Adapting Online Courseware to Decrease Time, Engage and Improve Performance

Julia Campbell, Ryan McAlinden, David Cobbins, Raymond New, Anthony DeCapite
University of Southern California
Los Angeles, CA
{campbell, mcalinden, cobbins, new, adecapite} @ict.usc.edu

Catherine Neubauer
U.S. Army Research Laboratory West
Los Angeles, CA
catherine.neubauer2.ctr. @mail.mil

Stephen L. Goldberg
U.S. Army Research Laboratory
Orlando, FL
stephen.l.goldberg.civ @mail.mil

Chad Cardwell, Jeramy Cook
Army Management Staff College
Fort Leavenworth, KS
{chad.h.cardwell, jeramy.p.cook} .civ@mail.mil

ABSTRACT

United States Army military and civilian supervisors who manage civilian employees must complete the Supervisor Development Course (SDC) upon appointment, and every three years after their appointment. The original SDC online course focused on standardizing course content for supervisors across the Army, and the SDC provided quality information for new and experienced supervisors. While the SDC online content was informative, thorough, and helped to standardize the lesson material Army wide, it had challenges. The Army recognized the need to create new content and application exercises that better engaged learners, and reduced the amount of time supervisors spend to meet refresher training requirements. This paper describes the Supervisor Development Course-Refresher (SDC-R) effort that aims to address several overarching challenges that include: decreasing delivery time while refining instructional integrity, increasing interactivity within the constraints of an online learning environment, evaluating performance, and integrating SDC-R software with the Army Learning Management System (ALMS). Additionally, this paper presents a user study comparing two groups: one completing the original SDC course and the other completing the redesigned SDC-R course. Results compared the original SDC and new SDC-R courses including: participant time for course completion, the number of attempts to pass module posttests, and qualitative reactions to the respective courses. Preliminary results indicate that participants took significantly less time to complete the SDC-R course compared to the original SDC. Finally, participant feedback suggests that the SDC-R significantly increases opportunities to apply their knowledge.

ABOUT THE AUTHORS

Julia Campbell is a Project Director at the University of Southern California Institute for Creative Technologies (USC ICT). Her work focuses on cognitive task analysis to improve performance and self-efficacy. More specifically, she has conducted ongoing research aimed at understanding and improving distributed learning through a series of recommendations and best practices for promoting and enhancing student engagement online. She received a M.A. in Communication and Ed.D. (in Education) from USC in 2006 and 2010, respectively.

Catherine Neubauer is a postdoctoral fellow for the U.S. Army Research Lab (ARL), Human Research and Engineering Directorate, and a professor in the Master's of Applied Psychology Program at the University of Southern California. Her work focuses on the use of cognitive models to predict human performance within applied settings. She earned her Ph.D. at the University of Cincinnati in 2014, was a 2012 Repperger Research Fellow at Wright Patterson Air Force Base, and recently completed a postdoctoral fellowship at (USC ICT).

Stephen Goldberg is a research psychologist working on detail to the U.S. Army Research Laboratory (ARL), Human Research and Engineering Directorate from the University of Central Florida's Institute for Simulation and

Training (IST). Prior to joining ARL/IST he was the Chief of the U.S. Army Research Institute (ARI) for the Behavioral and Social Science's Orlando Research Unit. Dr. Goldberg holds a Ph.D. in Experimental Cognitive Psychology from the State University of New York at Buffalo.

Ryan McAlinden is the Director of Modeling, Simulation & Training at USC ICT. He re-joined USC ICT in 2013 after a three-year post as a senior scientist at the NATO Communications & Information Agency (NCIA) in The Hague, Netherlands. Ryan earned his B.S. from Rutgers University and M.S. in Computer Science from USC.

Chad Cardwell is an Instructional Systems Specialist with the Army Management Staff College (AMSC) at Fort Leavenworth, KS. Chad received a B.S. in Computer Science from the University of Texas at Tyler and a M.S. in Instructional Technology from Texas A&M University - Texarkana.

Jeramy Cook is an Instructor/Writer and the SDC course manager at the Army Management Staff College (AMSC). For the past 10 years Jeramy has been developing and delivering leadership education to members of the Army Civilian Corps. He earned his B.S. from Utah State University in Education and M.S. in Instructional Technology from Texas A&M.

David Cobbins is a lead writer and content developer at USC ICT. He holds a B.A. from the University of Wisconsin and M.F.A. in Screenwriting from the University of Southern California. He served in the US Army from 2004-2010, and was honorably discharged as a Non-Commissioned Officer.

Anthony DeCapite is a creative content manager and writer at USC ICT. He served in the Marine Corps as a Combat Videographer and Video Chief and received a B.F.A. in Screenwriting from the University of Southern California. He uses his Marine Corps experiences and creative chops to write and produce engaging content for military training.

Raymond New is a lead programmer at USC ICT. Over the past 10 years, he has worked on numerous training applications and games for various schools in the US Army as well as the Naval Postgraduate School. Raymond received his B.S. in Computer Science from California State University Long Beach.

