



CALIFORNIA STATE UNIVERSITY  
MONTEREY BAY

**Writing Instruction for Computer Science Majors**

CAPSTONE REPORT

Submitted in partial satisfaction of requirements of the degree of

MASTER OF SCIENCE in

Instructional Science and Technology

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## **Executive Summary**

Students entering university from high school, or transferring from community colleges, do not necessarily have appropriate academic writing skills for university campuses. This is especially true for the students coming into Computer Science (CS) programs at California State University, Monterey Bay (CSUMB). Where faculty recognize the need for further academic writing instruction.

This capstone project offers seven instructional and interactive practice sections for a minimum of an hour of instructional training, regarding the academic writing process using the American Psychology Association seventh edition (APA 7th) standard. This training is for new and returning undergraduate or graduate students majoring in the computer sciences.

Learners are first presented with an introduction and offered learning objectives, then tasked with taking a prerequisite assessment to evaluate their current knowledge. The learners review the writing process, first with prewriting tools to help organize ideas for their documents. Then, begin instruction on writing a topic sentence, the origin of the paragraph structure.

Using Gagne's Nine Events of instruction as the basis for creating this project; each section was created with brief interactive instructions and practice elements available for the learner to experience the content. Each section includes knowledge checks to identify what information they recall from the previous instruction and practice activity. Further, they encounter the appropriate usage of the American Psychological Association (APA) writing format, including the use of writing proper citations and methods to proofread their documents appropriately. Thereafter, the learners access a

post-requisite assessment to assess their acquired knowledge after completing the training.

Gagne's Nine Events was the basis for creating this project; because, first I wanted to gain the attention of the learners. Once learners approach the training, it is immediately brought to their attention, that writing effectively takes practice, like any other skill or favorite hobby.

## **Introduction/Background**

### **Background on Project**

According to learner assessments by the faculty. Third-year students, entering the Computer Science (CS) program at California State University, Monterey Bay (CSUMB), are recognized for difficulty with the basics of academic writing. Their difficulty consisted of not developing the proper structure of an academic paragraph. In addition to not properly quoting or citing their sources, while using the American Psychological Association standards.

Dr. Sarah Evanick, professor in the Masters of Instructional Science and Technology (MIST) graduate program, and my project advisor offered the opportunity to develop this training due to some writing accomplishments early in the graduate program. In addition, to having a Humanities undergraduate degree, both from California State University, Monterey Bay (CSUMB).

Dr. Ryan Eller, Computer Science faculty, and Subject-Matter Expert (SME), who, in addition to others, instructs the CST 300 introductory Pro-Seminar courses. They are the faculty who have recognized their students that require additional

instruction with academic writing; especially when using the American Psychological Association (APA) standards.

Similarly, to the CS students, as informed by Dr. Eller, my experience with academic writing is relative; because it was a significant amount of time before my writing skills evolved. Therefore, I understand the pressures of writing at the collegiate level.

Although, had it not been for my experience in the creative writing program, my writing might not have improved. With the development of this training, I want to encourage these learners to continue practicing. Because, while it may seem difficult now, to write. It will only become better, the more the learner practices.

### **Problem Description**

To support the effective learning of academic writing with Computer Science students, on the California State University, Monterey Bay campus. Professors in the Computer Science department offer a writing-lab course in conjunction with a Pro-Seminar course, called CST 300, offer students the ability to discover academic, personal, professional, and social goals (*CST 300 – Major Pro-seminar, 2023*).

The professors of the CST 300 course determined the need for additional instruction in academic writing, especially using the American Psychology Association (APA) standard; because many students have difficulty with the process even though they have some previous experience. The lessons presented to learners is through an asynchronous training module embedded in the campus learning management system as an extension to in-classroom, or asynchronous coursework requirements, and to supplement content provided by the in-classroom instruction.

## **Target Audience and Context**

The primary target audience is third-year Upper Division Computer Science students, at California State University, Monterey Bay (CSUMB). According to faculty, their students range from their early twenties to approximately mid-forties who are relatively new to the computer science field. As such, many come ill-prepared for academic writing requirements established by the coursework and the California State University system. Even though these students passed required writing courses to achieve the next level of instruction. In addition, a secondary target audience with graduate level students in the computer sciences will also participate to advance their skills with academic writing, as indicated by Dr. Sarah Evanick, Faculty of the Masters of Instruction Science and Technology program (MIST).

## **Literature Review**

Academic writing is important in higher education institutions, and is a fundamental skill, as stated by Graham (2019). The basic purpose of academic writing, “is that it is used to either present information, or transmit ideas as efficiently and economically as possible.” This means the writing must be concise, and structured to carry those essential ideas, (Johnson, 2016, p. 3).

This does not mean, though, that academic writing cannot tell a story. “A strong thesis or paper has a story-like flow, with a sequence of concepts building from a foundation of knowledge assumed to be common to all readers up to new ideas and results,” (Zobel, 2014, p. 5).

Academic writing does not have to be a daunting task if the methodology is followed. Similarly, to many things in the computer sciences, academic writing is an

effectively messy process that must be practiced to improve and takes place over time. The writer must “think, plan, struggle, revise, rewrite, and mess about to discover exactly what they want to say, and how to say it,” (Johnson, 2016, p. 4).

The messing about includes figuring out how to connect ideas to make a sound rationalization to their topic, perhaps with using prewriting tools like a webbing structure to make those connections. To further this, asking crucial questions about the topic and ideas assists with the webbing, as does some necessary free writing to explore those ideas in paragraph form (Johnson, 2016).

This training provided necessary tools to improve a learner's academic writing skills. In addition, I hope it will help to alleviate some mental anguish when it comes to learning how to write effectively using the American Psychological Association standard, seventh edition.

## **Solution Description**

### **Goals of the Project**

This asynchronous training was designed to support in-classroom instruction for the faculty of the CST 300 Pro-Seminar and Writing Lab courses in the Computer Science department. It provided students the necessary information to advance their requisite knowledge of academic writing using the American Psychological Association (APA) standard, at California State University, Monterey Bay (CSUMB).

### **Learning Objectives**

- Learners will be able to list three tools to use in preparation for an academic writing assignment.

- Learners will be able to identify the components of a topic sentence.
- Learners will be able to distinguish the types of resources to support the thesis statement.
- Learners will be able to define and apply the different types of citations using the American Psychological Association (APA) standard, 7th Edition.
- Learners will be able to identify effective tools for proofreading their documents.
- Learners will be able to properly format an American Psychological Association (APA) structured document, while using an outline as a template.

### **Solution to Fill the Gap**

Students taking the upper division prerequisite course for the Computer Science major; Computer Science 300 (CST 300), Pro-Seminar, often come ill-prepared for academic writing assignments. They especially come without knowing the proper usage of the American Psychological Association (APA) standard, currently in its seventh edition.

The faculty teaching these courses realized a need for an alternative solution to improve student's academic writing ability. Therefore, this training provides the supplemental support for in-classroom, or asynchronous courses to provide the opportunity for learning effective writing skills. In conjunction to their coursework which is designed for long-term use beyond graduation.

Included in the training is access through the campus learning management system, Canvas. Each training section includes an introduction video with interactive instructional features regarding individual topics, and practice activities allowing the learner to develop familiarity with each writing specification.

