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### Designing Multimedia Learning for Student Employees in a Higher Education Institution

Sangyoon Park

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**Designing Multimedia Learning for Student Employees in a Higher Education**

**Institution**

By

Sangyoon Park

A Portfolio Paper

Submitted to the Graduate Faculty of

St. Cloud State University

in Partial Fulfillment of the Requirements

for the degree of

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### **Abstract**

This portfolio explores the multimedia learning design for student employees at a higher education institution to improve employment skills and knowledge. Based on the ADDIE Model, video-based learning, cognitive learning, and multimedia principles, this paper suggested eLearning designs that enhance learners' comprehension and employee training development approaches. This paper seeks to create and provide employment skills and knowledge training via the learning management system: Desire2learn Brightspace using various eLearning tools, including video-based learning, interactive web-based tools, and web-page learning materials.

*Keywords:* Multimedia learning, multimedia principle, eLearning, cognitive learning, learning management system, video-based learning, higher education

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## **Chapter 1: Introduction**

The COVID-19 pandemic intensified the need for online learning. Online-based learning and learning management systems can provide collaboration and connection for people in diverse locations and schedules (Mukhtar et al., 2020). With high-speed internet, a highly technologized online work and home learning environment can improve employee productivity and learning outcomes with approachable and accessible learning platforms (Carter Jr et al., 2020). With the challenging COVID-19 environment, organizations should select the eLearning platform that hosts various learning opportunities to pursue better organizational goals and needs (Reyes & Quiroz, 2020). eLearning provides education opportunities through online learning platforms such as Canvas, Desire2Learn Brightspace, Moodle. The eLearning platform has defined hosting online learning as an educational system that delivers instructional technology resources, interactive platforms, and live broadcast multimedia resources.

eLearning generates a trackable, individual learning pace to provide a personalized learning experience where individuals can check their learning status and build their learning strategy to improve their learning experience. Online learning provides students with more opportunities to apply their knowledge in real-world simulations and scenarios; instead of having face-to-face instructor-led courses, online learning offers more significant opportunities beyond the time and location limitations. Online learning platforms and activities such as blended learning, synchronous learning, and peer collaboration or subgroup activities can support various learning elements; written, visual, including pictures and videos. An organization can create sustainable, personalized training by incorporating multimedia principles to increase productivity.

The productivity of workers accelerates with enhanced online performance training (Moreno-Tenas et al., 2021). Training for new and existing employees is quickly moving from in-person to online training because of the advantages of online learning and COVID-19 restrictions (Mukhtar et al., 2020). Similar to training in the corporate sector, the outcome of eLearning shows a positive impact on academic organizations' performance improvement.

The outcome of eLearning shows a positive impact on academic organizations' performance improvement (Carter Jr et al., 2020). Also, the widespread application of learning management systems at corporate and educational institutions reflects the importance of developing online courses for employees. The important role of eLearning encourages instructional designers to plan individual learning through various multimedia materials and a learning management system; to help enhance understanding, training requires multimedia learning materials such as printable documents, visual learning materials, hands-on elements (Reyes & Quiroz, 2020).

For higher education institutions specifically, students could easily access its campus learning management system (LMS) for online training, including student employees. If the institution already has an LMS, student employees are most probably familiar with it through their studies. Student employees can access training materials through the LMS. LMS courses can contain multiple learning materials developed through instructional design frameworks depending on the organization's training and need analysis.

One of the advantages of developing online training is cost-effectiveness. Once a course is developed by the staff and administrators, new employees can train using unlimited time and choosing the location on their own. Unless the training content needs to be updated, the new employees' independence from time and space remains (Mukhtar et al., 2020). The learning

management system at higher education institutions is primarily used for a college education; the organization does not have to purchase an additional platform for student employees' training. St. Cloud State University uses Desire2Learn Brightspace (D2L) to track and record individual students' learning. The student union at St. Cloud State University, known as Atwood Memorial Center, has launched an online course for student employees to obtain specific skills and hosts that training inside D2L Brightspace.

This portfolio's objectives are to develop an eLearning training framework for Atwood Memorial Center's student employees. The ADDIE framework focused on improving student workers' performance and comprehension of the student union's role and the needs of the institution's goal. ADDIE framework is the steps of Analysis, design, development, implementation, and evaluation to develop eLearning. The portfolio is divided into five chapters: chapter one describes the theme, background, rationale, and significance of this portfolio; chapter two provides a literature review of best practices for designing and developing eLearning to improve performance as well as learning outcomes; chapter three outlines the portfolio products; chapter four presents the three portfolio products while chapter five provides a reflection on the portfolio products with analyzing practices on developing multimedia eLearning for student union employees.

### **Theme**

The theme of this portfolio is to implement best practices of eLearning and multimedia learning theories to train the student union's student employees on necessary job skills and knowledge. The primary purpose of creating an online learning experience is for student employees to access job training based on their schedule and needs with personalized learning

materials. Improvement of online employee training with multimedia learning materials provides flexible and accessible training for student employees.

Online eLearning theories and frameworks were applied to the content development process; in the analysis process, interviews were conducted with selected student workers in the student union about the audiences' learning characteristics and learning environment to provide an enhanced learning experience. The interviews result with student workers in Atwood Memorial Center (AMC) presents that most trainees prefer visual learning materials. Three Copies Plus student workers and two building managers conducted an interview among six students who work in different roles. The participants confirmed that they felt comfortable with visual aids such as videos, graphic and audio learning materials rather than text documents.

Due to the Atwood center building's daily operation, the student employees have different academic and work schedules. Therefore, scheduling training time that works for every employee is not easy. It is indispensable to offer alternative general training for student workers due to their work and academic schedules. Therefore, student workers need other options for acquiring the skills and knowledge about the Atwood Memorial Center's (AMC) goal and employment training. AMC uses the D2L Brightspace platform for delivering online training materials to student workers. Currently, these training materials are mostly text documentation training materials for students, with few multimedia elements.

The training elements needed to be updated with videos and images to support the learning concepts by visualizing them. The training modules can benefit from a link to multimedia learning resources to improve learners' understanding and the framework. The portfolio products provide a variety of multimedia learning materials that suit the D2L Brightspace.

Developing multimedia training materials will bring meaningful input to the organization and learners' performance (Reyes & Quiroz, 2020). The instructional design framework should align with knowledge and skills according to their roles in the student union. Atwood Memorial Center's training needs to embrace student workers' student union goals and functions to apply their skills and knowledge in workplaces and develop their leadership and collaboration skills.

Student workers will be enrolled D2L Brightspace course that offers flexibility in training. The LMS allows student workers to access the training materials without time and location restrictions (Mukhtar et al., 2020). The advantages of multimedia eLearning are systematically accessible by learners in any circumstances. Besides, learners can control the learning pace by planning individually.

### **Rationale**

Employee satisfaction with eLearning effectiveness proves the accessibility, cost-effectiveness, and convenience of eLearning programs (Mukhtar et al., 2020). Self-paced learning provides learning flexibility by learners' access to the learning content anywhere and anytime. Reyes and Quiroz suggest using the eLearning method for learning the organization's characteristics (2020). Along with AMC student workers' various work and academic schedules, the institution needs to support employees by providing the flexibility of online training. Furthermore, AMC employees prefer learning with multimedia resources to promote a deeper understanding of job knowledge and skills.

The project focused on developing multimedia-based learning, on-demand training using the internal student employees' learning management system, D2L Brightspace. The practices of creating online learning content guide student union training methods from face-to-face to online training. Online learning in each organization has a unique design, delivery system, and

evaluation method. The portfolio provided the practice of the development of eLearning training content.

The portfolio included the best practices for Atwood Memorial Center's student workers who need performance training and necessary job aid. AMC has training methods with face-to-face learning and online training to prepare for their employment. The student workers' supervisors monitor the learning management system, D2L Brightspace. Student employees were enrolled in an online training course, "Atwood Center Student Employee Training and Resources." Based on student workers' roles, employees select the training topics in the online module, each learning content required by AMC staff.

The learning contents were integrated sounds, pictures, videos, and flash text into a web-based online course platform, D2L Brightspace. D2L Brightspace can incorporate Microsoft Stream video embed code which provides sharable video streaming within the organization. The learners will be able to click the play icon and watch the training video. This video resource will be recorded and edited to deliver a solid message to audiences following Mayer's (2019) multimedia principles that promote a better understanding of multimedia eLearning. (Mutlu-Bayraktar et al., 2019; Wang et al., 2020).

### **Significance**

eLearning training has an effective result in skill-based learning outcomes. Even though learners do not have prior knowledge and experience, learners can learn better through multimedia learning materials than text-based material based on the cognitive learning process. The cognitive learning process is the learning process that learners experience when they learn about new information (Mayer, 2019). E-learning training will give learners flexibility so that they can take the course at learner's own pace. This self-pacing learning allows the learners to

take the learning content, such as the sequence of the module and content (Carter Jr et al., 2020). Furthermore, analyzing the audiences allows the personalized learning experience that benefits the learners' motivations with the learners' needs and expectations. Also, by commenting on the D2L Discussion, learners can feedback and interact with the administrators about the module and learning materials. Specifically, video eLearning with the well-chunked training session allows learners to check the information simultaneously to support their job role.

To increase employees' competency during higher education employment periods, applying their knowledge and capability in the workplace is crucial. St. Cloud State University reaches goals for growing students to become global citizens, grow academic achievement, and improve career development. The portfolio focused on developing the learning materials to align with an institutional goal to customize the eLearning for the organization (Reyes & Quiroz, 2020; Carter Jr et al., 2020).

