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Blended Learning Strategies: Opportunities and Limitations of Using YouTube Videos to Support Ready Relevant Learning

June 2022

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Naval Postgraduate School

Prepared for the Naval Postgraduate School, Monterey, CA 93943

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NAVAL POSTGRADUATE SCHOOL

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Acquisition Research Program
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ABSTRACT

In this thesis, we develop a business case analysis of the use of YouTube with the Navy's Ready Relevant Learning. We assess current literature regarding the effectiveness of YouTube videos for enhancing adult learning and job performance. We then identify the requirements for the Navy to implement YouTube learning and discuss the advantages and limitations associated with using YouTube for learning. Additionally, we conduct a qualitative analysis of data obtained from interviews with students and instructors at a Navy vocational training site on the use of digital learning strategies. We place the main findings from the interviews in the context of the current literature to validate that YouTube can be an effective tool to enhance learning. We conclude that YouTube is a viable tool for vocational training and we recommend that the Navy conduct a pilot program to identify implementation needs to scale effectively the use of YouTube as a training tool.

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LIST OF ACRONYMS AND ABBREVIATIONS

BCA	business case analysis
CNO	Chief of Navy Operations
CSFE	Center for Seabees and Facility Engineering
DCGS-A	Distributed Common Ground System-Army
ERNT	revolution in training executive review of Navy training
ETP	exception to policy
FRAGO	fragmentary order
HYT	high year tenure
ISBN	international standard book number
IT	information technology
LSO	learning standards officer
N-7	director of training
NETC	Naval Education Training Command
NETPDTC	Naval Education and Training Professional Development Technology Center
NKO	Navy knowledge online
NMCB	Naval Mobile Construction Battalion
NMCI	Navy/Marine Corps Intranet
OCCSTDs	occupational standards
POM	program objective memorandum
PQS	personal qualification standard
RRL	ready relevant learning
SIPRNET	SECRET Internet Protocol Router Network
SYSCOM	systems command
TIR	time in rate
TYCOM	type commander
UT	Utilityman
VI	visual information

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I. INTRODUCTION

The United States Navy works consistently to incorporate modern technological solutions in its operations as an imperative to stay competitive with adversaries and maintain superiority. Technology has transformed the Navy's ability to fight on diverse battlefields, with the Navy ensuring that Sailors have the most elite weapons and weapon systems, sensors, missiles, and platforms including nuclear-powered aircraft carriers and fighter jets. In an ever-changing technological world, the Navy also needs to ensure that Sailors are properly trained and educated in their field of work.

The Navy has prioritized training and education for decades, acknowledging that, to ensure that Sailors are equipped with the proper skills to operate efficiently, training and education needs must be at the forefront of the Navy agenda. In a 2001 report titled, *Revolution in Training Executive Review of Navy Training* (ERNT), the office of the Chief of Naval Operations (CNO) identified three objectives to transform the Navy's overall training program:

> The Revolution has three overarching objectives. The first is to develop a lifelong learning continuum that exploits technology, optimizes Sailors' time, minimizes students' time away from their parent commands, makes the best use of limited resources, and produces motivated and well -trained Sailors. The second is to determine the most effective learning strategy and delivery methods to ensure Sailors possess the knowledge, skills, and abilities to do their jobs. Third, the charter tasked us to provide recommendations for developing the most effective and efficient training organization, an organization with features that enhance innovation and facilitate rapid implementation of revolutionary ideas. Our organizational recommendations were also to address the optimum alignment of training resources. (United States Navy Chief of Naval Operations, 2001, p. 1)

Despite being 20 years old, the ERNT objectives are well aligned with current Navy priorities. Ready Relevant Learning (RRL) is the Navy's current effort to modernize training. This effort is operationalized through the 2019 CNO Admiral Mike Gilday Fragmentary Order (FRAGO) in which he categorized the efforts into warfighting, warfighters, and the future Navy. The warfighters section contained nine subsections;

training was the sole focus, or a critical component, of seven of these subsections (Gilday, 2019).

More recently, in 2021, Secretary of the Navy Carlos Del Toro published his Strategic Guidance for the Navy and Marine Corps. His enduring priorities are maintaining maritime dominance in defense of our nation and empowering our people and strengthening strategic partnerships. These three sections had 11 subsections; two of which dealt wholly or in part with training (Del Toro, 2021).

The ERNT report included a historical review of four major training reorganization attempts conducted by the Navy. It found challenges that prevent Navy training from being organized to deliver training efficiently or effectively at the Fleet or individual level (United States Navy Chief of Naval Operations, 2001). The specific challenges identified are:

- Did not advocate a "systems approach"
- Focused solely on schoolhouse training, thereby ignoring Fleet training and the opportunities for eLearning, simulation, etc.
- Never established strong central training leadership and/or management
- Focused on organization, not processes or outcomes
- Ignored the training roles of the System Commands (SYSCOMs)
- Did not create a single training and education spokesman for POM, budget, and execution
- Failed to build an organization that could seek and respond to new technologies
- Could not build consensus
- Did not correct bureaucratic layers that expended resources with little apparent impact on training outcomes. (p. 19)

The strong emphasis on training by the Navy's two senior-most leaders indicates that the goals highlighted by the ERNT are still relevant today. The Navy's training enterprise conducts critical work across a broad spectrum of commands. Improvements in Navy instructional design, course delivery, or other andragogy would yield tremendous benefits for the Navy.

Technology has revolutionized training delivery opportunities. Ready Relevant Learning is poised to capitalize on advances in technology to improve training delivery and

reduce costs for the Navy. It is necessary to identify the ways technology, and in particular, mobile technology can impact the effectiveness of Navy training. Our project aims to evaluate the potential advantages and disadvantages presented by utilizing YouTube for content delivery in vocational training.

A. PURPOSE

Ready Relevant Learning focuses on three aspects of training delivery: when, how, and where (Naval Education and Training Command, n.d.). "When" involves taking existing training and breaking them into separate blocks. These blocks are then delivered, as the information is needed, along a Sailor's career. The "how" stage leverages technology to change the delivery method of instruction from traditional face-to-face instructor delivery to an appropriate technologically advantageous method, e.g., immersive simulators, virtual trainers, or YouTube videos. Beyond simply utilizing technology for technology's sake, this is done to ultimately help facilitate stage three, "where." At this stage, training will be delivered at the point of need, not requiring students to travel to a physical schoolhouse.

This thesis develops a business case analysis of the use of YouTube with RRL. We initially draw on data from a small sample test of blended learning strategies, including instructor-curated YouTube videos, to assess the applicability of how-to videos to Navy training. The test involved eight students and two instructors from a vocational "C" school who conducted learning activities in a traditional classroom environment in week one of their training. They received training in using mobile learning technologies in week two, and testing learning activities supported by mobile technology, including YouTube videos in week three of their four-week course module curriculum. We then conduct a literature review to assess the evidence on enablers and barriers to using how-to videos in distributed, blended learning from previous studies and reports of relevance to allow us to place in the context of the literature review the main feedback from the students and instructors involved in the vocational training test including how-to YouTube videos.

B. RESEARCH QUESTIONS AND APPROACH

Our research is guided by the efforts to address three questions. The questions investigate if YouTube can be a viable path to pursue in modernized ready, relevant training to provide decision support regarding the use of YouTube. The research questions are:

1. What does current literature find regarding the effectiveness of YouTube/ videos to enhance adult learning/job performance?
2. What current Navy schoolhouse training requirements need to be adjusted or waived for YouTube/video learning to be utilized?
3. What are the advantages and limitations for using YouTube to facilitate/ enhance learning/job performance for the Navy?

The research was conducted in two phases. The first phase evaluated the use of digital learning resources in a Navy training course. The data analysis uses Dedoose qualitative analysis software to identify themes and extract examples from data collected through open-ended survey questions and interviews with Sailors and instructors in a Navy "C" school course. Analysis of the themes and extracts identify opportunities and limitations of using YouTube videos in training and on the job. The second phase consists of a systematic literature review on informal learning, the efficacy of videos and YouTube for learning, and preferences for video length in learning settings, and a map to Navy instructional methods in vocational training.

C. RELEVANCE

This study's findings can contribute to supporting RRL efforts. "The readiness of deployed Navy forces [is] the ultimate goal of training" (United States Navy Chief of Naval Operations, 2001, p. 5). If initial or follow-on training time could be reduced and complemented by a repository of YouTube videos that Sailors could access to use as job aids during work performance, this could potentially achieve similar levels of readiness at a lower cost.

II. EVALUATION OF HYBRID LEARNING STRATEGIES: APPROACH

Our data collection for the first phase of the research took place at Naval Base Ventura County Utility Technician (UT) "C" school. The UT "C" vocational training curriculum takes in about a dozen Sailors in each cohort, with about four cohorts per year. In its traditional classroom setting, the learning activities typically involve the use of a dozen textbooks the Sailors would carry with them. The schoolhouse, to modernize training and access the benefits of modern, mobile technologies-supporting training, issued Samsung tablets to the students. The tablets were used primarily to access electronic copies of the texts for the students to use vice being required to carry the physical books. While some books were easily downloadable, any of the books that had an ISBN were unavailable for download and the students were still required to carry these books with them. The only immediate tangible benefit of this tablet to the students was to lessen the burden of the numerous required texts the students had to carry and the ability to conduct searches for references in the digital textbooks. Once the course was completed, the Sailors lost access to the digital textbooks. Students primarily limited their use of the tablet to an electronic book replacement even though the tablets were fully functional. Tablet use was limited due to a lack of internet connectivity available in the classroom (Schoolhouse director, personal communication, September 8, 2021).

Upon completion of the initial meeting with the UT "C" school leadership, we observed a class interview as part of a research team. The research team asked detailed questions to 10 "C" school students starting with questions inquiring about general preferences for learning and then directing the students' attention specifically to the benefits and limitations of learning within the schoolhouse. One of the main focuses while conducting the classroom interviews were the pros and cons of the tablets that were issued to the students at the beginning of "C" school. The benefits included that the tablets were lightweight with the ability to easily access required texts. The "control F" option was another key benefit to the students in that it assisted them in finding what they were looking for in a fraction of the time it would take flipping through a book. Issues and limitations

that the students had with the tablets included the inability to perform updates or downloads, and that there was no integration with the Navy/Marine Corps Intranet (NMCI) network meaning that useful websites to Sailors such as "NKO" and "MyNavyPortal" were inaccessible. Overall, 80% of the students preferred having the tablets vice the physical hardcopy book.

Following the interviews with the "C" school students, all of the researchers participated in an interview with both of the "C" school instructors. The purpose of this interview was to learn about the instructors' perceptions of technology and the potential uses for blended learning in the classroom. We learned that their opinions varied concerning the usefulness of the tablets purchased by the schoolhouse. One felt it was useful, while the other did not. Both instructors felt that YouTube was very helpful as an aid to help illustrate concepts and assist in their class. However, they stated that they could no longer use YouTube because NMCI had blocked YouTube access. The classroom was equipped with a Smartboard, but the instructors made no use of its capabilities beyond a basic whiteboard and background for an overhead projector, they stated they did not know how to use any advanced functionality.

The following day we held another conversation with the Center for Seabees and Facilities Engineering (CSFE) N-7 and the Learning Standards Officer (LSO) to provide feedback on our initial visit and establish a plan for the future of the project. Technology interventions like using a cellular Wi-Fi puck to enable internet connectivity for tablets in the classroom were proposed as an alternative to wired Wi-Fi. At this meeting, the N-7 made the point that the ultimate goal would be for the school to be the start of lifelong learning and that students could refer back for a video quick reference job aid. They would have access to a repository of micro-videos of information that would teach them specific tasks. This comment would ultimately spark the train of thought that drove us toward changing the scope of our project from a review of blended learning in general toward a business case analysis of YouTube's Opportunities and Limitations to Support Ready Relevant Learning (Schoolhouse director, personal communication, September 9, 2021).

A. MOBILE LEARNING SYSTEM IMPLEMENTATION

Following the initial meeting, multiple trips were taken to Naval Base Ventura County. On these trips, the mobile learning system was taught to the instructors, and the technical limitations of the actual classroom locations were explored. NPS staff taught the learning site instructors the full capabilities of the mobile learning system and explained how they could leverage its capabilities in their course. The required tablets for the intervention were determined and network connectivity of the actual classroom space was established. These trips also included the introduction of the mobile learning system to the students and an initial feedback survey administered after the first day.

