed by an articulation of the contributions of this study to the fields of research related to corporate training, development, and sales enablement organizations, and ultimately a conclusion to the study.

5.1 Summary of the Study

While the exact term "microlearning" was not coined nor adopted until recently, the foundations of microlearning have been commonly discussed in both pedagogy and andragogy for years from the likes of Mayer, Skinner, and Garrison through theories and frameworks such as segmented learning, SDL, and programmed instruction.

This research was designed utilizing the mixed methods case study approach, to address the research question: to what extent do two modalities of microlearning – digital job aids and demonstration videos – compare regarding

a. Learner satisfaction?
b. Knowledge retention?
c. Behavior change?

Research question 1a was evaluated through interviews, while research questions 1b and 1c were evaluated quantitatively through assessments and self-reported evaluations. The hypotheses for the quantitative questions include

RQ1b: Knowledge Retention

- H_0 - Modality has no effect on knowledge retention.
- H_1 - Modality has an effect on knowledge retention.

RQ1c: Behavior Change

- H_0 - Modality has no effect on behavior change.
- H_1 - Modality has an effect on behavior change.

This mixed methods study had three phases, two of which were quantitative and one qualitative. An online survey to the intended audience: tech sales roles were distributed at the beginning of the study to determine demographic and preliminary tool understanding. Participants then took a pretest demonstrating their initial level of understanding of the tool taught within the treatment and self-identified if they were familiar with the tool taught prior to this study. Next, participants watched a microlearning video or read through a job aid learning how to use the tool, then took a follow-up test to determine their new level of understanding. Less than one week after this initial round of assessments, interviews were conducted to learn their satisfaction with the treatment type (RQ1a). Two weeks later, participants were instructed to take a final assessment to showcase their level of knowledge and self-report their behavior change.

There were 30 participants overall, evenly distributed between the two treatment types. 20 of which participated in interviews, also evenly distributed between the two treatment types. Notable demographic information to discuss includes:

- Majority participants were male (53% male, 47% female)

- Role distribution weighed heavily on Account Executives and Solution Engineers (43% Account Executives, 33% Solutions Engineers)
- Segment distribution varied with the majority representing Small Business and Enterprise (43% Small Business, 33% Enterprise)
- Age primarily included 25 - 44-year-olds (53% 25 - 34, 23% 35 - 44)
- Industry experience heavily ranged between 1 - 15 years experience (40% 1 - 5 years, 27% 6 - 10 years, and 20% 10 - 20 years)

5.1.1 Summary of Major Findings

Articulating the findings of learner satisfaction, knowledge retention, and behavior change as it relates to learning theories, frameworks, and research warrants a recap of how the treatment types relate to the definitions of corporate microlearning training presented in the literature review. Aligning with the four assumptions of adult learners outlined by Lindeman (1926), participants in the study were in-role tech sellers who participated based on interest, need or relevance, and time (Lindeman, 1926). Based on the definitions of corporate training modalities and types, the treatment options for this study included two self-paced online modalities, one print, and one multimedia, designed to alleviate internal sales process challenges (Rafiq, 2015; State of the Industry 2021, 2021). Each of these treatments took less than 10 minutes to consume, available by "pull" mechanisms (learning is available at the point of need) but positioned by the researcher as a "push," aligning with definitions positioned by Ivec (2021), Torgerson and Iannone

(2020), and Defelice (2021). Each treatment option was organized in a succinct content structure, limited distractors and influencers to cognitive overload, and within the realm of reason for applying Clark and Mayer's (2016) principles for multimedia: short "chunks" of content not exceeding 10 minutes in length; only relevant visual cues, graphics, and sounds used; introduced by relevant overview and introduction to provide context to the demonstration or process; and inclusive language, to name a few (Boyd, 2005; Keane et al., 2017; Russell, 2000; Sugar, Brown, & Litterbach, 2010; Sweller et al., 2011).

Learner satisfaction with this type of learning experience, for both video and job aid, was extremely high. While most learners noted they prefer video training over written text due to a variety of reasons (attention span, preference, disabilities, and affordances as primary reasons), participants indicated a great preference for video microlearning for introductory purposes and job aid documentation as a follow-up or reference material they can consume and action on quickly as they encounter challenges in the flow of work through many of the affordances aforesaid (eLogic Learning, 2018). Based on the interviews conducted within the participant group, learners prefer training or enablement that is less than 10 minutes in length, relevant, recently maintained, easy to find, engaging, credible, and immediately actionable; aligning with many of the definitions of microlearning used to define the treatment types in this study.

Early results to learn how modality impacts knowledge retention indicated that perhaps there would be a difference in knowledge retention influenced by modality treatment types. Overall video assessment mean was 5.58, while job aid was 5.56.

Additionally, job aid participants saw an increase from pretest to post-test 1 and another increase from post-test 1 to post-test 2, whereas video participants saw a higher increase from pre-test to post-test 1, but then saw a decrease from post-test 1 to post-test 2. However, the ANOVA results indicate that there was not a statistically significant interaction between modality and test time ($F = .70$, $p = 0.50$). Additionally, simple main effects analysis showed that modality did not have a statistically significant effect on knowledge retention ($p = 0.95$), but test time did have a statistically significant effect on knowledge retention ($p = 6.271E-05$). The effect of time on knowledge retention has long been studied with Ebbinghaus' well-known 1880s experiment on forgetting after time spent learning (Murre & Dros, 2015).

While behavior change is the desired outcome of any training created and delivered to the audience, content relevancy and accuracy will influence the desired behavior. Some of those who participated in interviews expressed sentiment towards if and how the tool discussed in the training would change their behavior. Of those who expressed such sentiments, those who would use the tool in daily functions or those who knew their teammates would use the tool expressed a potential for behavior change. Results indicate that there may be a relation between modality type and behavior change, but further studies are needed to determine the impact of learning preferential bias and role bias.

5.2 Discussion of Findings

The qualitative phase of this study addressed the need to understand learner satisfaction with training materials. Generally, participants, regardless of role, were

satisfied with both the video and job aid treatments due to their short, consumable, accessible, and easy-to-apply nature. Many participants expressed a preference for videos over written documentation for introductory or use-case content but preferred to review job aids or other written material as references after the initial training or during a hands-on application. However, nearly all participants expressed deep dissatisfaction with inaccurate or irrelevant content, the "overwhelming" amount of places there are to find training material, and a lack of hands-on practice or application when understanding a new tool or process.

The quantitative portion of this study aimed to address how treatment modality influenced knowledge retention and behavior change. This study determined that there was no significant impact on knowledge retention because of treatment modality, but there was a significant impact from the time last learned. Results indicate that video treatment types did have a higher mean rate of behavior change than job aid participants. Therefore behavior change may be influenced by modality, but it can also differ by in-role nuances and treatment relevance to roles. While the results from this study may be indicative of learning preferential bias, where one is more likely to change their behavior if they prefer the treatment or feel it meets their needs, behavior change is deeply linked to the Kirkpatrick Evaluation Model and should continuously be evaluated to understand the influence of training on a seller's behavior (Khalili et al., 2017).

This section aims to use the research questions to organize the research findings in coordination with available literature. Study limitations are provided to indicate

opportunities for further research on this study. Emergent themes and potential opportunities for research are then provided in subsequent sections.

5.2.1 RQ1a: Learner Satisfaction

As previously discussed, interviews were used to illustrate general learner satisfaction with this particular training experience and relate it to other methods of training or enablement experiences they have experienced. From these interviews, evidence was gathered supporting the preference of persona needs, time, modality, interactivity, and affordances of these treatment types. As Lindeman (1926) and Knowles et al. (2005) shared, four main assumptions can be made about adult learners: they are motivated to learn based on needs and interests; have a strong desire for life-centered, self-directed, and experiential learning experiences; and have varying differences among age groups. Findings from this study have validated these assumptions of adult learners, but expanded to understanding the preferences of a corporate adult learner, especially when considering the motivation for participating in this research: it could help them stay up to date in their field (LinkedIn Workplace Learning Report, 2022).

Satisfaction with the treatment time was high. Both treatment participants expressed deep gratitude towards quickly consumable content that was succinct and easy to interpret. The participants enjoyed the quick and easy to consume training material they could fit into their busy schedules at their own time. This coincides with research that indicates microlearning is best used for audiences who have limited time to consume training (Santos, 2017; Paul, 2016; Sharma, 2016; Kohn, 2015b). However, those who expressed improvement of the treatment material articulated the desire for more

"hands-on" or experiential learning to practice or "play" to learn the tool. Interview results indicate a positive correlation with research presented in the literature review from Keane et al. (2017), which indicated demonstration videos should be no longer than 10 minutes in length. Participants of this population indicated similarly that videos should be no longer than 10 minutes and written documentation should be no longer than 3 pages, but the use of proper design to maximize user experience and retention is extremely important to maximize impact in a short amount of time and reduce cognitive complexity (Mayer, 2001; Gutierriez, 2015; Sweller et al., 2011).

Ultimately, the design and the duration of the intervention contribute to the satisfaction of the material. Findings from this phase of the study indicate that regardless of modality, the treatment types were generally satisfactory because of their design features: organization and visual appearances. The video treatment had two major visuals within the experience: one of the screencast, and another of the individual recording their screen and speaking. While having the speaker within the video limits the whitespace and ability to see the screen, and could be classified as an unnecessary graphic, participants noted having this design "makes it feel a little more personal" than without the feature (Clark & Mayer, 2016). Participants indicated the use of the mouse and the presenter typing in the video allowed them to follow along (Kharishma, 2020), but when the typing was misspelled they became distracted and the content lost credibility. The job aid was satisfactory for learners because it had "good spacing" and despite being long, included "a lot of pictures" which made it "an easy read." Boyd (2005), Clark and Mayer (2016),

and Russell (2000) all identify that these types of visual elements should be used to provide visual clues and minimize extraneous processing.

Satisfaction with the modality of the treatment had mixed results. While some participants noted they like in-person training experiences over all asynchronous training experiences due to the social engagement and accountability, the general sentiment was microlearning training is preferable because they can be consumed in between calls or on the go via mobile, aligning with the research presented by Hall (2021), and Griffin et al. (2009) indicating a preference for self-directed learning. Most participants expressed a higher interest in using video-based training for introductory or high-level overviews than digital job aids due to the cognitive load/demands of their work, accessibility, and length. While participants expressed deep sentiments they do not prefer videos that are greater than 20 minutes in length, they generally prefer videos over written training as they can consume them faster and use transcripts to skim the content. Sharma et al. (2007) indicates video training is more beneficial to those who self-regulate, which may provide more insight into why videos were preferred over written content for this audience. Above all, the content, despite the length, must be relevant for the satisfaction to be high with the treatment and therefore usage of the material (i.e. behavior change influenced by treatment). A study conducted by Lee and Lehto (2013) shows similar sentiments when studying the impact of YouTube on procedural learning. They found that acceptance of the platform (video) is dependent upon the participant's perception of its usefulness (Lee & Lehto, 2013).

Participants expressed sentiments of affordances for videos similar or equal to that described within the research presented in the literature review by Rahman et al. (2020), Costley et al. (2021), and Ruffini (2012). Of the participants who self-identified as video-preferenced learners, the key reasons for such would include speeding up the videos to 1.25 or 1.5 speed, participating in comparative reflection (watching the video as they perform the task to compare their results to that of the screencasters'), and pausing or rewatching content (within appropriate time constraints) (Zhang et al., 2011, p. 457). Research presented by Ali (2016) indicates that screencasts are superior to lecture-style videos, particularly for procedural learning because they can showcase highly complex activities, which correlates directly to the results of this study. However, participants expressed dissatisfaction in old imagery, steps, or field names, aligning with a challenge identified by Mullamphy et al. (2010).

Digital texts, particularly the job aid, provide their audience with a digital medium that can include text, hyperlinks to other resources, and embedded videos and graphics, which enhance the experience for a self-regulated learner (Hicks, 2013; Jha et al., 2010). Participants shared a desire for more digitally written text to include meaningful graphics and related hyperlinks, as it allows them to bookmark one document but still reference a multitude of material. This study also found that when a job aid was presented and not bookmarked for reference, participants were more likely to ask their manager or peers, or spend time searching for similar content; this relates to research conducted by Elesenheimer (1998) who indicated these are a "cost-effective solution" that drive efficient performance as these individuals no longer have to rely on managers, peers, or

mentors to answer their questions (p. 35). However, several participants noted they ultimately prefer both: a video to introduce content or share use case scenarios, and a job aid or written document to bookmark and reference later; indicating that a job aid allows participants to bookmark and reference faster for workflow enablement over videos. Because microlearning is the cost-effective solution because it is relatively inexpensive, provides quick content delivery, and is effective in-moment applications and knowing that there is no influence of knowledge retention based on modality, businesses should consider deploying a meaningful approach that encourages participation and in-field application, but corresponds to what the participants of the training wants and needs so they have greater positive feelings towards the experience and thus use it (Dolansiniki & Reynolds, 2020). However, if the content is unable to be found, stored, or retrieved easily, no matter how meaningful it may be, it is irrelevant and a waste of time. Deeper details about the invaluable nature of a formalized content management strategy for means of efficiency and productivity will be discussed in the subsequent section.

5.2.2 RQ1b: Knowledge Retention

The simple main effects analysis showed that modality did not have a statistically significant effect on knowledge retention ($p = .95$), but test time did have a statistically significant effect on knowledge retention ($p = 6.271E-05$). Despite many of the participants indicating they “learn best from videos," these results were inconclusive of such. Furthermore, despite the Intuit case study previously discussed in Chapter 2 indicating their participants were more self-directed and effective using videos, the study lacked empirical evidence comparing it to that of other modalities. The other video study

represented in Chapter 2 worth mentioning is that of van der Meij (2018) who studied the effectiveness of video tutorials in elementary students. While they found that there were moderate lasting effects on learning, it did not test the effects over a period longer than one week. Both of these studies indicate a perceived impact of modality-specific training, but are limited by not evaluated the actual impact.

One study conducted within the healthcare environment used multimedia instruction to teach pediatric tracheostomy care. The study titled, "Implementation of an Online Multimedia Pediatric Tracheostomy Care Module for Healthcare Providers" (Ahmed et al, 2021) was very similar to this study, as it aimed aimed to evaluate knowledge retention and behavior change. Prior to the treatment, participants took a premodule quiz and a premodule survey to evaluate premodule knowledge and behavior confidence. Upon completion of the study, they took a subsequent postmodule quiz and survey. Of the 233 participants took both the pre and postmodule quizzes, "average quiz scores increased an average of 5.6 points" and were deemed statisticially significant results (Ahmed et al, 2021, p. 1896). This study aims to evaluate knowledge retention, but is limited to immediately after treatment. What is not evaluated is the knowledge retention over time, which could produce more significant findings in the field.