The learning goal for the student workers and their institution goal should be aligned for students' meaningful employment (Millard et al., 2020). Student-workers' experience of on-campus employment is developed as career skills and knowledge to impact student employees' future careers. Instructional designers can develop a multimedia eLearning course. Interactive learning keeps employees more productive and reduces cost, also physical constraints. In addition, online training methods encourage the employee's continuous education and training by providing the flexibility of learning (Mingyue et al., 2020).

## **Definitions of Terms**

### ***Blended Learning***

Learning provided is traditional face-to-face and online learning—a teaching method integrating technology and traditional classroom activities (Reyes & Quiróz, 2020).



### ***Cognitive Learning***

Cognitive learning develops the instructional process to minimize the chances of overloading the learner's cognitive system (Wang et al., 2020; Mutlu-Bayraktar et al., 2019).

### ***eLearning***

Primarily used in distance learning education. An educational system that delivers the learning content consists of instructional technology resources such as interactive platforms, live broadcast also multimedia (Almaiah et al., 2020)

### ***Hybrid Learning***

Learning via electronic online is also traditional face-to-face. It combines teaching and learning face-to-face and online (Reyes & Quiróz, 2020).

### ***Instructional Design***

Instructional design is creating instructional materials, lessons including learner analysis, goals, and objectives, designing and planning assessment methods (Septiani et al., 2020)

### ***Learning Management System (LMS)***

The online tool that organizes learning materials and delivers the learning content to learners assists communication between students and instructors (Septiani et al., 2020).

### ***Multimedia Learning***

Design improves comprehension in learners with pictures and words such as animation, video, and graphics with narration or text (Mutlu-Bayraktar et al., 2019).

### ***Online Learning***

This refers to a web-based learning process that helps distribute the learning materials, track the learning process, and manage the courses over the internet (Mukhtar et al., 2020).

### ***Personalized Learning***

Educational programs or strategies focusing on the different learning styles of individual learners support the learners' needs and interests (Septiani et al., 2020).

### ***Traditional Learning***

Traditional learning is considered face-to-face and lecture-based learning. Classroom setting teaching methods using blackboards and learners and instructors are in the same location and time (Reyes & Quiróz, 2020).

### ***Product***

Product will be referred to in this narrative as this portfolio products 1, 2, and 3.

### **Summary**

As the work environments continue to change with advanced technology, it is critical to utilize Learning Management System (LMS) to improve employees' training methods. Moreover, as the work environment rapidly changes, training should be able to deliver through LMS. Ergo, having the online training framework for developing eLearning content in an organization will help employees keep updated with new roles and understand the institution's vision. It is important to lead employees with a vision and mission, constantly communicating with them and using a variety of routes. This portfolio hence examined the framework for higher education institution eLearning training; it included three different training platforms shared with student workers to train them to have essential job skills and knowledge.

## **Chapter 2: Literature Review**

### **Introduction**

The instructional designer's role is to understand the learner's cognitive process and enhance the learning process using LMS materials that can improve students' learning (Quinn & Darby, 2021). Furthermore, due to the COVID-19 pandemic, higher education institutions are forced to enhance online learning programs. Along with technology development in education and the current "living with COVID -19" lifestyle, learning delivery methods have transitioned from face-to-face lectures to blended, online-based learning (Kalyanasundaram & Madhavi, 2020; Mukhtar et al., 2020). LMS allows learners to manage their learning.

Mayer (2019) emphasizes the ability of LMS to foster learning experiences by creating multimedia instruction to enhance learners' understanding. Following multimedia principles, LMS can provide deeper comprehension by providing verbal, text, and imagery, all combined enhancing learners' cognitive learning. Klepsch and Seufert (2020) indicated the significance of the instructional design perspective in obtaining learners' attention in learning materials and the cognitive learning process. Connecting learning and constructing learning elements can help attain deeper knowledge. This chapter will explore the foundational cognitive, multimedia learning theories and ADDIE framework focused on the effectiveness of multimedia learning.

### **Methodology for Literature Review**

The literature review research for this portfolio was done using a variety of electronic resources; the majority of the materials were gathered through online database searches, such as the Academic Search Premier, Google Scholar, JSTOR, Business Source Complete, ProQuest Global News stream, and ScienceDirect. Most articles were from peer-reviewed sources published within the last five years. Keywords included "eLearning," "Higher education

eLearning training," "Instructional design," "Cognitive learning," "Video-based learning," and "Multimedia learning principle." Additional sources included expert texts created by the leading organizations: Computers & Education and The Cambridge.

### **Review of Literature**

Mutlu-Bayraktar et al. (2019) proved the effectiveness of multimedia learning to achieve educational goals and assist organizations to build skills related to improved learning performance. An instructional designer concentrates on workforce learning focused on excelling skills and applying strategic knowledge. Depending on the organization and learners, instructional designers should find a suitable way to develop the learning content. Instructional designers should account for the way information is processed by learners when designing visual displays, and the development of specific design techniques can facilitate learning (Karthik et al., 2019; Klepsch & Seufert, 2020; Quinn & Darby, 2021).

Additionally, instructional delivery technology needs to be well-designed and implemented in eLearning to generate effective learning materials. As the instructor-led course should have a well-structured framework, eLearning development needs effective instructional methods. The framework suitable for the organization will bring effectiveness to learning. With an eLearning platform, learning content can have flexible, individualized, and multi communication channels (Karthik et al., 2019; Klepsch & Seufert, 2020; Radović et al., 2021).

### ***Cognitive Learning Theory***

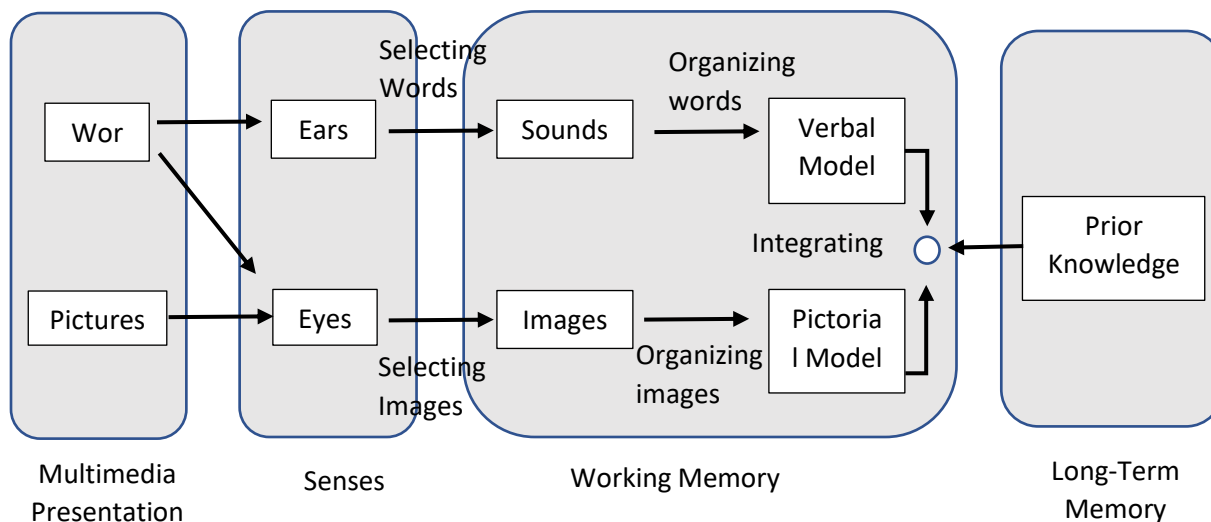
Based on the cognitive theory learning process, training courses can be maximized by providing multimedia learning materials that promote a deeper understanding, finally achieving the instructional goals. Furthermore, generating learning content based on the learners' prior knowledge can significantly optimize deeper comprehension (Klepsch & Seufert, 2020). As

Mayer (2018) mentioned, the learning process in cognitive theory approaches the knowledge-construction view. Learners can engage during the learning process and connect their prior knowledge with represented information. For example, text with a relevant picture improves learning. For more substantial learning outcomes, it is a good practice to represent a supportive image, including text. Moreover, reducing the overload of working memory is recommended by providing text and optional audio. Multimedia learning that maximizes cognitive learning provides learning effectiveness.

Mayer (2019) mentioned that the cognitive theory of multimedia learning has dual channels where people receive the information separately via eyes and ears. In the multimedia presentation, the audience will process visual and pictorial or auditory and verbal material (Mayer, 2020). Dual channels accept the information separately from the multimedia presentation. When the information consists of words and pictures, the learners accept the information through separate channels, as the graphic describes in figure 1.

**Figure 1**

*Mayer (2021) Cognitive Theory of Multimedia Learning (p.231)*



When the learners actively engage in multimedia learning materials, the cognitive learning process will occur with two supportive channels of the learning process. The learners will sense the text and visual materials with their ears and eyes separately. Eventually, the selected words and images access the learner's working memory through the ears and eyes, where word and image materials are processed into the verbal and pictorial model. The integration of working memory will connect with prior knowledge as long-term memory. The significant steps in the cognitive process include: 1) selecting words and images, 2) organizing words and images, 3) integrating new information with prior knowledge. The learners should pay attention to multimedia materials efficiently to mentally organize the verbal and pictorial model. Finally, the learners will be able to integrate the new information with prior knowledge.

Mayer (2021) points out the limited working memory capacity to process the organizing of two separate channels. To reduce the barrier of working memory, the instructional designer must follow the developing process that would help the learner's cognitive processing. By minimizing the complexity of learning content, learners will obtain information with enough capacity for the learning process. Instructional designers develop a reduction of unnecessary learning materials. In addition, for complex and difficult learning content, lessons should be "chunked" for better understanding (Klepsch & Seufert, 2020). Using conversational narration or script allows learners to motivate and engage in the learning activities.