The training was developed using the authoring tool, Articulate 360. With the tools programming, is Rise 360, an HTML web authoring tool that integrated interactive elements using Storyline 360, a slide-based tool. Further, included were audio narration and textual content used to facilitate instruction and provide practice activities throughout the design processes.

Learners participate with interactive learning components, in addition to practice activities. Further, the learner engages with knowledge checks after each experience. These knowledge checks coordinate with the prerequisite and post-requisite assessments that were created in Google Forms, and include ten questions that pertained to the learning material.

The learners access the content through the CSU campus learning management system, Canvas, using either a tablet, laptop, or desktop. The operating system that is best to use is a Microsoft Windows operating system and OS 10 or 11, or current Android OS.

**Note:** While a learner may be able to access the LMS system with a Mac OS laptop, computer, or iPad. Some discrepancy may occur when viewing, or interacting with the interactive content. Articulate Rise 360, with Storyline 360 integrations, may not be entirely accessible to their device. Therefore, it may be ideal if a learner could find access to a Windows OS, or Android device to experience the content properly.

**Addendum:** Articulate 360 recently updated their system which ameliorated the discrepancies first indicated regarding Apple MacOS and IOS devices.

## **Learning Theories, Instructional Principles**

### ***Behaviorism***

To gain the most reward out of the training experience, learners must follow directions. The experience is highlighted through audio, video, and textual components for the learner to engage, interact, and follow the processes of learning effective academic writing skills.

- For example, the use of a prewriting tool demonstrates how to organize their thoughts about writing a subject of interest, and by drawing connections between points or ideas. Additionally, positive feedback is offered with encouragement to continue long after completing each lesson and practice activity.

### ***Cognitivism***

There are several reflections of a cognitive approach.

- A learner engages with a small part of each lesson as part of a stepped process.
  - For instance, each lesson topic has four small sections or content blocks for the learner to engage with. Thus, allowing for the processing of the content in small doses, or chunks.
  - During each lesson, the learner will immediately gain feedback.
    - After engaging with the interactive practice section and knowledge checks, the learner presses a button and feedback is immediately returned.

### ***Constructivism***

The primary constructivist approach in this training is that learners must apply what they have learned through active practice within the lesson.

- For example, when it comes to defining what a topic sentence is, the learner must apply the concepts and attempt to write a topic sentence.

## **Learning Strategies and Justification**

### ***Gagné's Nine Events of Instruction***

- **Gain Attention:** In the first module, the learners will be introduced to “Eve,” their personalized learning experience guide, who is there to provide direction. Support, encouragement, and feedback throughout the module.
- **Learning Objectives:** The objectives are provided to direct what knowledge and experiences the learners will participate with for learning the associated concepts.
- **Stimulating Recall:** Recall is stimulated throughout the module with interactive lessons and practice activities that also include points of reference where they can look for additional information on their own.
- **Present the Content:** Content is presented through a stepped process, with lessons that are designed for the learner to engage and interact with to develop knowledge of the academic writing process.
- **Provide Learning Guidance:** The training guide, “Eve,” provides guidance, feedback, and encouragement throughout the training to direct the learner’s attention within the content. Additional guidance comes outside the training, interacting with fellow students and faculty, providing answers to questions while offering support.
- **Eliciting Performance (Practice):** Learners are instructed to interact and practice with the content. If they do not, they will not succeed, nor will they be

able to demonstrate what knowledge they have acquired from the experience by the time they reach the post-requisite assessment.

- **Provide Feedback:** Each section includes instructional and practice elements, including knowledge checks that immediately provide feedback through “Eve,” the training guide. Additional feedback comes when they interact with peers and instructors outside the module with their assignments.
- **Assess Performance:** Formative and summative assessments are utilized to assess overall performance. The former is used to discover what they already know, or what they recall from previous experiences, and a post-requisite assessment informs the knowledge the learner has acquired after experiencing the training.
- **Enhance Retention & Transfer:** With continuous practice activities relating to writing academically, in the classroom, or asynchronously, learners will retain and transfer the knowledge acquired from the training that they will use long after course completion.

Gagne’s Nine Events of Instruction was used because it was developed based on prior knowledge, (Kurt, 2020). This nuance is exemplified by the target audience whose ages have a broad range from early adulthood to middle age, and that they have some prior knowledge of academic writing.

### **Task Analysis**

Learners access the training through an asynchronous web URL link, installed either as a SCORM package or direct web link within a learning management system, or through a direct web link from an email or other virtual internet access point

depending on faculty or institutional practices. Each section was formatted similarly and included four components; an introductory video, interactive instruction, interactive practice, and interactive knowledge check. Therefore, the training content is sectioned by topic in one complete course application (See [Appendix A](#)). However, a learner can access a single section as required, after pressing the start button. (See [Appendix B](#)).

### **Media Components**

All project installations were created using Articulate Rise 360, with Storyline 360 interactive integrations, as content blocks. These components were created to make uploading into a learning management system a streamlined process either through a SCORM package (Sharable Content Object Reference Model) or web URL link. Either of these can also be integrated into a website as necessary.

This application was primarily used, because it offered robust accessibility features, providing a homogenous foundation for the author to use with her limited visual ability. These features provided the ability to include large text San-serif fonts that include text transcripts, audio/voiceover integrations, color contrast, background images, and captioned videos.

The Storyline integrations were created in an individual slide format, using sourced content from Adobe Creative Cloud, and design features in Articulate Storyline 360. These design features include using interactive text boxes (See [Appendix E](#)) for learners to practice writing certain elements tasked to them regarding various topics with button triggers to receive feedback throughout the entire process.

This design also included captioned videos, that included the introduction to the topic content and were created using Camtasia. With Camtasia, similar model images

from Adobe Creative Cloud were integrated to guide the learner (See [Appendix E](#)). Further, they included sourced background music to hold learner focus.

After producing the videos, they were rendered through the campus Panopto application that has a built-in caption feature. Along with the captions were text transcripts (See [Appendix G](#)) written in Microsoft Word, and published in Adobe Acrobat, and shared through Adobe Cloud links for individuals to download as necessary. Panopto was used because it is native to the campus just as this design product will be. However, if future iterations occur, then the videos will be published in YouTube, which has similar built-in caption features, unless otherwise transcribed.

In the initial design prototype, there were known functional discrepancies using Apple/Mac/iOS devices with Articulate Storyline features, however, with recent software and application updates these performance and function discrepancies were ameliorated. With this evaluation, it is the hope that functionality for learners using Apple products do not have the same prior issues.

### **Challenges / Breakthroughs**

In the weeks before completing the final sections of the project in Articulate Rise 360, using Storyline 360 interactions, the parent company Articulate made software updates that appeared at first to assist in making the product design more visually appealing to learners. The application added the ability to import background images, which decidedly overwhelmed the design in progress. It was better to use contrasting colors, instead of background images to make the product less distracting, even though the images may have provided more visual interest.

In addition, Adobe also updated and added new software in Adobe Creative Cloud, which the author discovered when sourcing images for the project. They had amassed a large amount of stock images only to discover the folder created in Adobe Images had disappeared. The missing files were soon located in their account under *License History*.

Design challenges appeared when making attempts to structure certain interactive Storyline 360 features. Some did not initially function the way I required. The difficulty was not being able to locate virtual documentation or instructions to amend the processes myself, and therefore sought assistance where needed when these events appeared.