However, the study that still resonates today, despite being over 100 years old, is that of Ebbinghaus' Forgetting Curve, which details that the last time learned impacts knowledge retention over time significantly. Another study conducted by Radossawljewitsch (1907) indicated that after 14 days an adult learner could forget anywhere between 59-70% of what they learned. Despite its historical significance, this

study validates the findings of the Forgetting Curve, demonstrating its' lasting impact on instructional methods. Another study conducted within the healthcare industry, "The Effect of a Microlearning Module on Knowledge Retention in Surgery Clerkship Students" evaluated 56 participants to determine the impact of single training experiences versus distributed training (Ichiuiji et al., 2021). A microlearning module was created to cover gallbladder diseases, with one randmoized group obtaining this experience while the other obtained a "45-minute commercially available module" (Ichiuiji et al., 2021, p. S218). This study found that microlearning participants test scores from the pretest to post-test 1 significantly increased but decreased from post-test 1 to post-test 2, whereas the 45 minute training participants increased from pretest to post-test 1 and pretest to post-test 2, with "no significant change from post-test 1 to post test-2" (Ichiuiji et al., 2021, p. S218). They ultimately drew the conclusion that microlearning participants performed significantly better than those of commercially available and longer-duration training, and it could be beneficial to participants given time constraints and ultimately "lead to improved knowledge retention" (Ichiuiji et al., 2021, p. S219). The study conducted by Icnhiuiji et al. aligns with the results found in this study: there was a significant change from pretest to post-test 2 for video learning, but no significant change for either modality from post-test 1 to post-test 2. However, video learning did show a significant difference between pretest and post-test 2 compared to job aids. Despite these similarities, there is still not enough research conducted on larger treatment groups to feel confident in the understanding of microlearning on knowledge retention. Due to this limited empriacle research within the industry, additional studies should evaluate the

impact of microlearning treatments on knowledge retention with larger participant groups to determine true statistical significance.

5.2.3 RQ1c: Behavior Change

Early results indicated that videos may be better for influencing behavior change due to the higher mean, however the p-value is insignificant. This articulates that behavior change influenced by modality cannot be assumed. Some studies have shown that individuals with high levels of motivation and who perceive the training material as useful are more likely to apply training in their daily functions, and "initial skill transfer appears to be a key predictor of longer-term transfer" (Govaerts et al., 2018, p. 211). Aligning with participants being preferential to video-based treatments, the video-treatment mean was higher than the job aid. However, training should be designed and organized to "wean people off the ecosystem of peer support and helpdesk and show them how to help themselves" partially because of the Forgetting Curve, another outlook indicating that it is due to the alteration of how we learn (Mosher, 2013, p. 18).

Providing performance support, defined as learning just-in-time within the context and flow of work, can encourage adoption of behaviors and reduce individual in person classroom training time by 15 hours (Mosher, 2013). According to Lee and Pershing (200), "training is worthwhile only if it changes behavior in the real job situation in a positive manner, including an increase in productivity in the workplace" (p. 245), but limited studies have been conducted in the corporate environment to evaluate behavior change, with most happening in the K-12 educational space.

One study conducted in 2013 evaluated the use of multimedia instruction on both knowledge retention (short-term) and behavior change with four students ages 10-11 experiencing behavioral outbursts within the classroom. While this study showed a direct relationship between the students' increase in knowledgeand decreased disruptive behavior in the classroom, it should not indicate significant meaning due to the low sample sizes and significant age gap to the population of this study (Mazzotti et al., 2013). Revisiting the healthcare study discussed in the previous subsection is applicable here as well, as it evaluated behavior change among healthcare workers. As the article titled, "Implementation of an Online Multimedia Pediatric Tracheostomy Care Module for Healthcare Providers" describes, confidence was evaluated using a Likert scale via survey. Postmodule surveys indicated a "significant increase in confidence," and that time since last behavior does influence confidence (Ahmed et al., 2021, p. 1986). These two related studies indicate the vast differences in adoption of multimedia learning and the challenge of finding studies evaluating similar factors of multimedia training, which indicates a significant opportunity for future corporate-based research.

5.2.4 Summary of the Study Limitations

The initial study proposed to evaluate knowledge retention over 5 weeks time with at least 100 participants to deepen the understanding of modality against Ebbinghaus' Forgetting Curve. However, participant dropouts were exceptionally high after three weeks, therefore the study is limited to data within that timeframe and only 30 participants. Additionally, the pre-test requires learners to guess answers even if they do not know them, reducing the reliability that learners did not in fact know the answers.

Differentiation between correct guesses and incorrect guesses cannot be determined due to this limitation.

Limitations of understanding the influence of training modality and behavior change are significant in this study. Participants were asked to self-respond, which may include bias as indicated in Chapter 3. Furthermore, behavior change was limited to only evaluation, but true understanding of the influence on training should be conducted for longer durations including but not limited to multiple weeks, monthly, quarterly, and yearly, and evaluated in the business function using fields and functionalities of tools and processes that can register the true behavior. Finally, behavior change was not evaluated against the population roles. Therefore, additional studies could include samples based on role or tenure to determine modality influence on behavior change with respect to experiences.

5.3 Discussion of Emergent Themes & Findings

These findings are important to consider in the development of microlearning approaches, but were not the original intent of the study. This section articulates the value of these emergent findings and the implications they have on learners, designers, and corporations when creating and deploying microlearning training.

5.3.1 Theme: “There is an Ocean of Knowledge”

The second theme identified from the analysis of the qualitative phase includes content management and organization. While not in the original scope of research, the more interviews conducted during this phase, the more challenges with content

management and organization became apparent. This is largely due to the use of the illustrative case study approach, which allows a researcher to gain insight into the experiences and emotions of the participant population to gain deeper insight into the realities of the full population (Baron & McNeal, 2019). While participants are more satisfied with microlearning training than traditional corporate training (hours of live sessions or asynchronous courses that are pushed to them), many participants indicated it has no value if it is not organized appropriately or updated frequently. This strengthens the credibility of the content: participants want to know they "found what [they] are looking for… and it's current and up to date," as described by one participant. As Clark and Mayer (2016) note, regardless of how great the design is of the treatment, if the materials are out of date, images and text become irrelevant quickly, and cognitive load and processing complexity increase as well. Furthermore, knowing that employees will forget roughly 90% of the information learned during a training session within one month of consumption, it is more important to have a post-training repository for employees to consume in their time of need (Cloke, 2018). However, as additional evidence to the need for relevant content, as the study from Lee and Lehto (2013) discusses, participants were more likely to use the platform for training purposes if they find the content useful; it has relevant, up-to-date, and sufficient learning resources from which to select; and they have high self-efficacy for using the content platform.

Microlearning, as defined by this study and treatment types, is best used in the flow of work, where materials are found easily and just in time, where learning and support are embedded in the workflow to be accessed while doing the work (Ivec, 2021).

With content provided just in time for a variety of purposes, it could be difficult to manage the overwhelming amount of content if a company were to deploy microlearning without a maintenance strategy, as limitations identified by Defelice (2021) indicate, this type of learning experience (pull microlearning) may have outdated, inaccurate, irrelevant, or credible content. This study found that participants would prefer to have more accurate and updated pull microlearning content than “pushed” required training, as the pull materials are often used most to help them perform their daily functions, despite the few comments that mentioned having pushed training does bring credibility and positive feelings towards the company, as well as help them understand the most recent high-level initiatives and goals. Having to first sift through various channels to find the content (one participant identified upwards of eight places), then having to sift through the various resources found to determine accuracy and relevancy significantly increases the extraneous cognitive load, where working memory resources are imposed by “the manner in which the information is presented or the activities in which learners must engage" (Sweller et al., 2011, p. 57). Furthermore, having outdated or inaccurate content is an accumulated risk the business is taking, which can have significant costs to productivity, customer satisfaction, and ultimately revenue (Baan, 2013). With the evolution of technology in the past 30 years, organizations continue to create content, but the robust amount of information means that “content management is no longer just a topic for large organizations, but also directly affects individual private users” meaning that a strong content management strategy must be defined in order to make the

individuals' use of work more meaningful and accessible (Maass & Kowatsch, 2012, p. 4).

Each modality type has advantages, disadvantages, and platform differences as it relates to content organization and management. As previously discussed, the majority of interview participants preferred video training over other types of training modalities, despite some of its drawbacks. While videos for training purposes can be long, segmenting them into playlists or microlearning moments can support cognitive load management, and also provide users with a more structured and organized repository for finding relevant content related to one topic without having to scrub through entire videos (Clark & Mayer, 2016; Merkt, 2021). While beneficial for users, video content management platforms, such as Vidyard, also offer companies data that can drive management approaches and learn more about their audiences such as videos watched, time watched, open rates, and notifications (Vidard, 2023). Organizations can use these insights to gain initial understanding of how content is being used, and by whom, to make strategic decisions on maintenance and archival processes. This step in the content creation and sourcing experience is vital for an employee's success and satisfaction with the content and training materials.

Despite videos being the primary training modality of choice, participants noted they would be more likely to bookmark and review a document than re-watch a video for follow-up training or a refresher of the concept due to the increased control and quick consumption affordances it provides (control + F, headers, screenshots, etc.). Participants noted items such as a table of contents, whitespace, relevant images, clear and distinct

headers, and content outline sidebars made documents much easier to use for quick retrieval or refreshes of knowledge. These features enhance desires to store or bookmark documents overviews for quick "in-flow" microlearning on the job. This validates the findings from multimedia principles defined for years that documents must be created using clear design principles, such as keeping it simple and digestible, and including relevant images to support accompanying text to increase effectiveness and reduce cognitive load (Boyd, 2005; Clark & Mayer, 2016; Russell, 2000). Furthermore, document tools familiar to the audience should be used to house the information, as the increased complexity of the software can increase the cognitive load (Darejeh et al., 2021). This has implications for tools used to create and provide content for new versus tenured employees; newer employees may encounter cognitive overload when learning new information from tools or platforms with which they are unfamiliar. Therefore, it is of utmost importance that document creation for training purposes is developed with a deep understanding of the intended audience.

However, it is not enough to have clear design principles used in documents to support training needs, a clean document management platform and strategy must be defined to provide lasting and holistic positive organizational effects. As aforementioned, every document should be evaluated against the dynamic nature of the corporate environment to truly understand effectiveness for the learner and return on investment (ROI) for the company (Russell, 2000), and without a process to do this, participants may find outdated or irrelevant information. Therefore, every company should have a document management strategy, as documents play a crucial role in storing and

disseminating corporate information (Forbes-Pitt, 2006; Macías-Jiménez et al., 2019). However, documents are only as good as the information management capability (IMC), or "the ability to provide data and information to users with a high level of accuracy, reliability, security, and timeliness" or the individuals' ability to manage information (Macías-Jiménez et al., 2019, p. 65; Mithas et al., 2011; Hwang, 2016). One participant shared that if a resource is not shared in a team channel or easily searchable, they ultimately go to their peers or manager, which may reduce productivity time of their teammates as well as themselves. One study found evidence to support this assumption, that "greater accessing of codified knowledge reduces calls for help" (Subramani et al., 2021, p. 1287).

Another participant expressed that "there's tons of info being thrown at you to save. So many bookmarks that there's no way I can figure them all out," and has been frustrated that having too much information and going to many places for information is a waste of their time, especially as they find irrelevant our outdated content. While only one participant provided such detail, they were not alone; many participants expressed grave challenges finding and bookmarking relevant content due to the variety of places to search and how quickly technology companies evolve. Therefore, "having it [the content] more consolidated and identifying where people can learn where to look for things" is extremely important for content management, corporate learner satisfaction, and even productivity (Elesenheimer, 1998).

Furthermore, the more frustrated an individual is at finding the content, the less motivated they may become to use the systems. The study conducted by Li et al. (2013)

indicates that motivation is a major factor in the usage of information systems in both traditional and diverse usage behaviors. Study participants indicated they prefer a microlearning learning experience for in-flow learning and for reinforced concepts, particularly for procedural-based learning, which will be discussed in the following theme. They often shared small resources with their team to promote a community-based learning practice, which indicates the potential for large-scale behavioral change. However, regardless if job aids or videos are formally defined as "microlearning," they often can be used for such, and microlearning content requires an intentional content and knowledge management plan to adopt, discuss and apply with peers, and update or maintain to ultimately provide the most useful experience and reach the maximum ROI (Emerson, 2018). To be most influential on the audience, microlearning content can and should be tagged using the metadata model (Maas & Kowatsch, 2012). The metadata model used should tag the assets described with a "semantic association" with other related concepts to be aggregated in a simple user-driven search, as well as relate the taxonomy within the metadata strategy to the associated schema built within the audience (Bachman, 2009; Maas & Kowatsch, 2012, p. 55). As stated by Bachman (2009) "schema elements will provide a user with all the critical information about an asset," which means they would be able to apply the taxonomy better to find more relevant content, thus we can assume this would reduce the time to access (p. 290).

Content management is no longer defined as simply as it has been in years prior, as described by Maas and Kowatsch (2012): "the scope of Content Management Systems has expanded to include the entire ecosystem surrounding the creation, management, and

consumption of content." One study conducted by Huang et al. (2016) found a positive effect on information management capability on organizational performance, through a measurement of five particular experiences as it relates to information management: collaborative work, communication, searching and accessing protocols, systematic storing, and sharing reports or documents with teammates (Macías-Jiménez et al., 2019). Meaning, there is a direct correlation between quality IMC and organizational performance. Another study concluded that clustering documents into groups saves time for users when finding documentation, especially for inexperienced or newer employees, as they may not have the knowledge of terminology or of previous work to quickly find the items necessary (Arnarsson et al., 2021). The study indicated that it reduced the several-hour procedure to "make a manual list of related documents" into mere minutes when documents were clustered appropriately (Arnarsson et al., 2021, p.148). Furthermore, especially because there is a direct correlation between unfamiliar platforms and cognitive load, content management systems and repositories should be selected with a great understanding of the audience they are serving and the flow in which they work (Darejeh et al., 2021). Therefore, having a set process for content management including platform, sourcing, tagging, archiving, maintenance, and retrieval by employees is extremely important to companies for significant behavioral influence, along with participant satisfaction with training materials, seen in these results.

5.3.2 Theme: The Keys to Procedural Microlearning Success

The corporate sales employee has a wide variety of tasks to complete each day: log calls or emails, conduct customer research or discovery, qualify leads, communicate

with teammates, managers, and customers, create quotes, and more. Therefore, new hire and tenured training needs to include procedural-based learning to teach the new tools or processes to effectively conduct these various activities. Procedural learning, described as the step-by-step instructions to acquire psychomotor skill acquisition, or how to perform an activity, has long been studied as it is an imperative part of many common activities personally and professionally (Rodriguez, 2002; Ellis & Whitehill, 1996; Gordon, 1994). Procedural instructions as it relates to learning effects, transfer, performance, and cognitive processing have been studied for years, but limited research has been conducted in an applied setting or to understand how modalities differ within these frameworks (Palmiter & Elkerton, 1993, Van Hooijdonk & Krahmer, 2008; Zacks & Tversky, 2003). While this study was unable to draw significant conclusions as it relates to the modality of treatment and behavioral change, nor knowledge retention, time-since-learning did have an effect on knowledge retention. Despite the study not outright identifying significant correlations, theoretical frameworks and results within this study can significantly influence the procedural learning microlearning framework created and used by institutions.

Results from this study can conclude that this particular persona (corporate technology sales employees), regardless of tenure, prefers a microlearning experience for procedural-based learning. The microlearning experience should include a brief introductory video, followed by use case examples to provide context, quizzes, and hands-on application to evaluate learning, as well as written-based resources to retrieve on the job. The participants recognized the need for a new hire versus a tenured mindset.

