Project #4: Conduct a User Observation Study

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CS 443: User Interface

Professor Hornof

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1. Introduction

The overall purpose of this user observational study is to test which of the two systems being observed (Sequential Tutorial and User-Managed Checklist) has a higher usability for college students. The usability will be measured using completion time and a 5-question multiple choice quiz on the reading material given at the end. The first system "Sequential Tutorial" was created by Jackson Zenti and guides the user through 4 stages (survey, question, read/recite, and review). The user is given clear instruction while they are guided through these sequential stages. The next system "User-Managed Checklist" created by Sorin West the right-hand side of the system displays the text, whilst the left-hand side of the system is where the user applies the SQ3R Notes and check list. The right-hand side has 3 tabs that the user can switch between. These tabs are: SQ3R checklist, note taking, and note review. There are also links provided at the bottom of the screen on what SQ3R entails. I hypothesize that the Sequential Tutorial will lead to more accurate comprehension due to its structured design, whereas the User-Managed Checklist may allow faster completion times due to its flexible layout.

2. Methodology

Participants. For this study four individuals were recruited to being observed using the two systems. These participants were recruited due to proximity and availability as they are my roommates. Participants provided informed consent to participate in the study.

Background information:

Participant #1:

Age: 21
Major: Elementary Education
Expected Graduation: Spring 2025
Current Occupation: Afterschool teacher
Occupational aspirations: Elementary teacher after graduate school
Participant #2:
Age: 21
Major: Human and Family Services
Expected Graduation: Spring 2025
Current Occupation: Afterschool teacher
Occupational aspirations: Social worker after graduate school
Participant #3:
Age: 20
Major: Art
Expected Graduation: Spring 2025
Current Occupation: N/A
Occupational aspirations: Art teacher
Participant #4:
Age: 21

Bates 5

Major: Sociology

Expected Graduation: Spring 2026

Current Occupation: Waitress

Occupational aspirations: Teacher

Setting. The study was conducted in the shared living room of the participants' residence.

This location was chosen to ensure a familiar and comfortable environment effective for focused

task completion. The living room is a neutral space often used for studying and completing

homework assignments, making it suitable for evaluating these systems in a realistic context.

Participants were allowed to choose between sitting on the couch with the laptop in their lap or

sitting at the table with the laptop on the surface. A smartphone mounted on a stable support

system was positioned behind each participant to capture their interactions with the system

without obstructing their workspace or capturing their faces.

Materials. For this study, the participants were given a computer to run the systems on.

This device does not belong to any of the participants. The system that the participant is using

will be displayed on the screen so that the user does not need to navigate to it. The participant

was also given a printed out copy of the participant instruction that was also read aloud by the

experimenter. A consent form is signed and received that the participant understands and is in

agreement to participate in the procedure based on their understanding of its nature, its potential

benefits and possible risks, and that they can withdraw at any point.

The experimenter is behind the participant with a phone camera that is stabilized to record the procedure. The experimenter has a printed out copy of the instructor instructions and the participant instruction.

Materials Listed

- Consent form
- Phone
- Computer
- Sequential Tutorial or User-Managed Checklist Prototype
- Experimenter instructions handout
- Participant instruction handout

Experimental Design. This study employed a between-subjects experimental design to avoid learning effects or biases resulting from repeating exposure to both systems. Participants were randomly assigned to one of the two systems (Sequential Tutorial or User-Managed Checklist) using an online randomization tool, ensuring an unbiased allocation process. Each participant interacted with only one system to complete the same set of SQ3R-related tasks. The primary performance measures included:

- 1. **Task Completion Time**: The time taken to complete all assigned tasks within the system.
- 2. **Task Accuracy**: Performance on a 5-question multiple-choice quiz evaluating their comprehension of the reading material.

Procedure.

Before the session:

- Use the online randomization tool to allocate two participants to either the Sequential Tutorial or User-Managed Checklist.
- 2. On the computer, open the assigned system in the browser. Ensure the system is ready to use, with the PDF reading material already preloaded and viewable.
- 3. Set up the camera behind the couch on a tripod. Ensure that the computer screen is visible and will not be obstructed by the user.
- Print out five copies of the Participant Instructions, one copy of the Instructor
 Instructions, four consent forms, and four copies of the 10-question multiple-choice quiz.
- 5. Inform other residents in the house that the experiment is occurring and not enter the premises.