## **Methods/Procedures**

### **Design/Development Narrative**

During the initial development Dr. Eller and I discussed the type of software application to use for the project. He mentioned using an older version of a design software that was not visually accessible to me, which is when introduced the Articulate 360 authoring tools.

I provided a demonstration of Articulate Rise 360 with content I created for a course in the IST program. He liked the overall appearance, then, I suggested that because our learners were computer science majors, that their viewing of the training would perhaps be more effective if the design appeared to look like a website, rather than a series of slides.

The next part of the discussion was the use of videos to assist with promoting the learner experience. I quickly discovered that curating videos to cover every topic in the training would be too much for the project timeline, and that to have videos be a part of the project, I had to create them. Which I did using Camtasia, with sourced model images as the training guide from Adobe Stock Images, writing transcripts for voiceover recordings and sourced background music (See [Appendix H](#)).

## Navigation

Articulate Rise 360, has a vertical scroll like a website, but can integrate slides from Storyline 360 to create interactive content (See [Appendix E](#)). The interactive features in this project include button and hover functions, in addition to interactive text boxes where a learner writes text, then presses a submit button for learner feedback. Some instructional content features a process interaction, or image carousels with text that have button functions and a horizontal flow (See [Figure 1](#)).

*Figure 1 - Interactive Process*

The following process outlines the paragraph structure.

Please complete this section before moving on to the next.

**Introduction**

the place where people go after they use  
**paragraph** /'pærəgrɑːf/  
 a group of lines of writing  
 ways begins on a new li  
**parallel** /'pærəlel/  
 Parallel lines are straight  
 lines that are the same distance

As mentioned above, **a paragraph comes in three parts**, beginning with introducing your ideas or claims about your topic. This introductory section typically **includes your topic sentence with your controlling idea that leads to providing information while developing your thesis statement**. The thesis statement will be explained further in the lesson following.

START >

## Training Components

Section 1: Introduction & prerequisite assessment	Section 7: Citations, Quotes, & Paraphrasing
Section 2: Prewriting tools	Section 8: Proofreading tools
Section 3: Creating an outline	Section 9: Post-requisite Assessment
Section 4: Topic Sentence	Section 10: Post Course Survey
Section 5: Paragraph Structure	Section 11: References (with APA Reference Page)
Section 6: Thesis Statement	

## Steps to Complete Project

At completion of the project, three additional sections were added to fulfill the SME Dr. Eller's need. A fourth was eliminated due to time constraints. In the development of this project, it was determined that a usability test is warranted, considering the design and functionality of the original prototype.

The initial prototype evaluation was performed using graduate level students who were a part of the target audience, although not the primary target. It was their perspective that led to the completion of prototype updates and the three remaining sections to further fit SME criteria. After finalizing the remaining sections, the product was deployed to the primary target audience asynchronously under faculty review.

## Resources

The following table identifies the multimedia resources used to cultivate and execute the project. Access to these resources came from either campus student access programs, like Adobe Creative Cloud, and TechSmith's Camtasia, while others were used at the discretion of the designer.

<b>Deliverables</b>	<b>Duration/Time</b>	<b>Status</b>	<b>Comments</b>
<b>Training Section Design</b>  Adding content blocks per prototype topic, then completing the project.	Due May 2023	Finalized November 2023	Developed using Articulate Rise 360. Adding content blocks for each section to upload media as it was produced, or available.
<b>Topic Videos</b>	Due October 2023	Completed November 2023	Camtasia videos that include topic scripts and narration, image, and sound recording.
<b>Interactive Practice Components</b>	Due October 2023	Completed November 2023	Storyline 360 interaction Approximately three per section depending on the topic. Includes Practice & knowledge check sections
<b>Documentation</b>	Due October 2023	Completed November 2023	Creating transcripts for videos and voice instructions to make them Accessible and Sharable Documents
<b>Assessment Pre- &amp; Post - Google Forms</b>	Due October 2023	Completed November 2023  Issued asynchronously	Forms were updated to include the current design format. Each having ten questions

<b>Usability Survey</b>	Due October 2023	Completed November 2023 Issued asynchronously	One device question, 10 feature satisfaction questions.
Learning Management System – Canvas Application	Due November 2023	Completed November 2023	SCORM Package Creation & Upload, or GitHub Generated Weblink URL

### Technical Skills Required

The technical skills required to complete the training development occurred throughout the MIST program and included the development of multimedia skills learned in IST 501, 531, and 526 with Mr. Beem and Dr. Lara. Included in the instruction were skills learned using the authoring tool Articulate 360 with Rise 360 and Storyline 360, and Camtasia video production and editing (See [Appendix H](#)).

The training course sections required editing the original prototype to include the addition of accessible content to every component. It also required making sure to align the content to necessary learning strategies. Further, the revision of the prerequisite and post-requisite assessment and usability survey tools was learned in IST 622 with Dr. Su (See [Appendices D](#) and [E](#)). All to include new content to fulfill the one-hour duration of course content.

## Timeline/Progress Report

### Milestone Checklist

The table below offers a timeline of each completed section of the training. Each section included an introductory video, an interactive instruction component, an interactive practice activity and an interactive knowledge check. Additional linked research resources are embedded within each section for learners to access any content they would like to have more clarity on.

<b>Deliverables</b>	<b>Schedule</b>	<b>Status</b>
<b>Module</b>		
1 – Introduction & Pre-Assessment	Feb – Jul 2023	Completed
2 – prewriting tools	Feb – May 2023	Completed
3 – Outline	Aug – Nov 2023	Completed - October
4 – Topic Sentence	Feb – May 2023	Completed
5 – Paragraph Structure	Feb – May 2023	Completed
6 – Thesis Statement	Feb – May 2023	Completed
7 – Citations	Sept – Nov 2023	Completed - November
8 – Proofreading	Sept – Nov 2023	Completed - November
9 – Types of Resources	November 2023	Eliminated
10 – Post Assessment	July 2023	Completed
11 – Post Course Survey	July 2023	Completed
12 – Reference page	November 2023	Completed

## **Evaluation and Testing Report**

### **Formative Evaluation**

Formative evaluation occurred throughout project development and included periodic review with the Subject Matter Expert Computer Science faculty and CST 300

Course Professor, Dr. Ryan Eller. Who reported that the direction of the project was satisfactory for his learner and course needs.

Once the project was ultimately deployed learners were to engaged with the content and provided feedback about their experience. This included the assessment of how they navigated through it and whether they thought it was beneficial to learning.

During the evaluation period, learners engaged the material asynchronously instructional devices and activities through interactive button. These features allowed learners the opportunity to continually practice throughout the training.

At completion learner review was mixed. Some thought it was easy to navigate and liked the interactive activities. While others seemed confused by the process and design development.