B. FINAL TRIP

Our team's final trip to Naval Base Ventura County was on 11/19/21. On this trip, two members conducted one-on-one interviews with each of the students. Each team member interviewed four students. Student interview questions are listed in Appendix A. Both team members conducted interviews with the instructors. Instructor interview questions are listed in Appendix B. All interviews were audio-recorded and later transcribed. Throughout the day all students were asked to complete an anonymous survey about their opinions on the blended learning system. This survey was derived from Aten & DiRenzo (2014). All tablets were collected, and this concluded our interactions with the schoolhouse.

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III. PHASE 1: EVALUATION OF HYBRID LEARNING STRATEGIES—ANALYSIS / FINDINGS

Interview coding was performed using Dedoose software with four total rounds of coding. The initial round used the same terms and definitions as the participant survey. Some of these codes were exactly as used by Aten & DiRenzo (2014), others were adapted. Following this round, the initial six codes had additional codes added and sub-codes nested to further clarify themes found. Definitions for all subsequent codes were made by attempting to best summarize the statements made by the participants. After the fifth round, there were 11 codes, 21 sub-codes, and four 3rd level codes.

A. CODING / ANALYSIS

For the initial round of coding, our goal was to allow the data to drive code selection. These items were selected to maintain consistency with the broad categories of questions from the student survey. The initial codes included:

- Multi-Media Self Efficacy: Competency with communication technology (e.g., internet, synchronous chat, and virtual worlds) (Aten & DiRenzo, 2014, p. 4)
- Perception of Learning System: Ease of use of digital learning resources, Usefulness of digital learning resources, interactivity with the instructor, and interactivity with the learning content (Aten & DiRenzo, 2014)
- Perception of Execution: Implementation of mobile technology
- Engagement: The course sparks student interest and curiosity while also holding his/her attention and focus (Aten & DiRenzo, 2014, p. 5)
- Attitude: Learning in the course is beneficial and pleasurable (Aten & DiRenzo, 2014 p. 5)
- Learning Outcome: Digital learning resources affected learning (Aten & DiRenzo, 2014)

After the initial coding process, the data pointed us toward different questions not previously identified which, in turn, resulted in three new codes and 18 subcodes. The new codes identified in the second round of coding were found through items that were not adequately captured by the original six codes. The subcodes we identified were items that fell under the original codes but required more specificity. New codes were developed using the Aten & DiRenzo (2014) derived survey framework or were newly created from what we felt best captured the statements of the participants. The added codes included:

New Codes

- Learning Experience: Description of a learning experience
- Teaching Experience: Description of a teaching experience
- Generational: References to generational differences

Subcodes

- (Engagement) Advancement Exam: Relevant to career and advancement exam success
- (Attitude) Negative: My experiences learning were not positive
- (Multi-Media Self Efficacy) Positive Self Efficacy: High competency with communication technology or willingness to learn
- (Multi-Media Self Efficacy) Neutral Self Efficacy: Statements about competency with communication technology, without being clearly positive or negative
- (Multi-Media Self Efficacy) Negative Self Efficacy: Low competency with communication technology or unwillingness to learn
- (Learning Outcome) Current Learning: Learning gains now
- (Learning Outcome) Future Work: Learning benefits in future jobs due to utilization of techniques learned using digital resources

- (Perception of Execution) WiFi: WiFi connectivity, access, or policy problems
- (Perception of Execution) Technology: Equipment or technology problems other than WiFi
- (Perception of Execution) Study implementation: Study implementation was a potential source of problems
- (Perception of Execution) Device Preference: Indicated preference for one device manufacturer.
- (Perception of Learning Systems) Useful Learning System: Learning System was utilized in the classroom
- (Perception of Learning Systems) Not Useful Learning System: Learning System was not utilized in the classroom
- (Perception of Learning Systems) Interactive: Interacted with other students and instructor
- (Perception of Learning Systems) Not-Interactive: Did not interact with other students and instructor
- (Perception of Learning Systems) Increased Comfort: User comfort with learning system increased over time
- (Perception of Learning Systems) Decreased Comfort: User comfort with learning system decreased over time
- (Perception of Learning Systems) Useful Reference: Non job/project/work specific future reference use

Round three of coding was similar to round two. We identified three new codes, one with zero subcodes, one with two subcodes, and the last had three subcodes with three third-level subcodes.

New Codes

- Barriers: Stated barriers to utilizing the learning system
- Alternative Learning: Utilizes mobile technology/internet to facilitate accomplishing work performance already or provides an example of future use
- Google: Specifically mentions Google in relation to Alternative Learning
- YouTube: Specifically mentions YouTube in relation to Alternative Learning

Subcodes

- (Device Preference) iPad: Stated preference for Apple iPad
- (Device Preference) Surface: Stated preference for Microsoft Surface Pro
- (Device Preference) Samsung: Stated preference for Samsung tablet

The fourth round of coding produced a single subcode:

Subcodes

- (Learning Experience) Hands-On: Described, or stated, a preference for Hands-On learning

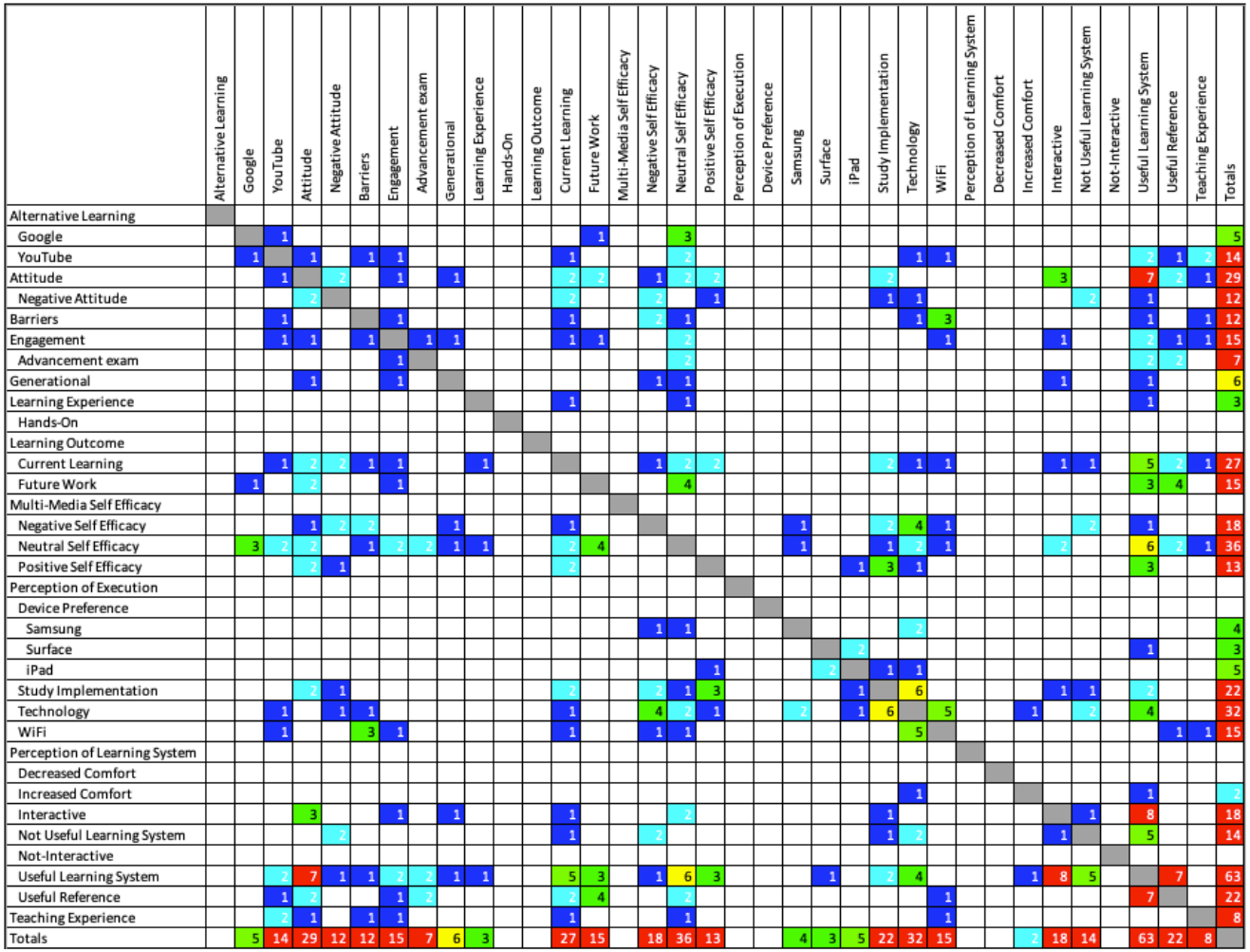
Through four rounds of coding, we concluded that the data was sufficiently analyzed and were able to clearly define the codes and subcodes based on our findings and observation of the interviews. Our actual analysis was conducted using Dedoose's Code Application qualitative analysis chart. This tool allowed us to visualize the codes across the entire sample of interviews. As we began writing, further questions surfaced. We found it necessary to complete a fifth round of coding. The fifth round would reinforce our definitions of the codes and add a new code.

We used Dedoose's Code Application charting capability to provide us with a visual representation of the occurrence of each code in each interview. This allowed us to

identify codes that occurred across multiple interviews and identify recurring themes that we wanted to investigate further. This is Figure 1. After using the Code Application capability, we shifted to using Dedoose's Code Co-Occurrence feature to identify situations where codes co-occurred within a single quote. However, we ultimately did not use this application in our analysis. This visual is Figure 2.

	Alternative Learning	Google	YouTube	Attitude	Negative Attitude	Barriers	Engagement	Advancement exam	Generational	Learning Experience	Hands-On	Learning Outcome	Current Learning	Future Work	Multi-Media Self Efficacy	Negative Self Efficacy	Neutral Self Efficacy	Positive Self Efficacy	Perception of Execution	Device Preference	Samsung	Surface	iPad	Study Implementation	Technology	WiFi	Perception of Learning System	Decreased Comfort	Increased Comfort	Interactive	Not Useful Learning System	Not-Interactive	Useful Learning System	Useful Reference	Teaching Experience	Totals
Blended Training - Interview 9.docx				1	1			1		1	2		2				2				1			3	2	1				1			7	3		28
Blended Training - Interview 8.docx		1	1			1	1	2			2			5		2	3	1							2					1	3		12	2		39
Blended Training - Interview 7.docx					1		1		1	1	1		2	1		1	3	1					1	2	3	3			1	2	2		3	3		33
Blended Training - Interview 6.docx		1	1	1									1	6		1	2	1						4	8	5			1		5		14	3	2	56
Blended Training - Interview 5.docx				1		1				2			3	1		2	1			1	2	1			6	3			1				9	2		36
Blended Training - Interview 4.docx				1	1					1	1			2		2		1				1	3	2	5				1				3	1		25
Blended Training - Interview 3.docx		1		1	2			1	1	1	1			2		3	1				1			1	4	1					2		5	3		31
Blended Training - Interview 2.docx				5	1		1	1	2	2								2						4	5					2	1		5	3		34
Blended Training - Interview 10.docx			2			1				2				2			1					3	1		3	2							7	2		26
Blended Training - Interview 1.docx			2	3	1	2	5		2				4	4			7	2				1		1		6				4			17	4	5	70
Totals		3	6	13	7	5	8	5	6	10	7		12	23		11	20	8		1	4	6	5	17	38	21			4	10	13		82	26	7	

Figure 1. Dedoose Code Application Round 4 Codes



	Alternative Learning	Google	YouTube	Attitude	Negative Attitude	Barriers	Engagement	Advancement exam	Generational	Learning Experience	Hands-On	Learning Outcome	Current Learning	Future Work	Multi-Media Self Efficacy	Negative Self Efficacy	Neutral Self Efficacy	Positive Self Efficacy	Perception of Execution	Device Preference	Samsung	Surface	iPad	Study Implementation	Technology	WiFi	Perception of Learning System	Decreased Comfort	Increased Comfort	Interactive	Not Useful Learning System	Not-Interactive	Useful Learning System	Useful Reference	Teaching Experience	Totals
Alternative Learning																																			
Google			1											1			3																		5
YouTube		1		1		1	1						1				2								1	1						2	1	2	14
Attitude			1		2		1		1				2	2		1	2	2						2						3			7	2	1	29
Negative Attitude				2									2			2		1						1	1						2		1			12
Barriers			1				1						1			2	1								1	3							1		1	12
Engagement			1	1		1		1	1				1	1			2									1				1			2	1	1	15
Advancement exam							1										2																2	2		7
Generational				1			1									1	1													1			1			6
Learning Experience													1				1																1			3
Hands-On																																				
Learning Outcome																																				
Current Learning			1	2	2	1	1			1						1	2	2						2	1	1				1	1		5	2	1	27
Future Work		1		2			1										4																3	4		15
Multi-Media Self Efficacy																																				
Negative Self Efficacy				1	2	2			1				1								1			2	4	1					2		1			18
Neutral Self Efficacy		3	2	2		1	2	2	1	1			2	4							1			1	2	1				2			6	2	1	36
Positive Self Efficacy				2	1								2										1	3	1								3			13
Perception of Execution																																				
Device Preference																																				
Samsung																1	1								2											4
Surface																						2											1			3
iPad																		1			2		1	1												5
Study Implementation				2	1								2			2	1	3				1		6						1	1		2			22
Technology			1		1	1							1			4	2	1			2		1	6		5			1		2		4			32
WiFi			1			3	1						1			1	1								5									1	1	15
Perception of Learning System																																				
Decreased Comfort																																				
Increased Comfort																									1								1			2
Interactive				3			1		1				1				2							1							1		8			18
Not Useful Learning System					2								1			2								1	2					1			5			14
Not-Interactive																																				
Useful Learning System			2	7	1	1	2	2	1	1			5	3		1	6	3				1		2	4				1	8	5			7		63
Useful Reference			1	2			1	2					2	4			2									1							7			22
Teaching Experience			2	1		1	1						1				1									1										8
Totals		5	14	29	12	12	15	7	6	3			27	15		18	36	13			4	3	5	22	32	15			2	18	14		63	22	8	

Figure 2. Dedoose Code Co-Occurrence Round 4

The process of coding/analysis of the data contributed to the shift in project focus as we saw the repeated emphasis on the use of mobile learning technology as a job aid to enhance workplace performance.