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U.S. Army Research Laboratory West
Los Angeles, CA
catherine.neubauer2.ctr. @mail.mil

Stephen L. Goldberg
U.S. Army Research Laboratory
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Chad Cardwell, Jeramy Cook
Army Management Staff College
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INTRODUCTION

United States Army military and civilian supervisors who manage civilian employees are busy professionals, and finding time to complete required training can be challenging. The Supervisor Development Course (SDC) is required training for supervisors when they assume their position, and every three years after their appointment. The original SDC was developed under pressures of a rigid timeline, limited budget, and predominantly in-house resources in response to a Federal mandate for supervisor sustainment training (House of Representatives, 2010). While the SDC online content was informative, thorough, and helped to standardize the lesson material Army wide, it had challenges. The Supervisor Development Course Refresher (SDC-R) effort aims to improve the user experience by decreasing delivery time and increasing interactivity within the constraints of an online learning environment.

The SDC-R effort is a cross-disciplinary collaboration between the Army Management Staff College (AMSC), the TRADOC Capability Manager for The Army Distributed Learning Program (TCM TADLP), the Product Lead - Army Distributed Learning System (PL-DLS), and the Civilian Human Resources Agency (CHRA). The design and production team included the Army Research Lab (ARL), the University of Southern California Institute for Creative Technologies (USC ICT), a commercial software development company, Riptide, and a professional content development company, Psychic Bunny. This paper describes the methods and challenges to consider when developing engaging courseware and integrating third party software with the Army Learning Management System (ALMS). Additionally, this paper presents a user study comparing student performance in and reaction to the original SDC and new SDC-R courses.

BACKGROUND & RELATED WORK

The SDC-R development and study are part of a broader research collaboration between ARL, AMSC, Maneuver Center of Excellence, and USC ICT. The Captivating Virtual Instruction for Training (CVIT) effort strives to systematically explore and identify best practices for instructional design and content design for engaging and effective courseware development (McAlinden et al., 2016). The CVIT study seeks to define accurate returns on investment (ROI) measures that will inform future Army courseware development. For example, investing a little more in developing quality learning content could help users reduce their time training, and possibly, improve performance. This study extends the original CVIT project by providing initial ROI measures in terms of engagement, performance based on number of posttest attempts, and total time spent to complete the course.

Supervisor Training Mandate

The Department of Defense must provide sustainment training for new managers and supervisors every three years (House of Representatives, 2010). The Federal mandate of 2010 outlines a training program for supervisors that reinforces skills needed to engage employees, mentor, coach and counsel employees, manage employees with unacceptable performance, and address reports of a hostile work environment (pp. 316-317). The SDC courseware developed in response to the mandate also covers supervisor responsibilities such as: responding to a workforce related injury, processing employee vacation or sick time requests, rewarding employees, and managing collective bargaining unit employees.

Instructional Design Processes and Principles

Core instructional design principles hold true no matter the domain or learner experience (Graesser, Halpern & Hakel, 2008; Mayer, 2009; Merrill, 2002) or the course delivery medium (Clark, 1983; Clark,Yates, Early, & Moulton, 2010). These principles include: 1) instruction, (practice), and evaluation must be aligned with the intended learning objectives (Bloom, et al., 1956; Anderson et al., 2000; Krathwohl, 2002); 2) Effective learning occurs when prior knowledge is activated, real-world problems must be solved, and skills demonstrations and practice reinforce the learning objectives (Anderson, Reder & Simon, 1996; Graesser, 2011; Merrill, 2002); 3) Learners have limited working memory (Paas, Renkl & Sweller, 2003), therefore, courseware developers must avoid presenting information that leads to cognitive overload (Mayer, 2009); 4) Paying attention is critical to the learning process, but student ability to focus attention is limited and vulnerable to other factors such as emotion, stress, or sheer boredom (Sylwester & Cho, 1992).

Defining and Evaluating Learning Objectives

Learning outcomes are achieved when learning objectives are explicit, when learners can relate to the information through real-world examples, (prior knowledge is activated), when learners see skills demonstrations, when learners can practice the skills in a controlled environment with feedback, and when performance measures reflect the previous instructional activities (Anderson et al., 2000; Krathwohl, 2002; Merrill, 2002). Incorporating these principles into an instructional design blueprint involves many moving parts. Every instructional design decision must be based on the intended learning objectives for what the student should know and be able to do under what conditions, and the standard by which they will be measured. Bloom's Taxonomy (Bloom, et al., 1956) identifies a hierarchy of learning objectives informed by cognitive processes and demonstrated learner behavior (Department of the Army Headquarters, 2013b). In addition to well-defined learning objectives, real-world examples and demonstrations are often underutilized. It is tempting to develop content that emphasizes conceptual knowledge rather than applied knowledge because presenting and testing factual information requires less effort. Factual information is readily accessible, and is not open to interpretation. Providing facts without concrete examples, however, does not engage higher order thinking skills.