The new hires indicated that time to understand the process and context is important, but only at a high level until they are in the flow and need to apply said process. Respectively, the more tenured persona notes that "the most useful training materials that I found in my role are what I think of as just in time. So I have a question. And then I look at the training materials, and I can find what I need to answer that question." These preferences are weighted by the perceptions of the (1) time to consumption, (2) relevancy and updated content, and (3) use case identification to support the transfer of knowledge.

One study conducted by Lee and Lehto (2013) indicated a strong preference for using YouTube for procedural-based learning, which relates distinctly to this study's population for video modality. Several participants indicated they prefer watching a video to learn how to do something, then apply their findings. If they are unable to conduct the task successfully, they would rather reference a document to revisit and validate their step-by-step process. This aligns with the research conducted by Eiriksdottir and Catrambone (2011), who indicate that instructions are most commonly available as written text, with accompanying diagrams or pictures. These good visual design practices may relate to why participants prefer storing written documentation over video documentation (Boyd, 2005; Clark & Mayer, 2016; Russell, 2000).

Study participants expressed extreme satisfaction with the material the more it related to their role; the ones who used or had direct teammates that could use the tool discussed in the treatment were more satisfied with the treatment experience. For instance, one participant shared the video with their team to increase their awareness and draw a deeper application of the tool in their daily functions. This will also influence

behavior change, discussed in a subsequent section, and develop a mentality for community based learning or Communities of Practice (CoPs). As an article published by Borzillo, Schmitt, and Antonio (2012) discussed, both modes of CoPs (aligned and adaptive) ultimately led to the creation of new products, or refinements and improvements of existing products. Therefore, if employees are finding satisfaction in skills-based training materials (treatments) and sharing it with their teams or colleagues, real knowledge exploration and behavior change is inevitable (Borzillo et al., 2012). Furthermore, this resonates with the study aforementioned that discusses the increased likelihood of applying training on the job if the user perceives the content as useful to their daily functions, thus behavior change (Govaerts et al., 2018).

However, population persona differences should be considered in the flow of learning, as more technical specialists enjoy playful moments of practice, while high-volume selling roles prefer a quick "get it done" experience. This may relate to the intrinsic and extrinsic motivational factors of learning versus completing a task due to innate learning preferences such as levels of curiosity or the role constraints of time, performance evaluation, or otherwise (Shaker, 2016). There were mixed results regarding the use of quizzes to check process comprehension, but those who enjoyed the use of quizzes had slight preferences for pre and post-treatment quizzes to evaluate their current and new level of understanding. They also expressed interest in using the pre-quiz results to influence the learning experience (i.e. if they can "pass out" of the course). A recent study evaluated the impact of textual cues and reflection prompts in learning, which found that using both in video training "were significantly beneficial to participants'

transfer test scores and learning engagement" as it made them more purposeful learners through cognitive engagement and a connection to prior knowledge (Zheng et al., 2023, p. 826).

Another study conducted to determine the impact of microlearning as it relates to knowledge retention and behavior change did find statistically significant impacts on treatment and knowledge retention, and found similar results in their focus groups aligning to several participants desiring quizzes to evaluate retention (Boring, 2020). Peterson and Drake (2018) suggest adding a knowledge check at the end of a passive learning experience in order to increase knowledge retention. Additionally, another study conducted in a workplace environment found that participants who engaged in a multiple-choice question at one-minute intervals, retained information after 20 - 35 hours, indicating that questions enhanced learning (Okano et al., 2018). Therefore, it is important to include assessment strategies during passive microlearning experiences, which may vary in type dependent upon the subject: conceptual or behavioral in nature.

Corporate tech sales learners, a unique subset of the adult learner population that may not be as intrinsically motivated as described by Knowles et a. (1999), as some requested gamification through points and badges, as seen by one participant who said, "the more I can get shiny badges on my profile, the better; I love it." This correlates with research positioned by Uden et al. (2019) which indicates 3 primary influencers of motivation: competence, autonomy, and relatedness, which can all be provided in a gamified context. However, both personas expressed sentiment in a badge or point-based practice environment through gamification, which indicates a positive correlation with

extrinsic and a competitive-based rewards system. They recognized the platform Trailhead as an idyllic learning platform for tool enablement, as it provides short content that fits within the microlearning definition boundaries, provides both video and text-based learning, encourages hands-on practice in a playground environment that provides real-time feedback, and encourages participation through a badge and point system.

Despite a study conducted by Miri and Macke (2022) in a workplace setting that indicated there might not be a strong correlation between gamification and motivation or engagement during work, there is substantial research that discusses the impact on gamification for learning purposes. The study was limited to analyzing the impact of different games on employee motivation and engagement in general. Upon conclusion of the research, little evidence was provided to conclude it has a significant positive impact, as many participants did not even discuss this within the study. Ultimately, they concluded that a gamified platform was "ineffective in promoting motivation and engagement in the environment at work" (Miri & Macke, 2022, p. 272; Landers et al., 2017). Other studies, like the aforementioned Udi et al. (2019) study that aimed to understand the impact of games on adult trainee motivation, indicate that "games should be an integrated part of the instructional motivational design" since they can offer real-world context and "refer to human psychological needs and behaviors" (p. 77). Therefore, conclusions can be drawn from the underlying influencer is motivation, which is seen to have a high correlation to behavior transfer in studies past (Govaerts et al., 2018)

Both populations indicated a preference for "use cases," which showcase how the particular tool was used or even "a full lifecycle of how to" use the tool. Participants implied that getting the full context: the overview, process instructions, and examples, help transfer the knowledge better than simple instructions alone. A study conducted by Eiriksdottir and Catrambone (2011) found that while specific instructions support initial performance, generalized instructions and examples support learning and transfer of the process, therefore combining different types of instructions is valuable to expend the appropriate cognitive effort for learning and transfer. This indicates that procedural-based training should incorporate tutorials and use case (example) instructions and context to provide (1) provide initial task completion and (2) a holistic view of the procedure or process using both explicit and generalized instructions to increase the likelihood of transfer or behavior change (Eiriksdottir & Catrambone, 2011).

Learner preferences should influence design, as usage of preference insight may impact learner satisfaction, which innately may cause a bias towards behavior change (e.g. if I am happy about the training I tool and feel I learned what I should, I am more likely to use it in my daily routine). However, it's important to note that while learning preference theories indicate that there is a perceived bias in treatment participants may retain more if the treatment is aligned with their learning preferences, but it is more so that "learning is enhanced when new material is presented via the most suitable sensory modality for the task of interest" (Lodge et al., 2016, p. 13). Therefore, the modality should fit the nature of the task, and be designed to minimize cognitive load, in order for it to be more impactful. If the intended audience of treatment indicates they would be

more apt to use a certain modality in the flow of work to resolve their challenges, then the training should support said reality to influence behavior.

As seen in this section, the design of the procedural training may be influenced by persona preferences but has deep roots in cognitive load, learning acquisition and transfer, information organization, and multimedia design principles. The challenging work of praxis is balancing the science and the art of the construct: rooting the training experiences in deep theory, but elevating it in relation to the preferences of the audience. As discussed in the literature review, having mixed training delivery methods can increase behavioral accuracy (Harvey et al., 2008). Therefore, training should be created to encourage the application or transfer of knowledge by deploying relevant and consumable content in dual modalities, having adequate instructions for initial and long-term behavioral transfer, and encouraging hands-on application for both the intrinsically and extrinsically motivated individual. New hire versus tenured procedural-based training should differ, as their time to implementation will be drastically different, but should follow a similar pattern: introduction, hands-on application with real-time feedback, and reinforcement using use case examples and abstract instructions, and additional in-flow application moments to promote real transfer of knowledge. This framework provides support for both initial task completion and long-term performance through explicit and implicit instructions.

5.4 Implications for Future Practice, Policy, and Research

Implications from this study are primarily related to corporate training, development or enablement organizations, as well as those interested in researching the

andragogy praxis versus theory. Suggestions for future research include a deeper level of treatment impact through Key Performance Indicators (KPIs), the impact of using the tool during training purposes related to long-term knowledge retention and behavior change, and content management and the organization's impact on cognitive overload.

5.4.1 Contributions to the Field

As discussed in Chapter 2, there have been few formal research attempts in the corporate environment to draw successful conclusions and relationships between academia and corporate learners. Despite the need for formal evaluation of training experiences and materials, much of corporate training "best practices" material is coming out of blog posts, limited "white papers," or conference presentations from training and development organizations. A recent review of the Association for Talent Development publication catalog, which is an industry-leading organization, noted there are 0 reports with the keyword "job aid" and only 9 hits for "video," with only 1 of those being a formal research report out of 869 possible publications. Thus there is an alarming lack of formally published studies surrounding adult learning in a corporate training environment, particularly in the areas of multimedia usage, that craft evidence-based guidelines for corporate training and development, despite evaluation frameworks like the Kirkpatrick Model being used throughout businesses.

The implications for training practice and programs using a microlearning strategy can be surmised into a 3-point plan based on the non-emergent and emergent findings of this study: (1) less is more, (2) content management and organization, (3) procedural based learning framework.

5.4.1.1 Less is More

Microlearning training is the preferred method of training for this audience due to role constraints and innate corporate learner persona differences. Training should be broken into segments no longer than 10 minutes to consume (including no more than 3 pages of written content with screenshots) and relative to the time of application. While new hires may have extended time to application, introductory content with playful practice is unlikely to be harmful, but it is imperative they are taught how to find the materials for in-the-moment retrieval. Videos are the preferred introductory modality due to their nature for high-level overviews and walkthroughs, but documents provide the instructions necessary to complete the task when prompted. The credibility of the content is important to the audience and can be brought through use case examples, presenters, and even polished materials. While there was no determination of the difference in knowledge retention and behavior change as it relates to treatment modality, behavior change can be influenced by proper content management, preferential treatment styles, and creating training and evaluations that are closest to reality. Therefore, it is recommended to keep fewer training materials housed but maintained more frequently, and follow the behavioral patterns and desires of the treatment population.

5.4.1.2 Content Management and Organization

As companies grow and evolve, they should continuously re-evaluate their content creation, management, and organization process and infrastructure to ensure maximum ROI on published training and support documentation. Particularly when

companies are deploying microlearning-based approaches which naturally cause the creation of many small training resources, corporations should consider investments in content management systems, information systems, or repositories that can contribute to user-generated or user-identified materials in which they can upload their own, up- or down-vote / rank materials, or even leave comments for archival to contribute to a bottom-up approach to content management. As discussed by the participants and the likes of Mayer and others, having accurate content is more important than creating new content, therefore a process should be in place for reviewing the data and curating existing content to update rather than spending the time, budget, and resources for creating new content each time a training program is defined. All training materials, curated or created, should be vetted against design principles to ensure appropriate cognitive load for users and efficient means of content retrieval via modality affordances (headings, chapters, table of contents, etc.), and regularly reviewed for maintenance or archival. Furthermore, training content and programs should aim to evaluate behavior change through in-flow functionality to have stronger ties towards business behavior change, therefore companies can use the data to determine true impact and if they should leverage the existing program or create a new version. An example of what this could look like for customer attrition training is explained in Table 5.1, below. This figure is called an impact map and is often used to determine how a proposed training will move the company toward the desired impact (Brinkerhoff & Steiner, 2022).

Table 5.1 Example Training Alignment to Behavior Change and Metrics

Topic	Learning Goal(s)	Behavior Change	Identifiable Metric
Customer Attrition	Reduce customer attrition.	Increase “red” account connections	Activities: Call logs, Email sends

5.4.1.3 Procedural Based Learning Framework

Training, development, and enablement organizations should create consistent and standard frameworks for procedural-based learning. Study participants described the ideal framework for learning new procedural knowledge as a brief overview (less than 5 minutes), dedicated time for hands-on practice, an evaluation of new concept understanding (quiz or assessment), and then follow-up learning supplied via job aid and use case videos. Participants liked the simplicity of the instructions, and expressed frustration with a lack of understanding of the full lifecycle of the tool, or if a field was inaccurate or different than what they see as they complete the tasks. However, research conducted by Eiriksdottir and Catrambone (2011) shares that for procedural learning to transfer appropriately long term, both explicit and abstract instructions should be shared. Providing learners explicit instructions up front, time to practice with real-time feedback, and examples may combat persona dissatisfaction and enhance transfer. Regardless of the results of this study that indicated there is no modality effect on knowledge retention or behavior change, other theories indicate that applied learning is best when the behaviors mimic the real world or the task they are completing (Lodge et al., 2016; Doyle & Zakrajsek, 2013). Therefore, procedural or behavioral skills should be demonstrated or

showcased in a walk-through manner and tested to evaluate the true application of skills after the treatments.

This study aims to draw evidence-based relationships and conclusions between educational theory to corporate training and development environments and program evaluation theories. By doing this, researchers and instructional designers alike can explore the similarities and differences between traditional adult learners (found in academia and medical studies) compared to corporate learners and draw conclusions to create more impactful and relevant learning experiences for a variety of adult learner types. The research presented in this study both aligns with and contradicts that of other research, as indicated in this chapter, which implies there is more to uncover about the applied learning theories in a corporate environment and sets the foundation for exploration and validation of other learning theories.

5.5.2 Suggestions for Future Research

This study only included 30 participants, which limits the ability for statistical significance; additional studies should include greater sample sizes to evaluate statistical significance. Additionally, assessments did not show impact on “guessing” answers, therefore future studies would benefit from uncovering true knowledge retention compared to the “guessed” answers. Furthermore, learner satisfaction was compared amongst two types of microelarning treatments, but could be evaluated quardratically with live training versus microlearning per treatment type to understand how microlearning treatment types compare with non-microlearning training.

Based on emergent evidence, the industry would benefit from additional studies including business results / KPIs; comparing the impact on knowledge retention and behavior change for those who did not practice the tool during the treatment to those who did; how manager or supervisor support influences behavior change (conducting a 360 degree evaluation); evaluating microlearning against other training evaluation frameworks; or the impact on performance and knowledge retention from content management or informational systems due to influences on cognitive load. These studies could include but would not be limited to impacts of supervisors or managers, content management or information system usage and frequency.

5.6 Conclusion

This chapter has provided a summary and discussion of the major findings from this study as it relates to the learning theories and frameworks presented in the literature review. Evidence from this study concludes that praxis includes balancing the neuro, educational, economic, and psychological sciences with the biases of deep personal preferences to create training that is relevant, enjoyable, and transferred. The chapter subsequently presented implications for practice, policy, and research that connect with the themes and findings described in the summary of results.

Ultimately, training should be kept to consumable limits, limiting cognitive load and fitting into the flow of daily work for the persona: fitting within the boundaries of both microlearning and procedural-based learning best practices and be vetted against a content management process to ensure the process or tools are relevant, accurate, and easy to find. Despite this study indicating that knowledge retention nor behavior change

are influenced by treatment modality, there are clear participant preferences that may influence adoption and recall. When content holds trainees accountable and is easy to find, consume, and apply, trainees are more likely to adopt the desired behaviors and retain information over time. It is important to recognize that outside influences such as manager or supervisor support, organizational psychology, company culture/dynamics, internal and external motivation, as well as others may influence the activation of the desired behaviors. Therefore, training organizations should invest their time and energy in investigating treatment modalities against a standard evaluation framework to ultimately determine how to best influence knowledge retention, satisfaction, behavior change, and business results of their populations; and thus how to create and deploy relevant, meaningful, and impactful microlearning experiences.

APPENDICES

APPENDIX A. COMMUNICATION AND RESOURCES

Connection 1 - Introductory Email

Hello!