B. FINDINGS

We began coding the data using initial codes derived from previous research. We added codes as themes emerged from the data. The findings of the Phase 1 analysis were essential in determining and solidifying our phase 2 research question.

1. Initial Important Codes

Below are the most frequently occurring codes from the interview data. These codes and interpretations were identified during the coding process or were one of the originally used codes.

Learning Outcome

- Future work

Perception of learning system

- Useful learning system
- Useful reference

Perception of execution

- Technology
- Wi-Fi
- Study implementation

Perception of execution

- Device preference
- Samsung
- Surface

- iPad

Multi-Media self-efficacy

- Negative self-efficacy
- Neutral self-efficacy
- Positive self-efficacy

a. Future Work

"Future work" was a code we developed to capture comments from the participants relating to the use of the mobile learning system on a job site in the future. This code is the first in a series of codes relating to future uses of the mobile learning system. However, this code deals exclusively with the use of the mobile learning system on a job site and in a professional environment. Similar to how we will use Google or YouTube to quickly find an answer to a question; comments relating to using the mobile learning system on the job, to complete a task or solve a problem, are captured by this code. In total, we had 23 instances of this code. Ultimately, this code was one of the most important as the use of the mobile learning system showed the willingness of the students to use it as a ready reference to accomplish their jobs. It also contributed greatly toward our ultimate shift in project focus. Figure 3 provides a visual of the "learning outcome" subcodes.

	Learning Outcome	Current Learning	Future Work	Totals
Blended Training - Interview 9.docx		2		2
Blended Training - Interview 8.docx			5	5
Blended Training - Interview 7.docx		2	1	3
Blended Training - Interview 6.docx		1	6	7
Blended Training - Interview 5.docx		3	1	4
Blended Training - Interview 4.docx			2	2
Blended Training - Interview 3.docx			2	2
Blended Training - Interview 2.docx				
Blended Training - Interview 10.docx			2	2
Blended Training - Interview 1.docx		4	4	8
Totals		12	23	

Figure 3. Future Work

b. Useful Learning System

"Useful learning system" was originally coded as "perception of learning system" during the first round of coding. We found that this did not adequately capture the wide variety of views held about the learning system by the participants. "Perception of learning system" eventually ended as seven different codes. "Useful learning system" specifically identifies explicit statements made by the participant that they felt the mobile learning system was conducive to learning. This was the most frequently occurring code with a minimum occurrence of three and a

maximum occurrence of 17, for each interview. Across all 10 interviews, this code occurred a total of 82 times. Figure 4 provides a visual breakdown of the "perception of learning systems" and its subcodes.

Our perception of "useful learning systems" was that a majority of the students found them to be effective. Although Figure 4 shows five students making statements that were reflective of a non-useful learning system with 13 total occurrences, all 10 participants in the study, including eight students and two instructors, generally found it to be useful with a total of 82 separate comments made in favor of the mobile learning system. This was irrespective of statements like "I am old school," statements indicating low self-efficacy towards technology or the mobile learning resources, and statements indicating a preference for hands-on learning. Some participants utilized the mobile learning resources strictly as a replacement for their books, while others leveraged all the available options provided. The participants saw the potential for further utilization. One participant envisioned the following future use case:

> While you're reading, you could have a voice, a narrator, reading it to you. And then you could have interactive, like make it into a game, to where like figuring out the slope on a pipe that you're installing, right? Like click, drag, and drop the pieces into where they go, and have your little torpedo level on the screen and make sure that you got the level right.

This use case is in line with the stated goal of revolutionizing the "how" portion of training delivery through RRL. The inspired description above could be translated into an interactive module that trainees use to learn or demonstrate proficiency with specific plumbing tasks and thereby test out of the narrative portion of the module and advance to more relevant sections. This structure allows students to move at the pace of their existing knowledge and test out of sections they already know, while learning through their preferred method—audio, visual, or kinesthetic. It would be expensive, in both time and cost, to devise adequate simulations for all the training topics required, even for a single training program. However, the long-term benefits of such a program in reduced training time, and increased trainee satisfaction, should be considered when attempting to revise training pipelines. This single brief intervention provided insight from the participants where our efforts could be improved with the investment of adequate resources. Mobile learning technologies can further support the goals of RRL and better support the end goal of a trained Sailor. Figure 4 provides a visual of the "perception of learning system" subcodes.

	Perception of Learning System	Decreased Comfort	Increased Comfort	Interactive	Not Useful Learning System	Not-Interactive	Useful Learning System	Useful Reference	Totals
Blended Training - Interview 9.docx				1			7	3	11
Blended Training - Interview 8.docx				1	3		12	2	18
Blended Training - Interview 7.docx			1	2	2		3	3	11
Blended Training - Interview 6.docx			1		5		14	3	23
Blended Training - Interview 5.docx			1				9	2	12
Blended Training - Interview 4.docx			1				3	1	5
Blended Training - Interview 3.docx					2		5	3	10
Blended Training - Interview 2.docx				2	1		5	3	11
Blended Training - Interview 10.docx							7	2	9
Blended Training - Interview 1.docx				4			17	4	25
Totals			4	10	13		82	26	

Figure 4. Perception of Learning System Subcodes

c. Useful Reference

Similar to the "useful learning system," "useful reference" was originally part of the "perception of learning system" parent code. However, "useful reference" specifically identifies instances where participants' stated they felt they could utilize the mobile learning system in the future as a reference. We specifically subdivided potential future use into reference use that was exclusive of use as a job aid and using it as a job aid on a work site. An example of reference use under this code would be utilizing the mobile learning system as a reference to refresh knowledge in preparation for an advancement exam or to assist in the preparation of lecture materials for a lesson for junior Sailors on a topic covered during the UT "C" school course.

We found it important to differentiate and articulate the difference between a future training tool, a future self-study training tool, and a future job-aid. According to Figure 4, every participant

in the study found that the use of mobile technology was a useful reference. Our findings concluded that students were able to use the mobile learning technology not only for academic purposes but for actual career-enhancing scenarios.

Four participants made statements that coded as "advancement exam." This code is an "engagement" subcode, not a subcode of "perception of learning system." However, participants in the study group, UT "C" school students that we spoke with during our initial planning trip, and CSFE staff members we spoke with during the planning trip, stated that attending UT "C" school was critically important to assist in advancement. They stated that attendance at UT "C" school resulted in the advancement of approximately 95% of the students to UT1. We did not attempt to validate this number in any fashion. The stated advancement rates are significantly above the historical advancement rates for UTs, according to Table 1 (MyNavyHR, 2022). Regardless of whether the actual advancement is 95%, the perceived value of attending UT "C" school exists for both the schoolhouse staff and the attendees of the school. This adds additional weight to the idea that UT "C" school is one of the best assets that Sailors' have access to increase their chances for promotion.

Table 1. UT Advancement. Adapted from MyNavyHR (2022).

ADV OPP. (Cycles 245/246/247)							
All-Navy	E1-3	E4	E5	E6	E7	E8	E9
10 yr Avg	TIR	34.90%	22.10%	13.90%	22.00%	11.60%	13.10%
All-Navy	TIR	28.30%	20.80%	8.10%	25.90%	13.60%	12.30%
UT	TIR	21.80%	18.00%	4.30%	0.00%	20.60%	0.00%

Participants stated that they found the mobile learning system as a useful reference a total of 26 times. Of these 26 comments, six comments were directly related to it being an effective tool that could help them study for the advancement exam and ultimately promote.

Additionally, Sailors found that the mobile learning system would be a great reference for divisional training. Divisional training is something that occurs in the Navy, typically monthly, to keep Sailors current on information within their rate. Participants saw value in the mobile learning system enabling them to provide the content from UT "C" school to Sailors that were unable to

attend "C" school. Utilizing the mobile learning system in this fashion would allow the transfer of knowledge from the "C" school to impact a larger number of Sailors, and ultimately, increase its benefit. Whether this would translate to increased rates of promotion for these Sailors is unknown.

One issue brought to light during this study is the potential mismatch between the motivations for selecting students for the course. The high year tenure (HYT) for an E-5 Sailor is 16 years of service. At this point, they must administratively separate from the Navy. To help an otherwise high-performing E-5 Sailor that is close to HYT increase their odds for promotion, a Seabee Battalion Commander could choose to send him/her to UT "C" school and significantly increase his/her chances of passing the next advancement exam. However, if he/she does not pass the advancement exam, he/she would be subject to administrative separation and removal from the Navy. In an alternative scenario, a much more junior Sailor would have more years of service in which to provide a higher return on investment for the extra schooling provided. We are not advocating for or against either option, as both may be equally valid in different scenarios. However, the motivation for selection is vastly different between the two Sailors and could create undesirable selections for UT "C" school.

d. Perception of Execution

There were three codes that fall under the parent code of "perception of execution." This code was used to capture the implementation of mobile technology for the study itself. However, this code could not fully capture the range of feedback provided in the interviews. The participants described several factors that were disruptive to learning that we felt needed to be captured as disparate codes. "Perception of execution" broke into the subcodes "technology," "Wi-Fi," and "study implementation." "Technology" was used to capture any comments relating to equipment or technology other than those that specifically stated Wi-Fi. There was no subjectivity used in this code. Even if it was reasonable to believe that bad Wi-Fi would have caused some connectivity issues, unless the participant explicitly stated "Wi-Fi" the comment was coded "technology." The "technology" code occurred 38 times. "Wi-Fi" captured all Wi-Fi connectivity, access, or policy problems, and occurred 21 times. "Study implementation" captures comments where the participants felt that the implementation of the study itself could have been a source of problems. This code occurred 17 times. All the participants coded for "technology" comments except one.

However, that one participant coded for "Wi-Fi" six separate times. These combine for a total of 76 comments on items that adversely impacted their use of the mobile learning system and learning. Figure 5 provides a visual of the "perception of execution" subcodes.

	Perception of Execution	Study Implementation	Technology	WiFi	Totals
Blended Training - Interview 9.docx		3	2	1	6
Blended Training - Interview 8.docx			2		2
Blended Training - Interview 7.docx		2	3	3	8
Blended Training - Interview 6.docx		4	8	5	17
Blended Training - Interview 5.docx			6	3	9
Blended Training - Interview 4.docx		2	5		7
Blended Training - Interview 3.docx		1	4	1	6
Blended Training - Interview 2.docx		4	5		9
Blended Training - Interview 10.docx			3	2	5
Blended Training - Interview 1.docx		1		6	7
Totals		17	38	21	

Figure 5. Perception of Execution Subcodes

e. Device Preference

We found that device preference among participants was spread across the manufacturers. Device preference was also originally coded under "perception of execution" and then sub-coded by brand into "Samsung," "Surface," and "iPad" for those that indicated a clear preference for one brand of device over another. Device comment totals were six for "Surface," five for "iPad," and four for "Samsung." These totals don't match the participant totals due to multiple comments by the same individuals. Device preference- Surface (6), iPad (5), Samsung (4). Additionally, one

participant did not prefer any brand of device, only recommending that the entire class use the same device. Figure 6 provides a visual of the "device preference" subcodes.