Learning complex content needs to be chunked not to exceed learners' cognitive process capacity (Wang et al., 2020). Three main challenges to maximize learner's learning with cognitive load theory exist: 1) decreasing extraneous processing, 2) managing content with simplifying 3) promoting engagement. The cognitive load made by inapplicable and vital processes exceeds working memory capacity. If the content is complex, it can exceed cognitive

knowledge. The learner will not be able to engage in sufficient processing to result in learning (Mutlu-Bayraktar et al., 2019).

### ***Multimedia Learning***

The main concept of multimedia learning is directly related to cognitive theory. Cognitive theory is described as a learner's cognitive system that should reduce overloading learning content (Mayer, 2021; Septiani et al., 2020). Designing multimedia that promotes meaningful learning to learners could be challenging. Based on cognitive learning, providing the appropriate amount of multimedia resources will support and create the learning environment to maximize learning capacity, leading to deeper understanding (Karthik et al., 2019).

Multimedia content must also be designed to focus on the learners' understanding (Dai & Liu, 2019). Step by step learning material can be used in multimedia components such as screen text or narration and pictures such as animation, video, or graphics. The combination of images and text is the most standard method for cognitive theory learning processing by avoiding the same explanation of narration or on-screen text. The repetition of similar information of writing and narration will not help support learners' comprehension. Because limited working memory exists, duplicated information such as the same text and narration would not help learners' understanding.

Through their ears and eyes, learners accept the words and pictures with sounds and visual channels in working memory. Through the separate channels, learners develop verbal and pictorial models and connect the individual information in working memory. Finally, learners integrate prior knowledge with working memory for further understanding of learning content. To increase the learners' comprehension, multimedia design can be created to comply with multimedia principles (Dai & Liu, 2019; Mayer, 2019).

Multimedia learning materials include pictures, graphics, drawings, animation, and video in accordance with cognitive theory. Mayer (2019) indicates learners could learn better through text with visuals, not text alone. eLearning content will support learners' comprehension by including visual components. Multimedia presentations can encourage learners to engage in learning by mentally representing the materials in words and pictures and making connections between the pictorial and verbal representations (Mayer, 2020).

Cognitive theory is directly related to multimedia learning to connect words and visuals in a learners' learning process. In the learning process, supportive visual content assists learners' cognitive process. Learning material, including text and pictures, should be relative and supportive for the learning process with the relevant information. However, they should not be overwhelmed by the multimedia materials. The supportive multimedia requires the selection, organization, and integration of the information.

### ***Multimedia Principles***

**Contiguity Principle.** The Contiguity principle has two types of definitions: 1) Spatial Contiguity principle 2) Temporal Contiguity principle. The Spatial Contiguity principle defines the text, and visual content needs to be closer together to improve the learning experience. The Temporal Contiguity principle defines the simultaneous presentation of text and corresponding visuals to better understanding (Ebied, 2019; Mayer, 2019).

The point of the Contiguity principle provides attention from the learners by removing obstacles between physical elements on learning materials. The Contiguity principle emphasizes the importance of the location and timing of the learning elements on integrating text and pictures. Working memory will process new information designed with Contiguity principle text and visuals with learners' prior knowledge (Antal et al., 2017).



When designers choose the on-screen element between voice audio with a picture and text with the picture, using voice audio is more supportive than text with pictures. Often, the text needs more process periods than audio to minimize the overloading of learning content, and the designer should select the visual. This is known as the Redundancy principle (Mayer, 2019). When an instructional designer uses a variety of multimedia resources such as video, visual graphics, and narration, it does not encourage the use of duplicated multimedia content.

**Redundancy Principle.** According to cognitive theory, learners may not pay attention to the text, duplicated narration, and graphics on the screen that require extraneous processing. Learners can learn better when learning content consisting of narration and visuals rather than narration, visuals, and text (Ebied, 2019). Since the working memory system has a limited capacity with the amount of learning information, the on-screen text could overload the visual channel with multimedia content, including graphics, printed words, and narration.

On the other hand, exceptions to the Redundancy principle are cases where the keywords are unfamiliar to learners or complex text for spoken text. Slow-paced lessons could include narration, on-screen text, and graphics. Learners' cognitive processes will not be overloaded if the lesson speed is under the learner's pace. Based on a learner's characteristics, instructional designers could exempt the Redundancy principle. For example, if the learners are not native speakers, designers would like to add subtitles to help learners' better understanding (Mayer, 2019).

**Modality Principle.** According to Mayer (2019), instructional designers should consider the Modality principle based on when cognitive theory indicates the spoken word is better than printed text. Spoken words use working memory space more efficiently when processing visual and audio content in dual channels simultaneously, preventing overload; on the other hand, the

graphic and printed text can disturb learners' concentration. In the visual channel process, with both text and graphic materials, designing content that consists of narration and graphics reduces the overloading working process. Using narration instead of written text will allow learners to avoid overwhelmed information on the graphics by assisting text efficiently and the learning progress (Ebied, 2019).

**Coherence Principle.** Graphic and text design avoids unnecessary multimedia sources in lessons (Mayer, 2020). According to the Coherence principle, irrelevant images include inappropriate schemas during long-term memory progress. Moreover, presenting irrelevant images interferes with learners' cognitive process by distracting learners. To create comprehensive learning content, learning material needs to eliminate unnecessary details in visuals, background music, or irrelevant text.

**Signaling Principle.** The use of the signaling technique attracts learners' attention. Signaling contains the use of headings, bold, italics, underlining, capital letters, larger font, color, white space, and arrows. This brings the learner's attention to significant areas of the display without eliminating the extraneous content (Mayer, 2020). If the learning material contains many spoken words, essential learning areas can be highlighted by speaking louder or reducing other materials such as visuals or text.

### ***Video-Based Learning***

Learners can understand well with realistic and simulation visuals learning. Multimedia materials can appeal to learners without any unsupportive multimedia resources that could distract a learner's understanding. Video-based learning has developed with the advantages of video technology. The interactive technology innovation includes elements that incorporate interactive learning activities (Sufirmansyah et al., 2021). Learning Management System can

collect and record the learners' views and reactions. It allows educators to design supportive video-based learning for students in the distance learning environment (Nadeak & Naibaho, 2020).

Video-based learning became a primary effective learning method in any learning environment during the COVID-19 pandemic (Almaiah et al., 2020). Video materials show visuals such as text and photos with narration. Furthermore, the flexibility of video-based learning enables the utilization of video-based learning in various learning environments such as traditional face-to-face classrooms and lecture types. It can also bring learners' attention effectively by applying the multimedia principle to increase engagement and motivation (Nadeak & Naibaho, 2020).

Video-based learning can support organizations to achieve their goals in an online environment. Video-based learning seeks to achieve learning outcomes through multimedia learning materials, including knowledge, skills, and performance (Van Der Meij & Dunken, 2020; Sufirmansyah et al., 2021). Video learning material promotes the learning process by supporting a cognitive approach to utilizing multimedia resources. Furthermore, interactive communication through comments on video-based learning can effectively improve problem-solving skills for learners by providing real-world scenarios. To generate interactive video learning, a video-based learning design framework should be relevant for an organization that motivates learners.

Video-based learning can support students' learning by showing the operating and effective learning methods for visual learners (Van Der Meij & Dunken, 2020). The development of the video course should follow multimedia principles. Moreover, the developer should consider technological facets such as sound and video quality for useful and attractive

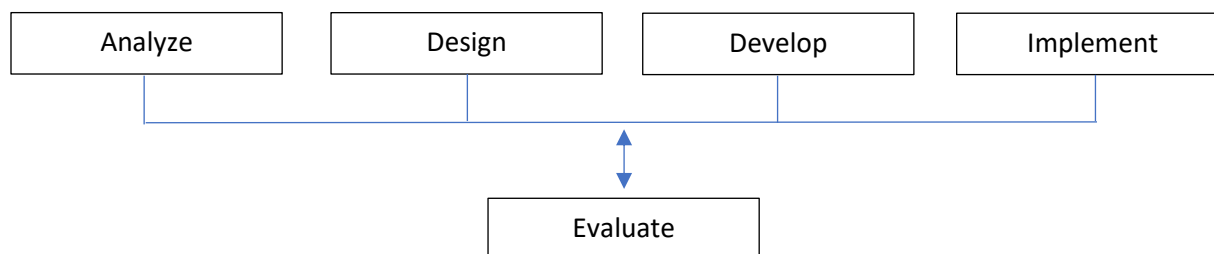
video courses. The design of the video frames is also essential, for instance, pace, length, voice, text size, and audio volume. The elements of the video are consistent but also remain as supportive learning materials for learners. The analysis of learners' characteristics and pre-knowledge is crucial for using technology and literacy with demographic characteristics. This will assist the constructed framework to engage learners.

***Framework: ADDIE Instructional Design Model***

Analysis, design, development, implementation, and evaluation (ADDIE) is a framework to create and develop learning programs in both education and business learning environments (Budoya et al., 2019). The wide usages of the ADDIE model are not limited to instructors or training but also in development and learning. By incorporating the ADDIE model in the learning development process, organizations create learning content to better understanding. ADDIE framework is designed by analyzing the learning environment, learners' prior knowledge, and characteristics. The analysis step requires inquiry regarding the learners' prior experience and knowledge to design the learning content. This is the first step and basic information in conducting plans for the eLearning design (Bąkała & Bąkała, 2020).