### ***Usability Testing***

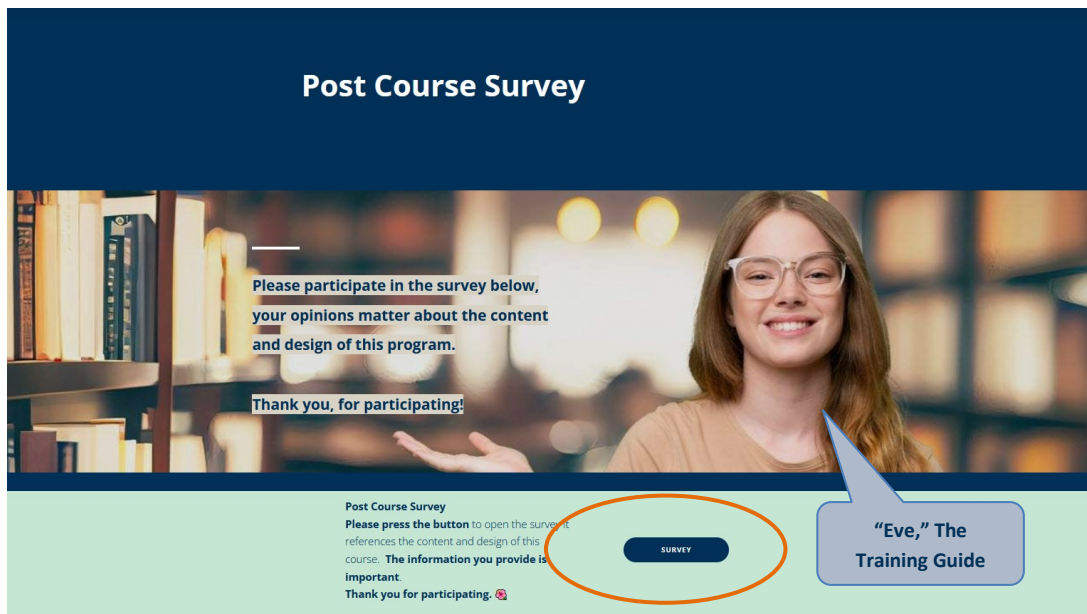
The usability, or post course survey identifies learner satisfaction and functionality of the overall training, from accessibility and navigation to learner and visual appeal, and whether they felt it was a benefit to their knowledge acquisition.

Once a learner completed the course and user testing, they were tasked to complete the survey (See [Appendix D](#)) to establish whether the design was suitable to establish learning gains among other desirable outcomes.

The content block design for the usability test was created after the initial prototype design, which was developed from earlier stages in the process. To appear as a cohesive unit, the block for the usability test was designed similarly to the pre-

requisite and post-requisite assessments, through a linked button in the content block in Articulate Rise 360, separate from the training (See [figure 2](#)).

Figure 2. Post course survey access button.



### ***Learner Reaction***

Feedback from learners came from the pre-assessment, post-assessment, and post-course survey to determine knowledge acquisition and learner satisfaction. In addition to product design and functionality. Using the Likert scale with designations ranking from *Strongly Agree to Strongly Disagree* prompted learners to evaluate their training experience along with the functionality (See [Appendix E](#)). Learners were provided with access to the usability survey following the learning assessments. In the initial prototype design learner comments helped to ameliorate and streamline some content design to make future iterations more functional.

In the new iteration, learner's reactions were mixed, but overall positive with the exception that there were perhaps too many audio components even though they are available for accessibility and for optional use, as indicated in [figure 3](#).

In [figure 4](#), this learner's statement offered the positive use of the interactive features that were built into the training design, and would like to have more interactive activities to help continue their practice. Out of the six participants one appeared to be confused with the process, as indicated in [figure 5](#).

#### [Figure 3](#) – Learner reaction statement

*Please elaborate on the overall functionality for your needs (e.g., access, accessibility*

 *, button functionality, etc.)*

From an accessibility standpoint, it may be nice to have all of the audio recordings but I felt like there were too many. For instance, it probably would've been okay to not have the audio recording before each "continue to next section" button.

Please add any additional thoughts, feedback, comments, etc. here.

#### [Figure 4](#) – Learner reaction statement

I think this instruction is well structured, I would like more interactive activities. Helps practice what is learned.

### Figure 5 – Learner reaction statement

There seemed to be a lot of different little things that I wasn't too sure the purpose of. There were a lot of things talking about merriam webster after a video or something and it felt a bit confusing with the transcripts as well. The assessments were a bit too easy, most of them seemed to just be all of the different options, and one had all the answers with the option "all of the above"

Additional feedback was represented by the following graphs in relation to the Likert scale questions regarding usability and functionality of the training. See the following results, figures 6 through 8.

When asking if the learning objectives were clearly stated, one reaction was neutral, while the others strongly agreed (figure 6). Asking whether the training incorporated accessibility through audio and visuals participants either agreed or strongly agreed (figure 7). When asking if the assessments were effective, one participant disagreed, while the others either agreed or strongly agreed. All these statements were important for future iterations of this training (see Appendix I).