	Device Preference	Samsung	Surface	iPad	Totals
Blended Training - Interview 9.docx		1			1
Blended Training - Interview 8.docx					
Blended Training - Interview 7.docx				1	1
Blended Training - Interview 6.docx					
Blended Training - Interview 5.docx	1	2	1		4
Blended Training - Interview 4.docx			1	3	4
Blended Training - Interview 3.docx		1			1
Blended Training - Interview 2.docx					
Blended Training - Interview 10.docx			3	1	4
Blended Training - Interview 1.docx			1		1
Totals	1	4	6	5	

Figure 6. Device Preference Sub-Subcodes

f. Self-Efficacy

There were three subcodes that fell under the parent code of "multi-media self-efficacy." We defined multi-media self-efficacy as "competency with communication technology (e.g., internet, synchronous chat, and virtual worlds)" (Aten & DiRenzo, 2014, p. 4). This code was split up into three separate subcodes to include negative self-efficacy, neutral, and positive self-efficacy with neutral being the largest category according to the number of occurrences. We defined "neutral self-efficacy" as statements about competency with communication technology without being clearly positive or negative. "Negative self-efficacy" was defined as low competency with

communication technology or unwillingness to learn and "positive self-efficacy" was defined as high competency with communication technology or willingness to learn. "Neutral self-efficacy" coded 20 times, "positive self-efficacy" coded 11 times, and "negative self-efficacy" coded eight times. Seven of the 10 participants coded for more than one of the self-efficacy codes with none of the participants coded for only negative self-efficacy. Figure 7 provides a visual of the "self-efficacy" subcodes.

	Multi-Media Self Efficacy	Negative Self Efficacy	Neutral Self Efficacy	Positive Self Efficacy	Totals
Blended Training - Interview 9.docx			2		28
Blended Training - Interview 8.docx		2	3	1	39
Blended Training - Interview 7.docx		1	3	1	33
Blended Training - Interview 6.docx		1	2	1	56
Blended Training - Interview 5.docx		2	1		36
Blended Training - Interview 4.docx		2		1	25
Blended Training - Interview 3.docx		3	1		31
Blended Training - Interview 2.docx				2	34
Blended Training - Interview 10.docx			1		26
Blended Training - Interview 1.docx			7	2	70
Totals		11	20	8	

Figure 7. Self-Efficacy Subcodes

Sorting through the findings utilizing a data coding application was a slow process, as our coding experience was very limited. Our advisor challenged us to "let the data do the work." The first round of coding was extremely slow. However, after the first round was complete we found ourselves with different questions that we wanted to answer as well as new ideas for codes. The

second round of coding was much smoother as we started to see the data naturally sorting itself into disparate categories. We were able to create new codes and subcodes that better fit together. The third and fourth round of coding was even easier as we were looking at quotes and key words that we knew were relevant to the study. The most interesting and effective result of the coding was that it led to our main research question. The more we looked at the data, the more questions we had about how YouTube could enhance the learning of the "C" school Sailors.

2. Fifth Round of Coding

The fifth and final round of coding was conducted two months after the initial four rounds of coding. While writing, we realized that it was necessary to subdivide the code for "useful reference" to better capture the two distinct categories of responses from the interviewees—those that were going to use the mobile learning system as a classroom training aid for future training, and those that were going to use it as a personal study aid in preparing for the semi-annual Navy-wide Advancement exams.

Subcodes

- (Perception of Learning Systems) Useful Reference: Non job/project/work specific future reference use. Excludes Advancement Exam comments
- (Perception of Learning Systems) Useful Reference – Advancement Exam: Non job/project/work specific future reference use. Includes Advancement Exam comments

Advancement exams play a significant role in the students' ability to promote in the Navy and were an essential aspect in their prospective use of the mobile learning system. We also used this as a final review of the codes and definitions to ensure they properly aligned with our definitions and usage of the codes. Figure 8 provides a visual of the fifth and final round of codes and Figure 9 provides a visual of round 5 code co-occurrences.

	Alternative Learning	Google	YouTube	Attitude	Negative Attitude	Barriers	Engagement	Advancement exam	Generational	Learning Experience	Hands-On	Learning Outcome	Current Learning	Future Work	Multi-Media Self Efficacy	Negative Self Efficacy	Neutral Self Efficacy	Positive Self Efficacy	Perception of Execution	Device Preference	Samsung	Surface	iPad	Study Implementation	Technology	WIFI	Perception of Learning System	Decreased Comfort	Increased Comfort	Interactive	Not Useful Learning System	Not-Interactive	Useful Learning System	Useful Reference	Useful Reference - Advancement Exam	Teaching Experience	Totals
Blended Training - Interview 9.docx				1	1					1	2		2				2				1			3	2	1				1			7	3	1		28
Blended Training - Interview 8.docx		1	1			1	1				2			5		2	3	1							2					1	3		12	1	1		37
Blended Training - Interview 7.docx					1		1		1	1	1		2	1		1	3	1					1	2	3	3			1	2	2		3	3			33
Blended Training - Interview 6.docx		1	1	1									1	6		1	2	1						4	8	5			1		5		14	3		2	56
Blended Training - Interview 5.docx				1		1				2			3	1		2	1			1	2	1			6	3			1				9	2			36
Blended Training - Interview 4.docx				1	1					1	1			2		2		1				1	3	2	5				1				3	1			25
Blended Training - Interview 3.docx		1		1	2				1	1	1			2		3	1				1			1	4	1					2		5	3	1		31
Blended Training - Interview 2.docx				5	1		1		2	2								2						4	5					2	1		5	3	1		34
Blended Training - Interview 10.docx			2			1				2				2			1					3	1		3	2							7	2			26
Blended Training - Interview 1.docx			2	3	1	2	5		2				4	4			7	2				1		1		6				4			17	4		5	70
Totals		3	6	13	7	5	8		6	10	7		12	23		11	20	8		1	4	6	5	17	38	21			4	10	13		82	25	4	7	

Figure 8. Dedoose Code Application Round 5

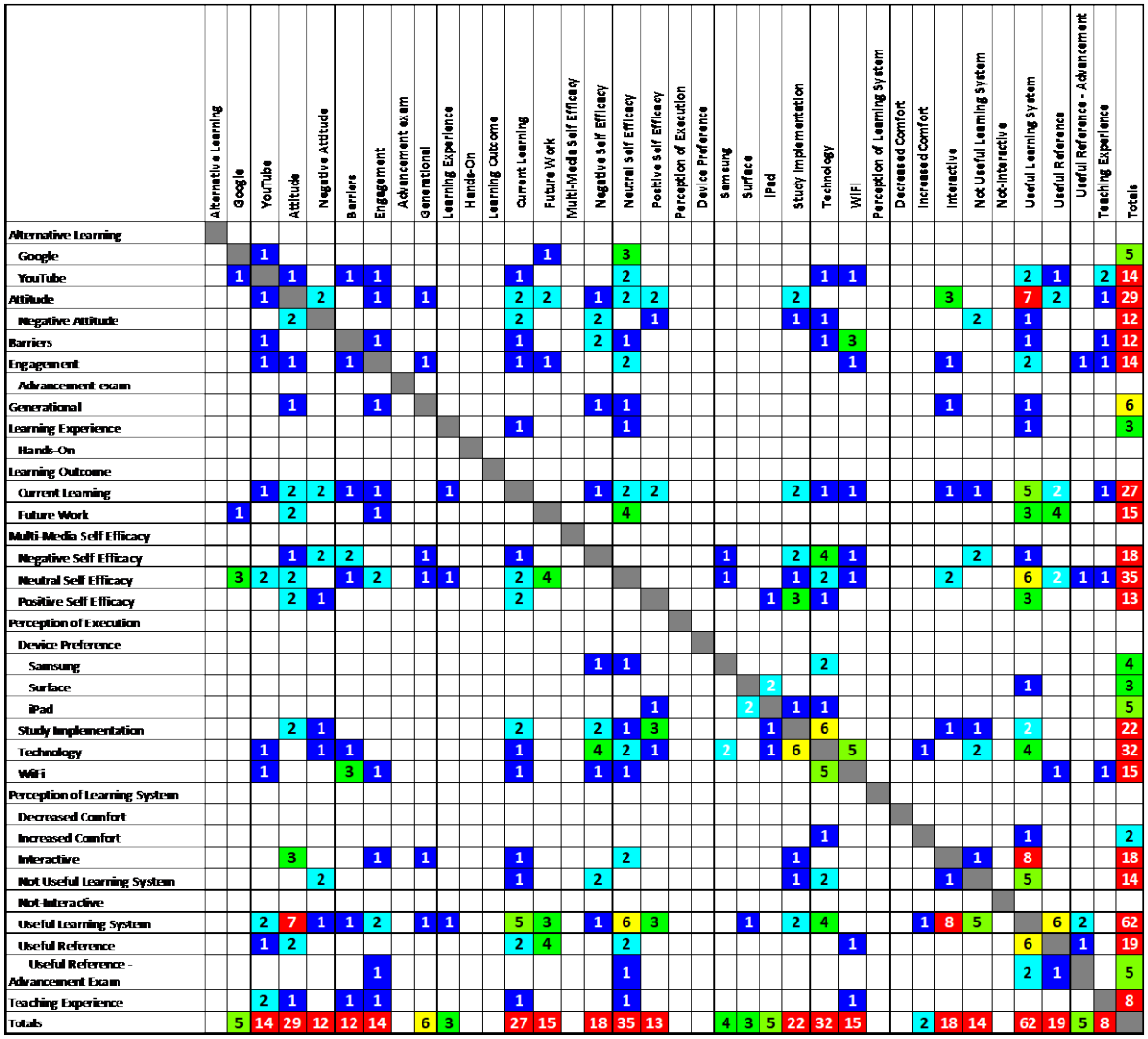


Figure 9. Dedoose Code Co-Occurrence Round 5

3. Code Co-Occurrence

Co-occurrence analysis was conducted through Dedoose at both the fourth and fifth rounds of coding. A co-occurrence is when a participant would make a statement that we felt should be classified under multiple codes. We intended to use co-occurrences as another point to discuss during our analysis. However, during our initial analysis, we shifted the project focus and did not use the Dedoose co-occurrence for any analysis in

this project. Figure 10 indicates the top five co-occurring codes. These codes were provided to our advisors as part of the larger mobile learning system project.

	Atttude	Current Learning	Neutral Self Efficacy	Study Implementation	Technology	WiFi	Interactive	Not Useful Learning System	Useful Learning System	Useful Reference	Totals
Attitude		2	2	2			3		7	2	18
Current Learning	2		2	2	1	1	1	1	5	2	17
Neutral Self Efficacy	2	2		1	2	1	2		6	2	18
Study Implementation	2	2	1		6		1	1	2		15
Technology		1	2	6		5		2	4		20
WiFi		1	1		5					1	8
Interactive	3	1	2	1				1	8		16
Not Useful Learning System		1		1	2		1		5		10
Useful Learning System	7	5	6	2	4		8	5		6	43
Useful Reference	2	2	2			1			6		13
Totals	18	17	18	15	20	8	16	10	43	13	

Figure 10. Co-Occurrence with Five or More Comments

C. PHASE 1 SUMMARY

The initial phase of the research was focused on blended learning and the utilization of the mobile learning system in a traditional classroom setting. Our original data collection and analysis investigated this theme. However, as we proceeded with our analysis it became clear that there was a need to better understand if and how YouTube could be a viable path to pursue in modernized ready, relevant training to provide decision support regarding the use of YouTube.

Our selection of this focus was driven by comments from Sailors and staff we interacted with during our first trip to the schoolhouse. There were comments from both the students we interviewed, and in our conversation with the CSFE staff, that dealt with the utility of YouTube as a job aid and for learning. When asked how he learns away from the schoolhouse, one Sailor we interviewed simply answered, "YouTube." Both instructors we spoke with on this trip also referenced the usefulness of YouTube videos. Additionally, the CSFE N-7's comments about quick video references also continued to linger with us while we continued to work on the project.