**Figure 2**

*Budoya et al. (2019) ADDIE Instructional Design Model (p. 37)*



During the first step, the designer analyzes learners' characteristics and collects information about learning delivery methods. Target audience analysis, including prior knowledge, skills, and learning environment, should be performed to enhance the learning process. The "Design" phase is the development of planning the learning outline and the delivery methods. The "Development" phase plans the LMS content, including learning materials and lessons. "Implementation" publishes the learning product to audiences. The "Evaluation" phase measures the instruction process in both effectiveness and outcomes whether instructional materials assist in reaching learning goals (Budoya et al., 2019).

The ADDIE model works best for developing multimedia content for corporate training as well as in educational institutions. According to Budoya et al. (2019), the ADDIE framework reduced errors and cost during the design process. Also, the ADDIE design process provides high learning efficiency objectives and outcomes for students. Designing multimedia content for learning should combine the instructional design model that promotes learning needs and interests. The ADDIE model can design and develop a variety of learning incorporated with multimedia content for learning (Almelhi, 2021).

### **Gap in Research**

Video-based learning with interactive activities and feedback reflection tools aim for self-paced learning. Designing learning materials with available interactive techniques should meet learners' characteristics, needs, and interests. Further research is needed to verify engaging nontraditional learners with diverse cultural backgrounds. Designing eLearning should individually support for diverse backgrounds students. Learning content needs to provide supportive learning materials to engage the learning process to pursue learners' and institutions' goals.

Providing customized integrative learning materials would be essential for learners to enhance learning. Based on the multimedia principle with cognitive theory, providing learning materials and activities could bridge the gap of prior knowledge through discussion and interactive questions (Mayer, 2018). For future work, evaluating eLearning courses, the gap between learning outcome and instructional objectives will better assess the effectiveness of multimedia learning.

### **Summary**

The literature review focused on multimedia principles and cognitive learning, supporting portfolio product multimedia design. The literature review allowed a greater understanding of the existing connections between the cognitive learning and multimedia principle. Multimedia learning provides relevant information by selecting, organizing, and integrating learning content such as graphics, text, and spoken words to better learning outcomes (Koc-Januchta et al., 2019). ADDIE frameworks provide a guideline on developing multimedia training materials that focus on video-based learning to promote learners' cognitive learning. Chapter three outlined the application with research being conducted on how multimedia principles work on college-level students.

## **Chapter 3: Methodology**

### **Introduction**

This portfolio described the design of multimedia learning based on cognitive theory. The research on multimedia principles supported and clarified the portfolio project. Based on the literature research, the multimedia principle applied to portfolio products for the practical student employee training. The portfolio focused on developing multimedia learning, including video, graphic, and interactive materials through the D2L Brightspace. The learning goal achieved necessary employment skills and knowledge training.

The student workers participated in training courses in D2L Brightspace, St. Cloud State University's learning management system. The administrators added the student workers' accounts in the AMC training course, and the student employees could view and download the learning materials at their convenience. Student workers' supervisors could obtain training record reports to measure student employees' progress; they could then review their performance. The skills learning like procedure skills, visual elements support learners' cognitive load process.

### **Goals and Objectives**

This portfolio provided accessible training to student employees regardless of time and location. The learning management system allowed student workers to complete the training in their available schedule at any internet-accessible location. The objectives of each product indicated skillsets for the role and knowledge of leadership and collaboration. Using the content of the LMS course, the student employees were acquired to acknowledge the skill and knowledge to align with the department goal.

***Product 1***

Product 1 defined a job skill - operating the laminator; the goal for this product was for student workers to operate the laminator after finishing the module. The video tutorial showed the operation of a large laminator with a video, graphic, caption, and narration.

***Product 2***

Product 2 focused on the interactive learning module that contains basic knowledge and skills of GoPro 6. GoPro 6 is a compact and mobility camera that utilizes recording hand-free generates an active video scene. Product 2 provided directions to operate the GoPro 6 camera's buttons and basic functions. The goal of product 2 was to teach student workers to use GoPro 6 after finishing the module. This module had four concentrate objectives:

- 1) The learners will be able to demonstrate the operating buttons of GoPro 6.
- 2) The learners will be able to identify the GoPro accessories.
- 3) The learners will be able to describe the three rules for GoPro maintenance.
- 4) The learners will be able to explain the most appropriate steps for taking the time-lapse video.

***Product 3***

Product 3 acknowledged the university and department goals to enrich the student employees' employment experience. As a higher education institution, the student union sets the goal to focus on student growth and global citizen competency. To achieve this goal, the institution should consistently provide opportunities to utilize the skills and information that students can obtain a meaningful experience. The student union at St. Cloud State University (SCSU) had a large population of international student employees who have diverse backgrounds. Many speak English as a second language or are nontraditional students. The



difficulties of working in a new environment and with many cultural differences could challenge the students. Therefore, the module should provide supportive learning content to motivate the students to learn about diversity and leadership. The product 3 modules focused on integrating and applying knowledge and experience across disciplines in both broad and specialized settings. The module content had various resources, including experience diverse group leadership, support organizations, and higher education career development opportunities.

### **Target Audience**

The module included multimedia learning in the LMS module focused on the multimedia principle and cognitive learning approaches, which supported students to be trained in new skills and apply knowledge in the workplace. Modules were available for self-paced learning to affect the learners' professional careers after graduation.

Learners decide which courses they need to take for their development of the workplace and how they can manage the courses related to their work roles. Also, modules were related to students' needs and interests. Learning content was selected based on the needs of learners' daily work. This learning content was more likely related to real-world situations. The goal was to intrinsically motivate students to match their goals with the institution, improving leadership and collaboration skills.

### **Media Used**

The products were planned to be delivered through D2L Brightspace. Product 1 was developed as a video learning material completed using Adobe Premiere Pro. Adobe Premiere Pro is a video editing tool combining video, pictures, and audio resources. The video learning content kept the learners' attention with visuals and narration. By demonstrating the operation process through video learning content, student workers could obtain the skill set easier than just

text. The materials had a variety of resources such as graphics, videos, and audio files to keep the best quality of the video, corresponding with pictures and graphics to enhance the learners' understanding. The graphic element was created with Canva, a free graphical tool for making posters, presentations, and brochures, and it was the student workers recorded the video clips. The narration audio and pictures were recorded to provide additional resources to ensure the learner's comprehension.

Product 2 was developed with the Udutu learning management system. The product was created as an interactive module with graphics, videos, and quizzes. Product 3 used Adobe Spark, a web page with interactive buttons to provide learners with multimedia materials. The web page's functions allow students to see pictures, videos, text, and linkable buttons. The hypertext links can lead to more information.

### **Methodology for Analysis and Evaluation**

The statistics of the course survey served as a basis for evaluation. The percentage of satisfaction with learners' reactions to the module was taken into significant consideration. Student employees were surveyed after finishing the Product 1 module. The survey was conducted only for the Product 1 video module. If 80% of the student employees were satisfied with learning the technical equipment training, the project qualified as training material for the Student Union. The training should also be applied to the workplace to ensure student workers' successful use of the technical equipment without additional face-to-face training. Therefore, the survey indicated questions related to online training supportiveness as a job aid.

### **Context for Implementation**

This portfolio followed the reliable ADDIE instructional design model to implement the products based on the following criteria: (1) Analysis of student characteristics and technical

support environment for AMC student workers. In this phase, the analysis was focused on the technical features and learners' traits to design the video and multimedia materials to fit learners' needs; (2) The design phase concluded the storyboard and the video learning materials according to the objectives. This step is essential to design the text on the screen and the video's pace, segmenting the video. In the development phase, it is important to consider the technical components such as quality of audio and video elements; (3) Development of video-based products along with the outcome and required skills on the job; (4) Implementation where learners learn through multimedia materials. In this step, student employees requested to take the training course in the D2L Brightspace.; (5) The evaluation phase measured the learners' reaction and learning. The survey conducted self-assessment through the online survey. ADDIE framework applied the development of eLearning in each portfolio product.

The products were uploaded on D2L Brightspace for student employee training. The learning management system provides delivery and inventory features. Furthermore, learners can track and record their learning process. The modules were designed for training job tasks and the manner in the student union. The online training is self-paced by using D2L Brightspace. Product 1 was intended for Copies Plus employees, a copying service provided within AMC, to operate the equipment. Copies Plus is one of the service areas where students can print, copy, buy the learning materials. The operating guide video was uploaded on Microsoft Stream, one of the video-sharing platforms in Microsoft Office 365. Then, the video was shared as an embedded link in the D2L Brightspace course. By sharing the organization's video training through Microsoft Stream and D2L Brightspace, students will access their school email accounts.

Products 2 and 3 were designed for student workers employed at AMC. The learning contents were embedded as external resources in D2L Brightspace. Product 2, GoPro 6 basic

level operation tutorial, was developed with Udutu, an eLearning development tool. Access to the training course was provided as a link and embedded in D2L Brightspace. Student employees can interact with clickable buttons and graphic materials in the online module. Product 3 was made with an Adobe Spark web page, which was imported into the D2L Brightspace. Student employees can easily access learning content with previewed images in D2L Brightspace.

### **Institutional Review Board Approval**

The primary purpose of the IRB is to protect human rights and welfare related to research activities. Accordingly, the IRB must minimize the risks of research projects through sound research design and procedures for participants to not be exposed to risks. It deals with the importance of knowledge related to risk and benefit in human research subjects. Profit is a valuable outcome, and risk is defined as the risk arising from the research process and the outcome. Subjects gain information about the risks and benefits of participating in the study, obtaining informed consent. Accordingly, prior consent for the subject is documented following federal regulations and IRB policy.