During the session:

- 1. Greet the participant and have them take a seat
- 2. Begin the recording on the camera.
- 3. Follow the introduction script:

"Hello! To begin, I would like to thank you for your participation in this study. This interview is part of a class project for CIS 443 User Interfaces taught by Dr. Anthony Hornof at the University of Oregon. Your participation in this study is entirely voluntary and you may withdraw from the study at any time without penalty. All data gathered from this study will be treated confidentially. If videos or photos are taken, these may be shown to the instructor and other students in the class, but they will not be published online or in print. There are no known risks to participation in this

study. Please feel free to ask if you have any questions and, if you would like to participate, please sign and date this form. Thank you very much. The form to sign is in front of you, along with a pen."

- 4. Receive the consent form. If the participant does not agree to sign, then end the procedure here.
- 5. Follow the explanation of the SQ3R method script:

"The SQ3R method is a structured approach to reading and studying that enhances reading comprehension and memory. SQ3R stands for Survey, Question, Read, Recite, and Review. It provides a systematic framework for active reading which makes it particularly effective for studying.

The steps in the SQ3R Method are:

Survey

Begin by skimming the chapter to gain an overview of the structure and content. The purpose is to create a mental map of the text and identify key concepts.

Question

Create questions based on the information you surveyed. For example, turn headings and subheadings into questions like "What is the main idea of this section?" These questions help focus attention and create a purpose for reading.

Read

Read the chapter with the goal of answering the questions you created. Pay attention to details and try to identify the main ideas and supporting information. Avoid passive reading by actively engaging with the text and writing notes.

Recite

After reading a section, pause and recall the main ideas and the answers to your questions without referring to the text. Summarize the information in your own words. This step reinforces your memory and helps identify areas that need further review.

Review

Finally, review the material to solidify your understanding and retention. Revisit your notes, summaries, or the text itself to reinforce what you've learned and clarify any concepts that remain unclear.

Do you have any questions regarding using the SQ3R Method? You will have the information on SQ3R during the study"

- 6. Answer any questions regarding the SQ3R method that the participant may have.

 Once all questions are clarified then proceed to the next step.
- 7. Follow the user instructions script:

"For this study you will be tasked with using the prototype in front of you to apply the SQ3R method to a chapter of text. I will be unable to assist or answer any questions you may have during the study. However, please think aloud as you work. Any observations, challenges, or thoughts that you have should be verbalized. Let me

know when you believe that you have finished applying the SQ3R method to the text.

Once you have finished you will be quizzed on the SQ3R method and the chapter.

Thank you again for your participation. You may begin when you are ready."

- 8. Start the timer.
- 9. Observe and take notes on the user's interactions with the prototype.
- 10. Stop the timer.
- 11. When the participant says they are finished, give them the quiz.

After the session:

- 1. Stop the recordings on the camera and ensure that the process was successfully captured on video with audio.
- 2. Capture screenshots of the screens and the data that the user inputted.
- Save the recordings, screenshots, and scanned copy of the consent form into a designated folder.
- 4. Thank the individual for their participation in this study. Reiterate that the recording and feedback will remain confidential and only be used for this study.
- 5. Grade the quiz using the answer sheet and record the time the user took to complete the task.

Threats to external validity. Three potential threats to external validity were identified and addressed:

1. **Small Sample Size**: With only four participants, findings are not generalizable to a broader population. To mitigate this, the study focuses on qualitative insights rather than

- statistical conclusions. In the future, further research should be conducted with a larger sample size to gain a deeper understanding of the usability.
- 2. Participant Bias: Familiarity between the experimenter and participants may influence performance. The level of familiarity is roughly equal among all participants to ensure consistency. Efforts were made to minimize the bias by maintaining neutrality during the observation.
- 3. **Environment:** The study setting (a living room) may differ from real-world use cases of the systems. However, the familiar environment was chosen to ensure participants' comfort and natural behavior during the study.