Several codes helped drive our Phase 2 project focus. First, there were several codes that we used to capture how the participants stated they would use the mobile learning system in the future: "future work" and "useful reference." Both codes referred to future use cases for the mobile learning system, but "useful reference" referred specifically toward a classroom use similar to how the participants were initially exposed to it. "Future work," on the other hand, was the participants describing a situation much more like the previously stated use of YouTube; a quick reference to learn how to do something outside the classroom. This difference in use we felt was important and merited distinguishing. The final code that drove our decision to focus on YouTube was our "YouTube" code. This code captured explicit references to YouTube use. While not as frequent, these comments were so similar in nature and described the "future work" code stated purpose, we felt it also captured the intent of the participant, despite not utilizing the mobile learning system to accomplish the task.

Our ultimate selection of the Phase 2 focus was based on our analysis and coding of the mobile learning system, Phase 1 data. Our findings led us to develop the Phase 2 research questions focused on YouTube and the positive impacts it could have on learning in the Navy.

IV. PHASE 2: SYSTEMATIC ANALYSIS OF LITERATURE

Our approach to the literature review was to start broad and end with specific research and concepts that addressed our research questions. We started by exploring the definition of learning as well as the psychology of learning and its effects on adults. As we understood the general aspects of learning we then moved into more detailed topics to better understand how technology impacts adult learners. Specifically, we discussed both the benefits and implications that YouTube has on learning by reviewing recent literature. Lastly, we examined the military's use of videos for adult learning and further explored any limitations or benefits that the Navy has on utilizing YouTube as a resource for adult learning.

A. DEFINITIONS OF LEARNING

Before addressing any more advanced concepts, we felt it was important to establish a clear definition for learning. A generic, non-theory specific, definition is "learning [is] a persistent change in human performance or performance potential" (Driscoll, 2005, p. 9).

Another definition for learning comes from the International Society for Performance Improvement's Handbook of Improving Performance in the Workplace Volume 1: Instructional Design and Training Delivery:

> Learning is a change in knowledge due to experience (Mayer, 2008) this definition has three components: (a) learning involves a change in a person, (b) learning involves the person's knowledge and can only be inferred indirectly from the person's behavior, and (c) learning is caused by experience such as participating in an instructional program. (p. 304)

A final, simpler definition of learning comes from the Merriam-Webster online dictionary "knowledge or skill acquired by instruction or study" (Merriam-Webster, 2022).

1. Adult Learning Theory

Adult learning theories are the "explanation of what happens when learning takes place" (Merriam & Bierema, 2014, p. 25). These learning theory explanations vary in the

criteria used to divide and label them. Additionally, this results in disagreements on the total number of theories (Merriam & Bierema, 2014). We have selected three of these theories to discuss. This will provide a basic understanding of adult learning from three classic theories: Behaviorism, Cognitivism, and Constructivism.

Behaviorism is commonly associated with the experiment conducted by Ivan Pavlov. His famous bell-ringing experiment found that his dog came to associate the ringing of a bell with food and the dog would salivate, even without food being present. This readily summarizes the idea that "observable behavior, not internal mental processes or emotional feelings, determines whether learning has occurred" (Merriam & Bierema, 2014, p. 26). This idea allows us to add another definition of learning to those previously listed: "Learning for behaviorists is defined as a change in observable behavior" (Merriam & Bierema, 2014, p. 26). Behaviorists believe that behaviors that are reinforced are likely to continue, and those that are not reinforced are likely to disappear. Therefore, what is learned is a direct response to the stimuli provided by the environment (Merriam & Bierema, 2014).

Cognitivism shifts the primary agent responsible for learning from the Behaviorism focus on environmental factors, to a focus on the learners' internal mental processes (Merriam & Bierema, 2014). Cognitivism uses concepts and ideas from computers and information processing as analogs to describe how humans learn and process information. A Cognitivist description of learning is "when learning occurs, information is input from the environment, processed and stored in memory, and output in the form of some learned capability" (Driscoll, 2005, p. 74). This theory places heavy weight on internal cognitive processes such as: the learners' senses, short term memory, long term memory, working memory, and their interactions.

Constructivism is a collection of theories that share the perspective that learning happens by people making sense of their experiences. A Constructivist definition of learning is "learning is the construction of meaning from experience" (Merriam & Bierema, 2014, p. 36,). This theory straddles the two extremes posed by Behaviorism, where all the learning is due to the environment, and Cognitivism, where all the learning happens internally to the learner. Constructivists believe that knowledge is socially constructed in

an interaction between a learner and their environment. Driscoll summarized and contrasted Behaviorism, Cognitivism, and Constructivism:

> Behaviorists define desired learning goals independent of any learner and then proceed to arrange reinforcement contingencies that are presumed to be effective with any learner; only the type of reinforcer is assumed to vary according to the individual. Although information processing theorists put mind back into the learning equation, they, too, appear to assume that knowledge is 'out there' to be transferred into the learner. The computer metaphor itself suggests that knowledge is input to be processed and stored by learners…constructivist theory rests on the assumption that knowledge is constructed by learners as they attempt to make sense of their experiences. Learners, therefore, are not empty vessels waiting to be filled, but rather active organisms seeking meaning. (p. 387)

2. Informal Learning

According to Marsick and Watkins informal learning is defined as "learning outside of formally structured, institutionally sponsored, classroom-based activities…often takes place under non-routine circumstances, that is, when the procedures and responses that people normally use fail" (Marsick & Watkins, 1990, as cited in Marsick et al., 2009, p. 571). This definition by Marsick et al. helps us to better understand informal learning and how it relates to everyday life. The authors allude to the fact that formal learning is not the only means of how we learn and that it doesn't necessarily have to be in a structured setting. The definition goes further when the authors talk about how learning will occur when the normal procedures which individuals typically use to learn fail. The authors are stressing that when formal learning fails, informal learning outside a structured setting is still achievable.

According to John Garrick in his book, *Informal Learning in the Workplace: Unmasking Human Resource Development*, informal learning has gained a considerable amount of attention with an increasing number of published works (Garrick, 1998). Garrick describes informal learning as "a powerful and elusive phenomenon, however, that no one perspective can capture its range of meanings" (1998, p. ix). Garrick emphasizes this in his book and describes the many definitions given by numerous authors. Garrick goes on to discuss how essential informal learning is stating, "it is being used by state authorities in reforms of national training and accreditation systems and processes" (1998, p. ix). The

relevance of informal learning is becoming more essential to companies around the globe because they are "promoting more highly-skilled, more highly-trained, workers" (Garrick, 1998, p. ix). He evaluates informal learning but more importantly relates it to the workplace focusing on daily experience. Garrick makes two assumptions about informal learning; "that there are indeed rich sources of learning in day-to-day practice situations and that what is learned from experience is dynamic and open to multiple configurations" (1998, p. 1). Garrick also states that industries are making changes to better improve worker productivity by increasing training, work-based learning, experimental learning, and acknowledging prior learning (Garrick, 1998).

Leslie et al. defines informal learning as "learning for which the process is neither determined nor specified, and which may take place inside or outside of the classroom – offers the possibility for enhanced workplace productivity" (Leslie et al., 1998, p. 12). The Education Development Center, Inc conducted multiple case studies on Teaching Firm companies and concluded that there are many skills for both the worker and the company that are acquired through informal learning, and that most informal learning happens in the workplace (Leslie et al., 1998, p. 13). According to Leslie et al. and research associated with the Teaching Firm Project, there are critical learning skills that are developed through informal learning. Additionally, they found that informal learning frequently takes priority over formal learning (Leslie et al., 1998, p. 12-13).

Based on the research in the Teaching Firm study conducted by the Education Development Center, they defined informal learning topics to include: formal management goals/requirements, internal workplace demands, cultural influences, personal characteristics, the development needs of employees, and acquisition/application of skills and knowledge (Leslie et al., 1998). The findings also revealed that informal learning wasn't just beneficial for attaining new knowledge of duties, responsibilities, and skills required for the job, but also benefited employees' interpersonal, intrapersonal, and cultural skills (Leslie et al., 1998). The Education Development Center also found that "the majority of informal learning in the workplace occurs in the course of the routine social and individual work activities through which employees interact, share ideas and resources,

and perform their job" (Leslie et al., 1998, p. 14). These skills are valuable in being a more competent worker, especially because most jobs require you to work with others.

The Teaching Firm study involved discussions with companies such as Motorola, Boeing, and Siemens, and they identified that the 21st century demands that employees require skills and capabilities that may not be achievable in a formal educational setting (Leslie et al., 1998). Motorola, a company that has experience with work training "revealed that the ability to learn informally was a critical determinate of worker success, especially at the front line" (Leslie et al., 1998, p. 13). Leslie also states that the informal learning concept gives great opportunity and "possibility for enhanced productivity" (Leslie et al., 1998, p. 13). "Companies must also create a culture that enhances informal learning if employees are to remain competitive in an increasingly complex and performance-based global environment" (Leslie et al., 1998, p. 17). Both Leslie et al. and the three Fortune 500 companies see value in informal learning especially today where skillsets to use new technology dominate the workforce.

Marsick et al. also talks about how formal learning "is divorced from real-life action" (Marsick et al., 2009, p. 572). Everyday life does not take place in a structured setting. The authors talk about "attention" and what that means in an informal and formal environment (Marsick et al., 2009, p. 572). First, with a formal learning setting, an individual is more alert and aware that they are in a space to learn, so they are in a way, more engaged (Marsick et al., 2009). In informal learning settings, however, an individual may not even be cognizant they are retaining information and will require "greater attention to making the most of the learning opportunity" (Marsick et al., 2009, p. 572).

Today's society allows for informal learning to occur daily because of easy access to information. "Informal learning can be supported by widespread access to Internet resources such as search engines, websites, and blogs, as well as other forms of electronic information (Marsick et al., 2009, p. 581). There have been more quantitative research dedicated to the study of formal learning vice informal/incidental learning (Marsick et al., 2009). This makes sense because of the societal norms of a standard classroom environment. There are more quantitative data because a structured learning environment

has always been the standard, so it is easily researched. Informal learning, however, according to Marsick et al., is driven by qualitative data (Marsick et al., 2009).

According to Marsick et al., the means by which adults learned informally included trial and error, reading pertinent materials, observing peers/supervisors, reflecting on experiences, and acquisition of knowledge, all of which improved learning (Marsick et al., 2009). Among the many informal ways of learning acquisition of knowledge was most relevant to our thesis. "Acquisition of knowledge (information) was generally accomplished through self-directed learning projects" (Marsick et al., 2009, p. 580). We previously stated that today's world involves fast and flowing information that is readily available within seconds. An example of such a self-directed learning project would be utilizing YouTube to solve a problem such as fixing a washer/dryer or replacing a faucet. Instead of hiring a handyman, we now have access to a quick and efficient way to solve everyday issues on our own.

Informal learning describes learning that takes place outside an organized or controlled environment and is a critical component to address when discussing adult learning (Marsick et al., 2009). Leslie et al. explain that "informal learning, through effectively applied organizational strategies, can help individuals retain information much longer and, therefore, be more successful in their educational pursuits" (Leslie et al., 1998, p. 16). The authors interpret a 1998 Bureau of Labor and Statistics report on informal learning to show that as much as 70% of workplace learning could be informal (1998). Leslie et al. are not the only authors to discuss the "70% rule," as it is widely known within their field (Clardy, 2018, p. 153). Clardy lists other authors that provide evidence and believe that the "70% rule" is indeed significant including Marsick et al. and Enos et al.

Enos et al. conducted a study that "examined how the extent to which managers engaged in informal learning, perceptions of support in the transfer environment, and level of managerial proficiency related to transfer of learning in twenty core managerial skills" (Enos et al., 2003, p. 369). The sample of this study was a large company of approximately 20,000 employees with 4,500 of those employees being managers (Enos et al., 2003). However, only 188 managers were selected to participate across numerous departments with 84 of them taking a questionnaire to determine different learning activities (Enos et

al., 2003). The managers identified 247 different learning activities which were then classified into two categories: formal training and informal learning (Enos et al., 2003). The study found that high-caliber managers who do not have a large amount of support such as supervisors and employees learned their managerial skills through informal learning (Enos et al., 2003). Additionally, they found that these managers will transfer knowledge/learning on a more recurrent basis (Enos et al., 2003). They found that overall, most managers learned the 20 managerial skills through some type of informal learning (Enos et al., 2003). "The percentage of managers who indicated that they learned from informal learning activities dropped below 70 percent for only four managerial skills, while the percentage of managers who indicated that they learned from formal learning activities reached higher than 20 percent for only seven managerial skills" (Enos et al., 2003, p. 377). The results also stated that 70 percent (173) of the learning activities were related to informal learning and the other 30 percent (74) related to formal training (Enos et al., 2003). Refer to Figure 11.