In the process, provisions are in place to protect personal information and data. IRB exemption and justifications with the attributes of secondary research and a specific item of the IRB protocol. This study does not require the IRB process. Individual identity was not specified along with the learning to analyze the process. The IRB Training conducted by the Collaborative Institutional Training Initiative was passed on October 17, 2018.

### **Application of Products**

The training course for student employees has developed accessible resources in D2L Brightspace as an LMS module to deliver unlimited time and location. The modules were focused on procedural skills and declarative knowledge based on job manner and role. Product 1

was shared in D2L Brightspace embedded with Microsoft Stream as a shareable training video material among the organization. Microsoft Stream is a secured video streaming service within an organization. An organization can upload, share, and watch videos, purpose video meetings, training, and presentations. The comment function allows people to share their thoughts about the video. The organization could protect its content and share it with Microsoft Stream.

Product 2 was created with a Udutu LMS uploaded with a HyperText Markup Language (HTML) link and a web-based training display. The users could operate the links by clicking the start button. The navigation for the online module was accessible with the module itself operated with browsers such as Chrome, Microsoft Edge, or Internet Explorer. Product 3 is a web-page with learning materials focused on delivering leadership and collaboration skills learning resources.

### **Timeline**

May-June 2020

- Revised the products
- Chapters 1, 2, 3

July-August 2020

- Revised the proposal with advisor

September-October 2020

- Approval of committee members
- Preliminary meeting
- Writing Chapters 4, 5
- Evaluated the products

September-October 2021

- Revision with advisor for final project
- Scheduled for final meeting
- Final meeting with committee

November 2021

- Submitted final project

### **Summary**

This portfolio contained a variety of multimedia learning materials to train student workers in the student union. Through delivering the learning materials for achieving university and department goals and training skills set to succeed in job performance, student workers were able to prepare job skills and knowledge. Chapters four and five presented the effectiveness and evaluation of portfolio products by reflecting the products and analyzing the training survey result.

## Chapter 4: Portfolio Products

### Introduction

This portfolio seeks to create student employee training materials based on multimedia principles and cognitive learning. The instructional design framework to create an LMS module adhered to the ADDIE model. The portfolio assisted higher education institutions by providing best practices of LMS materials focused on multimedia principles and cognitive learning. LMS-based training focused on support for student employees to obtain needed skills and knowledge in their job.

The portfolio products were delivered through a learning management system, D2L Brightspace. Student employees in AMC were registered for the training course in D2L Brightspace. Students employed at the Student Union could access the training materials. Since all students use D2L Brightspace at SCSU, navigation is familiar to student employees. Student workers could review these training materials at any time or location with self-paced learning wherever they have internet access. This chapter described multimedia resource design effectiveness when incorporating them into a learning management system.

Portfolio survey data (see Appendices A, B, C) presented the effectiveness of the multimedia design. The survey questionnaires focused on course structure, content, training material, visual design, and overall online training experience. All students who attended the online training improved their understanding of training content. A reported 90.8% of students felt more confident after completing the course. According to the survey results, the materials were considered well-chunked and explained the learning content for the large laminator, GoPro 6, and job manners knowledge. The pace and quantity of the learning content to complete eLearning covered the training course appropriately.

The questionnaires regarding visual design indicated the effectiveness of multimedia principles for eLearning that enhances cognitive learning. All students agreed that visual design helped their learning. Multimedia resources appropriately selected text, font, photography, and narration for this portfolio according to survey results. D2L Brightspace provided easy access to materials. Students reported no technical issues. Students agreed to take more eLearning courses and recommend eLearning for others. Overall survey results presented a positive online learning experience for learners.

### **Description of Products**

All products were located in the AMC training and resources course in D2L Brightspace. Product 1 consisted of video-based learning material using the Microsoft Stream platform to share the training video. It was placed as an external resource on the D2L Brightspace page. Students were able to click on the link to view the video in a new window tab. Product 2 was made by Uduu eLearning software and exported as an HTML web page. This module was created with graphics, text, narration, and background music. Clicking on the title on the D2L course page directs the web-based interactive learning material. Product 2, the final product in the IM 556 assignment, one of the core courses for the Information Media graduation requirement course, was modified and applied for this portfolio. Product 2 has a menu tab feature that includes: "exit," "course map," "mute," "refresh," "previous," and "next buttons." Student workers could navigate the course at their pace. The navigation of product 2 helped students to understand the menu tab. Product 3 was created with Adobe Spark and inserted in the D2L Brightspace course page. Embedded on the D2L Brightspace course page, students could access multimedia materials by scrolling the embedded web page.



The portfolio products were applied with multimedia principles and cognitive learning in mind. Multimedia learning materials provide a variety of learning resources to maximize learners' cognitive learning. The multimedia presentation consists of words and pictures processed in learners' senses separately by ears and eyes. Learners' working memory has limited capacity for processing information. The selected learning materials can reduce overload working memory by connecting prior knowledge that considers long-term memory and working memory where the learning takes place with multimedia material. To reduce the barriers and help the learning process, the instructional designer should apply the multimedia principle that assists collaborative and supportive visual information by selecting, organizing, and integrating learning content.

### ***Product 1***

Product 1 contains job skill training material of the Copies Plus service. The step-by-step video presents guides for using a large laminator with graphics, highlighted text, and narration. This three-minute video was activated the auto-generation closed caption. Viewers could manipulate the auto-generation closed caption (CC) feature by clicking the CC button on the control bar. This CC button used the exception of the Redundancy principle based on learners' characteristics. Many nontraditional and diverse background students worked for the Student Union. The subtitles help ESL students. Keywords unfamiliar to learners were presented on the screen with narrations.

Overall, videos showed corresponding images and text on the screen representing the Contiguity principle to reduce the cognitive barriers. Videos contained narration rather than text. One of the student workers narrated the step-by-step process of using a laminator. Instead of displaying text, narration with images and video presented the following Redundancy principle.

Product 1 delivered steps of using a large laminator with the Coherence principle; the content focused on describing the process of using a large laminator. Graphics highlighted important video information. Highlighted boxes in the images were used to attract learners' attention. The description was placed at the starting point of the video to clarify and highlight the safety messages on operating the large laminator. The training video proceeded with steps of using the large laminator to present pictures with highlighted text and graphics (see screenshots of product 1 slides, Figure 3 - 5).

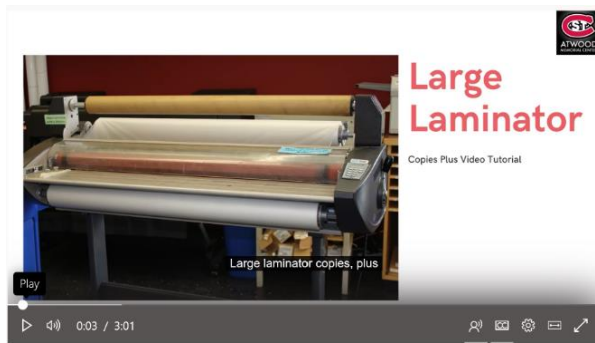
### **File 1**

*Link for the Product 1*

[https://mediaspace.minnstate.edu/media/Large+Laminator/1\\_y063w7vn](https://mediaspace.minnstate.edu/media/Large+Laminator/1_y063w7vn)

### **Figure 3**

*Screenshot of Product 1*



## Figure 4

### *Screenshot of Safety Description Product 1*



## Figure 5

### *Screenshot of Using Highlight Graphic Product 1*



## *Product 2*

Product 2 provided job skill training material to use a GoPro 6. Product2, a web-based eLearning tool, supported video, graphics, audio, and other multimedia content. The expected completion course time is approximately 20 minutes. Interactive slides contained corresponding text and images following the Spatial Contiguity principle. The narration was used for informative slides with images so that students could understand better. Narrations and images are used to promote cognitive learning. Product 2 presented four objectives. By completing the eLearning content, students could obtain GoPro 6 skills. The learning materials focused on

GoPro functions and accessories excluded any unrelated items. These slides emphasized each title of the GoPro instruction topics that related to objectives designed to contrast colored background lines and text.

Users could utilize the product's menu bar to mute, exit, map to navigate this course, refresh icons, and the buttons for previous and next pages. The content addressed GoPro 6 training objectives. The navigation and the 'tip for users' slides were designed to inform students how to use the eLearning course. Images, videos, and narrations support learners' understanding. To enhance learners' retention, interactive content and quizzes ask about GoPro 6 structures and accessories. Moreover, interactive learning improves learner satisfaction with motivation and increases attention to learning content. (see the screenshots of product 2 slides, Figure 6 - 18).