3. Results

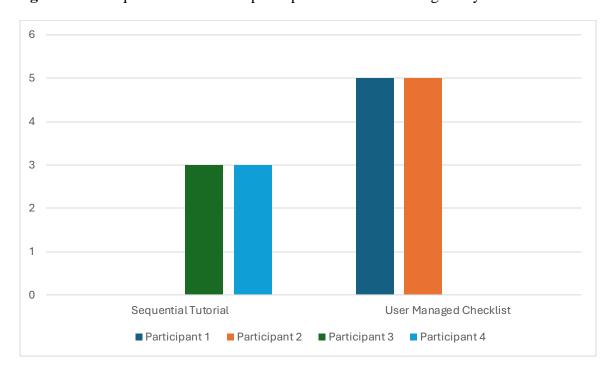
This section summarizes the data observed from participants' interactions with the two systems: Sequential Tutorial and User-Managed Checklist. Data includes quiz accuracy, task completion time, and usability issues identified during observations. Performance measures are presented with tables and figures for clarity.

Quiz Accuracy

Table 1 and Figure 1. Summarize the total quiz scores for each participant, grouped by system. Each participant answered five multiple-choice questions testing their comprehension of the SQ3R method and the given reading material. If the participant answered correctly, they receive a 1. If they answer incorrectly, they receive a 0.

	Question 1	Question 2	Question 3	Question 4	Question 5	Total
Sequential	0, 1	1, 1	1, 1	1, 0	0, 0	3, 3
Tutorial						
User-	1, 1	1, 1	1, 1	1, 1	1, 1	5, 5
Managed						
Checklist						

Figure 1. Total quiz scores for each participant based on the assigned system.

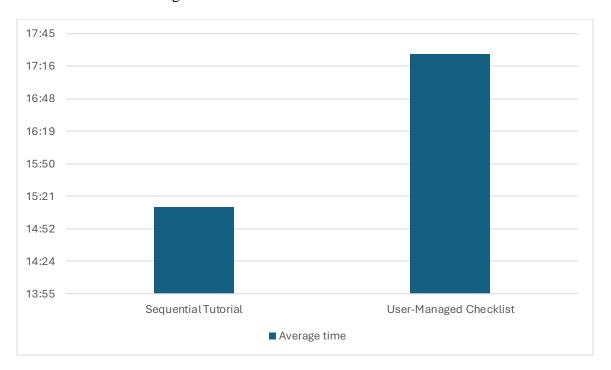


Completion Time

Table 2 and Figure 2. present the time taken by each participant to fully complete the SQ3R method. Times are recorded in minutes and seconds.

	Participant	Participant	Participant	Participant	Mean
	1	2	3	4	
Sequential	N/A	N/A	18:06	11:38	15:12
Tutorial					
User-	16:32	17:43	N/A	N/A	17:28
Managed					
Checklist					

Figure 2. Average completion times (in minutes: seconds) for participants using Sequential Tutorial and User-Managed Checklist.



Usability Observations

1. Sequential Tutorial:

- Navigation Issues: Participants struggled to locate the scrollbar, delaying task completion.
- b. Input Challenges: Some users found the input fields for note-taking non-intuitive, leading to backtracking.

2. User-Managed Checklist:

- a. Flexibility Issues: Despite explaining to the participants what the process of SQ3R method is prior to the study, they applied their own note taking preferences, rather than using the SQ3R method.
- Efficiency: Both participants completed tasks slightly faster than with the Sequential Tutorial.

To conclude, these results did not support my hypothesis that the Sequential Tutorial will lead to more accurate comprehension due to its structured design, whereas the User-Managed Checklist may allow faster completion times due to its flexible layout. In fact, the opposite was true. The User-Managed Checklist had slower completion time but a higher score on the multiple-choice quiz. Further research should be done with a higher sample size.

4. Analysis

This section discusses the observed trends, identifies usability challenges, and assesses the systems' effectiveness in meeting usability goals.

1. Sequential Tutorial

The Sequential Tutorial system demonstrated notable strengths in guiding participants through the structured steps of the SQ3R method, but a few usability challenges were observed:

Reading Challenges: Participant 3 initially struggled to identify how to scroll through the text, highlighting a need for clearer visual indicators or instructions.