My name is Megan Reynolds and I am a Sr. Learning Experience Designer for Global Sales Onboarding. I am working on my PhD at the University of Kentucky and studying how microlearning impacts a corporate learner's satisfaction, knowledge retention, and behavior change.

I am looking for volunteers to conduct my research and am asking you because of your new experiences with training and development in this corporate environment. This study spans over 3 weeks and includes a pre-test, small learning experience (less than 10 minutes), 2 post-tests, 1 interview, and 1 behavior change self-evaluation questionnaires, or roughly 1.5 hours of your time over the 3 week duration.

Please review the informed consent document (hyperlinked) to gain insight into your rights as a study volunteer. If you wish to proceed with the study, please proceed using this Google Form (hyperlinked).

Thanks

Megan

Connection 2 - Final Email

Hello!

My name is Megan Reynolds and I am a Sr. Learning Experience Designer for Global Sales Onboarding. I contacted you a few days ago regarding a study I am conducting and I wanted to follow up with you. I am working on my PhD at the University of Kentucky and studying how microlearning impacts a corporate learner's satisfaction, knowledge retention, and behavior change.

I am looking for volunteers to conduct my research and am asking you because of your new experiences with training and development in this corporate environment. This study spans over 3 weeks and includes a pre-test, small learning experience (less than 10 minutes), 2 post-tests, 1 interview, and 1 behavior change self-evaluation questionnaires, or roughly 1.5 hours of your time over the 3 week duration.

Please review the informed consent document (hyperlinked) to gain insight into your rights as a study volunteer. If you wish to proceed with the study, please proceed using this Google Form (hyperlinked).
Thanks,

Megan

Connection 3 - Interview Email

Hello!

Thank you for participating in the microlearning research study thus far! I am looking to schedule a quick 30 min to 1 hour interview next week to learn more about your satisfaction with the learning content you received.

Please reach out if you have any questions or concerns.

Thanks,

Megan

Connection 4 - Interview Calendar Invitation

Welcome to the Microlearning in a Corporate Setting interview! In today's call we'll:

- Align on the goals and procedures for today's experience.
- Share insight regarding the satisfaction of the training material you reviewed.

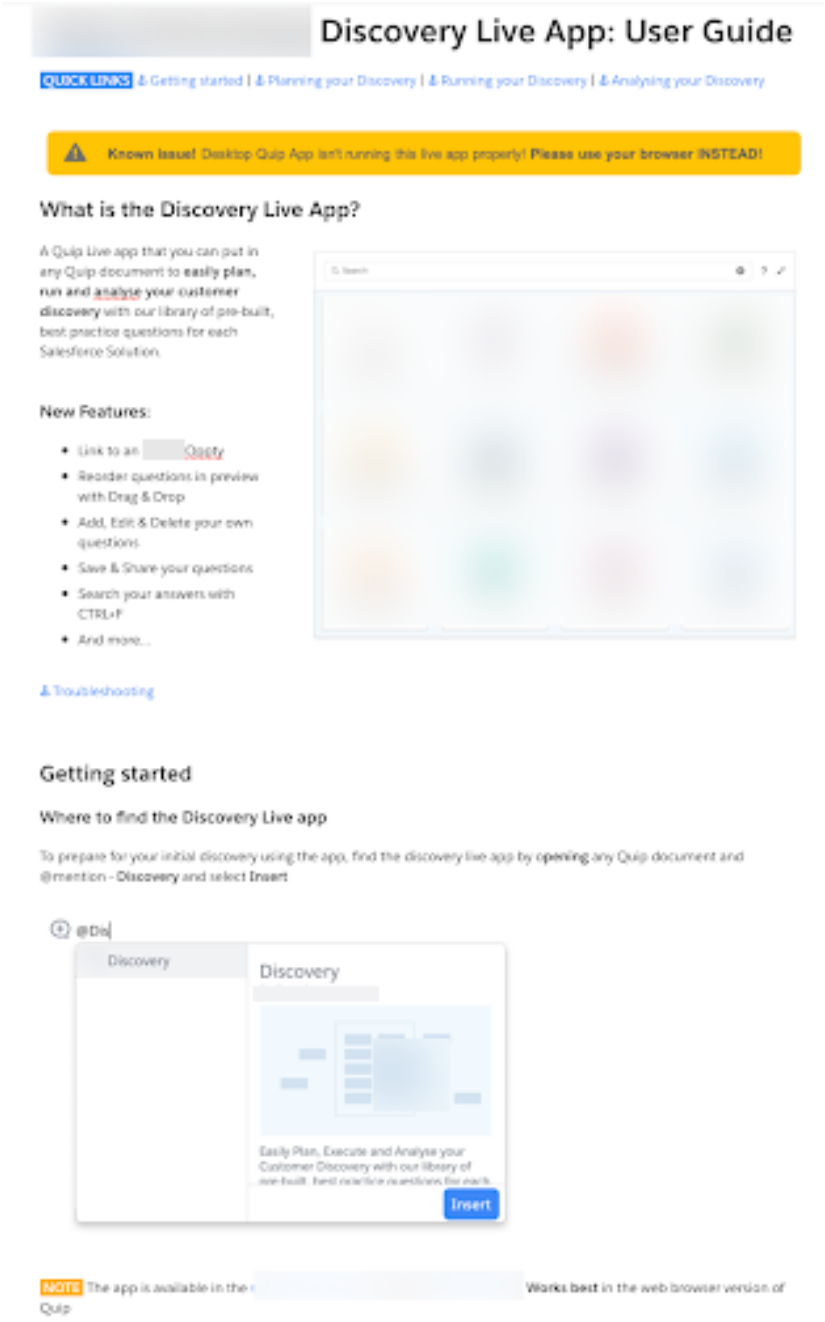
Please reach out if you have any questions or concerns.

Thanks,

Megan

APPENDIX B. TREATMENTS

Job Aid



Discovery Live App: User Guide

QUICK LINKS & Getting started | & Planning your Discovery | & Running your Discovery | & Analysing your Discovery

Known issue! Desktop Quip App isn't running this live app properly! Please use your browser INSTEAD!

What is the Discovery Live App?

A Quip Live app that you can put in any Quip document to **easily plan, run and analyse your customer discovery** with our library of pre-built, best practice questions for each Salesforce Solution.

New Features:

- Link to an Oppty
- Reorder questions in preview with Drag & Drop
- Add, Edit & Delete your own questions
- Save & Share your questions
- Search your answers with CTRL+F
- And more...

& Troubleshooting

Getting started

Where to find the Discovery Live app

To prepare for your initial discovery using the app, find the discovery live app by **opening** any Quip document and @mention - **Discovery** and select **Insert**

@Dis

Discovery

Discovery

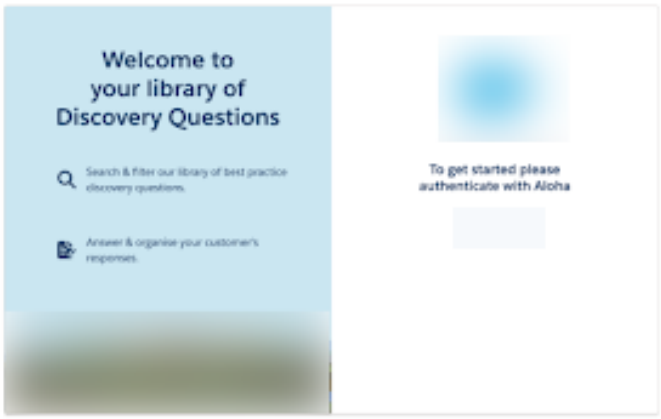
Easily Plan, Execute and Analyse your Customer Discovery with our library of

Insert

NOTE The app is available in the **Works best** in the web browser version of Quip

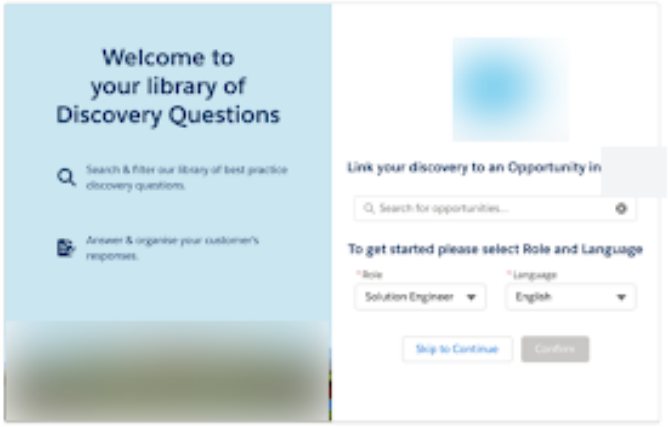
How to access the app

The **first time** using the app, it will request you to login. Select the **Login** button and sign in with your login details.



Search for the opportunity you are doing discovery on*
Select your **Role** and **Language** and then your ready to get started with Discovery!

*You have the option to Skip to Continue this is you just want to look around the app.



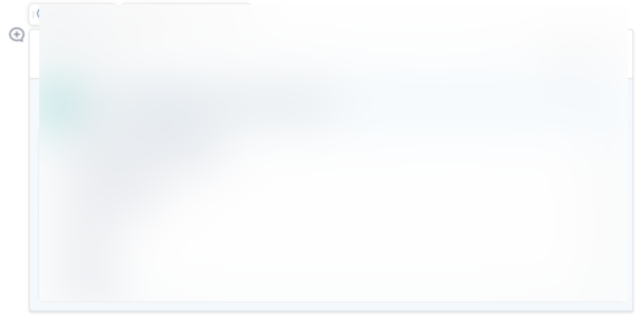
NOTE Today we only have the Solution Engineer Role and English Language, with potential to add more in the future.

Planning your Discovery

Selecting Discovery Questions

Our library of discovery questions are all **categorised by** **solution**.
Select the Solution you'd like to do discovery on...

Once you've selected the Solution, you can start to **add the product questions** with the add button (the plus sign against each product).



When you start selecting products, you'll see **a new bar appear summarising all the products** you'd like questions on. Here you can see I've selected and . To add more Solutions you can use the home button to go back to more or use the search bar to find more.

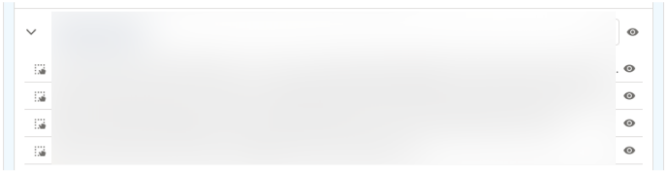
Previewing the Questions

You can click on any Product name to **preview the questions** before adding them to the quip.
You can also **choose to hide any questions** you wouldn't like to include here with the eye icon.

To **close the preview**, you simply click the Product name again.

Re-arrange the order of your questions

While previewing the questions for each solution you can **drag and drop** them in a different order. Click and hold the question you'd like to move and drag it to the position you'd like it to appear.



NOTE Today you can only drag and drop your questions in this part of the app, once you've added them to the Quip they are not draggable yet.

Add/Edit your own personal questions in preview

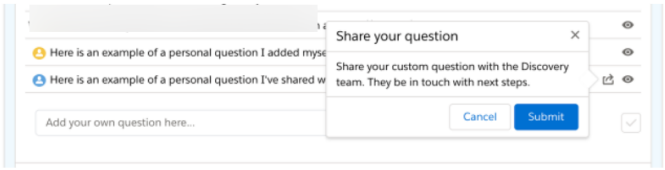
While previewing the questions you can also **add your own personal questions** to this section. Type the new question and click the "tick" icon or **press enter to save the question**.

Once you've added your own personal question, it is saved to your own personal question library, so every time you use the Discovery app **these will be saved for you to reuse** in each discovery session. You also have the **option to edit & delete** it here.

Your own personal saved questions are called out with a **blue circle icon.**

Sharing your own personal questions in preview

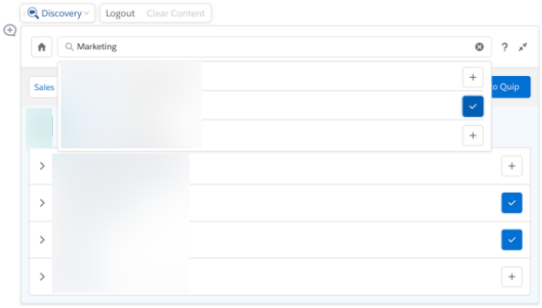
When you've tried and tested your awesome personal saved question you have the ability to share it with the Discovery app team to review and potentially add it to the master question list for everyone to use.



NOTE Once a question is shared it **can no longer be edited/deleted**, until the app team review and publish or decline and release it back to you to reuse. Your shared questions are called out with an **orange circle icon.**

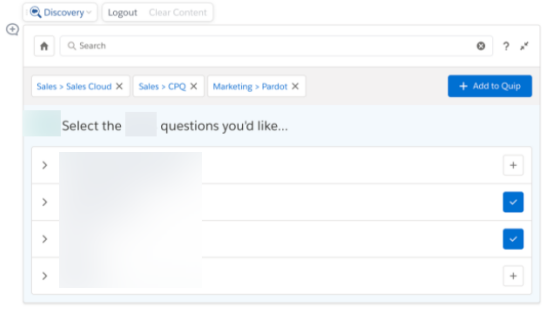
Searching for Questions

You can use the search bar at anytime to **search and select** product discovery questions.
Click the X in the search bar to close the search.



Adding Questions to your Quip

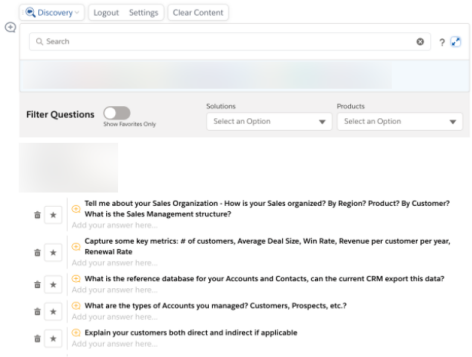
Once you've selected all the products you'd like for your discovery, you simply click on the **+ Add to Quip** button and they're be added to your quip. Now you're ready to run your discovery with your customer.



Running your Discovery

Answering your Discovery Questions

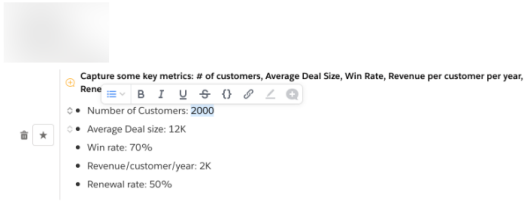
Once you've added your questions to the Quip you can now **take notes against each question**.
There is a section under each question where you can add your answers...



TOP TIP **Minimise the app** (in the top right hand corner) to have more space to do your discovery

Formatting your Discovery Questions

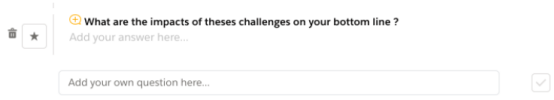
You can **highlight your answers** and use the normal Quip formatting features.
The below example shows how to format a piece of text.



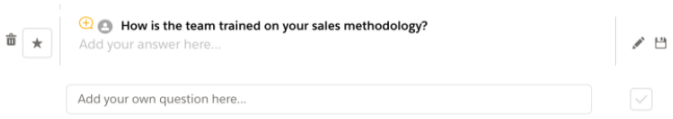
NOTE In this version you cannot add images to the answer sections. You can however add images by ⚓ Commenting on Questions...