### Figure 6. Learning Objective Clearly Stated

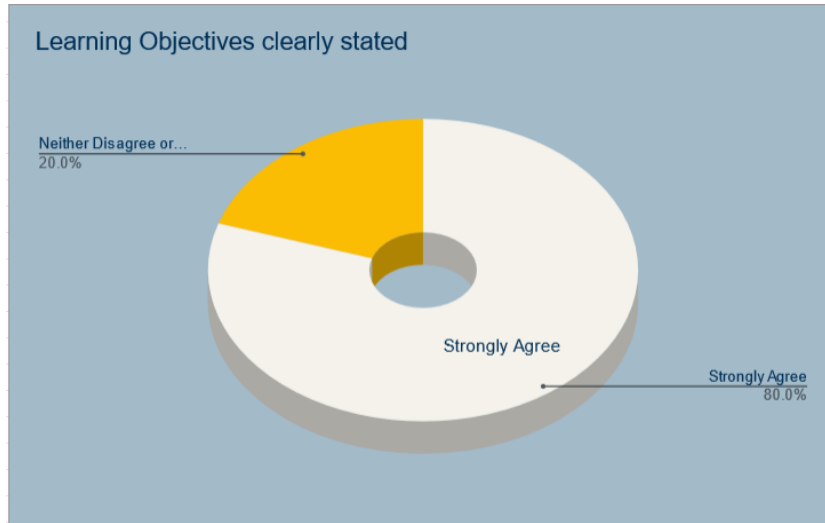


Figure 7. Audio/Visuals incorporated accessibility

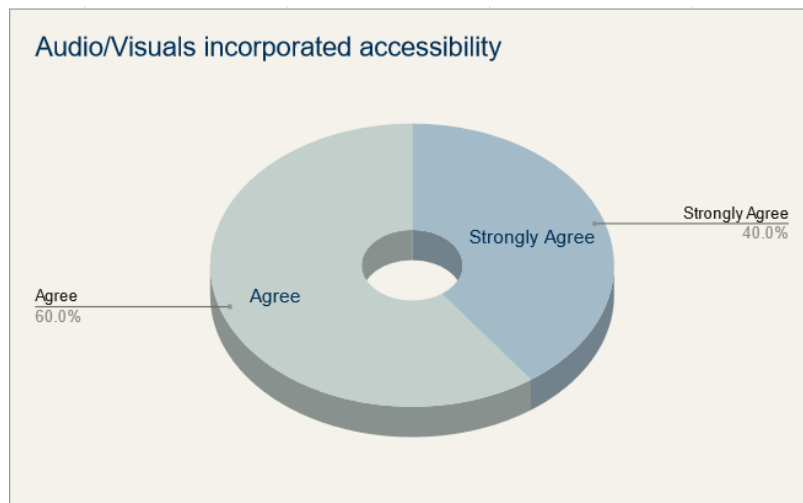
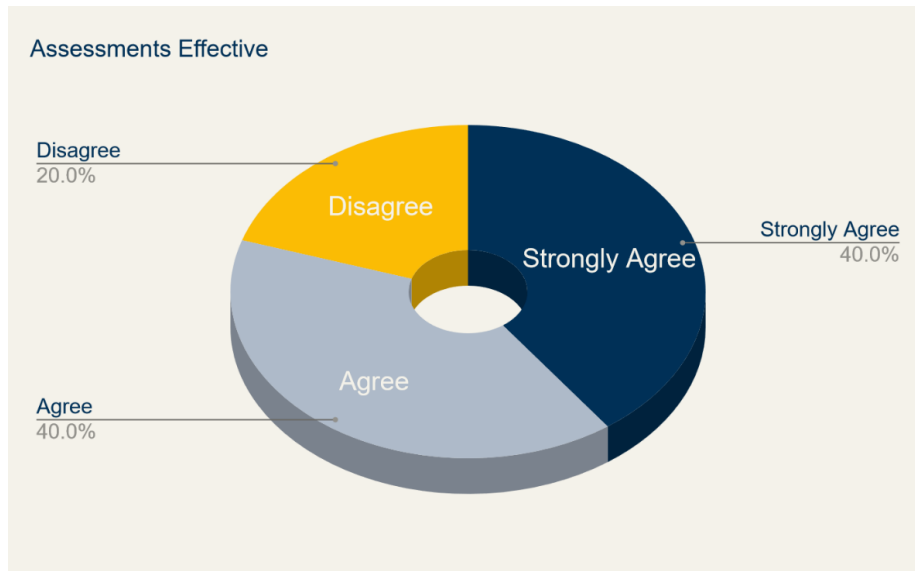


Figure 8. Assessments Effective



## Summative Evaluation

The first level of evaluation is demonstrated through the use of the Post-course survey (See [Appendix E](#)), which appears following the Pre- and Post-Requisite Assessments (See [Appendix D](#)). Attending the Post-course survey concludes the training and indicates whether the training was satisfactory in functionality, design, and whether the learner thought or felt they learned from the training.

## Entry Conditions

For this evaluation, the entry conditions were provided by the Computer Science faculty using either a SCORM package uploaded into the campus CANVAS LMS system, or through a URL web link embedded into an assignment page, also a part of the campus LMS system. Thereafter, Learners were to click the link to access the training. Then, to press the *Start Course* button ([See Appendix B](#)). There were no

expectant difficulties upon entering the training, however, if the URL web link is copied incorrectly, access to the training would be detrimental, unless immediately corrected.

## Data Analysis

The pre- and post- assessments had an equal score, totaling 20 points. Similarly, to the prototype evaluation, if a learner selected both a wrong answer and a correct answer on the Google form, they were scored zero points for completion. Therefore, manual scoring was essential to obtain true evaluation results, see [figure 9](#).

After the introductory video and review of the learning objectives, learners were instructed first to take the pre-requisite assessment to determine their current knowledge at entry. The Post-requisite assessment appears at the end (see [Appendix D](#)), prior to the usability survey (See [Appendix E](#)). Access to each is similar which is through a web link button content block.

[Figure 9](#) – Assessment Scores Example

✘ 1. In what ways, are a Mind map or Webbing tool, useful for writing? Check all that apply. \* 0 / 2

- Identifies methods of supporting your evidence. ✘
- Prompts for considering the journalistic questions to investigate your topic.
- Describes the suffusion of your thought process.
- Provides a method of drawing connections from one idea to another about your topic. ✔

Correct answer

- Prompts for considering the journalistic questions to investigate your topic.
- Provides a method of drawing connections from one idea to another about your topic.

Add individual feedback

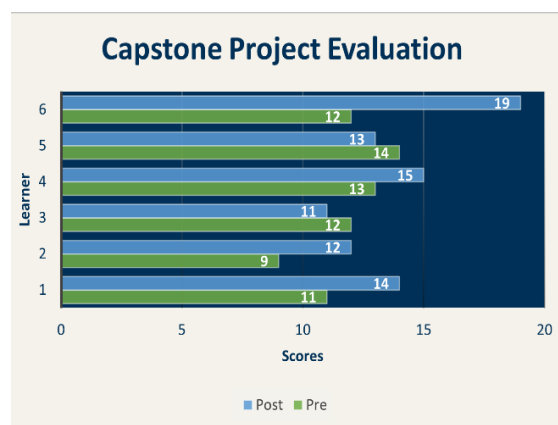
## Outcomes

Eight out of ten participants approached the training content, however, only six completed both the pre- and post-requisite assessments, as indicated in [table 1.1](#). In [table 1.2](#) is a graphical representation of learner scores overall, in observance of these scores they appear to have improved.

[Table 1.1](#) Evaluation Scores with learner count.

Capstone Evaluations		
Learners	Pre	Post
1	11	14
2	9	12
3	12	11
4	13	15
5	14	13
6	12	19

[Table 1.2](#) Graphical Representation of Learner Scores.



## Statistical Significance

After submitting the scores through statistical analysis, using a t-Test for Sample means (see [table 1.3](#)) it was determined by comparing scores from the pre-requisite and post-requisite assessments, that there was practical significance in learning gains between scores and mathematically represented as,  $[t, (6)=2.15, p<0.05 \text{ and } d=0.925]$ . See [table 1.4](#). Effect size scores 0.8 or above is considered a large effect and considered to have practical significance.

Therefore, this training mathematically speaking shows demonstrated evidence this training has value in strong learning gains. Which means, their significance indicates that one hour of training would have successful use in future computer science courses for learners to improve their writing skills effectively.

table 1.3 Paired Sample t-Test

t-Test: Paired Two Sample for Means		
	<i>Pre</i>	<i>Post</i>
Mean	11.83333333	14
Variance	2.966666667	8
Observations	6	6
Pearson Correlation	0.205267707	
Hypothesized Mean Differ	0	
df	5	
t Stat	-1.77236112	
P(T<=t) one-tail	0.068265855	
t Critical one-tail	2.015048373	
P(T<=t) two-tail	0.136531709	
t Critical two-tail	2.570581836	

table 1.4 Statistical Solution with Effect Size

<p>With a t Stat @ -1.77 and a t Crit one-tail @ 2.02 we do not reject the null hypothesis; because the t Stat is less than the critical value, and it is directional. Therefore we establish effect size to determine learning gains with Cohen's d.  <math>d = 2.167/2.341 \mid d = 0.925</math></p>
<p>[t(6)=2.15, p&lt; 0.05 and d=0.925]</p>

## Recommendations

The Computer Science faculty at California State University, Monterey Bay, have some decisions to make about the project going forward and whether they will continue to use it beyond its current iteration. Going forward otherwise requires consideration of the mixed reviews received during evaluation.

One recommendation from a participant mentioned they want more practice activities. Therefore, in future iterations perhaps adding branching activities would be a suitable extension to the project. Regarding the audio features, further review of the course design should be performed, perhaps with an accessibility expert to identify proper features beyond what is currently used; and whether some audio components should be eliminated. Additionally, perhaps further review of the project design could include further investigation for content clarity to further minimize learner confusion and engagement with the assessments.