Incorporating a visible, intuitive scrollbar could improve navigation and enhance user experience.

Confusion with Input Boxes: Participant 4 had trouble identifying where to enter notes during the "Survey" phase, as the first two pages were primarily informational. While the introductory content on SQ3R was helpful, usability could be enhanced by embedding the note-taking section directly beneath this information or making it more visually distinct.

Structured Guidance: Despite these challenges, participants valued the system's detailed, step-by-step guidance. They noted that the Sequential Tutorial is particularly beneficial for individuals unfamiliar with the SQ3R method, as it provides clear, structured support throughout the process.

2. The User-Managed Checklist

The User-Managed Checklist offered higher flexibility but required users to understand the SQ3R method and manage their progress independently. Observations include:

- Navigation Challenges: Participants occasionally struggled with switching between tabs, which could disrupt workflow. Simplifying navigation or providing clearer instructions may enhance usability.
- 2. **Flexibility vs. Structure**: While the flexibility of this system allowed users to approach tasks in their preferred order, it led to the user incorrectly applying the SQ3R method. For example, both participants who used the User-Managed Checklist prototype ignored the survey step and began fully reading the text. Whereas the other participants started

surveying the material prior to writing questions. Thus, this system may be better suited for users with prior knowledge of the SQ3R method who prefer greater self-autonomy rather than step-by-step guidance.

3. Performance Metrics

- Participants using the User-Managed Checklist achieved perfect quiz scores, indicating better comprehension. However, this may reflect individual prior knowledge and education rather than system design.
- 2. Sequential Tutorial participants had lower quiz scores but stated that they valued the structured guidance, thus the system may be better suited for SQ3R training purposes.

5. Conclusion

Overall, this study provided valuable insights into the usability and effectiveness of two user interface systems designed to support the SQ3R reading and studying method. From this project, I learned the importance of balancing structure and flexibility in user interface design. Structured systems like the Sequential Tutorial can provide essential guidance and information but risk confusing users if navigation and instructions are not intuitive. Flexible systems, like the User-Managed Checklist, appeal to experienced users but may lack the guidance necessary for novices. These insights show the need to design interfaces that cater to diverse user skill levels. Thus, highlighting the value of user observation in discovering usability issues that might not be evident during development. Observing participants' interactions revealed critical insights into how users interpret and navigate interfaces, informing areas for refinement.

I were to build a system based on these findings, I would aim to create a hybrid interface combining the Sequential Tutorial's structured guidance with the User-Managed Checklist's

flexibility. For example, I could implement optional prompts or hints that users can toggle on or off, providing guidance without limiting autonomy. Additionally, I would focus on improving navigational cues and reducing cognitive load through clearer visuals such as the text having a permanently visible scroll bar. All-in-all, this project has deepened my understanding of user-centered design and reinforced the importance of iterative testing in creating effective and efficient user interfaces.

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Participant Instructions

Thank you for agreeing to participate in this study! Please follow the instructions below carefully. If you have any questions, let me know before we begin the session.

Overview

This study is part of a project for CS 443: User Interfaces at the University of Oregon. The goal is to understand how two systems help users apply the SQ3R method for reading and studying. Your participation will involve interacting with one of these systems, completing tasks, and answering a short quiz at the end. This study will take approximately 30 minutes to complete.

What You'll Do

- 1. **Read Instructions:** Before starting, review this document. I will also explain key details about the study and the SQ3R method.
- 2. **Use the System:** Follow the on-screen prompts in the prototype system to complete the assigned tasks using the SQ3R method.
- 3. **Think Aloud:** While you work, verbalize your thoughts, observations, and any challenges you encounter. For example, say things like "I'm not sure what this button does" or "This part makes sense to me."
- 4. **Complete the Quiz:** After using the system, you will take a brief, 5-question multiple-choice quiz to assess comprehension of the SQ3R method and the text.

Rules

- Work Independently: I will not be able to answer questions or assist you once the session begins.
- Take Your Time: There is no time limit, so proceed at a pace that feels comfortable.

• **Think Aloud:** Your verbal feedback is essential for the study.

Steps

1. Setup:

- a. Sit comfortably in the provided workspace with the laptop in front of you.
- b. Adjust the screen or your seating position as needed.