Add, Edit & Manage your own personal questions during discovery

While answering the questions you can also **add your own personal questions** to this section. Type the new question and click the "tick" icon or **press enter to add the question**. You also have the **option to edit** it here.



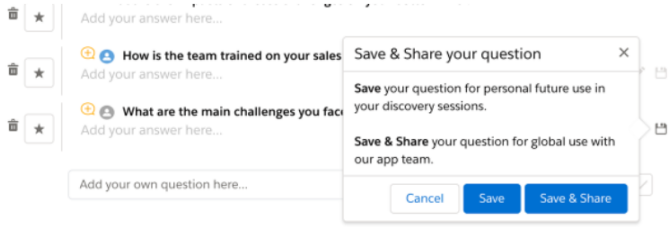
Once you've added your own personal question, it is **NOT saved** to your own personal question library and will only be available in this quip. To save for future use see: ⚓ Saving your own personal questions during discovery



Your own personal unsaved questions are called out with a grey circle icon.

Saving your own personal questions during discovery

To save your own personal question, click the "save" icon and select "Save", so every time you use the Discovery app **these will be saved for you to reuse** in each discovery session.

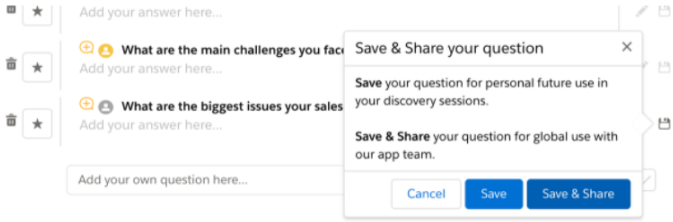


Your own personal saved questions are called out with a **blue circle icon**.

NOTE Once a question is saved it **can no longer be edited**, to edit return to the the preview of this question to make further edits. ⚓ Add/Edit your own personal questions in preview

Sharing your own personal questions during discovery

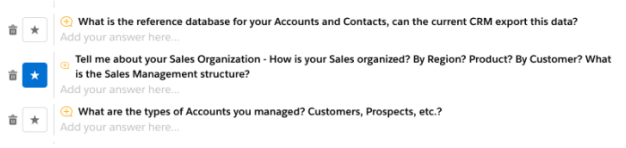
When you've tried and test your awesome personal question you have the ability to share it with the Discovery app team to review and potentially add it to the master question list for everyone to use. Click the "Save" icon and Select "Save & Share".



NOTE Once a question is shared it **can no longer be edited**, until the app team review and publish or decline and release it back to you to reuse. Your shared questions are called out with an **orange circle icon**.

Organising your Discovery Questions

To help organise and prioritise your discovery, you can **favourite/star important questions** to come back to later.
You can also **delete any irrelevant questions** with the trash can icon.



TOP TIP During discovery if your quip has too many questions to handle at once, you may want to try ⚓ Filtering your Discovery Questions to focus just on one Solutions or product at a time.

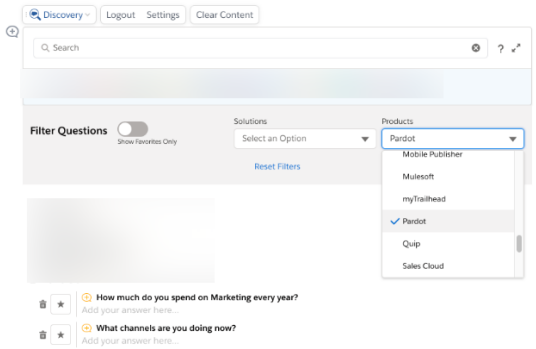
Adding more best practice questions during discovery

You can also add other solution/product questions during a discovery session by ⚓ Adding Questions to your Quip or quickly ⚓ Searching for Questions

Analysing your Discovery

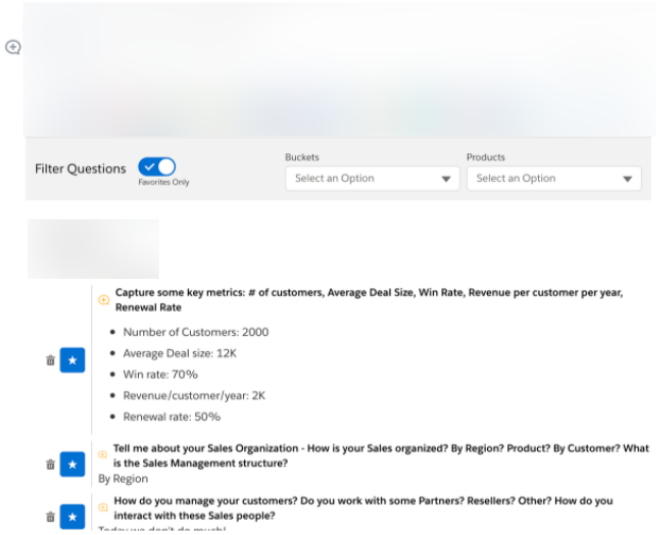
Filtering your Discovery Questions

You can use the **filters to display only certain questions** in a specific Solution or Product. You can **select one or more filters** at the same time to really narrow down your discovery. This can help focus your discovery in a certain area.



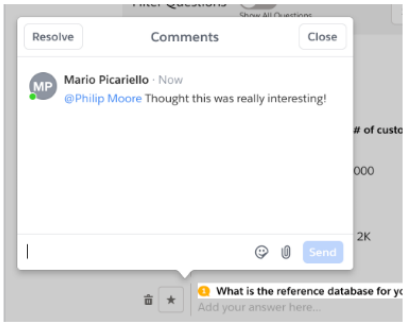
NOTE
To **reset the filters** you just simply click the "Reset Filters" button

You can also **quickly filter on your favourites**/stared questions to focus on the priorities of your customer.



Commenting on Questions

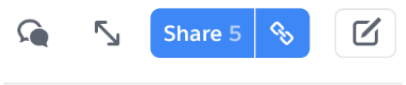
You also have the ability to **comment on a specific question** if you want to collaborate on a particular question



TOP TIP If you'd like to **attach an image** to a particular question you can add it in the comment with the paperclip icon.

Sharing your discovery with others

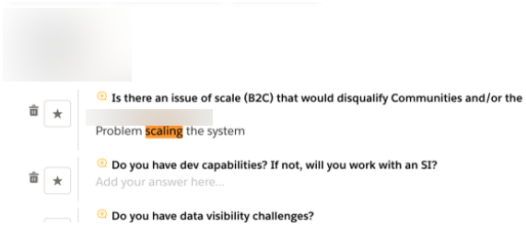
You can simply share the Quip with a colleague to plan, run and analyse your discovery together using the standard Quip sharing features. If they haven't used the Discovery app before **they will need to login with their** credentials: How to access the app



NOTE
The Discovery Quip app will only be visible to S employees. If you share the document with a customer they will NOT have access.

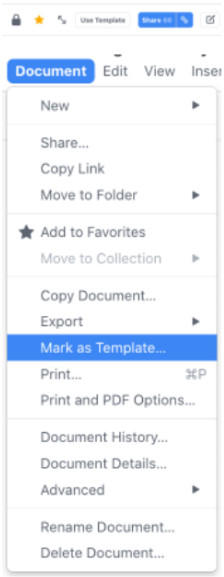
Searching through your answers

After you've finished your discovery and have collected all the answers from your customer. You can **press CTRL+F** on your keyboard and **search through the answers** to find any information you may need quickly.



NOTE Make sure you've clicked in the area where you've answered the questions to search these answers.

TOP TIP For easy duplication of the discovery live app, create and bookmark a clean template version to copy for each customer.



Demonstration Video Script

Scene	Section	Audio
	Video Intro	Background music (ends before scene 1)
1	Intro & value of the discovery live app	Hi! Today we want to share with you the power of the Discovery Live App. This is a Quip Live app that you can put in any Quip document to easily plan, run and analyze your customer discovery with our library of pre-built, best practice questions for each [redacted] Solution. Let's get started!
2	Getting Started	To prepare for your initial discovery using the app, find the discovery live app by opening any quip document and @ mention - discovery and select insert. You should note that The app is available in the [redacted] org and [redacted]. Works best in the web browser version of Quip
3	Accessing the app	The first time using the app, it will request you to login. Select the Login button and sign in with your [redacted] login details. You'll have the ability to Search for the opportunity you are doing discovery on, but feel free to skip this if you just want to look around the app or even change it if you link the incorrect version. Select your Role and Language and then you're ready to get started with Discovery!
4	Planning Your Discovery	The library of discovery questions are all categorised by Salesforce solution. Select the Solution you'd like to do discovery on...

5	Planning Your Discovery	Once you've selected the Solution, you can start to add the product questions with the add button (the plus sign against each product).
6	Planning Your Discovery	When you start selecting products, you'll see a new bar appear summarising all the products you'd like questions on. Here you can see I've selected [redacted] and [redacted]. To add more Solutions you can use the home button to go back to more or use the search bar to find more.
7	Planning Your Discovery	You can click on any Product name to preview the questions before adding them to the quip. You can also choose to hide any questions you wouldn't like to include here with the eye icon. To close the preview, you simply click the Product name again.
8	Planning Your Discovery	While previewing the questions for each solution you can drag and drop them in a different order. Click and hold the question you'd like to move and drag it to the position you'd like it to appear. It's important to note that you can only drag and drop your questions in this part of the app, once you've added them to the Quip they are not draggable yet.
9	Planning Your Discovery	Did you know that you can add or edit your own personal questions in preview? While previewing the questions you can also add your own personal questions to this section. Type the new question and click the "tick" icon or press enter to save the question.

10	Planning Your Discovery	Once you've added your own personal question, it is saved to your own personal question library, so every time you use the Discovery app these will be saved for you to reuse in each discovery session. You also have the option to edit & delete it here. Your own personal saved questions are called out with a blue circle icon.
11	Planning Your Discovery	When you've tried and tested your awesome personal saved question you have the ability to share it with the Discovery app team to review and potentially add it to the master question list for everyone to use. Once a question is shared it can no longer be edited/deleted, until the app team review and publish or decline and release it back to you to reuse. Your shared questions are called out with an orange circle icon.
12	Planning Your Discovery	You can use the search bar at anytime to search and select product discovery questions. Click the X in the search bar to close the search.
13	Planning Your Discovery	Once you've selected all the products you'd like for your discovery, you simply click on the + Add to Quip button and they're be added to your quip. Now you're ready to run your discovery with your customer.
14	Running Your Discovery	Once you've added your questions to the Quip you can now take notes against each question. There is a section under each question where you can add your answers...
15	Running Your Discovery	You can highlight your answers and use the normal Quip formatting features.

16	Running Your Discovery	While answering the questions you can also add your own personal questions to this section. Type the new question and click the “tick” icon or press enter to add the question. You also have the option to edit it here. Once you’ve added your own personal question, it is NOT saved to your own personal question library and will only be available in this quip. Your own personal unsaved questions are called out with a grey circle icon.
17	Running Your Discovery	To save your own personal question, click the “save” icon and select “Save”, so every time you use the Discovery app these will be saved for you to reuse in each discovery session. Your own personal saved questions are called out with a blue circle icon.
18	Running Your Discovery	When you’ve tried and test your awesome personal question you have the ability to share it with the Discovery app team to review and potentially add it to the master question list for everyone to use. Click the “Save” icon and Select “Save & Share“. It's important to remember that once a question is shared it can no longer be edited, until the app team review and publish or decline and release it back to you to reuse. Your shared questions are called out with an orange circle icon.
19	Running Your Discovery	To help organise and prioritise your discovery, you can favourite/star important questions to come back to later. You can also delete any irrelevant questions with the trash can icon. Now it's time to start analyzing your discovery!

20	Analyzing your Discovery	You can use the filters to display only certain questions in a specific Solution or Product. You can select one or more filters at the same time to really narrow down your discovery. This can help focus your discovery in a certain area. It's important to note that to reset the filters you just simply click the “Reset Filters” button
21	Analyzing your Discovery	You can also quickly filter on your favourites/stared questions to focus on the priorities of your customer.
22	Analyzing your Discovery	You also have the ability to comment on a specific question if you want to collaborate on a particular question If you’d like to attach an image to a particular question you can add it in the comment with the paperclip icon.
23	Analyzing your Discovery	You can simply share the Quip with a colleague to plan, run and analyse your discovery together using the standard Quip sharing features. If they haven’t used the Discovery app before they will need to login with their Aloha credentials. You should know that The Discovery Quip app will only be visible to [redacted] employees. If you share the document with a customer they will NOT have access.
24	Analyzing your Discovery	After you’ve finished your discovery and have collected all the answers from your customer. You can press CTRL+F on your keyboard and search through the answers to find any information you may need quickly. You should make sure you’ve clicked in the area where you’ve answered the questions to search these answers

25	Duplication	Now that you've taken the time to review the discovery app, it's time to use it to prep for your customer calls! One way to make this readily available to you is to create a templated version of the app for you to easily duplicate and use for other customers.
26	Closing	Be sure to stay curious with your customers and add to this document as you learn more about them through the selling process.
	Outro	Background music

APPENDIX C. DATA SOURCES AND PROTOCOL

RQ1a: Learner Satisfaction

Note that focus groups changed to interviews when study participation was low.

Moderator Pre-Session Tasks

- Contacts participants
- Add notes/participants to calendar invitation
- Sends reminder email requesting that they confirm/deny the group

Moderator Tasks During the Session

- Read the introductory script and questions
- Ask probing questions

Introductory Script

We will follow a general approach of four components as outlined by Krueger and Morgan (2002): (1) Welcome, (2) Overview of the topic, (3) Ground Rules, and (4) Questions.

The introductory script follows:

Greetings welcome to our session! Thanks for taking the time to join us to talk about your microlearning experience as a new seller here at Salesforce. My name is Megan and I am a design specialist, looking to get some information around your satisfaction with the microlearning you experienced on the discovery live app. You were selected because you completed the the first three weeks of the research study where you:

- took a pre-test sharing your initial level of understanding with the Discovery Live App
- watched a demonstration video OR read a digital job aid on how to use the tool

- completed one follow up post-tests demonstrating your new level of insight around the tool
- and reflected on if and how this training changed your behavior thus far

While I'm asking about your satisfaction with the training material (the digital job aid or demonstration video), you weren't selected because of any particular behaviors or experiences you may have had or answers you gave to the pre and post tests. I am having discussions and interviews in the next week or so with various sellers who meet the same criteria.

I want to know your satisfaction levels with the training materials (the video and digital job aid). There are no wrong answers, but rather different points of view. Please feel free to share your point of view, even if it differs from what others may have told you, what you think they may have told me, or even what you think I would want to hear. Please keep in mind that I'm just as interested in negative comments as positive ones, and at times the negative comments can be the most helpful because that's where I know how to change behaviors.

You've probably noticed the recording by now. I'm recording the session because I don't want to miss any of your comments. You're going to say very helpful things in this discussion, and I can't write fast enough to get them all down. I want to provide clarity on your confidentiality for this section of the study:

- You are welcome to skip any questions you would like or leave the session at any time.
- You are also welcome to keep your camera's off. While I am recording the session, I will only transcribe it after the call and delete the recording.

