



How does motion impact visual attention and learning?

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Background

Technology in education is evolving at lightning speed.

Multiple modes of presentation can be used simultaneously in educational presentations:

- On-screen text
- Narration
- Animation

Implementing multiple modes of presentation together increases cognitive load.

- Cognitive Load Theory and the Split Attention Effect suggest that mentally integrating different sources of contrasting information impairs learning of instructional material (Moreno & Mayer, 1999).

Three principles describe how students attend to and learn from multimedia presentations:

1. Contiguity Principle
 - When words and images are presented together, effectiveness of multimedia instruction increases.
2. Modality Principle
 - Words should be presented as auditory stimuli rather than visual text on the screen.
3. Modality Effect
 - Students learn better when verbal information is presented auditorily rather than in text format.

How does motion affect learning in a multimedia context?

Experimental Design

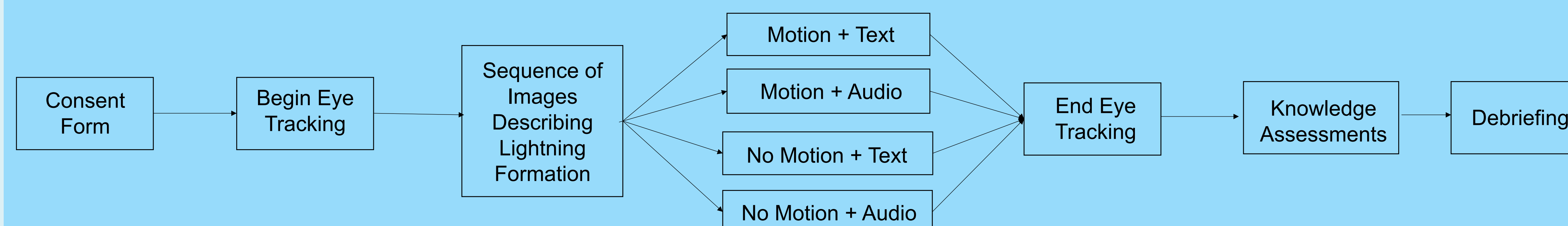
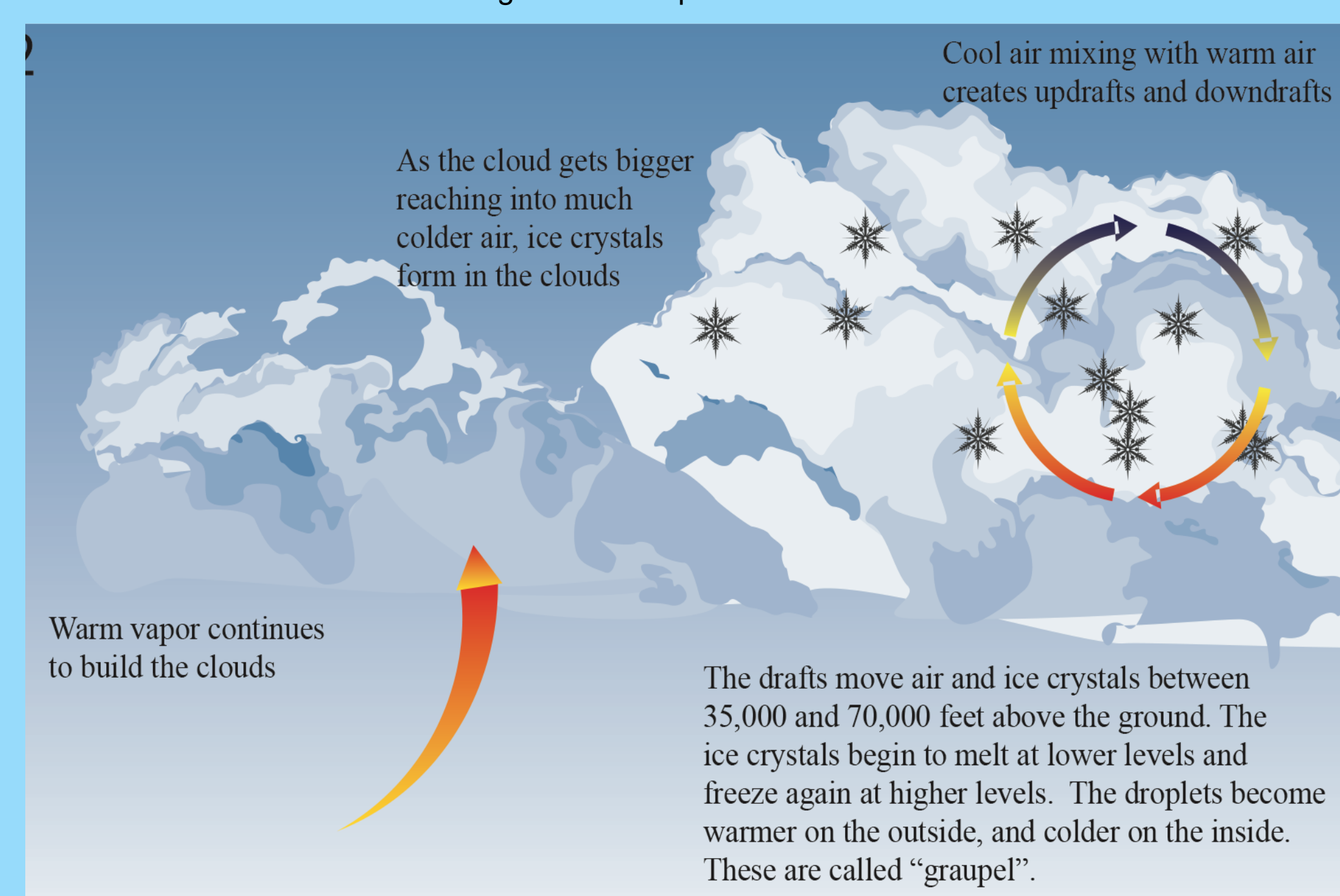


