Lecture Slide Design: Evidence Based Practices

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Students need to interact with the material in order to "encode" and "rehearse" the information. Without this it will be very difficult to recall it later. Making your own notes and drawings does this, so make lecture slides available for note taking, handouts should be in a form set up for note-taking, such as 3 slides to a page. This format has pictures of the slide end states on the left and lines for writing on the right. Students are far more likely to remember information from their own notes and drawings than from an instructor's. They take ownership and customize representation of the content in ways that are meaningful for them and thus memorable.

Slide shows tend to put students into a passive, "entertain me" mode that results in little information retention. Also, if students can get the slides online, many may mistakenly think they have all the important content, and thus will magically be able to retrieve this information for tests and assignments without having to do anything other than read the slides. You need to explain why this won't work, which is noted in the paragraph immediately above.

Memory works best when information is delivered in 10-minute chunks followed by immediate application (discussion, Q&A, notes consolidation), to help memory formation through consolidation. Consolidation includes figuring out how new information fits with students' current mental models of the topic and refining those models or creating new ones if none currently exist. (Klemm, 122)

Show only a few slides at a time, limiting content to pictures and diagrams that would take too long to draw on the board, or illustrations that use animation. It is effective to have some slides with no text at all—pictures are far more memorable.

When the instructor draws and writes, it slows things down enough for students to think about it.

Slides can be interactive quizzes that require completion of a diagram, contain movie clips, have links to Web sites, use slide animation features to illustrate the in-between states, not just before and after.

Students can read much more quickly than the presenters can speak. This is why reading text from the screen does not work—it results in "dual channeling" where two primary modes of information absorption (reading and listening) compete with one another so that neither works (Stone, 360). Better to have illustrations and short text summaries or keywords with the details presented in the narration. Ensure that the written key words are the same as the spoken ones, rather than synonyms, to further reduce dissonance.

"To accommodate templates, authors must often distort real conceptual relationships, or consistently violate the template, which invalidates the notion of *template*" (Stone, 362). Break free from linear

presentations. Hyperlink sets of slides to a menu, then link and move around according to student interest. Chunking breaks relationships between pieces of information. Use the slide show structure to reinforce information structure e.g., a graphic organizer with hot links and returns.

Consider how the PowerPoint structure affects the way students perceive and process the information. The linear structure, page templates and wizards "encourage a vacuous recital of reductive bullet points, while the projected display format minimizes the amount of textual or numeric information that can be communicated" (Cyphert, 185). "Authors trying to express logical relationships that are not similar to the default logic of PowerPoint must invest significant effort into working around the problem, if a work-around can be devised" (Stone 366). Some ideas for overcoming this are presented below.

For disciplines in which mathematical or quantitative application of central ideas is emphasized, instructors often need to repeatedly demonstrate step-by-step examples of how to apply models or churn through certain formulas. Having students see problems being worked out in real time—as they work along with the instructor—is often easily accomplished using other media such as a chalkboard, whiteboard, document camera, or overhead (Burke, 249).

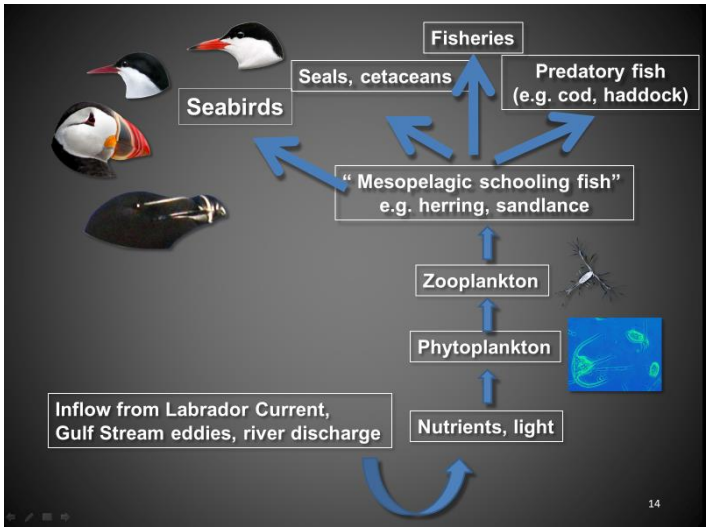
Speak to the students, not the screen. Consider that it is likely students will make an assumption of a positive correlation between the number of slides on a topic and its importance.

Dim lights near the screen to avoid wash-out. Use the light switch system to raise and lower light levels between slide show and application activities.

A good diagram or graph can explain much better than text. However, "…teachers need to ask whether each picture, sound, or video clip furthers student learning or is extraneous fluff" (Rosenthal, 85).