## File 2

*Link for the Product 2*

<https://publish.udutu.com/published/launch/87274/Course185508/Launch.html>

## Figure 6

*Screenshot of Product 2*



Figure 7

## Screenshot of Product 2



Figure 8

## Screenshot of Product 2

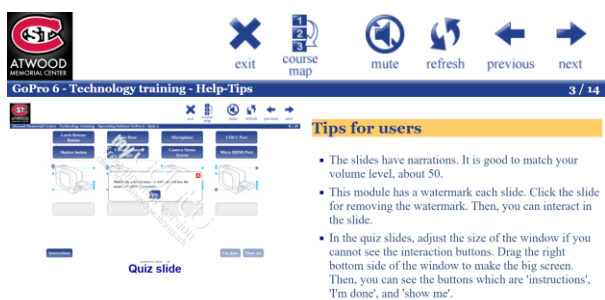


Figure 9

## Screenshot of Product 2



**Figure 10**

*Screenshot of Product 2*



**Figure 11**

*Screenshot of Product 2*



**Figure 12**

*Screenshot of Product 2*

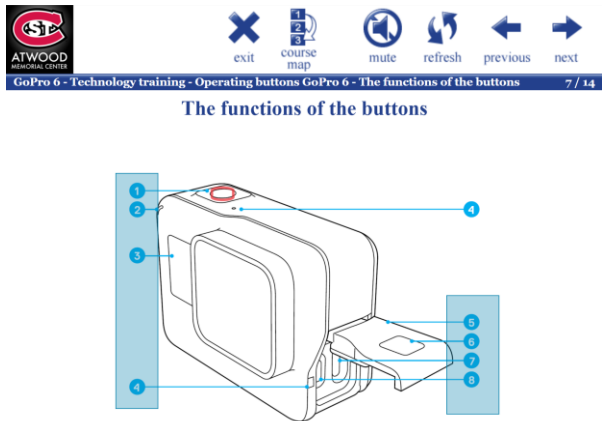


Figure 13

Screenshot of Product 2

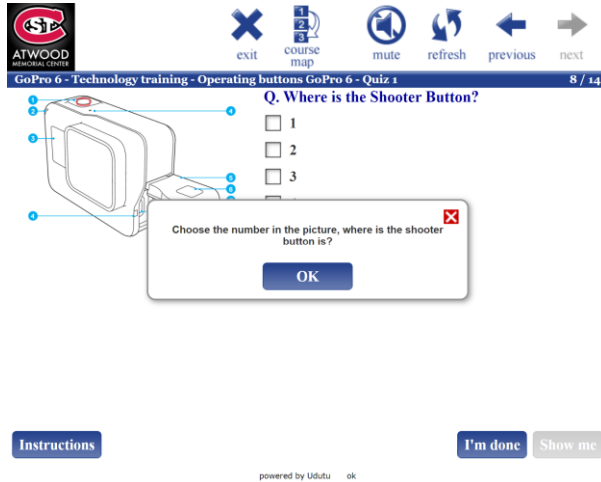


Figure 14

Screenshot of Product 2



Figure 15

Screenshot of Product 2

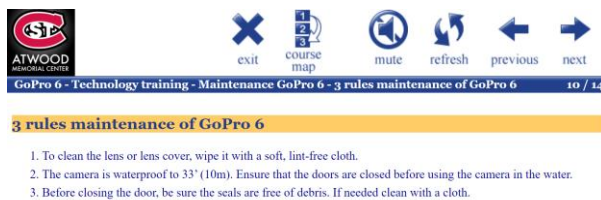


Figure 16

Screenshot of Product 2

ATWOOD MEMORIAL CENTER

exit course map mute refresh previous next

GoPro 6 - Technology training - Maintenance GoPro 6 - Quiz 11 / 14

Q. The camera is waterproof to 33' (10m). Ensure that the doors are closed before using the camera in the water.

True

False

True or False? Select the answer.

OK

Instructions I'm done Show me

Figure 17

Screenshot of Product 2

ATWOOD MEMORIAL CENTER

exit course map mute refresh previous next

GoPro 6 - Technology training - Time Lapse Video - What is Time Lapse Video? 12 / 14

Resource fair Watch later Share

Watch on YouTube

Figure 18

Screenshot of Product 2

ATWOOD MEMORIAL CENTER

exit course map mute refresh previous next

GoPro 6 - Technology training - Time Lapse Video - 5 Steps for taking Time Lapse video 13 / 14

5 Steps for the take Time Lapse video

1. Setting the camera on a tripod.
2. Change to the Time Lapse Video Mode
3. Press the top SHUTTER button to begin recording
4. The camera's red LEDs will blink to indicate that the camera is capturing footage.
5. Press the top SHUTTER button again to stop your recording



***Product 3***

Product 3 displayed a web page with learning material for enhancing employee knowledge. This web-page learning tool supported video, graphics, and text. The expected completion course time is approximately 15 minutes on the D2L Brightspace. This newsletter-style web-based material delivered a variety of content such as diversity at work, job manners, and communication skills. Students could watch an on-the-job interview with staff who share their experiences and knowledge. Text and images were located together in product 3. Two videos in the product contained narration for better understanding. Product 3 has knowledge-based training materials for student expectations during their employment at the student union. Staff and an instructional designer selected the topic that represented concise summaries on the learning platform. Title boxes and animations identified essential information on each topic.

Students were not required to click on the hyperlinks to read through the material. The product was embedded in the D2L content materials; students could read on the D2L course page or click on the link to see the material with a new window. The content was designed and selected to meet university and department goals, precisely the workplace diversity material. Every section included images and titles to help students find and highlight content. Images and videos were used for comprehension (see screenshots of product 3, Figure 19 - 23).

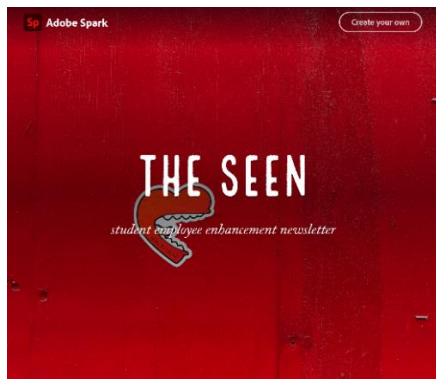
**File 3**

*Link for the Product 3*

<https://spark.adobe.com/page/xJI6onX4nvW08/>

## Figure 19

### Screenshot of Product 3



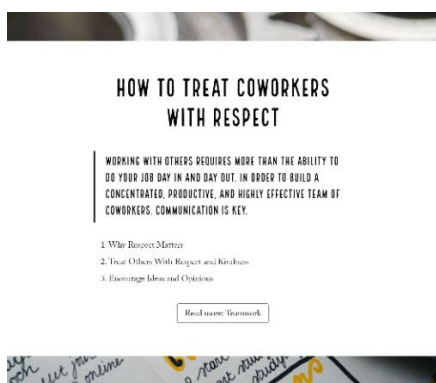
## Figure 20

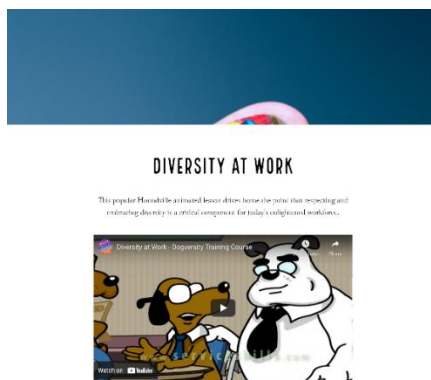
### Screenshot of Product 3



## Figure 21

### Screenshot of Product 3



**Figure 22***Screenshot of Product 3***Figure 23***Screenshot of Product 3***Description of Implementation of Products**

The products were shared in the AMC student employees training and resources D2L Brightspace. Student employees needed to log in to D2L Brightspace with their student accounts and access the content materials. Product 1 was uploaded to Microsoft Stream and shared on D2L as video-based learning material. Product 2 was created with the Uduu program and uploaded as HTML to display on the internet. Product 3 was created with Adobe Spark and shared as an external link in D2L Brightspace. All of the products are clickable and viewable through the link or buttons provided on the course page.

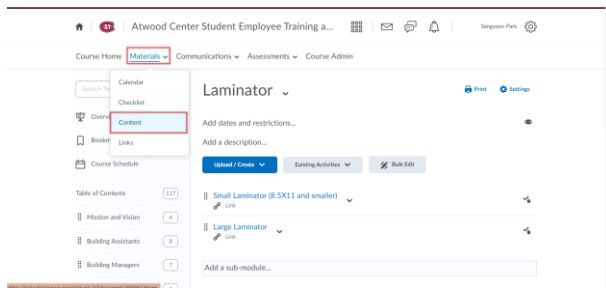
**Figure 24**

*Screenshot of Atwood Memorial Center D2L Training Module*



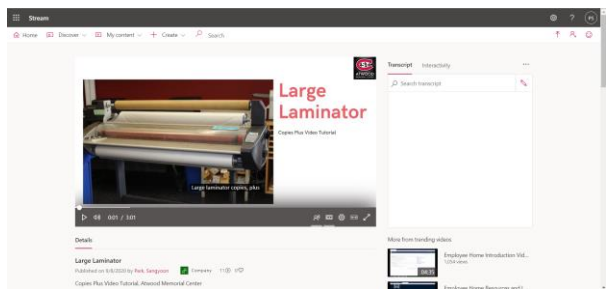
**Figure 25**

*Screenshot of a Content Section in Learning Material*



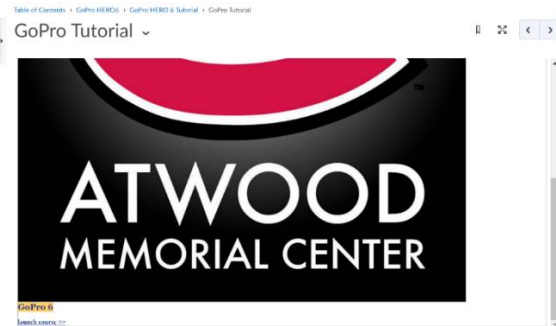
**Figure 26**

*Screenshot of Product 1 on the Course Page*

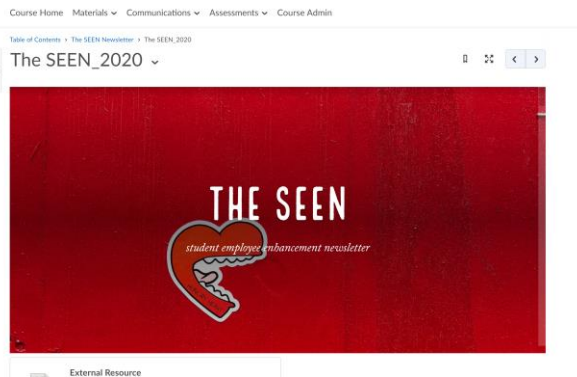


**Figure 27**

*Screenshot of Product 2 on the Course Page*

**Figure 28**

*Screenshot of Product 3 on the Course Page*



## Summary

eLearning training focused on how to help employees obtain needed skills and knowledge to improve their job performance. With multimedia content, student employees improved retention, understanding, and self-directed learning on their preference for learning materials. An accessible online environment allows students to take training at any time or location. This portfolio was the first attempt at multimedia training. The AMC training course previously offered only text-based documentation for training resources. By contributing to this portfolio, the eLearning development framework will assist a variety of multimedia learning

sources. Students will have more options to choose their learning resources and manage their training.