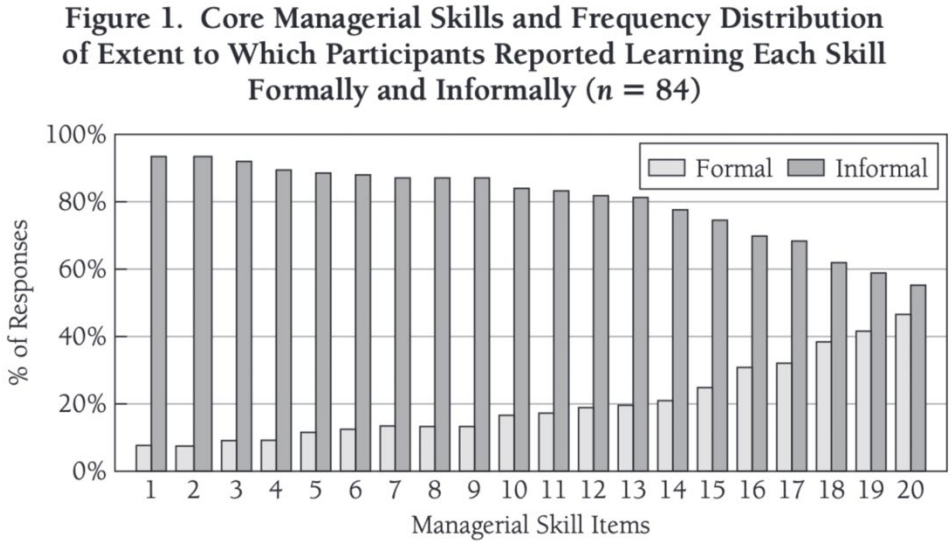


Figure 11. 70% Rule Visual. Source: Enos et al. (2003).

Clardy provides an alternative view that counters the "70% rule." Clardy recognizes that informal learning is essential, especially in a work setting, and acknowledges the fact that there are five different literature reviews that agree that "70% or more of work-based

learning occurs informally" (Clardy, 2018, p. 153). Although Clardy agrees that informal learning is important, he does not agree with the literature that says it makes up 70% and finds flaws in each review (Clardy, 2018). Clardy critiques each of the literature reviews that support the 70% rule and presents evidence as to why you cannot put a number on informal learning (Clardy, 2018). He claims that "a detailed examination of this literature finds that the evidential basis for the 70% rule is weak; human resource development (HRD) policies relying upon that claim are likely to be misleading" (Clardy, 2018, p. 153). Clardy's argument that informal learning is not three or four times as important in the workplace as formal learning can be supported by the evidence that he provides in his article including inconsistent definitions, sampling concerns, and questions about the validity of the data (Clardy, 2018).

Specifically, Clardy's first reason why the 70% rule should be challenged is that it has become universally known in the field as factual, making it very difficult to correct (Clardy, 2018). Second, the rule "presents a simplified and distorted view of the nature of the processes by which people learn to do their jobs" (Clardy, 2018, p. 154). The third reason is that if the rule is to be true, there are questions regarding the value of formal learning/training and its worth (Clardy, 2018). If 70% of learning takes place informally then is it necessary, to have formal learning? (Clardy, 2018). The fourth and fifth reasons are more specific to HR practices regarding formal education/training programs. Clardy argues that if the 70% rule is the source for HR policy, then it is rational to state that you could completely disregard formal education/training for all employees and that it could all be done informally without any cost (Clardy, 2018). The fifth reason states that "if formal training and education programs are minimized if not eliminated, there can be cascading negative consequences to the organization from such effects as productivity declines or increased legal risks from violating legal training mandates or increased liability from training negligence" (Clardy, 2018, p. 155). Based on his critiques he concludes that the 70% rule should be dropped and no longer be a "blanket or universal invocation" (Clardy, 2018, p. 172).

We have found multiple definitions that explain what informal learning is as well as numerous case studies that help prove its importance. Whether informal learning is 70%

of the workforce training solution or not, it is an essential aspect of how humans learn in the workforce. Informal learning definitions may differ, but the underlying principle is that it happens through more natural circumstances (Marsick et al., 2009).

3. Navy and Informal Learning

At every level, the goal of Navy training is to enhance the effectiveness of our fighting force. Phrased differently, "The readiness of deployed Navy forces [is] the ultimate goal of training" (United States Navy Chief of Naval Operations, 2001, p. 5). This means that all training efforts the Navy undertakes are aligned with the goal of making better maintenance personnel, training better operators, improving shipboard operations, or otherwise bettering our readiness for combat.

The Navy has long acknowledged and recognized the importance of learning that occurs outside the formal classroom environment. According to a 1981 DOD-wide review of on-the-job training (OJT), the Navy then defined OJT as "training in the actual job situation during daily operations" (Assistant Secretary of Defense (Manpower Reserve Affairs and Logistics), 1981, p. 5). This aligns well with the Marsick et al. definition of informal learning as learning happening outside a formal environment (2009).

The ERNT specifically called for providing "explicit support for the conduct of on-the-job training. OJT is, by all accounts (including our interviews with Sailors), the most effective training that our Sailors experience" (United States Navy Chief of Naval Operations, p. 34, 2001). They felt that with minimal investment in technology there would be a significant improvement in OJT effectiveness for learners. The ERNT proposed adopting a Navy Learning Model which utilized on-the-job learning as a key component of the learning process. Figure 12 provides a visual of this model. They felt the outer ring of on-the-job learning and mentoring "reflects the enormous importance to the Navy (especially) of hands-on, trial-and-error, mentor-guided learning in the performance of complex tasks by Sailors" (United States Navy Chief of Naval Operations, 2001, p. 42). The ERNT described OJT learners as interacting with their equipment, situations, or co-workers as a mechanism for learning. This clarifies that this learning was distinct from a formal classroom environment.

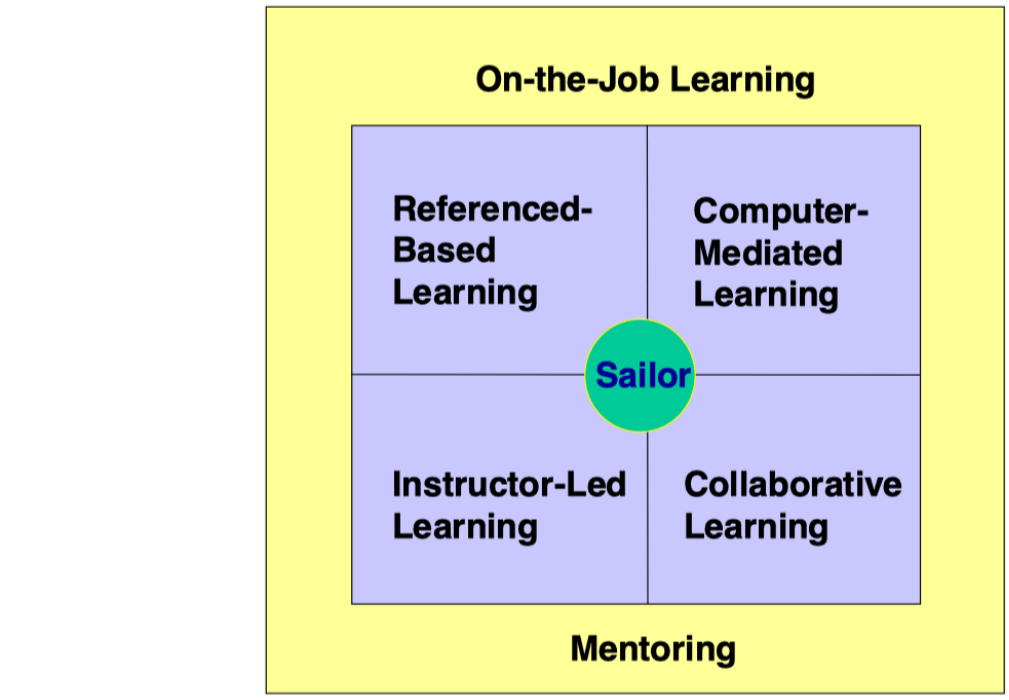


Figure 12. ERNT Navy Learning Model. Adapted from United States Navy Chief of Naval Operations (2001).

Current Navy training policy is governed by a multitude of instructions and policies. Starting with the highest level are the Navy Occupational Standards (OCCSTDs). OCCSTDs are the "logical standards for training objectives" (Office of the Chief of Naval Operations, 2017, enclosure (3)). As such, they establish what is taught in all phases of formal training, what is required to be learned in personal qualification standards (PQS), and therefore, what is accomplished in OJT. These OCCSTDs are the backbone behind all training requirements in the Navy.

The PQS operationalize the requirements of the OCCSTDs and provide the operational sailor a list of specific knowledge and tasks required to be performed to prepare for a specific watchstation. The use of PQS is required for sailors unless otherwise specified

by their platform's lead type commander (TYCOM) (Office of the Chief of Naval Operations, 2021). Beyond just being required, "PQS is an integral part of the development of the Navy's workforce and the formal process for documenting completion of on-the-job training" (Office of the Chief of Naval Operations, 2021, p. 1). The Navy PQS catalog contains approximately 868 currently active PQS applicable across the entire Navy (Naval Education and Training Command, 2021a). This heavy emphasis on PQS and the importance of documentation further reinforces the important role that OJT and informal learning play in the preparation of sailors for successfully accomplishing their tasking.

B. YOUTUBE AND LEARNING

We previously discussed the terms informal and formal learning as ways that individuals attain knowledge. Additionally, we also addressed how people have fast access to knowledge using modern-day technology. Our phones, laptops, and tablets all provide us with a quick and efficient way to gain knowledge through social media, internet websites, and YouTube.

Auxier and Anderson found that 95% of adults aged 18–29 reported using YouTube (2021). The pandemic made the use of technology and online resources a necessity as social distancing and sheltering in place was a new reality (Yaacob & Md Saad, 2020). The authors conducted a study that "aimed to investigate the factors that affected a student's acceptance of YouTube as learning resources" (Yaacob & Md Saad, 2020, p. 1732). The sample included 340 students that were in a distance learning environment and what the authors found was "the student's acceptance towards YouTube as learning resources was related to the perceived ease of use, perceived usefulness, and social influence" (Yaacob & Md Saad, 2020, p. 1732).

Yaacob and Md Saad describe the benefits that YouTube has on learning stating "using YouTube as a learning platform has the potential to help users achieve multi-faceted learning outcomes, including cognitive, social, emotional and psychomotor outcomes" (Yaacob & Md Saad, 2020, p. 1734). The authors recognize that YouTube is beneficial for learning by providing numerous references to explain its validity. They explain that using YouTube allows individuals to gain knowledge as well as enhance cognitive abilities

(Yaacob & Md Saad, 2020). YouTube allows the user to learn a variety of subjects, whether it be solving a math problem, or learning a new language, and can even enhance social skills by reacting to comments and providing advice or criticism to the content that is offered (Yaacob & Md Saad, 2020). The authors go further to describe how individuals also benefit "in the psychomotor aspect by using various functions that need to be managed by the users, such as downloading the video, sharing the video or skipping the advertisement" (Yaacob & Md Saad, 2020, p. 1734). Here the authors describe that YouTube does more than just learning from the actual content, but in using the application you are learning how to use the program without even thinking about it. This ties back to our previous review of research on informal learning where Marsick et al. discuss how informal learning is conducted through trial and error (Marsick et al., 2009). Manipulating the YouTube application and scrolling through videos is essentially the same concept where the user is subconsciously learning how to learn. Yaacob & Md Saad sum up the benefits of YouTube and learning by stating that "YouTube as a learning platform has the potential to support the lifelong learning experience for users; it was highly relevant to the respondents of this study who were students of distance education" (Yaacob & Md Saad, 2020, p. 1734).

Another study that was conducted examined how YouTube could be used as a learning resource specifically through the lens of a social cognitive perspective (Zhou et al., 2020). The purpose of the study was to use the social cognitive theory "to examine how personal, environmental and behavioral factors can interplay to influence people's use of YouTube as a learning resource" (Zhou et al., 2020, p. 339). To achieve such a study, the authors used data that was gathered from a survey that included 150 personnel who have previous YouTube learning experience (Zhou et al., 2020). What the authors found "revealed that personal factors, i.e., learning outcome expectations and attitude, had direct effects on using YouTube as a learning resource (person→behavior)" (p. 339). The authors also found direct correlations between the environment and behavior as well as behavior and person (Zhou et al., 2020). The authors concluded one can understand the use of YouTube as a learning tool from a social cognitive perspective (Zhou et al., 2020).