Use visual consistency as an instructional aid (e.g., colours and styles for similar types of content). Avoid using canned templates and clip art. Three colors should be sufficient, however: one for the slide background, one for the text color, and perhaps one accent color.

Example visual slide that shows content organizational relationships:



Be careful with publisher-provided slides—some simply replicate textbook examples or just take the chapter headings and subheadings.

Don't have too many slides in any one class. Don't let PPT slides become the lecture—they should supplement the lecture. Engage students with the slides by:

- Having slide blanks to fill in.
- Presenting slide content as questions or challenges rather than statements.
- Including open-ended, thought-provoking and brainstorming slides.
- Assigning students to co-lead class lectures.
- Having topic slide summaries and questions to which students indicate their answer selections by hands or coloured cards or clickers.

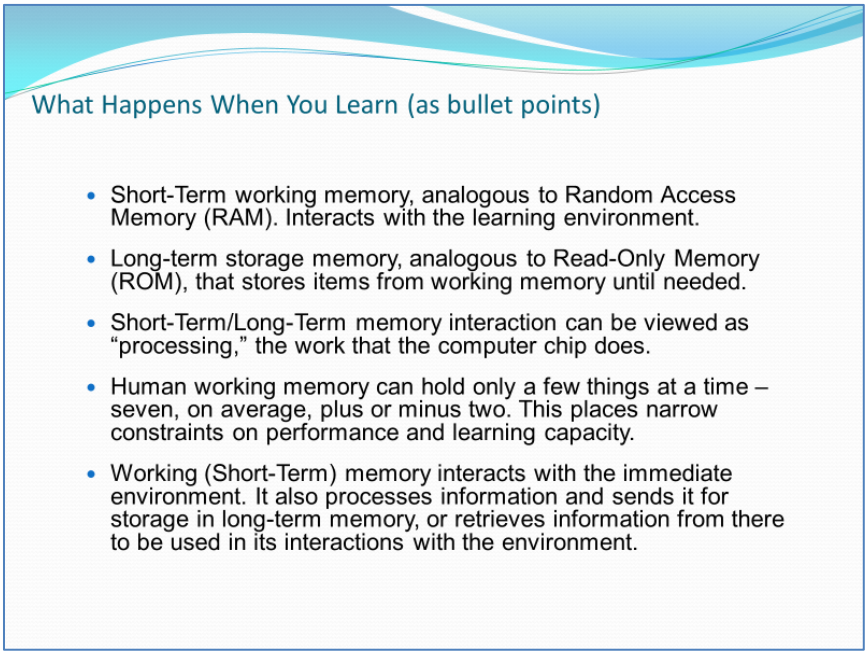
More practical tips:

Assertion-Visual Evidence approach vs. Title-Bullet Points

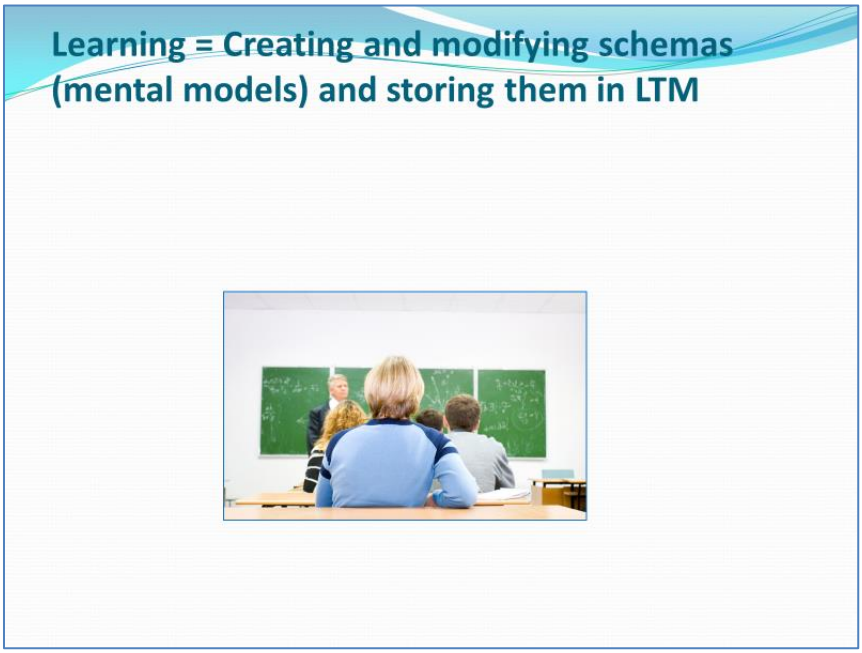
Consider a slide approach of Assertion-Visual Evidence instead of Title-Bullet Points. Two recent studies showed significant improvement in test scores using this method in Computer Science (Wolfe) and Geoscience (Diesel). The assertion-visual evidence approach more readily orients students to the purpose of the slides. Makes it easier to know where topics begin and end (Wolfe). Allows the instructor

to clearly emphasize the most important point of the slide be giving that assertion more emphasis than it would receive in a bulleted list (if it were even there). Visual evidence follows findings from research that students learn better from relevant images coupled with words than from words alone. Also, from images placed close to, and represented simultaneously with, corresponding text. (Diesel, T2G-12)