To develop effective test instruments, learning objectives, instructional activities, and test items must be closely aligned (Bloom, et al., 1956; Anderson et al., 2000; Krathwohl, 2002). Writing effective scenario-based multiple choice test questions requires an iterative review process. The team worked to avoid common mistakes such as: relying on fill-in-the-blank statements, using "none of the above" or "all of the above" distractors for right answers in every situation, writing simple recognition items rather than knowledge application items, and providing negatively worded questions (Bothel, 2001; Brame, 2013; Burton, Sudweeks, Merrill & Wood, 1991; Clay 2001). Test items should also engage, and in this case, measure how well supervisors apply their knowledge and skills.

Cognitive Load Theory and Theory of Multimedia Learning

Information is important, but how the information is presented can enhance or inhibit learning (Mayer, 2009). For example, diagrams with key words, images or videos can convey more information than text alone. The least effective technique would be an instructor or narrator reading text that is identical to that being displayed to the learner. This method does not work because learners have limited working memory (Paas, Renkl & Sweller, 2003) and would be overloaded with redundant information (Mayer, 2009; Moreno & Mayer, 1999).

Pay Attention

In order for students to learn something, they actually have to pay attention to the information. Any classroom teacher will tell you this is easier said than done, but now add the additional limitations of the distributed learning delivery medium. How students perceive the educational content and overall learning experience affects their motivation to engage with the courseware material, pay attention, and ultimately, retain the information (Sylwester & Cho, 1992). To help overcome these barriers, students need to know why the information is important to them, including the consequences for failing to learn the information, common mistakes and misperceptions, and how to put the information into practice (Clark, 2004). The original SDC content provided excellent material, such as job aids, that achieved most of these goals. Despite quality content, the SDC used amateur narration and slides overloaded with information. The SDC is also mandatory training which presents additional challenges to engage and motivate supervisors who would rather spend time doing other things.

Put It Into Practice

Plenty of resources offer theories and techniques for instructional design development (Clark & Mayer, 2011; Gagne, Briggs, Wager, 1992; O'Neil, 2005; Smith & Ragan, 2005). The SDC-R instructional design incorporates techniques from the ADDIE model (Department of the Army Headquarters, 2013a), Gagne's nine states of instructional design (Gagne, Briggs, Wager, 1992), and Clark's Guided Experiential Learning (GEL) model (Clark, 2004). Executing these techniques successfully *and* developing engaging content, practice exercises and effective test instruments require teams of specialists. Courseware developers alone may not possess the needed skills to successfully create engaging content. These skills include: storytelling, game design, user interaction and user experience design. Each of these components must come together in a perfect marriage that supports the learning objectives. Therefore, courseware development teams should include domain subject matter experts, instructional systems specialists, instructional designers, user experience designers, software developers, and professional writers (Graham, Schlechter & Goldberg, 1986).

Professional writers are a key ingredient to developing engaging instructional content. In-house courseware developers should consider hiring writers who know the craft of storytelling to enhance scenario development. Stories remain the most powerful method of information transfer (Graesser, Halpern & Hakel, 2008; Speer, Swallow & Zak, 2009). The iterative review process between course developers, subject matter experts and writers ensures that content is accurate, pedagogically sound and engaging. Developers must also consider the constraints of the technology delivery platform. Students are able to read text, listen to audio, watch videos, and click on items, or drag and drop, to indicate user input. These limitations have implications on interaction and testing activities that could compromise the learning objectives and the user experience if not taken into account. The following sections present SDC-R course design and development activities, the ALMS integration lessons learned, and user study results.

SDC-R COURSE DESIGN & DEVELOPMENT

The SDC-R course design and content development focused on: rewriting SDC learning objectives, distilling and removing repeated or extraneous course information, refining job aids, writing instructional video scripts, designing interactive practice exercises, and collecting real-world scenarios that informed the videos, practice exercises and test measures. The SDC-R modules streamlined content by combining module lessons (e.g. lessons focused on supervisor interpersonal skills), and by removing redundant lesson content across modules. The first three levels of the Department of Defense Leader Development Continuum: Lead Self, Lead Teams/Projects, Lead People provided a framework for SDC-R module reorganization. See Table 1 for a comparison of SDC and SDC-R course modules.

Table 1. SDC-R and SDC module lesson alignment.

SDC-R	SDC
Module 1 Supervisor 101	Module 0 Supervisor Transition
Module 2 Supporting a Positive Work Environment	Module 4 Supervising a Diverse Workforce
Module 3 Motivating and Managing Performance	Module 2 Performance Management
Module 4 Shaping the Workforce	Module 1 Workforce Management
Module 5 Labor and Employee Relations	Module 3 Labor and Employee Relations

Major additions to the SDC-R that set it apart from the SDC included professionally produced animated instructional videos and interactive Fantasy Workforce exercises. Animated instructional videos allow more flexibility than using live actors, and USC ICT re-used animation assets from the previous CVIT effort. The average run time for each module video was about 3 to 5 minutes for a total runtime of about 3 hours. The videos condensed content delivery time, and when possible, allowed for skills demonstrations. The popular online fantasy sports games inspired the Fantasy Workforce exercises. In the fantasy sports games, players select and manage a team based on real player statistics, and scores are based on real player performance. In SDC-R's Fantasy Workforce exercises, supervisors execute real-world supervisory skills with a notional workforce team. Success is based on supervisor decisions and how they impact employee engagement. Fantasy Workforce exercises emphasize both procedural and interpersonal skills. The SDC-R design and development activities required an iterative review process between subject matter experts, content developers and AMSC stakeholders. As mentioned, this review process is essential to the success of the content development effort.