The training results were mixed, although largely positive, and even though the assessments may not have engaged some learners the results were positive for learning gains overall. Therefore, this project could be utilized beyond its current scope and improved upon over time to include the recommendations above.

## Conclusion

The capstone project sought to assist with improving learners' skill in academic writing using the American Psychological Association standards. It also sought to provide the essentials in basic effective writing overall. The gaps it was meant to fill were to secure a foundation not clearly presented in learners upon arrival to the CST 300 courses by faculty observation.

Although learners may have passed their qualifying exams to reach the next level of education, they are not always prepared for what awaits them with advanced skills courses like Upper Division Computer Science courses that require the essentials of academic writing for documentation and research.

In consideration of the test scores and that they represent a significant result, and in consideration of the mixed feedback. I believe this project has fulfilled the criteria as a valuable online resource for learning basic academic writing skills.

For the near future, Dr. Eller plans to use this project in his Computer Science CST 300 classes this coming Spring 2024 semester to determine further usability beyond its current scope. In addition, He plans to invite additional faculty members to participate in using the project in the hopes of seeing it become more successful in obtaining further learning gains.

Dr. Eller has mentioned potentially teaming up to write an academic paper based on a full cohort research of the training for a research conference paper. These findings would measure the project in full course based on this project and whether it was of benefit to learning gains overall.

It was suggested by Dr. Miguel Lara, Assistant Professor of the Masters of Instructional Science and Technology (MIST) program and supported by Dr. Eller, that this project could be submitted to the Merlot organization as Open-Resource Educational material (OER), that will be free to use by individuals, and institutions. The Merlot organization is operated by the California State University organization.

## References

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### Images and Audio

#### *Images*

Adobe Stock Images: Under Enterprise – Educational license.

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[https://stock.adobe.com/contributor/203651281/luismolinero?load\\_type=author&rev\\_url=detail](https://stock.adobe.com/contributor/203651281/luismolinero?load_type=author&rev_url=detail)

## **Audio**

### **Free to use with attribution**

AudioCoffee, & Kyshchuk, D. (2023, March 1). Bookmark in a book [Audio]. Pixabay.

<https://pixabay.com/music/corporate-bookmark-in-a-book-140930/>

## Appendices

### Appendix A.

#### Course Content Page

## Writing Instruction for Computer Science Majors

Author Hidden ▾

---

**Welcome to Writing Instruction  
for  
Computer Science Majors.**

**This course entails basic instructional tools and methods to use in academic writing for undergraduate and graduates students in the computer sciences.**

You will have the option to listen to audio instruction, or read textual instruction.  
However, there will only be textual instruction where audio cannot be placed.

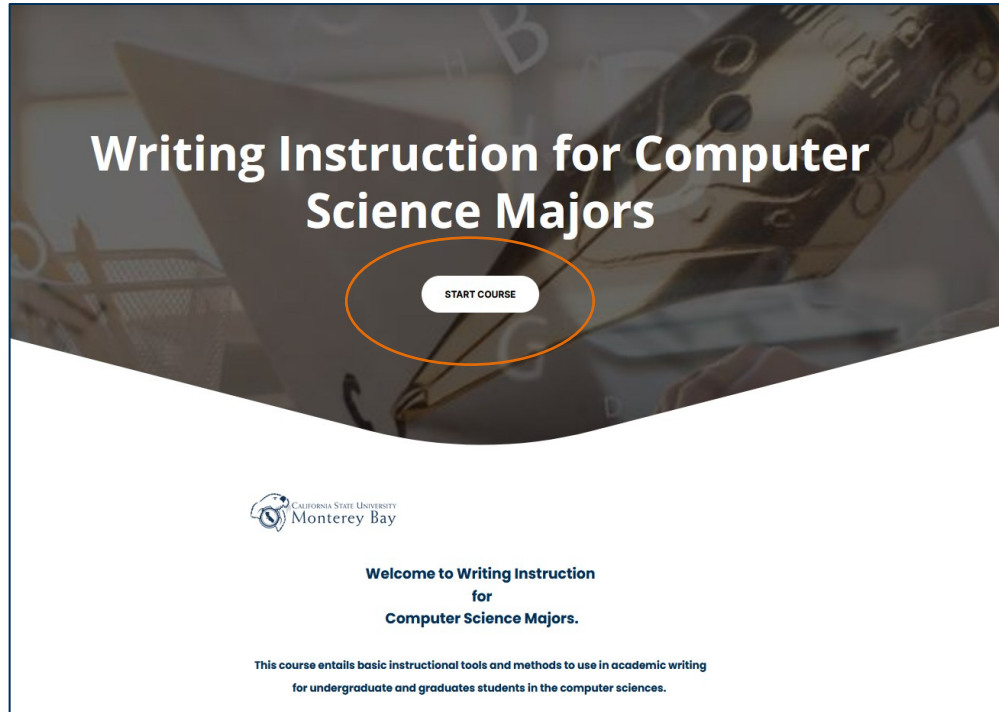
Note: All Recorded Audio and Video have transcripts linked through Adobe Cloud.

Any information you submit in the training, will not be recorded.  
If you wish to keep anything you've written, copy and paste it into a blank document when you've finished.

☰	Introduction to Academic Writing for Computer Science Majors	EDIT CONTENT
	Lesson	
☰	Prewriting Tools	EDIT CONTENT
	Lesson	
☰	Writing an Outline	EDIT CONTENT
	Lesson	
☰	Writing a Topic Sentence	EDIT CONTENT
	Lesson	
☰	Paragraph Structure	EDIT CONTENT
	Lesson	
☰	Writing a Thesis Statement	EDIT CONTENT
	Lesson	
☰	Quotations, Paraphrasing & Citations	EDIT CONTENT
	Lesson	
☰	Proofreading	EDIT CONTENT
	Lesson	
☑	Post Assessment	EDIT CONTENT
	Lesson	
<b>POST COURSE SURVEY</b>		
☰	Post Course Survey	EDIT CONTENT
	Lesson	
☰	Invitation to Students	EDIT CONTENT
	Lesson	
☰	References	EDIT CONTENT
	Lesson	

## Appendix B.

### Start Course Button



## Appendix C.

### Training Project Learning Objectives

## Learning Objectives

By the end of this lesson, learners will be able to...

▶ ● 00:37


**Press Above ▶ for Audio**

Music Attribution: Bookmark in a book | AudioCoffee | Pixabay.com | <https://pixabay.com/music/corporate-bookmark-in-a-book-140930/>

- 1 Identify tools to use for pre-writing topic ideas to organize a writing assignment.
- 2 Produce an outline to connect supportive ideas to write a first draft.
- 3 Illustrate the components of a topic sentence in relation to the thesis statement.
- 4 Describe elements of a supporting paragraph in relation to the thesis statement.
- 5 Define the properties of a Thesis statement in relation to how it applies to the structure of academic writing.
- 6 Develop proper quotations through paraphrasing and citation in APA style.