2. Start the System:

- a. I will confirm the prototype is ready before you begin.
- b. Follow the system's prompts to navigate.

3. Apply the SQ3R Method:

- a. Use the system to practice the steps of the SQ3R method:
 - i. **Survey:** Skim the provided text to get an overview.
 - ii. **Question:** Form questions based on the headings or key concepts.
 - iii. **Read:** Read the text in detail, looking for answers to your questions.
 - iv. **Recite:** Summarize the main ideas and answer your questions.
 - v. **Review:** Go over your notes and the material again to reinforce understanding.

4. Complete the Quiz:

a. Notify me when you are finished. I will give you the quiz to complete.

Important Notes

- This session will be recorded, but your identity will remain confidential, and your face will not be visible in the recording.
- You can stop participating at any time without penalty.

• Feel free to ask any clarifying questions before starting the task.

Thank you for your time and participation!

Experimenter's Script

- 1. Introduction to the participant
 - "Hello! To begin, I would like to thank you for your participation in this study. This interview is part of a class project for CIS 443 User Interfaces taught by Dr. Anthony Hornof at the University of Oregon. Your participation in this study is entirely voluntary and you may withdraw from the study at any time without penalty. All data gathered from this study will be treated confidentially. If videos or photos are taken, these may be shown to the instructor and other students in the class, but they will not be published online or in print. There are no known risks to participation in this study. Please feel free to ask if you have any questions and, if you would like to participate, please sign and date this form. Thank you very much. The form to sign is in front of you, along with a pen."
- 2. Explanation of the SQ3R method after the participant has signed the consent form "The SQ3R method is a structured approach to reading and studying that enhances reading comprehension and memory. SQ3R stands for Survey, Question, Read, Recite, and Review. It provides a systematic framework for active reading which makes it particularly effective for studying.

The steps in the SQ3R Method are:

Survey

Begin by skimming the chapter to gain an overview of the structure and content. The purpose is to create a mental map of the text and identify key concepts.

Question

Create questions based on the information you surveyed. For example, turn headings and subheadings into questions like "What is the main idea of this section?" These questions help focus attention and create a purpose for reading.

Read

Read the chapter with the goal of answering the questions you created. Pay attention to details and try to identify the main ideas and supporting information. Avoid passive reading by actively engaging with the text and writing notes.

Recite

After reading a section, pause and recall the main ideas and the answers to your questions without referring to the text. Summarize the information in your own words. This step reinforces your memory and helps identify areas that need further review.

Review

Finally, review the material to solidify your understanding and retention. Revisit your notes, summaries, or the text itself to reinforce what you've learned and clarify any concepts that remain unclear.

Do you have any questions regarding using the SQ3R Method? You will have the information on SQ3R during the study"

3. The explanation of what this study is and what task they need to complete.

"For this study you will be tasked with using the prototype in front of you to apply the SQ3R method to a chapter of text. I will be unable to assist or answer any questions you may have during the study. However, please think aloud as you work. Any observations, challenges, or thoughts that you have should be verbalized. Let me know when you believe that you have finished applying the SQ3R method to the text. Once you have finished you will be quizzed on the SQ3R method and the chapter.

Thank you again for your participation. You may begin when you are ready."

Multiple-Choice Quiz

- 1. What is a characteristic feature of a cause-and-effect organizational pattern in paragraph writing?
 - A. Use of comparative language
 - B. Chronological sequencing of events
 - C. Use of phrases like "results in," "due to," and "consequently"
 - D. Avoidance of transition words to emphasize clarity

2. What is the main distinction between the "Question" and "Recite" steps in SQ3R?

- A. Question involves answering questions, while Recite involves memorization
- B. Question involves generating queries about the material, while Recite involves verbalizing answers
- C. Question is done before reading, while Recite is done during reading
- D. Question is for finding definitions, while Recite is for defining terms

3. Why is the "Survey" step important in the SQ3R method?

- A. It ensures you memorize all the text immediately
- B. It provides an overview of the material before detailed reading
- C. It eliminates unnecessary sections
- D. It tests your knowledge before studying