SDC-R Test Development

Supervisors must pass a pretest and/or posttests to receive SDC completion certification. Therefore, significant development time focused on comprehensive review of SDC pretest and posttest items, and authoring new SDC-R test items. Pretest and posttest development started with analysis of existing SDC posttest questions. These served as a starting point to write pretest and posttest question banks for the SDC-R course. The SDC-R pretest and posttests have 60 questions that reflect the amount of content in each module (10 questions for modules 1 through 4 and 20 questions for module 5). The SDC-R posttest question bank has a total of 226 questions to allow for different questions per student, and for multiple posttest attempts. The SDC-R pretest and posttest instruments incorporated scenario-based questions when possible in order to avoid questions that only tested rote memorization. Scenario-based test questions needed to be authentic, would ideally provide distractors that represented common misperceptions or biases when possible, and that were at an acceptable difficulty level for an audience that ranged widely in grade and supervisory experience.

SDC and SDC-R Courseware Overview

Supervisors may opt to take a pretest in the original SDC and SDC-R courses. They have one attempt to pass the SDC pretest with a score of 80% or higher per module or pass the SDC-R pretest with a score of 90% or higher to receive course certification. The SDC course presents a pretest prior to each module, and the SDC-R course presents one pretest prior to starting any module. If supervisors fail to meet the score threshold, then they must complete modules for the failed pretest sections. Modules can be completed in any order for SDC with the exception of the course introduction and course conclusion modules which must be accessed after all the main content modules are finished. Modules can be completed in any order for SDC-R with the exception of the course conclusion module. Supervisors receive a narrated slide presentation for SDC lessons within each module. Module lessons for SDC-R are animated videos. In both SDC and SDC-R, supervisors receive scenario-based checks on learning. The SDC-R also provides several interactive Fantasy Workforce exercises.

ALMS INTEGRATION

This section presents a high-level technical approach for the ALMS integration efforts as part of the SDC-R

software development and delivery. A full report on ALMS integration lessons learned is outside the scope of this paper, but is necessary future work as the Army continues to explore emerging technology options for courseware delivery. The ALMS integration effort would not have been possible without guidance and leadership from TCM TADLP and PL-DLS. Personnel from both organizations spent countless hours helping software developers navigate and utilize the ALMS platform.

The ALMS hosts courseware for hundreds of thousands of Army personnel. Supporting users in a stable and secure environment is no small feat. The stability and security of the ALMS platform, however, also result in inflexible messaging protocol and limited access. For example, it was not possible to integrate the xAPI functionality to track isolated learning tasks for any portions of the course, but this is an area for future consideration. For the SDC-R effort, a key goal was to explore how to take advantage of the ALMS capabilities while also providing an engaging interactive learning experience. All courseware hosted on ALMS must be SCORM conformant (https://www.adlnet.gov/adl-research/scorm/scorm-2004-3rd-edition/). Additionally, the ALMS limits messaging from outside sources. In order to login users and track user progress, the SDC-R software needed to communicate information to the ALMS in the most transparent way possible. To achieve transparent login and operate within the ALMS SCORM conformant parameters, the SDC-R course software launches via a single SCORM package which automatically launches the externally hosted SDC-R application within an Inline Frame (Iframe) window. Iframes are used to embed content from another source inside a web page. The SDC-R software maintains a SCORM communication link back to the ALMS via a secondary communication window that runs in the background. The application utilizes the Windows messaging protocol, which enables safe cross-origin communication between browsers of differing domains. The messaging protocol is compatible among various web browsers including IE 11.

The courseware is designed to automatically authenticate learners into the externally hosted application using their unique ALMS-provided identifiers. While this design works well for most learners, an early issue involved the course not loading as intended (in an IFrame) for some learners, due to differences in browser and network security configurations. These differences blocked cross-domain IFrame content at their locations. As a workaround, an alternate launch method was developed for learners who required it. The alternate launch method temporarily solved this issue by not opening the course in an IFrame window. This workaround should no longer be needed once the course is hosted on a dot mil (.mil) domain where cross-domain security restrictions will not be a problem.

When learners successfully complete the course, an automatic completion message is communicated back to the ALMS communication window using cross-window/domain messaging. The ALMS communication window then communicates a SCORM completion message back to the ALMS. This process is completely transparent to most learners, and all they need to do is close the window to return to the ALMS and see their completion credit. However, if learners were required to launch the course via the alternate launch method, the course is configured to detect this and provide additional instructions at the point of need. In this case, learners are instructed to manually transfer an auto-generated completion code back to the ALMS communication window. Once the ALMS communication window authenticates their unique completion code, it will communicate a SCORM completion message back to the ALMS.