The above studies have found YouTube to be beneficial for learning. However, some critics think otherwise. Azer conducted a study that questioned if YouTube was a beneficial way for students to learn surface anatomy (Azer, 2012). This study took a more explicit approach where the population was specific to medical students and how they find information on the internet to learn (Azer, 2012). He discussed how students use YouTube and that it has become a useful reference for students to gain knowledge (Azer, 2012). Azer gathered data on videos that pertained to surface anatomy and then "statistically analyzed and videos were grouped into educationally useful and non-useful videos on the basis of major and minor criteria covering technical, content, authority, and pedagogy parameters" (Azer, 2012, p. 465). The results were contrary to the other studies previously stated. Azer reviewed 235 with only 57 of them providing information on surface anatomy (Azer, 2012). Of the 57 YouTube videos that were relevant to the subject, there were only 15 that provided information that was concrete and suitable (Azer, 2012). Azer concluded from the data that only 27% of the YouTube videos provided were relevant and beneficial and that it was "an inadequate source of information for learning surface anatomy. More work is needed from medical schools and educators to add useful videos on YouTube covering this area" (Azer, 2012, p. 465).

Through our review, we found multiple international studies on the effects of YouTube on learning. Of note was the study of YouTube in learning English as a second language (Kim & Hyeon-Cheol, 2021). The authors conduct a qualitative analysis of Korean students' experiences and perspective in the United States and try "to add a new dimension to possible ways of using YouTube for educational purposes" (Kim & Hyeon-Cheol, 2021, p. 1). They specifically focus on Korean international students within the United States and how YouTube assists with their "linguistic and cultural diversity" (Kim & Hyeon-Cheol, 2021, p. 1).

The sample of Korean international students was to take two basic English language courses where they would participate in discussions and activities, as well as write essays to learn English (Kim & Hyeon-Cheol, 2021). However, the instructors would encourage the students while working in small groups to use other types of online resources to assist in their development of academic writing and learning English as a second language (Kim

& Hyeon-Cheol, 2021). Kim and Hyeon-Cheol approached the study by analyzing nine Korean students who were born and raised in Korea with English not being their first language (Kim & Hyeon-Cheol, 2021). The results of the study proved YouTube a beneficial aid to learning with three major themes "surrounding the role of YouTube for educational purposes to promote multicultural competence" (Kim & Hyeon-Cheol, 2021, p. 7). The three themes included "(1) enhancing cross-cultural sensitivity, (2) building content knowledge and skills in L2, and (3) refining an understanding of English as a global language" (Kim & Hyeon-Cheol, 2021, p. 7). The major areas where YouTube benefited the students included the ability to understand slang and cultural norms, knowledge of multicultural contexts, gaining sufficient knowledge of basic English, ability to effectively check for grammatical errors, learning academic writing skills, and a better understanding of Korean-style English (Kim & Hyeon-Cheol, 2021).

Based on our review of YouTube research, the majority of the literature suggests that it can be used as a learning tool by many different types of people. The length of the videos on YouTube is one area with conflicting findings. Dias da Silva et al. assessed the quality of dental education videos on YouTube. While their focus was primarily on the quality of the videos, they made interesting findings about video length that could be applied elsewhere. They found an inverse relationship between video length and user retention. As videos got longer, more users quit before the video ended. Additionally, they found the relationship between video length, user retention, view rate, and user interaction summarized in Table 2 (Dias da Silva et al., 2019). Videos in the "B" category had the best balance of user retention and view rate for training videos.

Table 2. Video Length and Factors. Source: Dias da Silva et al. (2019)

Table 1 The influence of video length over user retention, viewing rate and interaction index (A=less than 2 min; B=between 2 and 5 min; C=between 5 and 10min; D=more than 10 min)

	A	B	C	D	
Length	71.8	189.4	522.8	1,187.8	Average time (s)
User retention	69.5	43.5	28.3	21.3	Average % of retention
View rate	1,008	17,833	20,476	23,543	Average views per month
Interaction index	0.9	3.0	8.5	19.6	Likes – dislikes/total number of views

In a similar medical setting, Rangarajan et al. created medical videos and uploaded them to YouTube. They analyzed the videos five years later and found that the two videos at approximately five minutes were the most viewed, most liked, most commented on, and numbers one and three for most shared (Rangarajan et al., 2019). Additionally, two independent experts graded the videos and assigned qualitative scores based on "the quality of information provided, relevance to learning objectives for each video, quality of technique displayed, usefulness impact and finally technical audio-visual video quality" (Rangarajan et al., 2019, p. 145). The two previously mentioned videos scored the maximum possible rating of a 5, while another video also scored a 5, but was less well-received by viewers on YouTube. It is impossible to differentiate which factors drove the decrease in viewers. Foster identified that the title of the video, the video thumbnail image, and the length of the video, were rated the most influential in YouTube video selection criteria (Foster, 2020). This makes it impossible to determine the exact cause of the difference in viewer rates between the videos.

Offering a differing perspective, Long et al. addressed the use of videos as preparatory materials for classroom instruction. In this setting, their students preferred videos that were 20–30 minutes in length and were from National Geographic and Discovery (Long et al., 2016). This use of videos is in the context of a flipped classroom style of instruction where the learner is expected to come to the classroom acquainted with

the information to be discussed. This setting requires more familiarity on the part of the learner. This makes the preference for longer videos in this context more understood as they are functioning as a replacement for a lecture. This is consistent with the average time for educational videos on YouTube of 22 minutes found by Foster (2020).

The most detailed assessment of video length preference comes from Buzzetto-More, where the preferences for video length were assessed through a survey. For in-person learners, ~48% of learners preferred 1.5-3-minute videos and ~22% preferred 3–5-minute videos. While for fully online learners ~28% preferred 3–5-minute videos and ~28% preferred 5–7-minute videos (Buzzetto-More, 2014). This offers insight on disparate preferences in video length between viewers fully online compared with viewers that also have a classroom component to their instruction. This provides additional support that videos of approximately three to five minutes are preferred.

C. MILITARY AND VIDEO USE

A review of current literature on the military's use of videos for training found very little. There has been much more research conducted on the use of video games and virtual reality than videos alone. The one area that did have some research was in the medical realm. Military Medicine had multiple published studies relevant to the use of videos for training. A study from 2016 used live tissue, simulations, and video training, to train Army Combat Medics to recognize the effects of nerve agents. The authors found that there was a difference in arousal of the student, as measured by surface skin conductance. They used this as an analog for learner engagement. However, learner engagement was not associated with reduced performance gains relative to the other methods of learning (Bukoski et al., 2016). A study by Ryan-Wenger and Lowe compared the results of using videos in six levels of increasing training intensity in self-diagnosing vaginal symptoms. The lowest level of training consisted of only watching a 23-minute video, and the most intense level of training consisted of a 23-minute video, psychomotor skill training, and cognitive rehearsal training. Despite the differences in preparation, there were no differences in accuracy rates for diagnosis (Ryan-Wenger & Lowe, 2015).

Moving from peer-reviewed research to the *Military Intelligence* professional bulletin, a paper proposed by Tripp recommended the use of QuickTime or VLC Media Player by the Army to support training Soldiers in the use of their Distributed Common Ground System-Army (DCGS-A). DCGS-A is a complex system in which Soldiers receive between several hours and up to 10 days of initial training to learn to operate (Tripp, 2018). He felt that similarly to how YouTube was effectively used by the younger generation of Soldiers through watching videos to learn how to use other technology, they could use pre-recorded videos on the secure SECRET Internet Protocol Router Network (SIPRNET) to assist with learning how to use DCGS-A (Tripp, 2018). Tripp also lamented the drop-off in proficiency learned from formal training, to in the field use of DCGS-A. He felt that the use of videos stored on the SIPRNET and accessed "just like on YouTube" would greatly enhance the proficiency of DCGS-A users (Tripp, 2018, p. 55). The scarcity of published research on the military's use of video for training provides an area that deserves further study.

Naval Education and Training Command (NETC) is the largest shore command in the Navy and "has full ownership of the entire 'Street to Fleet' process, recruiting civilians, and through world-class training, transforming them into combat-ready warfighters ready to meet the current and future needs of our fleet customers" (Naval Education and Training Command, n.d.). In this capacity, NETC has developed policies governing all aspects of the training process. Specifically relevant are those applicable to the development of training curriculum and materials, oversight of IT resources, and development of micro-videos.

NETC divides their curriculum development into two distinct categories: task-based curriculum development and personnel performance profile-based curriculum development. Task-based curriculum development is designed for training learners to accomplish a specific task using a Plan, Analyze, Design Develop Implement, and Evaluate (PADDIE) phasing sequence (Naval Education and Training Command, 2009). Personnel performance profile-based curriculum development is focused on development to "teach operation and maintenance of hardware and/or performance of tasks or functions" (Naval Education and Training Command, 2010, p. iv).

NETC's task-based curriculum development manual categorizes videos as support materials. These are "…instructional materials and other devices used in support of formal instruction, informal instruction, or for independent study" (Naval Education and Training Command, 2009, p. 1-5). The specific category of support material is visual information (VI), this category includes wall charts, overhead projector transparencies, and other graphic media presentations, in addition to video (Naval Education and Training Command, 2009).

Taking a similar view toward visual information, the personnel performance profile-based curriculum development manual states "VI materials are used to introduce, reinforce, or supplement training provided in the formal environment" (Naval Education and Training Command, 2010, p. 9-3). However, the personnel performance profile-based curriculum development manual does address the utility of visual information in enhancing hands-on, or skill-based performance, and directs conducting a visual information needs assessment to determine the utility of adding visual information to the lesson. This consists of determining if the visual information enhances training (Naval Education and Training Command, 2010).

Both curriculum development manuals have identical sections on videos as a specific form of visual information. They both state that videos "provide one of the best means of conveying an idea or series of ideas where complex or dangerous operations or motion must be presented. Video tapes/video media can be provided as stand-alone" (Naval Education and Training Command, 2010, p. 9-8; Naval Education and Training Command, 2009, p. 9-8). This identical quote in both curriculum development manuals underscores the fact that video is seen as an ideal medium for training delivery in some instances. The personnel performance profile-based curriculum development manual provides the following list of advantages for the use of videos:

- The immediate search and playback capabilities permit greater utilization of the learning effort
- Familiarity of the average trainee with the equipment minimizes distracting novelty effects
- Video Tapes/digital media are relatively inexpensive to duplicate, either one time or in large quantity

- Provide alternate information channels for trainees with low reading skills
- Provide continuity of action, showing events as they actually occur
- "Front seats" can be provided. Demonstrations can be shown, using all necessary equipment, showing all of the actual steps. Everything can be shown at the right angle, aspect, and speed for the best analysis and learning
- Skills can be learned by watching a task performed on film and subsequently practicing the task
- Dangerous or expensive procedures can be shown (Naval Education and Training Command, 2010, p. 9-8, 9–9)

These advantages provide a broad range of justifications supporting the use of videos in the classroom.

Both curriculum development manuals address the disadvantages of the use of videos. However, the disadvantages are focused on technological concerns relevant to video cassettes no longer being used (Naval Education and Training Command, 2009; Naval Education and Training Command, 2010). Both manuals also address the cost considerations associated with video development as a cautionary concern. However, these manuals were developed before the rise of ubiquitous and capable cell phone cameras and websites tailored to capitalize on their ability to record quality video, like TikTok's official expansion in 2018 (Tidy & Smith Galer, 2020). Both curriculum development manuals reference NETCINST 3104.1 (series), the Visual Information (VI) program management instruction, and direct individuals that desire to develop VI to see their command's VI manager (Naval Education and Training Command, 2009; Naval Education and Training Command, 2010).