## Appendix D

### Assessment Form – Both Pre- & Post have the same questions.



CALIFORNIA STATE UNIVERSITY  
**Monterey Bay**

---

### Academic Writing Instruction Quiz

This quiz assesses your knowledge about academic writing after completing the training. All answers are required, so please do your best, even if you have to guess.

kasimmons@csumb.edu [Switch account](#)

\* Indicates required question

---

**Email \***

Record kasimmons@csumb.edu as the email to be included with my response

---

**Please provide your First Name and Last Initial: \***

Your answer

---

**1. In what ways, are a Mind map or Webbing tool, useful for writing? Check all that apply \***

- Identifies methods of supporting your evidence.
- Prompts for considering the journalistic questions to investigate your topic.
- Describes the suffusion of your thought process.
- Provides a method of drawing connections from one idea to another about your topic.

---

**2. What are the two parts of a topic sentence. \***  
Choose one.

- The subject of the paragraph and supporting idea.
- The concept and the proclamation.
- Topic and controlling idea
- The focus and main idea.

---

**3. How does an outline assist with writing a document? Check all that apply. \***

- Places your document in an order that makes sense for your argument and your audience.
- It's an effective way to conclude your argument.
- Pulls all the parts of your document together to make your points clear and concise.
- Identifies the principle features of your document, the introduction(i.e., arguments, evidence, thesis, conclusions).

**4. Paragraph Structure should... \***

Choose

---

**5. What does a thesis statement do for your writing assignment? Check all that apply. \***

- It aligns your document to the topic giving your document a direction.
- Identifies the scope of your document by outlining your evidence which offers a direction of your investigation through your writing.
- Follows your controlling idea, by allowing further exploration of additional ideas about your topic.
- Draw connections between your ideas to help map out the flow of your document as you write.

---

**6. Quotations and Citations provide what to your document? Check all that apply. \***

- Legitimizes the support your evidence.
- Provides authenticity refuting your argument
- Makes your findings less significant
- Gives credit where credit is due

---

**7. Proofreading \***

- Helps to finalize the organization of your document.
- Takes up too much time
- Makes sure punctuation and grammar align to the flow of your document.
- Provides style to misinterpreted words

---

**8. Depending on the paper; what type of thesis statement is required? \***

- Conceptual, Provisional, Documentary
- Proverbial, Hypothetical, Allegorical
- Analytical, Argumentative, Expository
- Transcendental, Phenomenal, Metaphysical

---

**9. Prewriting tools include \***

- Merging, Converting, and Parceling
- Free-writing, Mind-Mapping, and Questioning
- Conjoining, Querying, and Synchronizing
- Listing, Looping, and Clustering

---

**10. The Conclusion of your document should... \***

Choose

## Appendix E

### Post-Course Survey

# Words Have Power

---

## Writing Instruction - Post-Course Survey

This course survey evaluates learner experience after completing the training.

**Your opinion matters. Please tick a box in every section.**

kasimmons@esumb.edu [Switch account](#)

\* Indicates required question

---

**Email \***

Record kasimmons@esumb.edu as the email to be included with my response

---

**What type of device did you use? \***

This question pertains to device interaction & screen size.

Apple/Mac

PC/Windows

iPad/Tablet

Laptop

Desktop

Other: \_\_\_\_\_

---

**1. Approximately (in minutes), how long did it take you to complete the module, \* including the quizzes.**

Note: Please, use numbers.

Your answer \_\_\_\_\_

Please rate the following statements: \*

	Strongly Disagree	Disagree	Neither Disagree or Agree	Agree	Strongly Agree
Learning Objectives clearly stated	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Training Topics Appropriate	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Interactions Functional	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Audio/Visuals incorporated accessibility	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Graphical representations appropriate	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Content design consistent	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Design aesthetically pleasing	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Training was easy to navigate	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Content meets Learning Objectives	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Assessments Effective	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

---

Please elaborate on any of the selections above.

Your answer \_\_\_\_\_

---

Please elaborate on the overall functionality for your needs (e.g., access, accessibility , button functionality, etc.)

Your answer \_\_\_\_\_

---

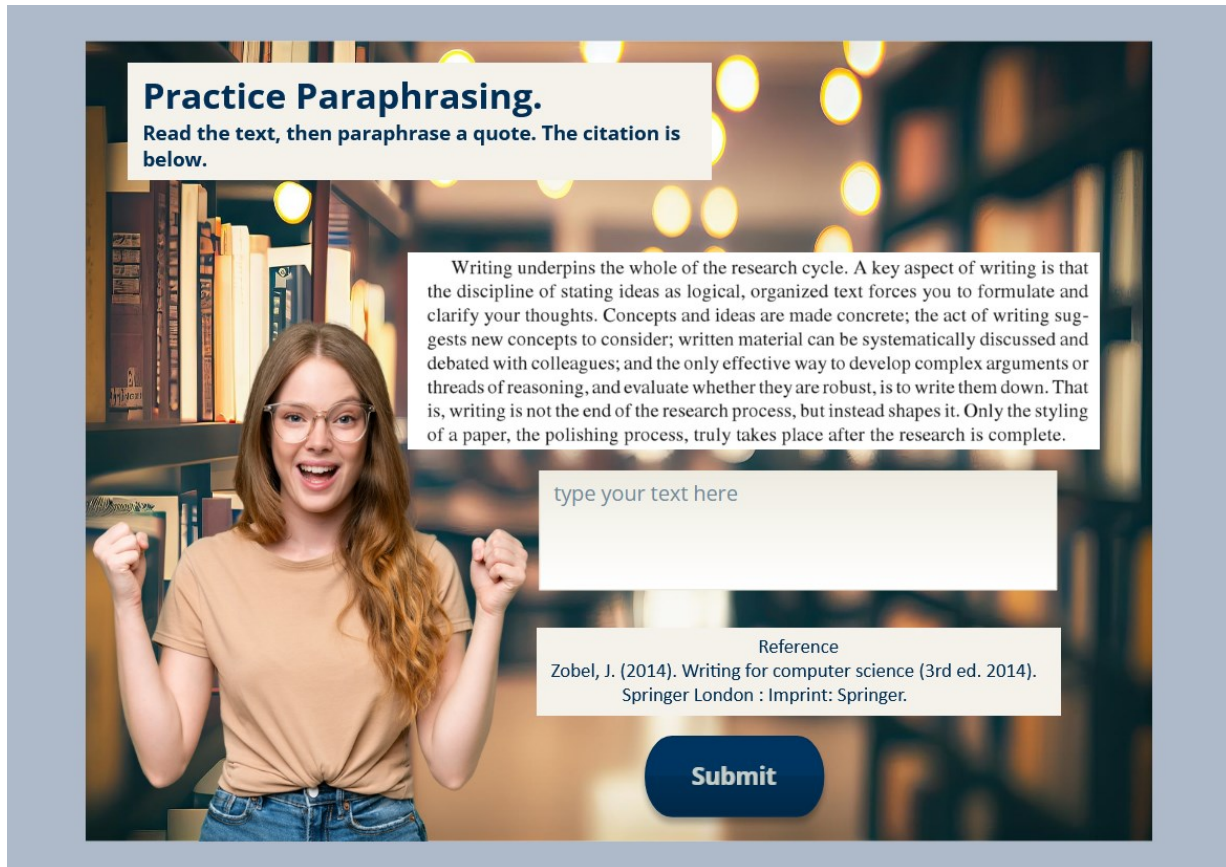
Please add any additional thoughts, feedback, comments, etc. here.