To ensure learners cannot cheat or game the system during authentication or course completion processes, the authentication system generates a random string for the user each time they login to the SDC-R application. This random string is coupled with a security solution that "hashes" the authentication data prior to transmission. Note that one drawback to limiting communication between the SDC-R software and the ALMS is that it is difficult to track individual test scores. For the purpose of this study, SDC and SDC-R supervisor performance is based on ability to pass posttests with a score of 80% or higher.

USER STUDY

This study compared the original SDC and new SDC-R courses including: participant time for course completion, the number of attempts to pass module posttests, and qualitative reactions to the respective courses. The SDC-R software does not communicate pretest and posttest item performance to ALMS so it was not possible to track

performance for each posttest item for this study. Therefore, the user study compared posttest attempts for each course module.

Participants

Supervisors of Army civil servants participated in this study as part of their three-year refresher training requirement. The supervisors were split into two groups: those who took the SDC, which was used for both initial supervisor training and refresher training (*N* = 423), and those taking the SDC-R, which was used to replace the initial SDC for refresher training (*N*= 83). Since participants were taking these courses to meet their mandatory training requirements, experimenters had no control over participant course assignment. Participants enrolled in SDC were primarily new supervisors and those supervisors who had not completed their refresher training within the three-year timeframe. SDC participants were both Civilians (*N*= 287) and Military Personnel (*N* = 127). Participants enrolled in SDC-R were supervisors who had last taken a Supervisor Development Course within the three-year timeframe. SDC-R participants were also both Civilian (*N*= 66) and Military (*N*= 16) Personnel. Participants in both groups ranged in age from 25 to 65 years and older (the most answered response was 46 to 55 years of age), experience (i.e., less than 5 years to over 20 years of supervisory experience) and grade (i.e., civilian GS-7 to GS-15, and military rank from Sergeant First Class to Colonel).

Procedure

Participants registered for either the SDC or SDC-R through the ALMS. All participants had the option to complete a pretest in order to test out of course module content. The SDC participants answered pretest questions prior to each module (20 questions for Modules 1 through 4, and five questions for Module 5) for a total of 85 questions. The SDC participants had to score 80% or above on each module pretest to pass. The SDC-R participants were directed to answer 60 pretest questions in one sitting prior to accessing any modules. The SDC-R pretest questions included 10 questions each for Modules 1 through 4, and 20 questions for Module 5. The pretest passing score for SDC-R participants was 90% or higher for each module section.

If participants did not test out of the module content during the pretest for SDC or SDC-R, then they completed the respective modules and took module posttests. Participants had to score 80% or higher to pass the posttests in both SDC and SDC-R. The SDC posttests included 85 total questions, and the SDC-R posttests included 60 total questions. If participants failed the posttests in either course, they had to review the failed modules, and were allowed up to three attempts to complete and pass the posttests. After participants passed the pretest, or completed all modules and passed the posttests, participants in both courses volunteered to complete a survey of demographic, opinion, and performance items. Qualitative comparisons were important for this study given the differences in the SDC and SDC-R pretest and posttest instruments.

Results

Study analyses compared user engagement, reaction and performance in the SDC and SDC-R modules. Performance included number of posttest attempts per module and time to course completion. Results are discussed in the following sections.

Time to Course Completion

First, the study team compared participant time to complete the two courses. For the original SDC course, participant completion time ranged from less than 10 hours to 40 hours or more. Participant completion time for the SDC-R course was much lower, and ranged from less than 5 hours to 15 hours or more. Results revealed that participants in the SDC-R course took significantly less time to complete the course (i.e., most participants took less than 5 hours to complete), while the majority of participants in the original SDC course took 10-19 hours to complete the course. See Figure 1.