## **Chapter 5: Reflection**

### **Introduction**

In higher education, employment experience for student workers provides learning opportunities to prepare various job skills and manners. These portfolio products have found a way to increase positive employment experiences through online training. Higher education institutions have a vision and mission that should align with learners' academic and employment experience growth. Higher education institutions like SCSU have goals to ensure the academic and career growth of students. The student union can prepare students for their careers and to obtain the knowledge necessary in the workforce as a global citizen. Therefore, it is essential to have an effective training delivery method for the student workers.

The effectiveness of eLearning optimizes flexibility for learners to learn. Furthermore, multimedia instruction has advantages in supporting a better understanding (Ebied, 2019). Multimedia content such as video, images, and graphics provides learning options for students to explore the learning subject. This chapter presents a reflection and recommendations on products and the application and conclusions of the portfolio significance.

### **Reflection on Product as It Relates to the Theme and to the Literature Findings**

This portfolio followed the standard approach for eLearning courses with multimedia principles. The major multimedia principle of the instructional design was followed Contiguity, Redundancy, Modality, Coherence, and Signaling principles. The ADDIE design model was adapted to create the products. The analysis phase contributed to the design, development, and implementation steps by focusing on diverse background demographics, different prior knowledge, and characteristics. The design process was required to create enhancing learning materials and methods to deliver learning content. A survey was conducted to measure learners'

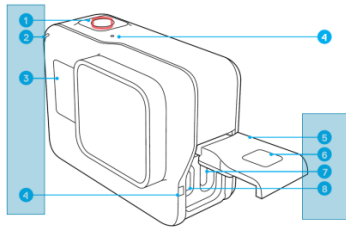
satisfaction; however, further research needs to be conducted to evaluate diversity and inclusion on eLearning design for assessing eLearning in a diverse workplace.

Product 1 represented the main product in the portfolio. It was developed explicitly for this portfolio. Video-based learning can simulate realistic learning by excluding irrelevant learning content to remove learning barriers. Applying multimedia principles for creating supportive learning materials could improve learners' problem-solving skills. Video design focused on pace, length, narration, text size, and audio to support learning. Learners' characteristics, diverse background, and nationality were reflected to exclude the Redundancy principle by incorporating auto-generation of closed caption. Applying the cognitive learning and multimedia principle to video-based learning allowed learners to better understand the content by removing the learning barriers.

### ***Contiguity Principle***

**Spatial Contiguity Principle.** Students learn better when they see text and images are corresponding and placed nearby together (Mayer, 2020). Product 1 has several slides and video clips that use text that correspond with related images and graphics. Product 2 presented corresponding text and images with interactive slides. Learners could hover over the blue box areas and see the text information of GoPro buttons and functionalities (see figure 29).



**Figure 29***Example of Spatial Contiguity Principle in Product 3*

**Temporal Contiguity Principle.** Students learn better when an image is presented with narration rather than image and text (Mayer, 2020). Product 1 has narrations for core steps of using a large laminator. Video with the text was used for displaying additional information so that the narration information could stand out as the major information from the video. Product 2 presented informative slides with narration and images. Product 3 video resources were selected to present narration and images or video for greater understanding.

***Redundancy Principle***

Narration and images with reduced text support learners' cognitive learning (Mayer 2020). Product 1 has narration following images and video clips by reducing the text, whereas Product 2 primarily used background music or narration on each slide; the background music was inserted to highlight slides such as welcome, objectives, and ending credit. Other slides contained narrations and images that promote cognitive learning.

### ***Modality Principle***

Students learn better with narration rather than multimedia with text (Mayer, 2020). Similar to the Temporal Contiguity and Redundancy principle, Products 1, 2, and 3 were selected learning content with multimedia by adding narrations.

### ***Coherence Principle***

Students learn better when the lesson excludes extraneous learning material (Mayer, 2020). Products 1, 2, and 3 were carefully selected on learning content along with the objectives of each product. Product 1 focused on delivering steps of using large laminator information by providing multimedia material. Product 2 was provided clear objectives and information with interactive content. Product 3 was selected as the learning topic with the guidance of AMC staff.

### ***Signaling Principle***

Product 1 highlighted icons, boxes, marks, and lines to bring learners' attention to a specific part of the video or images. Product 2 presented interactive learning content in GoPro 6 structure. The slides highlighted the blue boxes that show the button names when students hover over the blue box (see figure 29). Each slide title had a contrast color consisting of a yellow-colored text box and blue-colored text to highlight each objective. Product 3 highlighted images with each learning element animated on the web page when users scroll in each topic.

## **Reflection on the Overall Portfolio as it Relates to the Theme and to the Literature**

### **Findings**

This portfolio followed the ADDIE model to design an eLearning experience for learners. Analyzing learners' characteristics assisted in developing a learner-friendly learning environment for student workers in AMC. Utilizing D2L features, such as embedding multimedia resources, was essential for sharing the video and multimedia materials. The design of products focused on

storyboarding according to the D2L platform and the coordination of other software programs such as Microsoft Stream, Udutu, and Adobe Spark, designing the multimedia resources with multimedia principles sought to maximize learners' understanding. In the development phase, technical components such as the quality of audio and video elements were considered.

Collaborating with AMC student employee supervisors was crucial in developing the AMC goals and required skills on the job. Moreover, in the implementation phase, student employees enrolled the eLearning training course in the D2L. For the evaluation phase, the online survey was conducted as a self-assessment that measured learners' reactions in eLearning.

The online survey (see Appendix B and C for more information) was conducted by 11 students, and its results show improvement in students' understanding. All students (100%) marked agree or strongly agree on content understanding. Most of the students (90.8%) agreed on feeling more confident after completing the eLearning. The training was enjoyable, well-chunked, and at an appropriate pace for learners. The D2L platform supported easy access to learning materials explaining job knowledge, skills, and concept with multimedia. All students agreed on the efficiency and clarity of training material design. The eLearning designed clear text, narrations, and beneficial images. Based on students who conducted the survey, overall training technical feature experience was stable, with no errors or learning platform access issues. Most students (96.4%) would like to recommend the eLearning training to peers or coworkers. The comments on the training material were positive regarding the content organization, multimedia materials, and appropriate pace (See Appendix C).

### **Recommendations for Application**

The job skills in AMC training resources should provide multimedia learning materials. The results indicated that student employees prefer multimedia resources to text alone.

Furthermore, it is recommended to update text-based training resources to multimedia content. Products 1 and 2 are good examples of job skills and knowledge training, whereas product 3 material focused more on informative and knowledge-based learning. It would be ideal for publishing the content at least once a month to deliver the latest and useful learning content for student workers. Visual design that follows Contiguity, Redundancy, Modality, Coherence, and Signaling principles are recommended to create eLearning modules.

### **Recommendations for Additional Products**

Building eLearning according to the ADDIE framework provided meaningful results to the institution. The ADDIE designing process offers precise direction to establish eLearning training that suits the organization. Analysis of all learners' preferences suggests a general preference for visualized learning content. Including auto-generation caption with video-based learning supports learning for students who speak English as a second language, as presented in Product 1. Furthermore, video-based learning has the advantage of providing realistic visual components in the online learning environment. Video-based learning that follows multimedia principle design enhances learners' retention and understanding.

Over 90% of students agreed on the effectiveness of eLearning training. eLearning components with a variety of multimedia resources improved learners' understanding. AMC student employees agreed that the accessible eLearning and learning management system setup is easy to navigate. eLearning content should be well-chunked to support learners' learning process and completion. Product 2 provided interactive learning content consisting of knowledge and practices on each slide. Each knowledge slide followed with practice questions to promote retention. Product 3 presented job knowledge on a web-page that included topics and images for

students to interact with. Providing multimedia eLearning created expanded learning opportunities for students with self-paced learning and enhanced comprehension.

### **Conclusions and Significance**

To promote the best training and learning experience, it is recommended to analyze the audience and find their characteristics to improve the learning process. The analysis should hence focus on the learning environment and the learner's characteristics. Designing multimedia materials can create a self-directed learning environment where learners can choose their learning path. Modules applied multimedia principles to help each learner's cognitive learning process. Selecting effective delivery methods and incorporating interactive learning materials is significant in eLearning. Preparing a learning management system would be recommended before choosing the learning material platform for development.

Through online surveys, instructional designers can get direct feedback from subject matter experts and learners. The results of the survey could also improve eLearning by obtaining constructive feedback with open-ended questions. According to survey results, eLearning for student employees at AMC, with more than 90% of student employees finding the eLearning materials useful. Student employees answered with 100% agreement to take another eLearning course for their training. The results suggested that learners are ready for multimedia learning and acknowledge its effectiveness.