Figure 1: Example slide



Participants will view a sequence of images describing lightning formation. Some participants will be shown static images, and some will be shown images with motion. Descriptions of lightning formation will be presented in text or auditory format. Auditory stimuli will mimic text presented on images.

Figure 3: Regions of interest

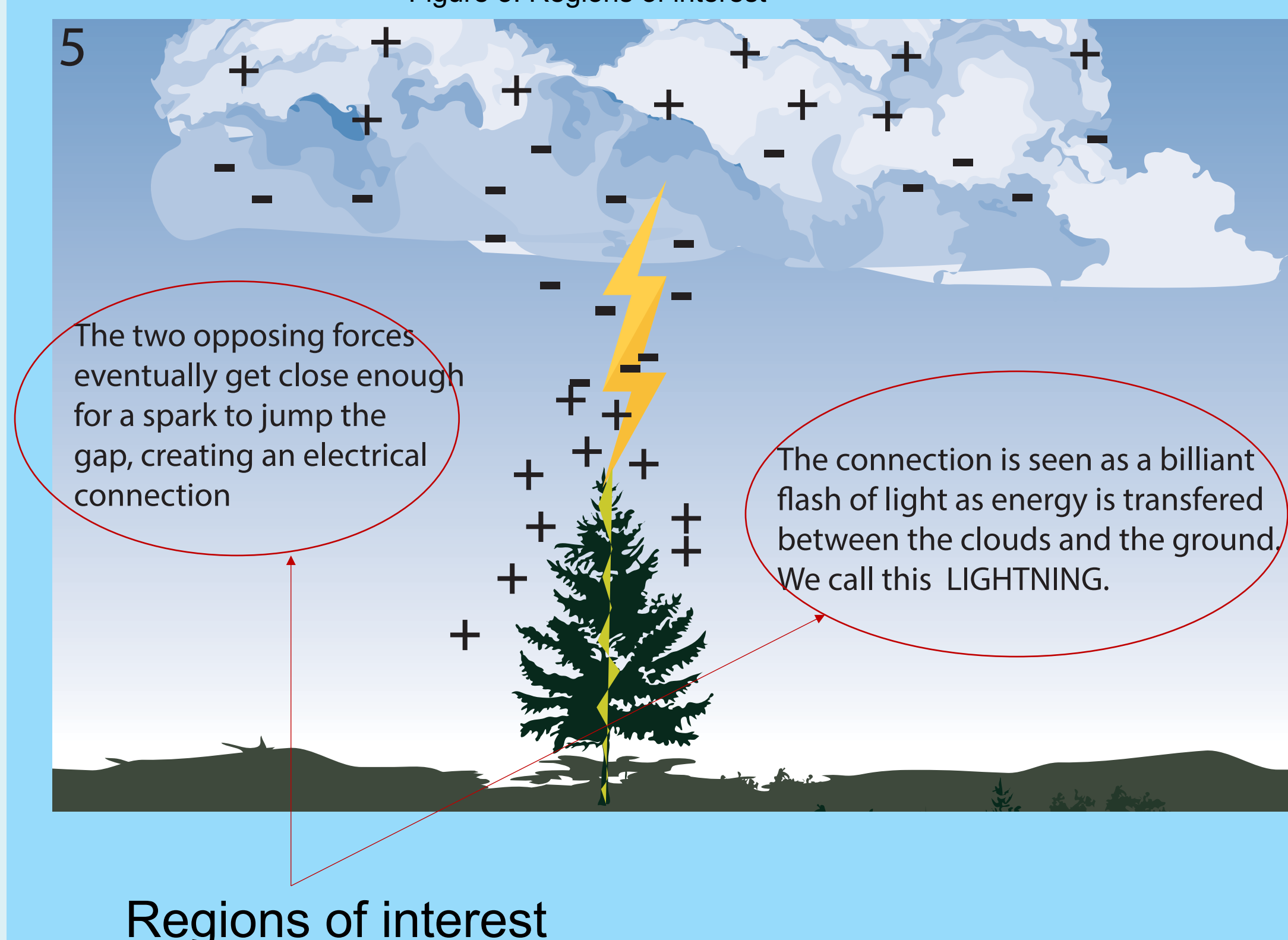
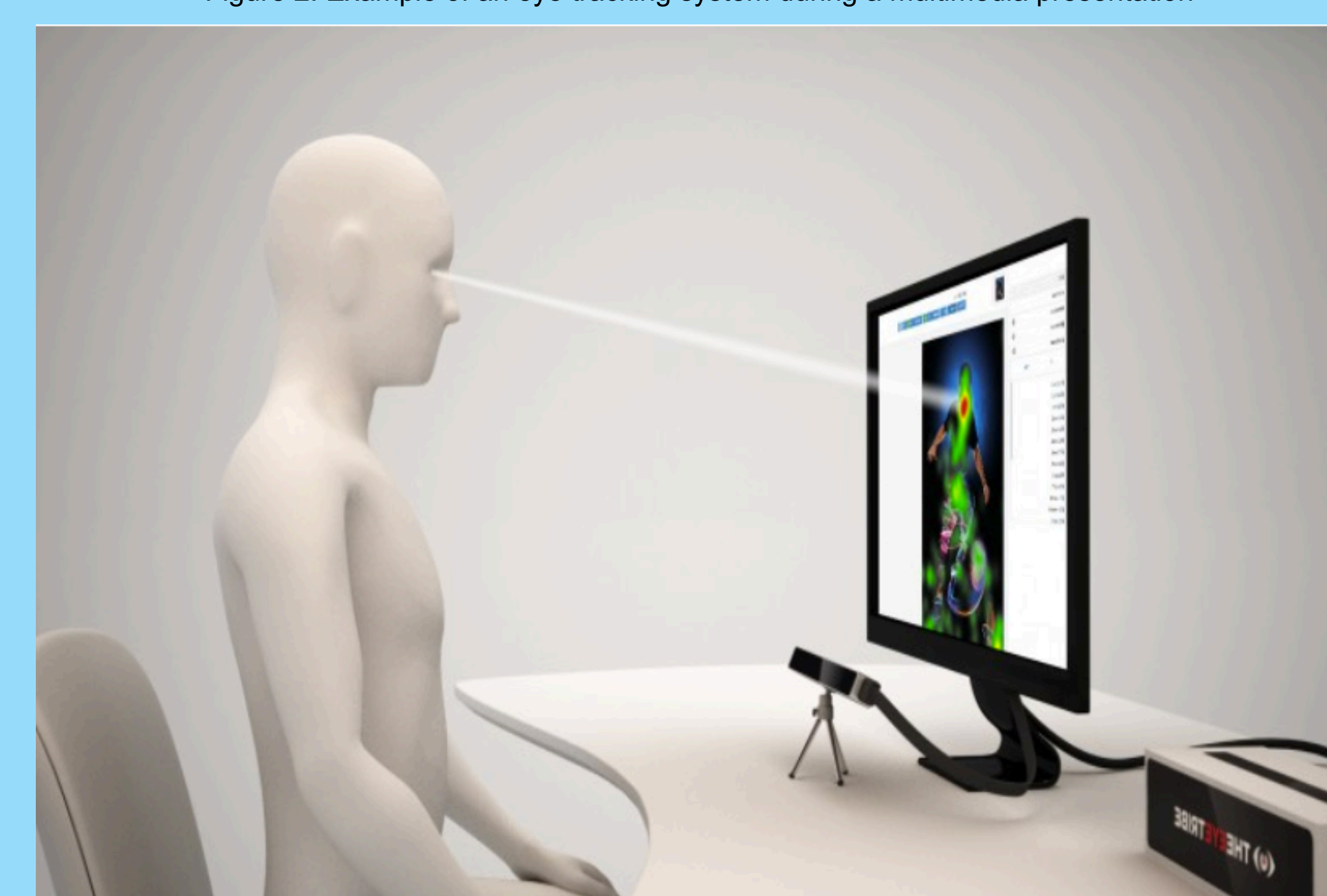
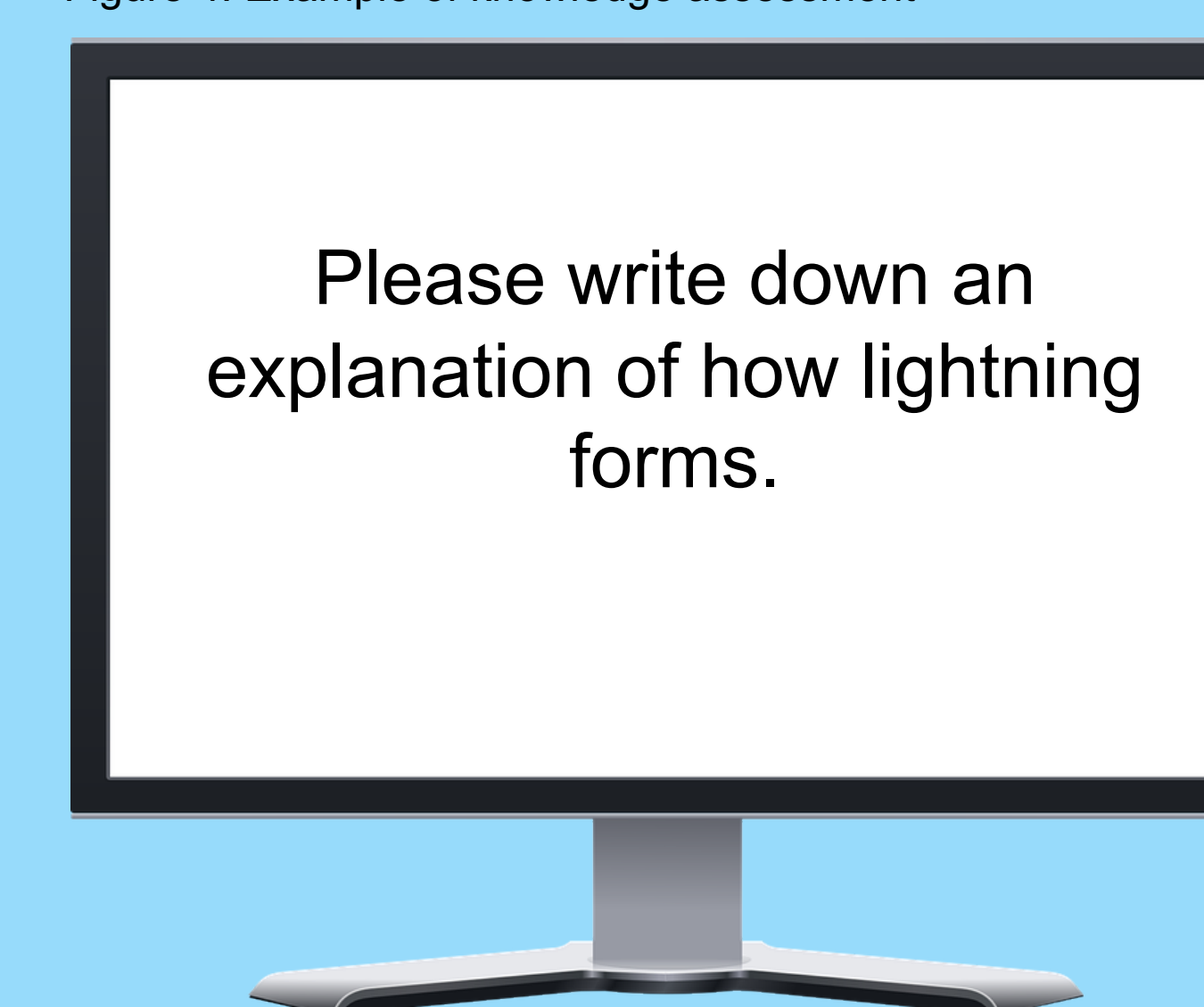