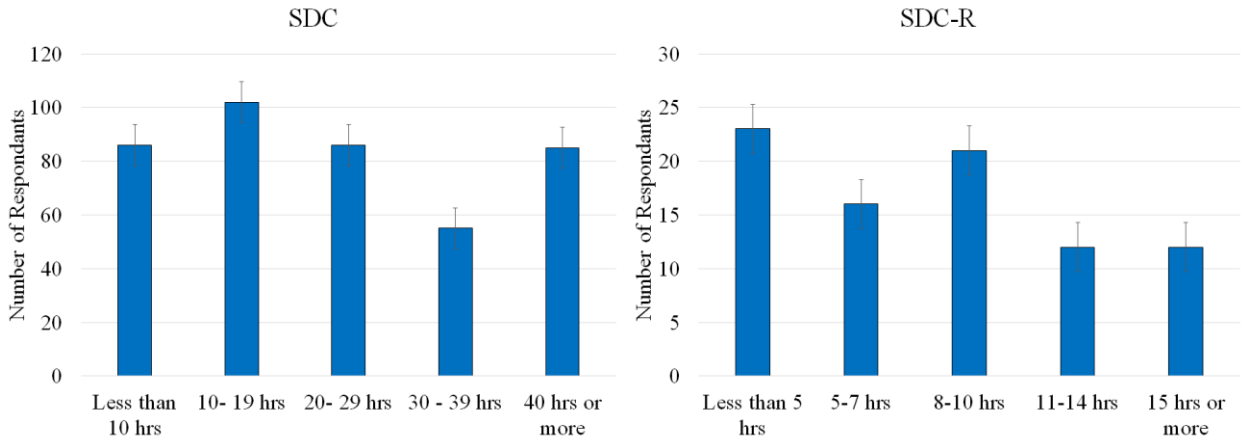

Figure 1. Time to complete the original SDC (left) and new SDC-R (right) courses.

Performance

Although it took participants significantly less time to complete the new SDC-R course, the study team was interested in whether the amount of time saved actually helped improve performance on each module posttest. As previously mentioned, participants were required to get a score of at least 80% on the posttests in order to pass. Therefore, participants were asked to report how many attempts it took them to complete each module across both the SDC and SDC-R courses. Results concluded that the number of attempts to pass each module posttest did not significantly differ for participants in the SDC and SDC-R courses, $p > .05$ for each module. See results in Figure 2.

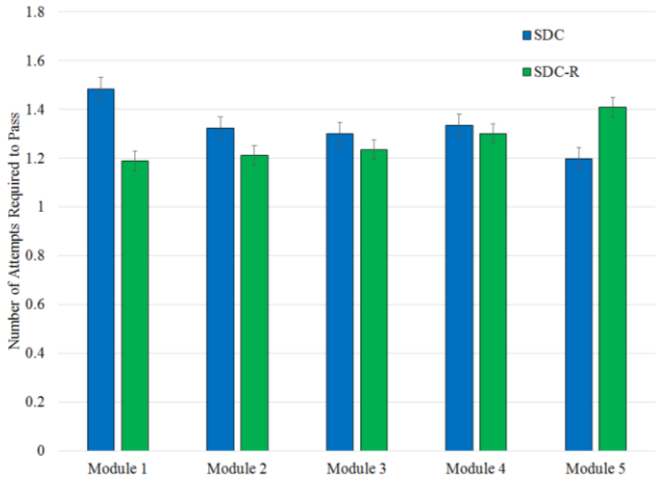

Figure 2. Number of attempts to pass each module posttest for the SDC and SDC-R courses. Error bars are standard errors.

User Experience Reactions

Participants responded to several post-survey questions to assess overall user experience and reaction for both the SDC and SDC-R courses. It should be noted that questions 8 and 9 were not applicable to participants in the SDC course as they did not see videos or participate in the Fantasy Workforce exercises. These questions were included in the SDC course, but were not analyzed in the following section for SDC user experience reaction. User experience reaction questions included the following:

1) As a result of taking this course, I am going to change some of my supervisory behaviors.

2) I learned new things in this course.
3) The course was more effective than previous Army courses I have taken.
4) The course was appropriate in length.
5) The course included material that will help me be a better supervisor.
6) The tests were about the right level of difficulty.
7) The tests covered the course material.
8) The course videos were effective in relaying the course content.
9) The Fantasy Workforce Exercises were effective in applying the knowledge learned during the course videos.
10) I would recommend this course to others.

Results for the user experience reaction questions for SDC and SDC-R are presented in Figures 3 and 4. Generally, participants responded positively by indicating a 'strongly agree' or 'agree' response for each question in both the SDC and SDC-R survey. Answers relating to 'disagree' or 'strongly disagree' were minimal at most. Taken together, the results of the user experience questions indicate that both courses were effective in that supervisors learned new material, responded positively to the material, and also approved of the course length and effectiveness. Lastly, an overwhelming majority of participants responded that they would recommend this course to others. See Figure 3 and Figure 4.