The current NETCINST 3104.1C empowers Naval Education and Training Professional Development Technology Center (NETPDTC) as the "agent for all VI matters within NETC" (Naval Education and Training Command, 2014, p. 2). In this capacity, NETPDTC has oversight of all aspects of visual information production. They are the only ones allowed to produce visual information products for NETC commands, or validate requests for contracted video production. This instruction also outlines the specific forms to be completed and documentary requirements that must be met by all videos produced for NETC:

- All Navy VI productions will conform to the standard screen and metadata requirements specified in reference (c), enclosure (6).
- NETC productions will not contain personal credits. Only the production facility's name will be included in the closing credits. The closing should state "Produced for NETC" (with logo) "by (identify production facility by name)."
- A release form (DD Form 2830) is required to authorize the use of talent such as actors, models, and narrators. Additionally, DD Form 2830 is required when private property appears in the production.
- The NETC VI Script/Production Approval form (NETC 3104/4) is available for download from Naval Forms Online. (Naval Education and Training Command, 2014, p. 2-2)

NETC has a micro-training video production management instruction which was released in 2021. This policy provides "policy and guidance for production, distribution, and management of micro-training videos" (Naval Education and Training Command, 2021, p. 1). This instruction defines micro-training videos as 3–5-minute videos and aligns their purpose similarly to both the task-based and personnel performance profile-based curriculum development instructions, "videos designed to enhance formal training and focus on a specific learning objective to address key concepts, improve performance, or enhance knowledge and skill development" (Naval Education and Training Command, 2021b, p. 1).

NETC intended for these videos to be used "in conjunction with other training methods to improve job performance and promote technical development" (Naval Education and Training Command, 2021b, p. 1). Specifically focused on remediation or refresher training in a specific job skill or task, these videos are intended to be accessed as just in time or point of need tools on a training center's YouTube sub-channel (Naval Education and Training Command, 2021b). This instruction further delineates responsibilities for video review and approvals, checklist routing, and local YouTube sub-channel management.

V. CONCLUSIONS, RECOMMENDATIONS AND DISCUSSION

In this project, we attempted to identify the utility of YouTube to support RRL. This was important because RRL is the Navy's current effort to improve and modernize training. We attempted to find answers to the following three questions: what does current literature find regarding the effectiveness of YouTube/videos to enhance adult learning/job performance; what current Navy schoolhouse training requirements need to be adjusted or waived for YouTube/video learning to be utilized; and, what are the advantages and limitations for using YouTube to facilitate/enhance learning/job performance for the Navy? We conducted interviews with students and instructors from a Navy vocational training site to obtain their feedback on the use of a mobile learning intervention. We then used the Dedoose software to conduct a qualitative analysis of their interview responses. Based on their comments, we shifted our project focus and addressed the potential viability of YouTube as a training tool for the Navy. We then conducted a targeted literature review to validate the responses from our interviews. Our main findings show that there is support in current literature for the utility of YouTube in learning and there is a preference for shorter videos, therefore we propose the following six recommendations for implementing the use of YouTube in a vocational training setting:

- Authorize YouTube videos in the UT "C" school as a pilot program
- Purchase current generation iPhone Pro phones and support equipment
- Utilize "C" school staff and students to record videos
- Post videos on publicly accessible YouTube channels
- Solicit feedback from Seabee Battalions on content and future videos
- Determine the long-term viability of the program

A. MOTIVATION

The Executive Review of Navy Training, published in 2001, was a high-level review of the Navy's training programs then. This review provided several recommendations in an attempt to modernize Navy training. These efforts were referred to as the "Revolution in Training." Fast forward approximately 20 years and the Navy is yet again undertaking another effort to overhaul training, this time the effort was called Ready Relevant Learning. According to the ERNT, the Navy budget at that point was approximately $10B, or 14% of the total Navy budget (United States Navy Chief of Naval Operations, 2001). A similar total Navy budget figure was not provided with the RRL guidance. However, it did emphasize that there were approximately 4,000 lost work years from inefficiencies in the Navy's training pipelines. These lost work years equated to costs of approximately $400M annually (United States Fleet Forces Command, 2017). Taken together, these documents indicate a sustained investment by the Navy in training and a desire to increase training efficiencies.

CNO Gilday's 2019 FRAGO emphasized the importance of accelerating the pace of adopting RRL. An especially relevant line we will revisit is, "Sailors who enlist today are learning in vastly different ways than in the past" (Gilday, 2019, p. 4). This was confirmed through our review of the literature on informal learning. SECNAV Del Toro's 2021 Navy-Marine Corps Strategic Guidance stated, "we will create a continuum of learning…through ready, relevant education" (Del Toro, 2021, p. 5). The Navy's two senior-most leaders recently emphasized the importance of learning and training. More recently, CNO Gilday released his "Get Real, Get Better" campaign. This is a call to action for Navy leaders to improve themselves and their Commands through targeted behaviors. Specifically relevant, the third pillar of "Get Real, Get Better" challenges Navy leaders to "…using a learning mindset…" the fourth bullet under which calls for us to "Experiment frequently to find the best solution. Adjust your plan based on learning" (United States Navy, 2022).

Our conversations with CSFE staff and interviews with students and instructors at the "C" school are what initially pointed us towards looking at the utility of using YouTube in the classroom. Their comments provided insight about previous YouTube use in the

classroom and the current challenges the schoolhouse faced. It was clear that there was an opportunity for potential use of YouTube and that it had been missing in the classroom. Additionally, we learned that Sailors used search engines and YouTube as a reference/job aid while working in the field. Our literature review served to validate three overarching themes: informal learning is an important contributor to learning, YouTube and videos are effective learning methods, and short videos are preferred. Additionally, a review of current Navy policy documents demonstrates that the Navy understands the importance of both informal learning and videos in learning. The information gained from our interviews and discussions, validated by our review of academic literature and Navy policy, has given us the opinion that a limited scope pilot program is justifiable.

B. RECOMMENDATION DISCUSSION

1. Pilot Program

Micro-training videos normally fall under NETCINST 3502.1, NETCINST 1550.1, and the NETC Micro-Training Video Production SOP. We were unable to procure a copy of the NETC Micro-Training Video Production SOP to review in conjunction with this project, therefore, we cannot assess if an exception to policy (ETP) would be required or appropriate to facilitate the production of micro-training videos in the fashion required for this pilot program. NETC would need to authorize a pilot program and the business rules required for the production and approval of all micro-training videos in conjunction with this pilot program.

Due to the limited amount of data collected in our interviews, we cannot generalize the potential utility of YouTube outside of the UT rating and UT "C" school. Therefore, we recommended the pilot program be conducted at the UT "C" school.

2. Equipment

Expected equipment expenses to initiate the program would be relatively low. The largest purchase would be the iPhone Pro used to record content. This specific device was recommended based on feedback from the participants in our study and expected familiarity with the largest portion of the student and staff population, along with the

availability of accessories to facilitate recording content. The current generation iPhone Pro retails for $999 for a 128GB model (Apple, n.d.) and will be the largest single expense associated with the pilot program. Cell phone gimbals cost under $200 and can be purchased as a combination light, cell phone holder, and microphone, all-in-one. We are not making a specific recommendation as to the model, as this is beyond the scope of our expertise. We would recommend consulting with appropriate video recording experts at NETCPDTC.

A monthly unlimited data cell service should also be established on the phone to facilitate the full functionality of the device. There was no Wi-Fi accessibility in the schoolhouse and video uploads would otherwise be complicated by requiring a connection to a computer. An alternative could be facilitated using a Wi-Fi puck, but this creates additional purchase requirements and hardware considerations over an onboard cell phone plan.

3. Program Staff

UT "C" school instructors should be utilized as the primary content creators. This is not to say that they should be required to be the primary actors in the videos, but the instructors are the technical experts in the subject matter and are in daily contact with the course material. As such, they are uniquely positioned to provide valuable insight on what videos should be created, and in what order. During our interviews, the instructors stated they previously utilized YouTube videos to illustrate concepts throughout the course. The ability to create tailored video content would be beneficial in instructing their courses.

The time impacts for the instructors are anticipated as relatively low. We envision the video creation as happening organically during instruction, or while in-between classes. An instructor could film the other instructor explaining a concept, demonstrating a technique, or even film a student's work. These unscripted micro-videos should happen as authentically as possible and provide as minimal an impact as possible on the learning process.

4. Content Accessibility

Accessibility is critical to the pilot program's success. First, CSFE must communicate with Naval Mobile Construction battalions that a YouTube channel will be available for use and become familiar with the YouTube page. Awareness should be spread throughout the battalions so that Sailors are aware of and have access to the content.

Additionally, the YouTube channel must be available publicly. This is an important aspect of accessibility because a Sailor will have access to the information through their mobile devices. Sailors within Naval Mobile Construction battalions often rely on google to answer any job-related questions. However, with the YouTube channel, they will easily be able to search for the answer through the series of micro-videos provided by the schoolhouse. Not only will the community have access to a job reference but also to a study reference. Sailors will be able to study for promotion exams using the YouTube page. Because the YouTube page will be public, other users will be able to access the content including people outside of the Navy.

5. End-User Feedback

Following the initial development of a small library of videos, feedback from the NMCBs should be solicited. Specifically, feedback about the content, usefulness, community awareness of the YouTube channel, and recommendations for further video development. This will provide an opportunity to educate the NMCBs on the YouTube channel's ability to provide Sailors that couldn't attend UT "C" school access to information that was taught at the school without actually attending the course. The "C" school plays a large role in promotion and retention and Sailors will now have access to information directly from the schoolhouse, which can ultimately help them study for advancement exams. With the pilot program in place, and the NMCBs aware of the YouTube channel, Sailors will benefit from the micro-videos being made on topics that pertain to their rating.

6. Long-Term Viability

Since the goal of all Navy training is "The readiness of deployed Navy forces" (United States Navy Chief of Naval Operations, 2001, p. 5), the long-term viability of the pilot program should ultimately be made on an assessment of its impact on operational units. As the library of developed content increases, the impact of these videos should increase. It should become a tool for the operational UT to turn to while on a job site. Instead of going to Google, a UT in the field could go to a Navy-curated library of content developed to assist with the exact skill set she is expected to demonstrate. Over time, the need to have a physical schoolhouse could be minimized as analytics can reveal the true breadth of impact the micro-training videos have. The cost may ultimately be proven minimal for the impact.

C. CONCLUSION

We believe the goals of the Navy's Revolution in Training were never realized. Ready Relevant Learning is poised to revolutionize Navy training. Although the scope of this project was limited, we believe a limited pilot program could validate our findings and provide valuable data, at low cost, to the Navy for consideration in future research and training endeavors.

APPENDIX A. STUDENT INTERVIEW QUESTIONS

Student individual interview (post segment 2)
Interviews are semi-structured, and participants will be encouraged to describe their perceptions in their own words, style, and order.

- Please describe a good learning experience you had in the past. What about it worked for you?
- What contributed most to your learning in this course? Please give an example.
- What was distracting or difficult about the mobile learning technology resources? Please give an example.
- How did you use the mobile learning technology resources? Please give an example.
    - How did you use textbooks?
    - How did you use notetaking?
    - How did you use annotation of PPT?
    - How did you use group discussions?
    - Other
- What was added or better with the mobile learning technology resources?
- Which features were most useful? Which features were least useful? Please explain why.
- Which were distracting? Please give an example.
- What did you most enjoy (about the mobile learning technology resources)? What did you least enjoy? Please give an example.
- How will this experience influence your interest/ability in using mobile learning technology resources in the future?
- What would you change (about the mobile learning technology resources)?
- How could mobile learning technologies be used to better support learning outcomes?
- What barriers prevent you from using mobile learning technologies?
- How could mobile learning technologies support your-on -the-job performance?
- What would you change (about mobile learning technologies in the Navy)?

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APPENDIX B. INSTRUCTOR INTERVIEW QUESTIONS

Instructor interview (post segment 2)
Interviews are semi-structured, and participants will be encouraged to describe their perceptions in their own words, style, and order.

- Please describe a good teaching experience you had in the past. What about it worked for you?
- What learning resources (technology and traditional) did you use in the class?
- How did you use the mobile learning technology resources? Please give an example.
    - How did you use textbooks?
    - How did you use notetaking?
    - How did you use annotation of PPT?
    - How did you use group discussions?
    - Other
- How did teaching differ with the full mobile learning technology resources?
- What was distracting or difficult about the mobile learning technology resources? Please give an example.
- How do mobile learning technology resources enhance your teaching?
- Which features are most useful? Which features are least useful? Please explain why.
- What did you most enjoy (about the mobile learning technologies) in the class?
- What did you least enjoy? Please give an example.
- How will this experience influence your interest/ability in using mobile learning technologies in the future?
- What would you change (about the mobile learning technologies)?
- How could mobile learning technologies be used to better support learning outcomes?
- What barriers prevent you from using mobile learning technologies?
- How could mobile learning technologies support your-on -the-job performance?
- What would you change (about mobile learning technologies in the Navy)?

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