## References

- Almaiah, M. A., Al-Khasawneh, A., & Althunibat, A. (2020). Exploring the critical challenges and factors influencing the e-learning system usage during COVID-19 pandemic. *Education and Information Technologies*, 25, 5261-5280  
<https://doi.org/10.1007/s10639-020-10219-y>
- Almelhi, A. M. (2021). Effectiveness of the ADDIE model within an e-learning environment in developing creative writing in EFL students. *English Language Teaching*, 14(2), 20–36.  
<https://eric.ed.gov/?id=EJ1284437>
- Antal, H., Bunnell, H., McCahan, S., Pennington, C., Wysocki, T., & Blake, K. (2017). A cognitive approach for design of a multimedia informed consent video and website in pediatric research. *Journal of Biomedical Informatics*, 66, 248–258.  
<https://doi.org/10.1016/j.jbi.2017.01.011>
- Bąkała, A., & Bąkała, M. (2020). E-learning course design in ADDIE methodology as a process in BPMN 2.0. *Informatyka Ekonomiczna*, 4 (58), 21–32.  
<http://cejsh.icm.edu.pl/cejsh/element/bwmeta1.element.desklight-b22b763e-6c27-4598-ac7a-758528cb1c0a>
- Budoya, C., Kissake, M., & Mtebe, J. (2019). Instructional design enabled agile method using ADDIE model and feature driven development method. *International Journal of Education and Development using Information and Communication Technology*, 15(1), 35-54. <https://eric.ed.gov/?id=EJ1214264>
- Carter, Jr, R., Rice, M., Yang, S., & Jackson, H. (2020). Self-regulated learning in online learning environments: strategies for remote learning. *Information and Learning Sciences* 121(5/6), 321-329, <https://doi.org/10.1108/ILS-04-2020-0114>

- Dai, Y., & Liu, A. (2019). Understanding student variances in learning outcomes and task interpretations from multimedia presentations. *British Journal of Educational Technology*, 50(5), 2685-2702. <https://doi.org/10.1111/bjet.12715>
- Ebied, M. (2019). The effectiveness of an educational program based on cognitive load theory in developing multimedia production skills at general diploma in education in Najran university. *Journal of Educational Multimedia and Hypermedia*, 28(3), 265–286. <http://www.learntechlib.org/p/182098/>
- Kalyanasundaram, P., & Madhavi, D. C. (2020). Students' perception on e-learning with regard to online value added courses. *International Journal of Management (IJM)*, 11(3), 89-96. [https://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=3568373](https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3568373)
- Karthik, B. S. S., Chandrasekhar, B. B., David, R., & Kumar, A. K. (2019). Identification of instructional design strategies for an effective e-learning experience. *The Qualitative Report*, 24(7), 1537-1555. <https://doi.org/10.46743/2160-3715/2019.3870>
- Klepsch, M., & Seufert, T. (2020). Understanding instructional design effects by differentiated measurement of intrinsic, extraneous, and germane cognitive load. *Instructional Science*. 48, 45-77. <https://doi.org/10.1007/s11251-020-09502-9>
- Koć-Januchta, M. M., Höffler, T. N., Eckhardt, M., & Leutner, D. (2019). Does modality play a role? Visual-verbal cognitive style and multimedia learning. *Journal of Computer Assisted Learning*, 35(6), 747–757. <https://doi.org/10.1111/jcal.12381>
- Mayer, R. E. (2018). Designing multimedia instruction in anatomy: An evidence-based approach. *Clinical Anatomy*. 32, 2-11. <https://doi.org/10.1002/ca.23265>
- Mayer, R. E. (2018). Thirty years of research on online learning. *Applied Cognitive Psychology*, 33(2), 152–159. <https://doi.org/10.1002/acp.3482>

- Mayer, R. E. (2019). How multimedia can improve learning and instruction. *Cambridge University Press*. 460-479. <https://doi.org/10.1017/9781108235631.019>
- Mayer, R. E. (2021). Evidence-based principles for how to design effective instructional videos. *Journal of Applied Research in Memory and Cognition*, 10(2), 229–240. <https://doi.org/10.1016/j.jarmac.2021.03.007>
- Millard, L., Hollins, N., & Sharman, R. (2020). Students as colleagues: creating belonging and confidence through employment on campus. *Staff and Educational Development Association (SEDA)*, 17-19. [https://rke.abertay.ac.uk/ws/files/31742596/Millard\\_StudentsAsColleagues\\_Accepted\\_2020.pdf](https://rke.abertay.ac.uk/ws/files/31742596/Millard_StudentsAsColleagues_Accepted_2020.pdf)
- Mingyue, F., Krampah-Nkoom, A., Manu, B. D., & Oduro, D. (2020). Evaluating the Effects of Online Training on Employee Self-efficacy. A Dilemma from the Banking Industry in Ghana. *Journal of Arts and Humanities*, 9(2), 01-16. <https://doi.org/10.18533/journal.v9i2.1832>
- Moreno-Tenas, A., León-Zarceño, E., & Serrano-Rosa, M. A. (2021). The Use of Online Training Tools in Competition Cyclists During COVID-19 Confinement in Spain. *Frontiers in Psychology*, 12. <https://doi.org/10.3389/fpsyg.2021.622905>
- Mukhtar, K., Javed, K., Arooj, M., & Sethi, A. (2020). Advantages, limitations and recommendations for online learning during COVID-19 pandemic era. *Pakistan Journal of Medical Sciences*, 36(COVID19-S4). <https://doi.org/10.12669/pjms.36.covid19-s4.2785>



- Mutlu-Bayraktar, D., Cosgun, V., & Altan, T. (2019). Cognitive load in multimedia learning environments: A systematic review. *Computers & Education, 141*, 103618.  
<https://doi.org/10.1016/j.compedu.2019.103618>
- Nadeak, B., & Naibaho, L. (2020). Video-based learning on improving students' learning output. *Journal of Archaralogy of Egypt/Egyptogy, 17*(2), 44–54.  
<https://doi.org/10.48080/jae.v17i2.25>
- Quinn, J., & Darby, F. (2021). The learner-centered instructional designer: purposes, processes, and practicalities of creating online courses in higher education. *Stylus Publishing, Llc.*
- Radović, S., Hummel, H. G. K., & Vermeulen, M. (2021). The mARC instructional design model for more experiential learning in higher education: theoretical foundations and practical guidelines. *Teaching in Higher Education, 1–18.*  
<https://doi.org/10.1080/13562517.2021.1872527>
- Reyes, R. C., & Quiróz, J. S. (2020). From face-to-face to virtual, a model for the use of online training in times of Covid-19. *Educar Em Revista, 36.*  
<https://doi.org/10.1590/0104-4060.76140>
- Septiani, A. N. S. I., Rejekiningsih, T., Triyanto, & Rusnaini. (2020). Development of interactive multimedia learning courseware to strengthen students' character. *European Journal of Educational Research, 9*(3), 1267–1280. <https://eric.ed.gov/?id=EJ1262371>
- Sufirmansyah, S., Prameswati, L. N., Wati, D. T., & Sulistyowati, E. (2021). Student's preferences in using video-based learning applications and its efficiency in higher education. *Nazhruna: Jurnal Pendidikan Islam, 4*(2), 272–283.  
<https://doi.org/10.31538/nzh.v4i2.1474>

Van Der Meij, H., & Dunkel, P. (2020). Effects of a review video and practice in video-based statistics training. *Computers & Education*, 143, 103665

<https://doi.org/10.1016/j.compedu.2019.103665>

Wang, C., Fang, T., & Gu, Y. (2020). Learning performance and behavioral patterns of online collaborative learning: Impact of cognitive load and affordances of different multimedia. *Computers & Education*, 143, 103683.

<https://doi.org/10.1016/j.compedu.2019.103683>

## Appendix A

### Atwood Memorial Center Online Training Survey Questions

The purpose of this survey is to receive recommendations for improvement from online training.

The results of this survey will show us insights into how we can provide you with online training for Atwood Memorial Center. The survey will take you approximately 5 minutes to complete.

The response will remain completely anonymous. Thank you for taking the time to respond.

1. Please rate about course structure and content.

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
My understanding of the training content improved.					
My confidence level for completing the knowledge or skill is higher after completing the course.					
The amount of material covered appropriately.					
I enjoyed the training.					
The content adequately explains the knowledge, skills, and concepts.					

The amount of time to complete this training is appropriate.					
The pace at which the eLearning training advanced is appropriate.					
The eLearning access setup or LMS setup is easy to follow.					

2. Please rate the training material about visual design.

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
The overall visual design of the course content and materials is helpful understanding.					
The legibility of the text and fonts in this course is advanced.					
The quality of the photography used in the course is beneficial.					

The amount of narration used in the course is appropriate.					
The amount of multimedia used in the course is appropriate.					

3. Please rate overall the experience with online training.

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
The technical feature of the course materials is stable.					
Based on this experience, would you take another e-learning course?					

4. Additional comments on the training course?

5. Based on your experience how much rate on online training recommendation to your peers or coworkers?

## Appendix B

### Survey Result of AMC Training

The survey is anonymous, 11 students answered.



### **Appendix C**

#### Online Survey Additional Comments on the Training Course.

The survey is anonymous, 7 students answered additional comments on the training course.

'Very well organized. Easy to understand and not overwhelming'

'Audio sounded a little weird, but I could still understand what was being said, so it was fine.'

'I really appreciated the videos showing how rather than just a text telling us how. Seeing helps out a ton.'

'The training is short and informative. It is a good way to recall and see a specific duty which is doubtful, especially for new hires.'

'Well explained.'