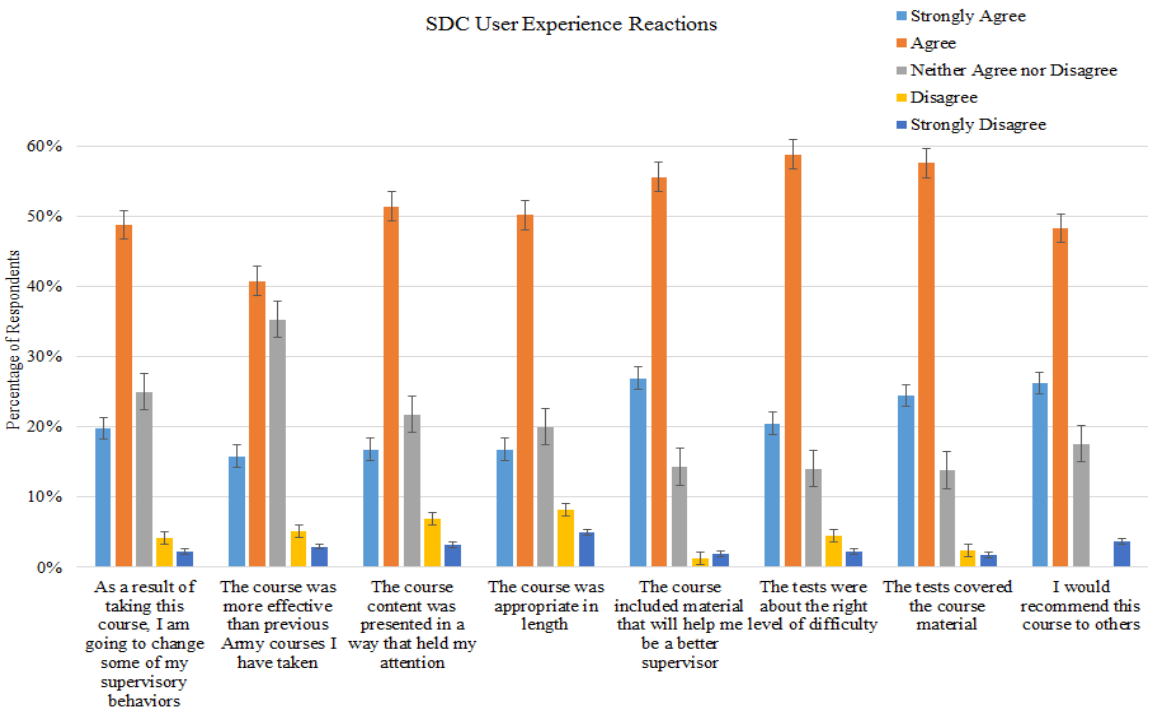

Figure 3. SDC survey questions for overall user experience and reaction.

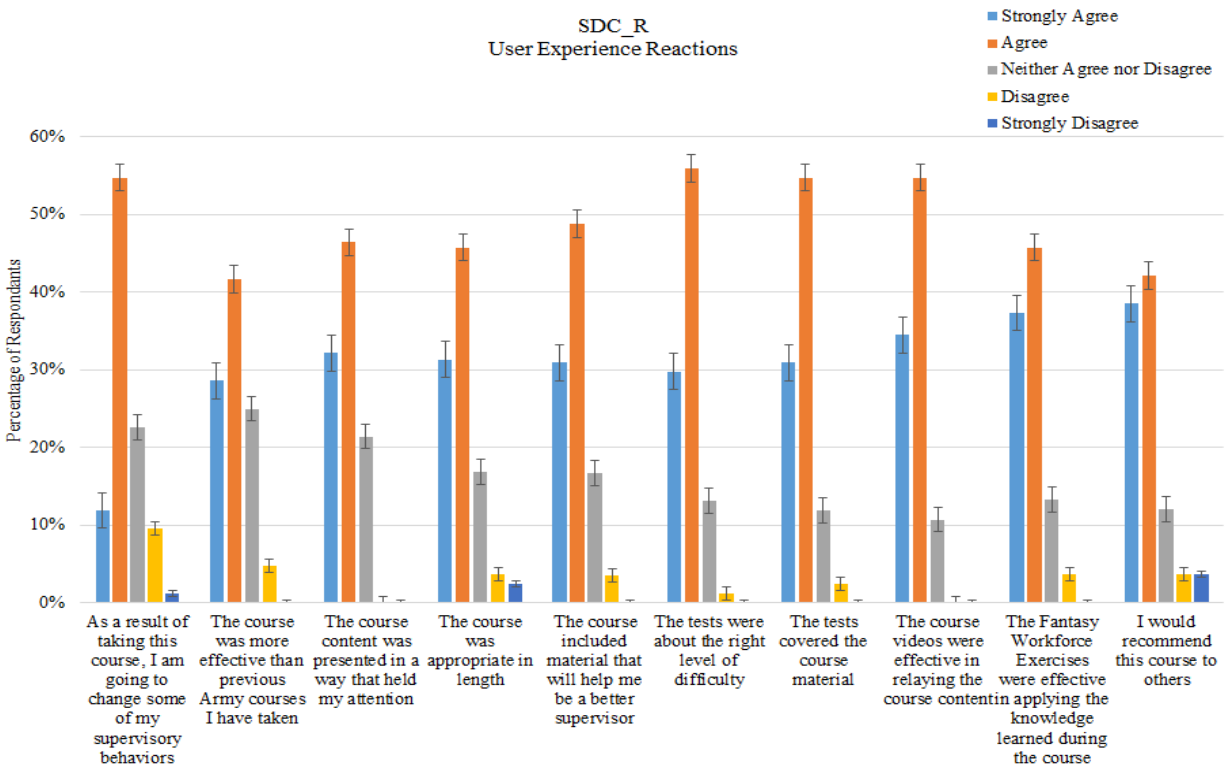

Figure 4. SDC-R survey questions for overall user experience and reaction.