Your answer \_\_\_\_\_

## Appendix F.

### Storyline 360 Interactive Integration – Course Sample Practice Activity

The learner reads the paragraph, paraphrases a quote in the text box, and presses submit for feedback.



The screenshot shows a digital learning interface for a 'Practice Paraphrasing' activity. On the left, a young woman with glasses and a tan shirt is smiling and cheering with her fists raised. The background is a blurred library with bookshelves and warm lighting. The interface includes several text boxes and a button:

**Practice Paraphrasing.**  
Read the text, then paraphrase a quote. The citation is below.

Writing underpins the whole of the research cycle. A key aspect of writing is that the discipline of stating ideas as logical, organized text forces you to formulate and clarify your thoughts. Concepts and ideas are made concrete; the act of writing suggests new concepts to consider; written material can be systematically discussed and debated with colleagues; and the only effective way to develop complex arguments or threads of reasoning, and evaluate whether they are robust, is to write them down. That is, writing is not the end of the research process, but instead shapes it. Only the styling of a paper, the polishing process, truly takes place after the research is complete.

type your text here

Reference  
Zobel, J. (2014). Writing for computer science (3rd ed. 2014). Springer London : Imprint: Springer.

**Submit**

## Appendix G.

### Video Transcript Example

Proofread Transcripts

Hey everyone,

In this training we are going to discuss proofreading and why it is important.

Proofreading helps to organize your paper correctly, identifies spelling and grammatical mistakes that an electronic version may not otherwise identify. It is best to read your own work, or have someone else do it for you, so that the spelling and grammar checkers do not miss the context of the points you are making in your document.

With APA Style, "it helps writers present their ideas in a clear, concise, and inclusive manner...style works best, ideas flow logically, sources are credited appropriately, and papers are organized predictably," (Style and Grammar guidelines, n.d.).

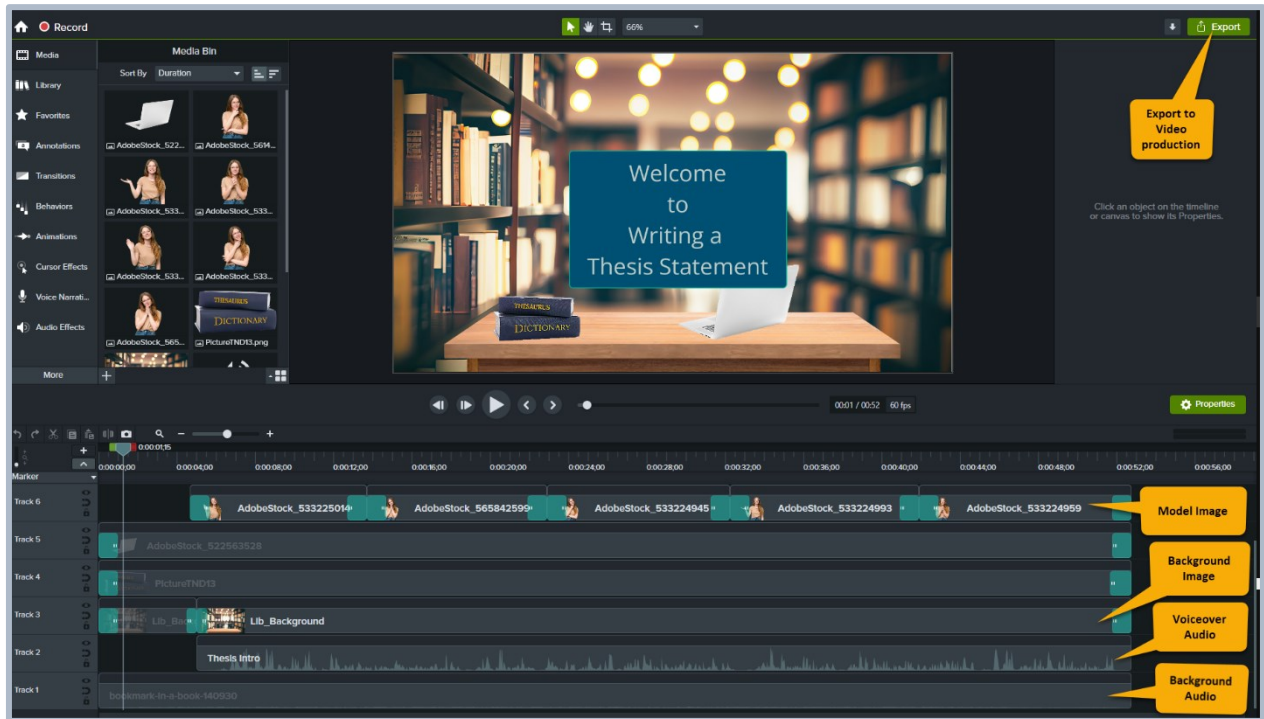
It is these reasons why proofreading is important. If your writing is done well, it will be noticed. If it is done well enough it could prove positive that you may be recognized academically, or professionally for the work you have accomplished. It may also lead to publication. All of these are reason to proofread.

## Appendix H.

### Camtasia Work Screen

### Camtasia Video Editing & Production Screen

### Video Example



## Appendix I.

### Knowledge Check Example

The image shows a digital interface for a knowledge check. The background is a blurred library with bookshelves and warm lighting. A young woman with glasses and a brown shirt is pointing towards the right. The interface features a title 'Knowledge Check' in a dark blue font. Below it is a question: 'The thesis statement establishes \_\_\_\_\_ for your writing assignment?'. There are four multiple-choice options, each with a checkbox. The second and fourth options are selected with purple checkmarks. At the bottom, there is a dark blue feedback box with white text and a 'Submit' button.

**Knowledge Check**

The thesis statement establishes \_\_\_\_\_ for your writing assignment?

- a road map about your evidence.
- provides an outline for the support of your topic.
- a break down, an explanation, or a choosing of a side about your topic.
- a connection from the introduction, to the conclusion.

**You're right. That's great!  
Don't stop practicing.  
You'll only get better.**

Submit

## Appendix J.

### Usability Learner Statements


Please elaborate on any of the selections above.

3 responses

interactive activity allowed me to practice what I learned

The assessments became redundant because most of the time all of the answers were correct. Some of the activities, like the select the topic sentence, did not have the interactivity that was described in the instruction.

There seemed to be a lot of different little things that I wasn't too sure the purpose of. There were a lot of things talking about merriam webster after a video or something and it felt a bit confusing with the transcripts as well. The assessments were a bit too easy, most of them seemed to just be all of the different options, and one had all the answers with the option "all of the above"

Please elaborate on the overall functionality for your needs (e.g., access, accessibility , button functionality, etc.)

3 responses

The overall functionality made learning a topic more interesting for me.

From an accessibility standpoint, it may be nice to have all of the audio recordings but I felt like there were too many. For instance, it probably would've been okay to not have the audio recording before each "continue to next section" button.

I thought all the buttons were very clear and easy to click, and it wasn't difficult to navigate through slides and whatnot.

Please add any additional thoughts, feedback, comments, etc. here.

3 responses

I think this instruction is well structured, I would like more interactive activities. Helps practice what is learned.

Some of the questions were vague. I believe that if the questions were asked in a clearer manner, it would have been more beneficial.

The modules were informative and provided a good introduction into academic writing. I would've been happy with less audio recordings, but I felt that overall the module was well put together.