4. What does the "Recite" step in the SQ3R method involve?

- A. Verbally summarizing key points from memory
- B. Skipping sections that seem too difficult
- C. Writing down every detail
- D. Creating a new outline of the material

5. What is the potential risk of burying the topic statement within a paragraph?

A. It allows readers to interpret the content more freely

- B. It increases the likelihood of redundancy within the paragraph
- C. It encourages selective reading of the paragraph
- D. It can mislead readers about the main point

Speech Notes

SLIDE 1

Hello! My name is Amelia Bates. Today, I'll be presenting the results of my user observational study, which compares two user interfaces: the Sequential Tutorial and the User-Managed Checklist. The purpose of this study was to determine which system offers better usability for college students using the SQ3R study method. Let's explore the methodology, results, and key insights.

SLIDE 2

To conduct the study, I recruited four participants, each with different academic backgrounds. These included majors like Elementary Education, Sociology, and Art, which provided some diversity in learning preferences. Future research would benefit from a larger sample size, increased diversity in age, and inclusion of STEM Majors.

The goal of this study was to measure usability through two metrics: how long it took participants to complete the SQ3R method and their performance on a five-question quiz about the material.

The study used a between-subjects design to avoid learning effects, meaning each participant used only one of the two systems. Participants were randomly assigned to either the Sequential Tutorial or the User-Managed Checklist using an online generator.

SLIDE 3

These are quiz questions created to measure participants' comprehension of the SQ3R method and the reading material.

The quiz consisted of five multiple-choice questions, such as:

- Why is the 'Survey' step important in the SQ3R method?
- What is the main distinction between the 'Question' step and the 'Recite' step?
- What is the potential risk of burying the topic statement within a paragraph?

The variety in question types ensured a balanced evaluation of their comprehension and critical thinking skills related to the method.

The purpose of this quiz is to gain insight into the effectiveness of the two systems, as it directly measured the impact of their designs on users' learning outcomes.

SLIDE 4 + 5

Moving on to the results, let's look at the quiz performance. The participants using the User-Managed Checklist achieved perfect scores, demonstrating strong comprehension. However, participants using the Sequential Tutorial scored lower on average.

This suggests that the flexible design of the checklist system allowed users to focus on comprehension, while the tutorial's structured design might have distracted them from the learning material. However, this may reflect individual prior knowledge and education rather

than system design. This is especially plusable as both participants of the User-Managed Checklist System are in the educational field and in research/reading intensive majors.

SLIDE 6 + 7

Next, let's talk about task completion times. Participants using the Sequential Tutorial took an average of 15 minutes and 12 seconds, whereas those using the User-Managed Checklist took slightly longer at 17 minutes and 28 seconds.

This is interesting because it contrasts with my initial hypothesis. I expected the checklist system to be faster due to its flexibility, but it turns out that the extra freedom led to more self-directed exploration and, in some cases, backtracking.

The tutorial system's step-by-step design ensured that the participants worked linearly, which contributed to shorter completion times

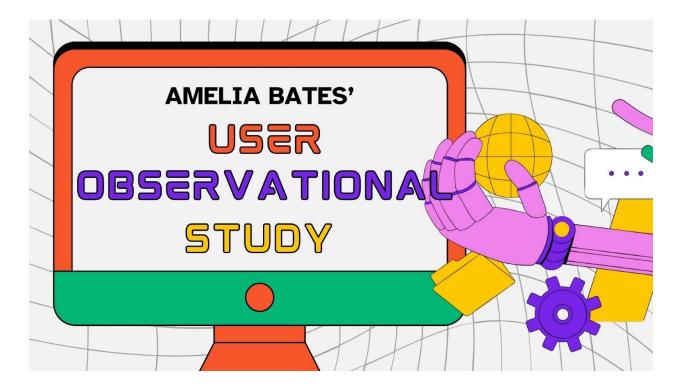
SLIDE 8

To summarize, this study revealed an important tradeoff between structure and flexibility in user interface design. The Sequential Tutorial was better at guiding users through the process efficiently, making it ideal for beginners. However, the User-Managed Checklist enabled higher comprehension scores, showing its value for more experienced users. One thing of note is that despite all the participants being instructed on how to use the SQ3R method prior to the study, none of the participants completely applied the method. For instance, both participants in the User-Managed Checklist neglected to survey the material before writing notes. And the

participants in the Sequential Tutorial did not Recite their questions and answers and only briefly did the Review step.