For course impact and general impressions about each course, some participants provided open-ended responses to the following questions: "Please provide any specific examples of feedback for your responses concerning course impact," and "Is there anything else you would like to share concerning your experience in the course?" Out of 423 SDC participants, 96 supervisors provided open-ended responses. Out of 83 total SDC-R participants, 31 provided open-ended responses. While participants offered comments on a number of topics, for the purpose of this study, supervisor feedback is categorized by: overall positive and negative general impressions, time burden feedback, pretest option feedback, general test feedback and general content feedback. Overall positive and negative comments included general reactions to and utility of each course. Participants offered generally favorable statements regarding course impact and impressions. Participants in both courses indicated that they valued the opportunity to test out of course material using the pretest. Negative test comments concentrated on the wording of test questions, and participants offered positive responses to SDC and SDC-R course content. See Table 2.

Table 2. SDC and SDC-R open-ended responses for course impact and general impressions.

	Overall		**Time Required**		**Pretest**	**Test**	**Content**	
	Positive	**Negative**	**Positive**	**Negative**	**Positive**	**Negative**	**Positive**	**Negative**
SDC (*N* = 96)	29.20%	9.38%	0.00%	13.54%	7.29%	13.54%	12.50%	6.25%
SDC-R (*N* = 31)	41.95%	3.22%	9.67%	0.00%	19.35%	9.67%	15.10%	0.00%

CONCLUSION & FUTURE WORK

The Army Management Staff College invested time and resources to improve supervisor refresher training required every three years. The SDC-R effort focused on refining courseware to decrease training time and increase

interactivity and engagement. This paper described the SDC-R development and pilot test. This study reported on: time needed to complete the courses, the number of attempts to pass module posttests, and qualitative reactions to the respective courses.

A majority of participants (74%) completed the SDC-R in less than 10 hours. Only 26% of SDC participants finished in under 10 hours. Instructional videos in place of slides resulted in significantly shorter content delivery time for SDC-R compared to SDC. Future work should focus on measuring ROI impact in terms of supervisor time, productivity and morale. Several participants from both courses expressed that they would rather focus on their jobs than on lengthy required training programs. In terms of performance and time savings, SDC-R participants also took fewer repetitions to pass modules.

Performance measures for this study were limited. While the SDC-R tracks participant pretest and posttest scores, the messaging capability between the ALMS and the SDC-R software did not allow for detailed performance data collection. For example, it was not possible to pair pretest scores with posttest scores because the SDC-R reports pretest/posttest pass or fail status. Therefore, the study's performance data are a combination of time to complete the course and the number of times it took to pass a module posttest if failed initially. The number of attempts to pass each module posttest did not significantly differ for participants in the SDC and SDC-R courses. Future work could include more detailed pretest and posttest data comparison for each course.

The original SDC received positive reviews despite the length of time required to completion and some reports of user experience frustrations. Participants rated both courses highly on the post course survey. Participants in both courses indicated very positive reactions to the pretest option for testing out of the course. The study team was particularly interested in supervisor reactions to the statement: "The course content was presented in a way that held my attention." This question helped determine if the SDC-R effort to develop engaging instructional videos and exercises resulted in supervisors being more engaged with the courseware than supervisors taking the SDC. This seems to be the case. For the SDC-R, 70% of supervisor participants agreed to or strongly agreed to the statement. For the SDC, 27% of supervisor participants agreed to or strongly agreed to the statement. Supervisors seemed engaged and involved in the learning experience when they watched the animated instructional videos and completed the Fantasy Workforce exercises. Regarding video and Fantasy Workforce effectiveness, 75% of supervisors agreed or strongly agreed that the videos were effective, and 68% agreed or strongly agreed that the Fantasy Workforce exercises were effective.

Supervisors in this study ranged in experience from less than five years to over 20 years. It was difficult to control for supervisor experience and objective feedback for the SDC and SDC-R courses given this wide range of supervisor experience, rank and even familiarity with interactive media technologies. On one hand, the ideal candidate for SDC-R would have taken the previous SDC course, and would offer insights comparing both courses. This previous experience, however, could also impact performance results, and this is a potential limitation for our study. Supervisors rated the SDC-R courseware favorably overall, but challenges remain when developing courseware that is one-size-fits-all. For courseware development, it is difficult to create scenarios and test instruments that resonate with the entire supervisor audience. Future work should explore intelligent tutoring technologies that allow courseware developers to rapidly modify content to meet a range of experiences, and to readily adapt to demonstrated user performance in real time. Future work must also push processes and advancements that allow outside courseware developers easier access to the ALMS.

While the Army has made significant investments in the advancement of distributed learning, subject matter experts and courseware developers must continue to inform the Army learning community. Fostering opportunities for diverse development teams to collaborate seamlessly is key to success, and will help the Army standardize best practices for online courseware development. This study offers one example that investing resources and effort to develop engaging and interactive courseware leads to time savings, and improves supervisor performance within the course. These results provide arguably immeasurable ROI benefits that translate to supervisor on-the-job productivity as a result of reduced time required to complete mandatory training.

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