Applying Cognitive Load Theory (CLT) to Improve Accessibility of Lecture Slides

When creating lecture slides it is crucial that they are accessible for all students. One important concept to assist with this is cognitive load theory (Sweller, 1988/1994/2010; Sweller, van Merrienboer, & Paas, 1998). The working memory has a limited amount of space and it is important to maximize this space as much as possible for learning to occur. Cognitive load is housed within working memory. If the cognitive load is too high, overload can occur, and learning will become more difficult.

There are three components to cognitive load theory:

- **Extraneous Load** is caused by inappropriate instructional designs that ignore working memory limits and fail to focus working resources on schema construction and automation.
- **Intrinsic Load** is caused by the natural complexity and structure of the material that must be processed.
- **Geeman Load** is caused by effortful learning resulting in schema construction and automation.

Another way to think of the three cognitive loads types:
- **Extraneous Load** is the distractions that occur outside of the learning-the environment, the method of learning (typically slides, handouts, and lectures), and other instructional design elements
- **Intrinsic Load** is the complexity of the material that learner is trying to process
- **Geeman Load** is the actual learning that occurs

For germane load maximization to occur, it is important to manage intrinsic load and minimize the extraneous load. All of this can be completed with properly designed lecture slides.

For slides, it is important that the content is easy to understand. This will make sure that the germane load, extraneous load, and intrinsic load are controlled.
Tips for Making Slides Accessible (Mayer, 2001)

1. **Use fewer words, and more graphs/charts**
   - This technique streamlines the information on the slides and helps the presenter not to read off the slides
   - This also allows for the slides to be updated more quickly in the future as most of what is delivered in a lecture will be spoken

2. **Photos used in slides should reflect the material and not distract**
   - Use of *seductive details* can seem fun, but they distract the learner from the material presented on the slide as well as from listening to the presenter

3. **Limit animation as it can distract from the material**
   - Animation of texts and transitions can overwhelm the learner

4. **Reduce use of extreme fonts, colors and animation**
   - Less is more! Backgrounds without much color, neutral font colors and neutral text are better for fostering learning

5. **Ensure that slides are accessible for students with diagnosed disabilities that may need to utilize alternative software**
   - Microsoft Office has an Accessibility button. Under the *Review* Tab across the top of PowerPoint, click on *Check Accessibility* button and will show a box of alert issues.

   - To add alternative text for photos, right click and select *Edit Alt Text*, and type in the description or have it generate a description for you
Examples of Poorly Designed PowerPoint Slides

This slide has a random photo of a snake (a seductive detail with no connection to the lesson) and a blue box that also doesn’t connect to the lesson and distracts from the title.

This slide has a busy background and fonts that are hard to read because of color, shading and size. It also includes animation, which is distracting.

This slide has too much text. It is hard for the learner to see it, follow it, and understand it. Also, the chances of reading off the slide are greater for the presenter, which can also overwhelm the learner.
Examples of Well-Constructed PowerPoint Slides

This slide has a clear and easy to read font, it is free from photos and outlandish text.

This slide has all the necessary information above, but is now organized in charts that are easy to follow and understand. The photos have been labeled with alternative text. The lecturer would use this information as a basis for the presentation but also verbally expand for the audience to increase learning.

For more information on effective lecture and multimedia for slide design:
https://support.office.com/en-us/article/make-your-powerpoint-presentations-accessible-to-people-with-disabilities-6f7772b2-2f33-4bd2-8ca7-dae3b2b3ef25

Or contact the Center for Excellence in Teaching at usccet@usc.edu