Figure 2: Example of an eye tracking system during a multimedia presentation



Eye movements will be tracked to gauge participants' viewing behaviors during the presentation, such as fixation times and transitions between regions of interest.

Figure 4: Example of knowledge assessment



Participants' knowledge of lightning formation will be tested using written assessments and a multiple-choice quiz.

References

1. Mayer, R. E. & Moreno, R. (1998). A split-attention effect in multimedia learning: Evidence for dual processing systems in working memory. *Journal of Educational Psychology*, 90(2), 312-320.
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3. Swaffer, M. A. (2019). *Seductive details in educational materials: Exploring attention distraction using eye tracking*. [Doctoral Dissertation, University of Northern Colorado]. UNCO Digital Archive. <https://digscholarship.unco.edu/dissertations/611>

Expected Results

The addition of motion will be beneficial to learning when presented with auditory information.

- Text and audio together reduce cognitive load.

The addition of motion will hinder learning when images are presented via text.

- Text and motion together increase cognitive load.

Expected Results



Eye tracking will indicate participants' viewing behaviors during the multimedia presentation.

- Text and motion – shorter fixation times and more transitions between regions of interest due to increased cognitive load
- Audio and motion – longer fixation times and fewer transitions between regions of interest due to reduced cognitive load

We can use the results of this study to improve learning in multimedia contexts, especially when learning about complex systems.