- All reports/findings/data will be stored in a password-protected storage folder and can only be accessed by me.
- The reports and findings will be used in publicly available research to support industry personnel on how to strategically adopt training programs that sellers enjoy.
- It's also important to note that I won't use any names or specific identifiers in the reports or findings - you may be assured of complete confidentiality. I will keep your information confidential to the extent possible by law.

Consent Questions

- What questions do you have about this study, your anonymity, the usage of this research, or otherwise before I begin?
- Do you agree to continue? [need verbal yes from every individual before proceeding]

[SCRIPT CONTINUES] Let's start off with some brief introductions. I'd love to learn a little about you: your name, where you're located, and your background. I will begin for us.

Questions

1. Describe your level of satisfaction with this particular learning experience*.
2. What difficulties, if any, did you have with the learning experience*?
3. In what ways do you think the learning experience* can be improved?
4. For you, what are the main benefits or drawbacks of using this type of learning experience*?
5. Do you feel that you remember more from this type of learning experience* compared to others? Why or why not?
6. Generally, how satisfied are you with this type of learning experience* for training?

**replaced w/ specific language: the video or the job aid*

Ending/Summary Question

1. Of all the things we've discussed, what's the most important to you?
2. The purpose of our discussion today was to explore your satisfaction with this type of learning experience*. Is there anything you can think of that we've missed talking about?

**replaced w/ specific language: the video or the job aid*

Moderator's Concluding Remarks

Thank you so much for your time and valuable comments. I really appreciate your participation and you've provided me with some very important insights on your perceptions and experiences with [demonstration videos or digital job aids].

Moderator Post-Group Tasks (Beginning Analysis)

Immediately Following

- Finalize participate names, roles, locations
- Conduct moderator and assistant moderator debriefing
    - Note themes, hunches, interpretations, and ideas
- Label and organize field notes
    - Link the meeting recording
- Remove inactive participants from any calendar invitation

Within 1 Week

- Analyst listens to recording, reviews field notes, and reads transcript
- Prepare report in a question-by-question format with direct quotes
- Delete video recording
- Develop a draft report for comparison with others
- Compare data after second group and then dive into further analysis

RQ1b. Knowledge Retention: Assessment (Pre-Test/Post-Tests)

Instructions: Please complete the following pre-test/post-test.

1. Email (ensure that you use the same throughout the study)
2. Select two: What value does the Discovery live app bring to your selling habits?
    a. Using Quip to articulate how Salesforce uses Salesforce.

   b. **Search and filter best practice discovery questions.**
   c. **Plan, run, and analyze your customer discovery.**
   d. Organize your discovery Quip documents.
3. When should the Discovery live app be first used by sellers in the selling process?
   a. **Deal stages 0-2**
   b. Deal stages 3-5
   c. Deal stages 6-8
4. How do you access the discovery live app?
   a. Search Concierge for the Discovery Live App.
   b. Finding and opening the discovery Quip in the opportunity you wish to work with in Org62.
   c. **Opening a blank Quip document and typing @discovery.**
5. What is one proposed strategy for easy duplication of the discovery live app?
   a. **Create and bookmark a clean templated version to copy for each customer.**
   b. Create and bookmark a robust discovery document with all questions related to all solutions and products.
   c. Create and bookmark your first discovery live app document to duplicate as is for other customers.
6. True or False: Once you create your discovery questions, you cannot change the linked opportunity in the document.
   a. True
   b. **False. Select "settings" from the top of the app and you can change the opportunity, role, or language.**
7. Select the two best ways you can link an opportunity in the org app.
   a. By copying the URL and pasting it in the org app opportunity notes.
   b. **By searching the opportunity when first loading the app.**
   c. By adding the document into the opportunity's files.
   d. **By selecting the "link to org app opportunity" button.**
8. True or False: You must only use one type of questions per discovery document.
   a. True
   b. **False; you can add more questions by selecting the "home" tile and finding a particular product to use as a foundation.**
9. Select the two statements that complete the sentence: An easy way to focus the priorities of your customers in the document is to ____.
   a. **add personalized questions you've used in the past.**
   b. manually add all relevant questions by solutions or products.
   c. **filter the questions by solutions or products.**

RQ1c. Behavior Change: Self-Evaluation Questionnaire

Instructions: Please complete the following self-reported evaluation. Use the scale to help guide your responses.

- Always - 100%
- Very Frequently - 80%
- Occasionally - 60%
- Rarely - 40%
- Very Rarely - 20%
- Never - 0%

1. I use the discovery live app to prepare for my customer calls.
    a. Never, very rarely, rarely, occasionally, very frequently, always
2. I use the discovery live app during my customer calls.
    a. Never, very rarely, rarely, occasionally, very frequently, always
3. I am able to connect the discovery live app with my opportunities in the org app.
    a. Never, very rarely, rarely, occasionally, very frequently, always
4. I am able to initially select the most valuable subset of questions I intend to use with a customer.
    a. Never, very rarely, rarely, occasionally, very frequently, always

APPENDIX D. DEMOGRAPHIC SURVEY

Instructions: Please complete the following demographic information. Please note that all personal information will be kept completely confidential.

1. Gender (male, female, non-binary, other, prefer not to answer)
2. Age range
    a. 18-24
    b. 25-34
    c. 35-44
    d. 45-54
    e. 55-64
    f. 65 or older
3. General Operating Unit
    a. (E)SMB
    b. CMRCL
    c. ENT
    d. NEW LOGO
4. Years of relevant work experience
    a. 1-5
    b. 6-10
    c. 10-15
    d. 16-20
    e. 21+

REFERENCES

Acker, S. R. (2008). Will Digital Texts Succeed?. *Campus Technology*, *21*(7), 54-56.

Ackerman, R., & Goldsmith, M. (2011). Metacognitive Regulation of Text Learning: On Screen Versus on Paper. Journal of Experimental Psychology. Applied, 17(1), 18–32. https://doi.org/10.1037/a0022086.

Aharon, L. (2020, May 4). History of Microlearning: EdApp Microlearning. EdApp Microlearning Blog. https://www.edapp.com/blog/is-microlearning-a-genuine-contender-for-the-future-of-learning/.

Ahmed, S. T., Yang, C., Deng, J., Bottalico, D. M., Matta‐Arroyo, E., Cassel‐Choudhury, G., & Yang, C. J. (2021). Implementation of an Online Multimedia Pediatric Tracheostomy Care Module for Healthcare Providers. The Laryngoscope, 131(8), 1893–1901. https://doi.org/10.1002/lary.29400.

Ali, A. D. (2016). Effectiveness of Using Screencast Feedback on EFL Students' Writing and Perception. English Language Teaching, 9(8), 106-12. https://eric.ed.gov/?id=EJ1106616.

Allen, I. E., & Seaman, J. (2017). Digital Compass Learning: Distance Education Enrollment Report 2017. *Babson survey research group*.

Allen, M. (2012). Leaving Addie for Sam: An agile model for developing the best learning experiences. Copyright Clearance Center.

Altunışık, R., Coşkun R., Bayraktaroğlu S. & Yıldırım E. (2004). Sosyal bilimlerde araştırma yöntemleri (3. bs). İstanbul: Sakarya Kitabevi.

Alvesson, M. and Kärreman, D. (2007), “Constructing mystery: empirical matters in theory development”, Academy of Management Review, Vol. 32 No. 4, pp. 1265-1281.

Angel, I. (2000). E-learning. CIPD Conference Proceedings, Harrogate, October.

Antonenko, P., van Gog., T., & Paas, F. (n.d.). Implications of Neuroimaging for Educational Research. In J.M. Spector et al (Eds.), *Handbook for Research on Educational Communications and Technology* (p. 51-63). Springer.

Arnarsson, I. Ö., Frost, O., Gustavsson, E., Jirstrand, M., & Malmqvist, J. (2021). Natural language processing methods for knowledge management—Applying document clustering for fast search and grouping of engineering documents.

Concurrent Engineering, Research and Applications, 29(2), 142–152. https://doi.org/10.1177/1063293X20982973.

Arshavskiy, M. (2014, February 3). Level 4 training evaluation. [blog post] Retrieved from https://elearningindustry.com/level-4-training-evaluation.

ATD. (n.d.). Kirkpatrick's Four Levels of Evaluation: Templates and Tools. Retrieved from https://d22bbllmj4tvv8.cloudfront.net/3b/32/926a547941c884a89264e0e2b534/atd-kirkpatricks-four-levels-of-evaluation.pdf.

ATD Case Study Team. (2019, November 26). N2 Publishing: Training a remote sales force with video-based courses. 10-Minute Case Studies. https://casebycase.td.org/n2-publishing-training-a-remote-sales-force-with-video-based-courses.

Baan. (2013). Enterprise information management when information becomes inspiration. Springer.

Bachmann, T. (2009). Metadata explained: The evolution of schemas, taxonomies and ontologies in today's DAM systems - An Interview with Tom Bachmann of EAS Planning. Journal of Digital Asset Management, 5(5), 286–297. https://doi.org/10.1057/dam.2009.21

Baron, A., & McNeal, K. (2019). Case study methodology in higher education (A. Baron & K. McNeal, Eds.). IGI Global. https://doi.org/10.4018/978-1-5225-9429-1.

Boring, C. (2020). Microlearning: An Andragogical Case Study on Knowledge Retention, Learner Satisfaction, and Behavior Change. ProQuest Dissertations Publishing.

Borzillo, S., Schmitt, A., & Antino, M. (2012). Communities of practice: keeping the company agile. The Journal of Business Strategy, 33(6), 22–30. https://doi.org/10.1108/02756661211281480.

Bouchrika, I. (2023, July 27). *28 video training statistics: 2023 data, Trends & Predictions*. Research.com. https://research.com/education/video-training-statistics#:~:text=According%20to%20industry%20data%2C%20more,is%20estimated%20to%20be%20%2430%2C420.

Boyd, Susan. (2005). Using Job Aids. ASTD PRESS. ISBN: 9781562863982.

Brand-Gruwel, Saskia, Kester, Liesbeth, Kicken, Wendy, & Kirschner, Paul A.. (n.d.) Learning Ability Development in Flexible Learning Environments. In J.M. Spector et al., (eds.), *Handbook of Research on Educational Communications*

and Technology (p. 363-372), DOI 10.1007/978-1-4614-3185-5_29, Springer Science+Business Media New York 2014.

Brandon Hall Group. (2017). *Training Budget Benchmarks and Optimizations for 2017: Research Summary.* SAP Litmos.

Brinkerhoff, R. O., & Steiner, M. T. (2022, September 28). *The impact map: Make the value proposition of your L&D investment crystal clear*. Chief Learning Officer - CLO Media. https://www.chieflearningofficer.com/2022/04/08/the-impact-map-make-the-value-proposition-of-your-ld-investment-crystal-clear/.

Brockett, R. G., & Hiemstra, R. (1991). Self-Direction in Adult Learning: Perspectives on Theory, Research, and Practice. London: Routledge.

Brysbaert, M. (2019). How many words do we read per minute? A review and meta-analysis of reading rate. *Journal of Memory and Language*, *109*, 104047. https://doi.org/10.1016/j.jml.2019.104047.

Callisen, L. (2016). Why micro learning is the future of training in the workplace. Resource document. Retrieved from https ://elearningindustry.com/micro-learning-future-of-training-workplace.

Campbell, K. (2019, July 5). *How to use drip marketing and microlearning to deliver training at the speed of business*. Training. Retrieved from https://trainingmag.com/how-to-use-drip-marketing-and-microlearning-to-deliver-training-at-the-speed-of-business/.

CAST (2018). *Universal Design for Learning Guidelines version 2.2.* Retrieved from http://udlguidelines.cast.org.

Clark, & Mayer, R. E. (2016). E-learning and the science of instruction : proven guidelines for consumers and designers of multimedia learning (Fourth edition.). Wiley.

Cloke, H. (2018, March 30). *What Is The Forgetting Curve (And How Do You Combat It)?*. eLearning Industry.

Cohen, L., Manion, L. & Morrison, K. (2000). Research methods in education (5th ed.). London: Routledge/Falmer.

Costley, J., Fanguy, M., Lange, C., & Baldwin, M. (2021). The effects of video lecture viewing strategies on cognitive load. *Journal of Computing in Higher Education*, *33*(1), 19-38.

Creswell, J. W., & Plano Clark, V. L. (2017). Designing and conducting mixed methods research (3rd ed.). SAGE Publications.

Crowe, S., Cresswell, K., Robertson, A., Huby, G., Avery, A., & Sheikh, A. (2011). The case study approach. *BMC Medical Research Methodology*, *11*(1). https://doi.org/10.1186/1471-2288-11-100.

Data Bridge Market Research (2021). *Global microlearning market - Industry trends and forecast to 2028*. https://www.databridgemarketresearch.com/reports/global-microlearning-market.

Darejeh, Marcus, N., & Sweller, J. (2021). The effect of narrative-based E-learning systems on novice users' cognitive load while learning software applications. Educational Technology Research and Development, 69(5), 2451–2473. https://doi.org/10.1007/s11423-021-10024-5.

Defelice, R. (2021, October 25). *The push-pull of leading motivation using microlearning*. Learning Solutions Magazine. Retrieved from https://learningsolutionsmag.com/articles/the-push-pull-of-leading-motivation-using-microlearning.

Denny, J. (2021, May 12). What is the forgetting curve (and how do you combat it)*?* eLearning Industry. https://elearningindustry.com/forgetting-curve-combat.

Dillon, A., & Jobst, J. (2005). Multimedia learning with hypermedia. In R. E. Mayer (Ed.), The Cambridge handbook of multimedia learning (pp. 569–588). Cambridge, New York: Cambridge University Press.

Dillon, A., McKnight, C., & Richardson, J. (1988). Reading from paper versus reading from screens. The Computer Journal, 31, 457–464.

Dixon-Fyle, S., Dolan, K., Hunt, V., & Prince, S. (2021, July 12). *Diversity wins: How inclusion matters*. McKinsey & Company. https://www.mckinsey.com/featured-insights/diversity-and-inclusion/diversity-wins-how-inclusion-matters.

Dobbs, K. (2000). What the online world needs now. Training, 37, 84 – 94.

Dolasinski, & Reynolds, J. (2020). Microlearning: A New Learning Model. Journal of Hospitality & Tourism Research (Washington, D.C.), 44(3), 551–561. https://doi.org/10.1177/1096348020901579.

Doolin, B. (1998). Information technology as disciplinary technology: being critical in interpretive research on information systems. *Journal of Information Technology*, *13*(4), 301-311.

Downs, E., Boyson, A. R., Alley, H., & Bloom, N. R. (2011). iPedagogy: Using Multimedia Learning Theory to iDentify Best Practices for MP3 Player Use in Higher Education. Journal of Applied Communication Research, 39(2), 184–200. https://doi.org/10.1080/00909882.2011.556137

Doyle T., Zakrajsek T. (2013). *The new science of learning: How to learn in harmony with your brain*. Stylus.

Druin, A. (2002). The role of children in the design of new technology. Behaviour and Information Technology, 21, 1–25.

Dunaway, K. (2011). Connectivism. Reference Services Review, 39(4), 675–685. https://doi.org/10.1108/00907321111186686.

e-Learning Feeds. (2019, July 5). The history of microlearning and its current trends - e-learning feed*s*. The History of Microlearning and its Current Trends. https://elearningfeeds.com/the-history-of-microlearning-and-its-current-trends/.