Overall, this project emphasized the value of user-centered design and iterative testing. By observing real users, it showed important insights that might otherwise be overlooked during development. Thank you!

Presentation Slides



METHODOLOGY

Participants

Participant #1

- Elementary Education Major
- 21 Years old

Participant #2

- Family and Human Services
- 21 Years old

Participant #3

- Art Major
- 20 Years old

Participant #4

- Sociology Major
- 21 Years old

Metrics

Completion time and a 5-question multiple-choice quiz to test their knowledge of the SQ3R Method and the required reading

Experimental Design

Between-subjects in order to avoid learning effects

Randomly assigned to the two



QUIZ QUESTIONS



What is a characteristic feature of a cause-and-effect organizational pattern in paragraph writing?



Why is the "Survey" step important in the SQ3R method?



What is the main distinction between the "Question" and "Recite" steps in SQ3R?



What does the "Recite" step in the SQ3R method involve?



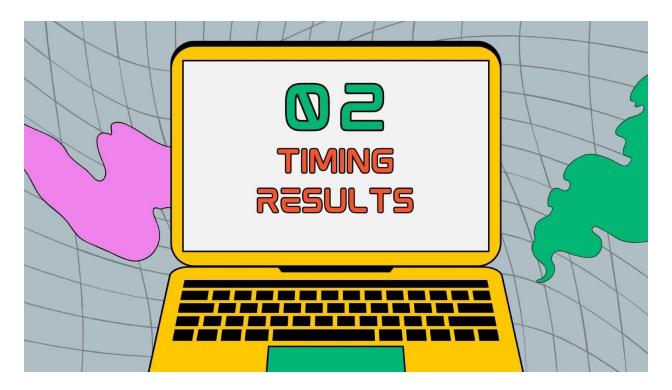
What is the potential risk of burying the topic statement within a paragraph?





Table 1 and Figure 1. Summarize the total quiz scores for each participant, grouped by system.

Each participant answered five multiple-choice questions testing their comprehension of the SQ3R method and the given reading material. If the participant answered correctly, they receive a 1. If they answer incorrectly, they receive a 0.



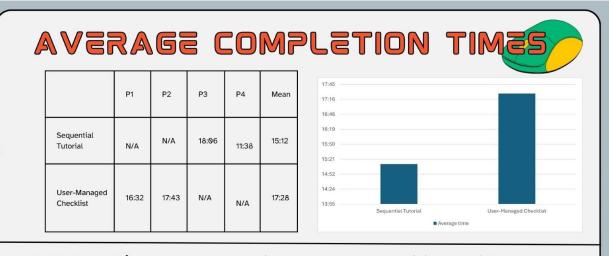


Table 2 and Figure 2. present the time taken by each participant to fully complete the SQ3R method. Times are recorded in minutes and seconds.



Signed Consent Forms

This interview is part of a class project for CIS 443/543 User Interfaces taught by Dr. Anthony Hornof at the University of Oregon. Your participation in this study is entirely voluntary and you may withdraw from the study at any time without penalty. All data gathered from this study will be treated confidentially. If videos or photos are taken, these may be shown to the instructor and other students in the class, but they will not be published online or in print. There are no known risks to participation in this study. Please feel free to ask if you have any questions and, if you would like to participate, please sign and date this form. Thank you very much.

Name: Aysa Taylor

Signature:

If you have any questions, please contact Dr. Anthony Hornof, 541-346-1372, hornof@cs.uoregon.edu

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Signature: Lynco Addi Date: 12/3/2024

If you have any questions, please contact Dr. Anthony Hornof, 541-346-1372, hornof@cs.uoregon.edu

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Name: Penny Jay

Signature:

Date: 12 2 2024

If you have any questions, please contact Dr. Anthony Hornof, 541-346-1372, hornof@cs.uoregon.edu

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Name: <u>Ella Wedderburn</u>

If you have any questions, please contact Dr. Anthony Hornof, 541-346-1372, hornof@cs.uoregon.edu

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