Eiriksdottir, & Catrambone, R. (2011). Procedural Instructions, Principles, and Examples: How to Structure Instructions for Procedural Tasks to Enhance Performance, Learning, and Transfer. Human Factors, 53(6), 749–770. https://doi.org/10.1177/0018720811419154.

eLogic Learning. (2018). *The Role of Microlearning in Corporate Training*. https://trainingindustry.com/content/uploads/2018/11/The-Role-of-Microlearning-in-Corporate-Training-11.13.18.pdf.

Ellis, J. A., Whitehill, B. V., & Irick, C. (1996). The effects of explanations and pictures on learning, retention, and transfer of a procedural assembly task. *Contemporary Educational Psychology*, *21*(2), 129–148. doi:10.1006/ceps.1996.0012.

Elsenheimer. (1998). Job aids in the technology age. Performance Improvement (International Society for Performance Improvement), 37(8), 32–35. https://doi.org/10.1002/pfi.4140370808.

Emerson, L. C., & Berge, Z. L. (2018). Microlearning: Knowledge management applications and competency-based training in the workplace. *UMBC Faculty Collection*.

Forbes‐Pitt, K. (2006), “A document for document’s sake”, Records Management Journal, Vol. 16 No. 1, pp. 13-20.

Fuchs, J. (2021, June 7). Top sales challenges FACING salespeople in 2020 [NEW DATA]. HubSpot Blog. https://blog.hubspot.com/sales/challenges-threatening-salespeople.

Galloway, D. L. (2005). Evaluating distance delivery and e‐learning is Kirkpatrick's model relevant? Performance Improvement, 44(4), 21-27. Retrieved from https://onlinelibrary.wiley.com/doi/pdf/10.1002/pfi.4140440407.

Goldie. (2016). Connectivism: A knowledge learning theory for the digital age? Medical Teacher, 38(10), 1064–1069. https://doi.org/10.3109/0142159X.2016.1173661.

Gordon, S. (2014). *Systematic training program design: Maximizing effectiveness and minimizing liability*.

Govaerts, N., Kyndt, E., & Dochy, F. (2018). The Influence of Specific Supervisor Support Types on Transfer of Training: Examining the Mediating Effect of Training Retention. Vocations and Learning, 11(2), 265–288. https://doi.org/10.1007/s12186-017-9190-y.

Graebner, M.E., Martin, J.A. and Roundy, P.T. (2012), “Qualitative data: cooking without a recipe”, Strategic Organization, Vol. 10 No. 3, pp. 276-284, doi: 10.1177/1476127012452821.

Green, Pinder-Grover, T., & Millunchick, J.M. (2012). Impact of Screencast Technology: Connecting the Perception of Usefulness and the Reality of Performance. Journal of Engineering Education (Washington, D.C.), 101(4), 717–737. https://doi.org/10.1002/j.2168-9830.2012.tb01126.x.

Griffin, D. K., Mitchell, D., & Thompson, S. J. (2009). Podcasting by synchronizing PowerPoint and voice: What are the pedagogical benefits?. *Computers & Education*, *53*(2), 532-539.

Grimes S (2008) Unstructured data and the 80 percent rule. Retrieved from http://breakthroughanalysis.com/2008/08/01/unstructured-data-and-the-80-percent-rule/ (accessed 29 November 2019).

Gros, B., & García-Peñalvo, F. J. (2016). Future trends in the design strategies and technological affordances of e-learning. Springer.

Gutierrez, K. (2015, November 17). Numbers don’t lie: Why bite-sized learning is better for your learners (and you too). [blog post] Retrieved from 117 https://www.shiftelearning.com/blog/numbers-dont-lie-why-bite-sized-learning-is-betterfor-your-learners-and-you-too.

Haladyna, T.M., Downing, S.M., & Rodriguez, M.C. (2002). A review of multiple-choice item-writing guidelines for classroom assessment. *Applied Measurement in Education*, 15(3), 309-334.

Hall, Darci. (2021). Microlearning Meets Compliance. Talent Development, 75(5), 42–47.

Hanson, T. (2021, December 29). 4 Areas Leaders Must Focus on in 2022. Fast Company | Business News. https://www.fastcompany.com/90704729/4-areas-leaders-must-focus-on-in-2022.

Haskin, S. (2013). Using video in e-learning. American Society for Training & Development.

Harvey, Jennings, L., Chinyama, M., Masaninga, F., Mulholland, K., & Bell, D. R. (2008). Improving community health worker use of malaria rapid diagnostic tests in Zambia: package instructions, job aid and job aid-plus-training. Malaria Journal, 7(1), 160–160. https://doi.org/10.1186/1475-2875-7-160.

Hromalik, C. D., Myhill, W. N., & Carr, N. R. (2020). "ALL Faculty Should Take this": a Universal Design for Learning Training for Community College Faculty. TechTrends, 64(1), 91–104. https://doi.org/10.1007/s11528-019-00439-6.

Huang, K.E., Wu, J.H., Lu, S.Y. and Lin, Y.C. (2016), "*Innovation and technology creation effects on organizational performance*", Journal of Business Research, Vol. 69 No. 6, pp. 2187-2192.

Hurmerinta-Peltomaki, L., & Nummela, N. (2006). Mixed methods in international business research: A value-added perspective. Management International Review, 46, 439-459.Nardi, P. (2018). Doing survey research : a guide to quantitative methods (Fourth edition.). Routledge, Taylor & Francis Group.

Hwang, Y. (2016), "A study on the multidimensional information management capability of knowledge workers", Aslib Journal of Information Management, Vol. 68 No. 2, pp. 138-154.

Ichiuji, B. A., DeAngelis, E. J., Corpodean, F., Thompson, J., Arsenault, L., Vaziri, K., Lee, J., & Jackson, H. T. (2021). The Effect of a Microlearning Module on Knowledge Retention in Surgery Clerkship Students. Journal of the American College of Surgeons, 233(5), S218–S219. https://doi.org/10.1016/j.jamcollsurg.2021.07.450

Intuit: Using videos to define values and empower every employee to lead. (2018). Association for Talent Development.

Ivec, S. (2021, June 10). *Workflow learning: Enabling the 5 moments of need*. eLearning Brothers Blog. Retrieved January 23, 2022, from https://blog.elearningbrothers.com/workflow-learning-enabling-the-5-moments-of-need.

Jha, S. K., Joseph, R. P., & Mankad, N. (2010). Technology and new digital sensibilities: Impact of Digital Text 2.0. Picmet 2010 Technology Management for Global Economic Growth, 1–8.

Jin, S.-H. (2013). Visual design guidelines for improving learning from dynamic and interactive digital text. Computers and Education, 63, 248–258. https://doi.org/10.1016/j.compedu.2012.12.010.

Kaltura. (2019). *Video and Learning at Work: The State of Video in the Enterprise 2019*.

Kapp, K. M., & Defelice, R. A. (2019). *Microlearning Short and Sweet*. Association for Talent Development.

Karel, C. (2020, March 3). The 6 types of video for learning. Learning Carton. https://learningcarton.com/the-6-types-of-video-for-learning/#:~:text=The%206%20Types%20of%20Video%20for%20Learning%20follows%20the%20premise,as%20learning%20or%20instructional%20videos.

Keane, Therese, Loch, & Birgit. (2017). Peer tutoring using student-made screencasts. Australian Senior Mathematics Journal, 31(2), 6-21.

Keller, J. M. (2010). Motivational Design for Learning and Performance: The ARCS Model Approach. Springer. http://dx.doi.org/10.1007/978-1-4419-1250-3.

Khalili, A., Ajideh, P., & Yaghoubi-Notash, M. (2017). An Investigation of Learning Styles as Sources of Bias in Second Language Grammar Tests. The English Teacher, 46(2), 88–101.

Kharishma, V. (2020). Design a screencast video for software learning in higher education (case study: Tutorial video for digital illustration course). JISA (Jurnal Informatika dan Sains), 3(1), 15-20.

Kirk, J., & Miller, M. L. (1986). Reliability and validity in qualitative research. Beverly Hills: Sage Publications.

Kirkpatrick Partners, LLC. (2022, February 13). The Kirkpatrick Model. Kirkpatrick Partners. Retrieved March 13, 2022, from https://kirkpatrickpartners.com/the-kirkpatrick-model/.

Kirschner, P. A., Sweller, J., Kirschner, F., & Zambrano, J. R. (2018). *From Cognitive Load Theory to Collaborative Cognitive Load Theory*. International Journal of

Computer-Supported Collaborative Learning, 13(2), 213–233. https://doi.org/10.1007/s11412-018-9277-y.

Klein, S. & Richardson, N. (2021). (rep.). People at Work 2021: A Global Workplace View (pp. 1–48). ADP Research Institute.

Knapp. (2017). An introduction to ANOVA. SAGE Publications Ltd.

Knowles, Elwood, Holton III, & Swanson. (1998). The adult learner: The definitive classic in adult education and human resource development. 5th edition, New York: Heinemann.

Knowles, M.S. (1975). *Self-Directed Learning*. Chicago, IL: Follett Publishing Company.

Knowles, Malcolm, Holton, & Swanson. (2005). The adult learner the definitive classic in adult education and human resource development (6th ed.). Elsevier.

Kobayashi VB, Mol ST, Berkers HA, et al. (2018) Text mining in organizational research. Organizational Research Methods 21(3): 733–765. Crossref. PubMed. ISI.

Kohn, A. (2015, August 20). Brain science: Bursts – creating brief training for short attention spans [blog post]. Retrieved from https://learningsolutionsmag.com/articles/1774/brainscience-burstscreating-brief-training-for-short-attention-spans.

Könings, K. D., Seidel, T., & van Merriënboer, J. J. (2014). Participatory design of Learning Environments: Integrating perspectives of students, teachers, and designers. *Instructional Science*, *42*(1), 1–9. https://doi.org/10.1007/s11251-013-9305-2

Krueger, R. A., & Casey, M. A. (2000). *Focus groups: A practical guide for applied research* (3rd ed.). Sage Publications, Inc.

Larson, L.C. (2010). Digital readers: The next chapter in e-book reading and response. The Reading Teacher, 64(1), 15–22. doi:10.1598/ RT.64.1.2.

Lee, & Lehto, M. R. (2013). User acceptance of YouTube for procedural learning: An extension of the Technology Acceptance Model. Computers and Education, 61(1), 193–208. https://doi.org/10.1016/j.compedu.2012.10.001.

Lee, S. H., & Pershing, J. A. (2000). Evaluation of Corporate Training Programs: Perspectives and Issues for Further Research. Performance Improvement Quarterly, 13(3), 244–260. https://doi.org/10.1111/j.1937-8327.2000.tb00184.x.

Li, X., Hsieh, J. J. P.-A., & Rai, A. (2013). Motivational Differences Across Post-Acceptance Information System Usage Behaviors: An Investigation in

the Business Intelligence Systems Context. Information Systems Research, 24(3), 659–682. https://doi.org/10.1287/isre.1120.0456.

Limperos, A. M., Buckner, M. M., Kaufmann, R., & Frisby, B. N. (2015). Online teaching and technological affordances: An experimental investigation into the impact of modality and clarity on perceived and actual learning. Computers and Education, 83, 1–9. https://doi.org/10.1016/j.compedu.2014.12.015.

Lindeman, E.C. (1926). The meaning of adult education. New York: New Republic.

LinkedIn's 2018 workplace learning report. (2018). https://learning.linkedin.com/resources/workplace-learning-report-2018

LinkedIn Workplace Learning Report 2022. 2022. https://learning.linkedin.com/content/dam/me/learning/en-us/pdfs/workplace-learning-report/LinkedIn-Learning_Workplace-Learning-Report-2022-EN.pdf.

Little, B. (2016). Benchmark report reveals trends in corporate learning and development. Industrial and Commercial Training, 48(5), 225–230. https://doi.org/10.1108/ICT-12-2015-0079.

Lodge, J. M., Hansen, L., & Cottrell, D. (2016). Modality preference and learning style theories: rethinking the role of sensory modality in learning. Learning (Abingdon (England)), 2(1), 4–17. https://doi.org/10.1080/23735082.2015.1083115.

Lumsdaine, A. A., & May, M.A. (1965). Mass communication and educational media. *Annual Review of Psychology, 16*, 475-534.

Maass, & Kowatsch, T. (2012). Semantic Technologies in Content Management Systems Trends, Applications and Evaluations (Maass & T. Kowatsch, Eds.; 1st ed. 2012.). Springer Berlin Heidelberg. https://doi.org/10.1007/978-3-642-24960-0.

Macías-Jiménez, Acosta-Fontalvo, L. C., & Jiménez-Barros, M. A. (2019). Document management practices in SMEs: An information management capability-based approach. Records Management Journal (London, England), 30(1), 63–79. https://doi.org/10.1108/RMJ-10-2018-0042.

Macpherson, A., Elliot, M., Harris, I., & Homan, G. (2004). E-learning: reflections and evaluation of corporate programmes. Human Resource Development International, 7(3), 295–313. https://doi.org/10.1080/1367886031000163063 8.

Martin, Shannon. (2021). Mic Check. Talent Development, 75(6), 24–29.

Mayer, Richard. (n.d.). Multimedia Instruction. In J.M. Spector et al (Eds.), Handbook for Research on Educational Communications and Technology (p. 385-399). Springer.

Mayer, Richard. (2001). Multi-media learning. Cambridge: Cambridge University Press.

Mayer, Richard.(2009). Multimedia learning (2nd ed.). Cambridge University Press.

Mazzotti, V. L., Test, D. W., & Wood, C. L. (2013). Effects of Multimedia Goal-Setting Instruction on Students' Knowledge of the Self-Determined Learning Model of Instruction and Disruptive Behavior. Journal of Positive Behavior Interventions, 15(2), 90–102. https://doi.org/10.1177/1098300712440452.

McDonald, J. K., Yanchar, S. C., & Osguthorpe, R. T. (2005). *Learning from programmed instruction: Examining implications for modern instructional technology*. Educational Technology Research and Development, 53(2), 84-98.

McKim, C. A. (2017). The Value of Mixed Methods Research: A Mixed Methods Study. Journal of Mixed Methods Research, 11(2), 202–222. https://doi.org/10.1177/1558689815607096.

Merkt. (2021). Buffering – Please Be Patient! Does the Attribution of Pauses to Technical Issues Hamper Learning? Frontiers in Psychology, 12, 771394–771394. https://doi.org/10.3389/fpsyg.2021.771394.

Merriam-Webster. (n.d.). Learning. Merriam-Webster. https://www.merriam-webster.com/dictionary/learning.

Merriam-Webster. (n.d.). Micro. Merriam-Webster. https://www.merriam-webster.com/dictionary/micro.

Millet, I. (2003). Managing Document Taxonomies in Relational Databases. In S. Becker (Ed.), *Effective Databases for Text & Document Management* (pp. 36-52). IGI Global. https://doi-org.ezproxy.uky.edu/10.4018/978-1-93177-747-6.ch004.

Mithas, S., Ramasubbu, N. and Sambamurthy, V. (2011), "How information management capability influences firm performance", MIS Quarterly, Vol. 35 No. 1, pp. 237-256.

Mohammed, G., Wakil, K. & Nawroly, S. (2018). The Effectiveness of Microlearning to Improve Students' Learning Ability. International Journal of Educational Research Review, 3 (3), 32-38. DOI: 10.24331/ijere.415824.

Mordor Intelligence. (2021). *Microlearning market - Growth, Trends, COVID-19, impact, and forecasts (2022-2027)*. https://www.mordorintelligence.com/industry-reports/microlearning-market.

Mosher, B. (2013). Training staff to help themselves. Training Journal, 17–20.

Mosher, B., & Gottfredson, C. (2011). *Innovative performance support: Tools and strategies for learning in the workflow*. McGraw-Hill Professional.

Mukadam P, Vyas S, Nayak H. (2014). Skinner's Programmed Learning vs. Conventional Teaching Method In Medical Education: A Comparative Study. National J Community Med 5(1), 144-147. http://njcmindia.org/uploads/5-1_144-147.pdf.

Mullamphy, D. F., Higgins, P. J., Belward, S. R., & Ward, L. M. (2010). To screencast or not to screencast. Anziam Journal, 51, C446-C460.

Murre, J. M., Dros, J. (2015). Replication and analysis of Ebbinghaus' forgetting curve. PloS One, 10(7), e0120644–e0120644. https://doi.org/10.1371/journal.pone.0120644.

O'Brien, & Voss, S. (2011). Reading Multimodally: What Is Afforded? Journal of Adolescent & Adult Literacy, 55(1), 75–78. https://doi.org/10.1598/JAAL.55.1.9.

Oehrli, J. A.; Piacentine, J.; Peters, A.; & Nanamaker, B. (2011). Do screencasts really work? Assessing student learning through instructional screencasts. In ACRL 2011 Conference Proceedings (Vol. 30, pp. 127-44). Philadelphia: Chandos.

Okano K., Kaczmarzyk, J. R., & Gabrieli, J. D. E (2018) Enhancing workplace digital learning by use of the science of learning. *PLoS ONE 13* (10), e0206250. https://doi.org/10.1371/journal.pone.0206250.

Pacheco-Guffrey, H. (2019). UDL Strategies With Technology. Science and Children, 57(2),36–40. https://www-proquest-com.ezproxy.uky.edu/docview/2281719729/fulltextPDF/E2E113D2364B42FDPQ/1?accountid=11836.

Palis, A. G., & Quiros, P. A. (2014). Adult learning principles and presentation pearls. *Middle East African journal of ophthalmology*, *21*(2), 114.

Palmiter, S., & Elkerton, J. (1993). Animated demonstrations for learning procedural computer-based tasks. *Human-Computer Interaction*, *8*(3), 193–216. doi:10.1207/s15327051hci0803_1.

Pandey, Asha. (2018, March 26). 15 Types of Microlearning for Formal and Informal Learning in the Workplace. eLearning Industry.

https://elearningindustry.com/types-of-microlearning-formal-informal-learning-workplace-15.

Paul, A. M. (2016). Microlearning 101. HR Magazine, 61(4), 36-42. Retrieved from https://www.questia.com/read/1P3-4043710951/microlearning-101.

Peterson, M., & Drake, L. (2018, March 9). Should I use YouTube for employee training? Retrieved from https://elearningindustry.com/youtube-for-employee-training-use.

Prensky, M. (2001). Digital natives, digital immigrants. Part 1. *On the Horizon, 9*(5), 1–6.

Rajabalee, & Santally, M. I. (2020). Learner satisfaction, engagement and performances in an online module: Implications for institutional e-learning policy. Education and Information Technologies, 26(3), 2623–2656. https://doi.org/10.1007/s10639-020-10375-1.

Radossawljewitsch, PR. (1907). Das Behalten und Vergessen bei Kindern und Erwachsenen nach experimentellen Untersuchungen [An experimental investigation of the retention and forgetting among children and adults]. Leipzig: Nemnich.

Rafiq, M. (2015). Training Evaluation in an Organization using Kirkpatrick Model: A Case Study of PIA. J Entrepreneur Organization Management 4: 151. doi:10.4172/2169-026X.1000151.

Rahman, M. R., Shah, S., & Subhlok, J. (2020). Visual summarization of lecture video segments for enhanced navigation. *2020 IEEE International Symposium on Multimedia (ISM)*. https://doi.org/10.1109/ism.2020.00033.

Railean, E. (2015). Affordances in Digital Textbook Use and Development. IGI Global. http://doi:10.4018/978-1-4666-8300-6.ch002.

Reed, F. D. D., Chok, J., & Brozyna, G. A. (2017). The "Tyranny of Choice": Choice Overload as a Possible Instance of Effort Discounting. The Psychological Record, 61(4), 547–560. https://doi.org/10.1007/BF03395776.

Rodriguez, M. (2002). Development of diagrammatic procedural instructions for performing complex one-time tasks. *International Journal of Human-Computer Interaction*, *14*(3), 405–422. doi:10.1207/s15327590ijhc143&4_08

Ruffini, M. (2012, October 31). Screencasting to engage learning. EDUCAUSE Review Online. https://er.educause.edu/articles/2012/11/screencasting-to-engage-learning.

Russell, Susan. (2000). Effective Job Aids. ASTD PRESS. ISBN:9781562862183.

Saeedi, Ghorbani, N., Sarafraz, M. R., & Shoar, T. K. (2020). A bias of self‐reports among repressors: Examining the evidence for the validity of self‐relevant and health‐relevant personal reports. International Journal of Psychology, 55(1), 76–82. https://doi.org/10.1002/ijop.12560.

Sangrá, Raffaghelli, J. E., & Guitert‐Catasús, M. (2019). Learning ecologies through a lens: Ontological, methodological and applicative issues. A systematic review of the literature. British Journal of Educational Technology, 50(4), 1619–1638. https://doi.org/10.1111/bjet.12795.

Santos, P. (2017, June). Engaging today's learners with interactivity: A guide to improving corporate learner engagement. Technology Enabled Learning Excellence Essentials. Retrieved from https://reddog.rmu.edu/login?url=https://reddog.rmu.edu:3479/docview/1953037407?accountid=28365.

Schiffeler, N., Plumanns, L., Stehling, V., Haberstroh, M., & Isenhardt, I. (2018, November). Technology acceptance in corporate learning processes of production companies: a qualitative pre-study. In *Proceedings of the International Conference on Intellectual Capital, Knowledge Management and Organisational Learning, ICICKM* (pp. 293-300).

Schunk, D.H. (2001). Social cognitive theory and self-regulated learning. In B.J. Zimmerman, & D.H. Schunk (Eds.), Self-regulated learning and academic achievement: Theoretical perspectives (pp. 125–152). Mahwah, NJ: Erlbaum.

Séror, J. (2012). Show me! Enhanced feedback through screencasting technology. TESL Canada Journal, 104-104.

Shaker. (2016). Intrinsically motivated reinforcement learning: A promising framework for procedural content generation. IEEE Conference on Computational Intelligence and Games, CIG. https://doi.org/10.1109/CIG.2016.7860450.

Shapiro, A., & Niederhauser, D. (2004). Learning from Hypertext: Research Issues and Findings. In D. H. Jonassen (Ed.), *Handbook of research on educational communications and technology* (pp. 605–620). Lawrence Erlbaum Associates Publishers.

Sharma, S., Dick, G., Chin, W., & Land, L. (2007). Self-regulation and e-learning.

Skjott Linneberg, M., & Korsgaard, S. (2019). Coding qualitative data: a synthesis guiding the novice. Qualitative Research Journal, 19(3), 259–270. https://doi.org/10.1108/QRJ-12-2018-0012.

Stake, R. E. (1995). The art of the case study research. Sage Publications.

Stancampiano, J., & Lambert, B. (2016, June 1). *The new talent development mandate*. Association for Talent Development.

State of the Industry 2020. (2020). American Society for Training & Development.

State of the Industry 2021. (2021). American Society for Training & Development.

Singer, L. M., & Alexander, P. A. (2017). Reading Across Mediums: Effects of Reading Digital and Print Texts on Comprehension and Calibration. The Journal of Experimental Education, 85(1), 155–172. https://doi.org/10.1080/00220973.2016.1143794.

Skinner, B. F. (2003). *The technology of teaching*. Copley Publishing Group.

Subramani, Wagle, M., Ray, G., & Gupta, A. (2021). Capability Development Through Just-In_Time Access to Knowledge in Document Repositories: A Longitudinal Examination of Technical Problem Solving. MIS Quarterly, 45(3), 1287–1308. https://doi.org/10.25300/MISQ/2021/15635.

Sugar, Brown, A., & Luterbach, K. (2010). Examining the Anatomy of a Screencast: Uncovering Common Elements and Instructional Strategies. International Review of Research in Open and Distance Learning, 11(3), 1–20. https://doi.org/10.19173/irrodl.v11i3.851.

Sugar, W., & Luterbach, K. (2016). Using critical incidents of instructional design and multimedia production activities to investigate instructional designers' current practices and roles. Educational Technology and Development, 64(2), 285-312. doi:10.1007/s11423-015-9414-5.

Sullivan, S. A., & Puntambekar, S. (2015). Learning with digital texts: Exploring the impact of prior domain knowledge and reading comprehension ability on navigation and learning outcomes. *Computers in Human Behavior*, *50*, 299-313.

Sung, E., & Mayer, R. E. (2012). Affective impact of navigational and signaling aids to e-learning. Computer in Human Behavior, 28, 473–483.

Sweller, J., Ayres, P., & Kalyuga, S. (2011). *Cognitive load Theory*. Springer New York.

The future of work: Technology, predictions, and preparing the workforce. (2019). (rep.). Association for Talent Development.

The Interaction Design Foundation. (n.d.). What are affordances? https://www.interaction-design.org/literature/topics/affordances.

Thoermer, A., & Williams, L. (2012). Using Digital Texts to Promote Fluent Reading. The Reading Teacher, 65(7), 441–445. https://doi.org/10.1002/TRTR.01065.

Torgerson, C. (2016). The Microlearning Guide to Microlearning. Torgerson Consulting.

Torgerson, C., & Iannone, S. (2020). *What Works in Talent Development: Designing Microlearning*. Association for Talent Development.

Thalheimer, W. (2017). Definition of Microlearning. Work-Learning Research. https://www.worklearning.com/2017/01/13/definition-of-microlearning/.

Training Magazine. (2019). 2019 Training Industry Report. *Training Magazine*.

U.S. Bureau of Labor Statistics. (2021, November). *Labor force characteristics by race and ethnicity, 2020*. BLS Reports. Retrieved from https://www.bls.gov/opub/reports/race-and-ethnicity/2020/home.htm

Uden, L., Liberona, D., Sanchez, G., & Rodríguez-González, S. (2019). Gamification Design Framework Based on Self Determination Theory for Adult Motivation. In Learning Technology for Education Challenges (Vol. 1011, pp. 67–78). Springer International Publishing AG. https://doi.org/10.1007/978-3-030-20798-4_7.

van der Meij, van der Meij, J., Voerman, T., & Duipmans, E. (2018). Supporting motivation, task performance and retention in video tutorials for software training. Educational Technology Research and Development, 66(3), 597–614. https://doi.org/10.1007/s11423-017-9560-z.

Vidyard. (2023). *Product Features.* https://www.vidyard.com/products/product-features/.

Watzman, S. (2003). Visual design principles for usable interfaces. The human computer interaction handbook, 263-285.

Wen, & Zhang, J. (2015). Design of a Microlecture Mobile Learning System Based on Smartphone and Web Platforms. IEEE Transactions on Education, 58(3), 203–207.

Willmore. (2019). Don’t Overlook Job Aid Evaluation: The evaluation process should extend to job aids--even if your client resists. Talent Development (Alexandria, Va.), 73(2), 69–72.

World Economic Forum. 2019. Towards a Reskilling Revolution: Industry-Led Action for the Future of Work. Geneva, Switzerland: World Economic Forum.

Wu X, Zhu X, Wu GQ, et al. (2014) Data mining with big data. IEEE Transactions on Knowledge and Data Engineering 26(1): 97–107. Crossref. ISI.

Yarbrough, J. R. (2018). Adapting Adult Learning Theory to Support Innovative, Advanced, Online Learning--WVMD Model. *Research in Higher Education Journal*, *35*.

Yin, R. K . (1994). Case study research: Design and methods. Beverly Hills, CA: Sage Publications.

Yin, R. K. (2009). Case study research: Design and methods (Vol. 5). Sage Publications.

Yin, R. (2014). Case Study Research: Design and Methods (5th ed.). Thousand Oaks, CA: Sage Publications, Inc.

Zacks, J. M., & Tversky, B. (2003). Structuring information interfaces for procedural learning. *Journal of Experimental Psychology. Applied*, *9*(2), 88–100. doi:10.1037/1076-898x.9.2.88

Zhang, Lundeberg, M., Koehler, M. J., & Eberhardt, J. (2011). Understanding affordances and challenges of three types of video for teacher professional development. Teaching and Teacher Education, 27(2), 454–462. https://doi.org/10.1016/j.tate.2010.09.015.

Zheng, X., Ma, Y., Yue, T., & Yang, X. (2023). Effects of different types of cues and self-explanation prompts in instructional videos on deep learning: evidence from multiple data analysis. Educational Technology Research and Development. https://doi.org/10.1007/s11423-023-10188-2.

Zohrabi, M. (2013). Mixed Method Research: Instruments, Validity, Reliability and Reporting Findings. Theory and Practice in Language Studies, 3(2), 254–. https://doi.org/10.4304/tpls.3.2.254-262.

VITA

MEGAN LAIRD REYNOLDS

Education

M.S. in Instructional Systems Design (ISD) 2019	University of Kentucky
B.A. in Elementary Education 2015	University of Kentucky

Certifications

Certified Scrum Product Owner, CSPO
2022

Kentucky Teacher Certification K - 5
2015 - 2025

Professional Experience

Oct. 2023 - Present	Learning Product Owner, Sales Onboarding	Salesforce
April 2020 - Oct. 2023	Learning Experience Designer	Salesforce
March 2019 - April 2020	Instructional Designer	Advancement Courses, Wiley Inc.
June 2018 - March 2019	Technology Integration Specialist	eCampus.com
July 2015 - June 2018	Teacher, Grades 4-5	Fayette Co. Public Schools, Ky

Publications and Experiences

Leveraging Tech to Launch PBL in Your Classroom	KySTE 2019 Co-Author Company Sponsored: eCampus.com

Teachers will discover how to better leverage tech tools to enhance reflection and impact learning outcomes in a project based learning environment. We'll guide you through planning effective PBL that encourages student choice using dynamic digital resources. Gain practical implementation ideas that propel authentic problem solving experiences and amplify learning

with PBL.

Undergraduate Students' Perspectives of Digital Gaming and Implications for University-Sponsored Gaming Initiatives	University of Kentucky, 2019 Unpublished, used for University Purposes Co-Author

Esports has increasingly become popular on University campuses throughout the world and this vision sought to evaluate how Esports impacts student and University success. To respond to this need, the Steering Committee committed to evaluating other campuses' Esports commitments and conduct focus groups of current University of Kentucky students to answer the following questions: (1) what is the undergraduate student population's perspectives and experiences on digital gaming? (2) How do undergraduate students perceive a campus-sponsored gaming center?

Scholastic and Professional Honors

2020	Learning 30 Under 30	Learning Conference
2013	John Edwin Partington and Gwendolyn Gray Partington Scholarship	

Professional Memberships & Organizations

Association for Talent Development (ATD)	January 2022 - Present