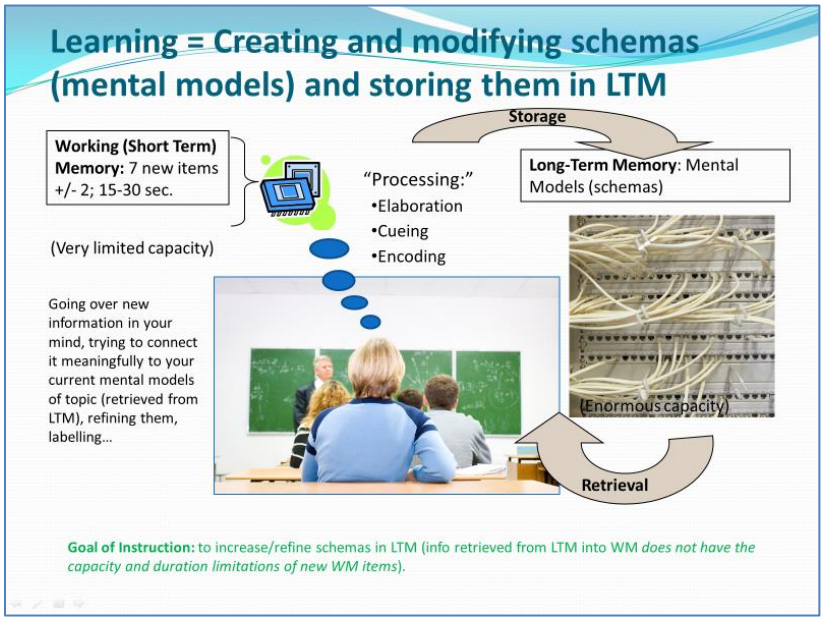
Title-Bullet Points Approach ex. 1:



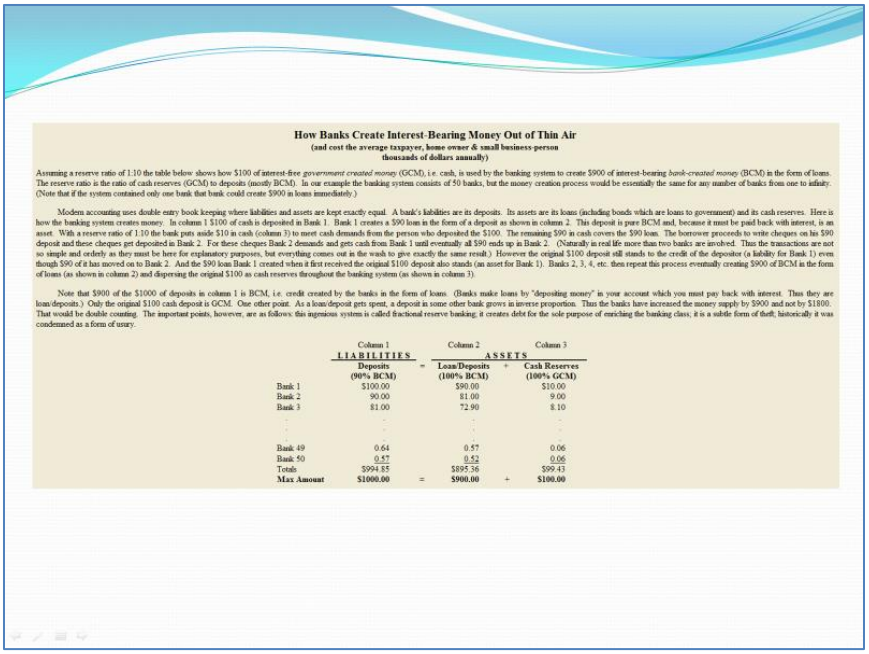
Assertion-Visual Evidence Approach using animations ex. 1: start



Assertion-Visual Evidence Approach using animations ex. 1: end



Title-Bullet Points Approach ex. 2:



How Banks Create Interest-Bearing Money Out of Thin Air
(and cost the average taxpayer, home owner & small business person thousands of dollars annually)

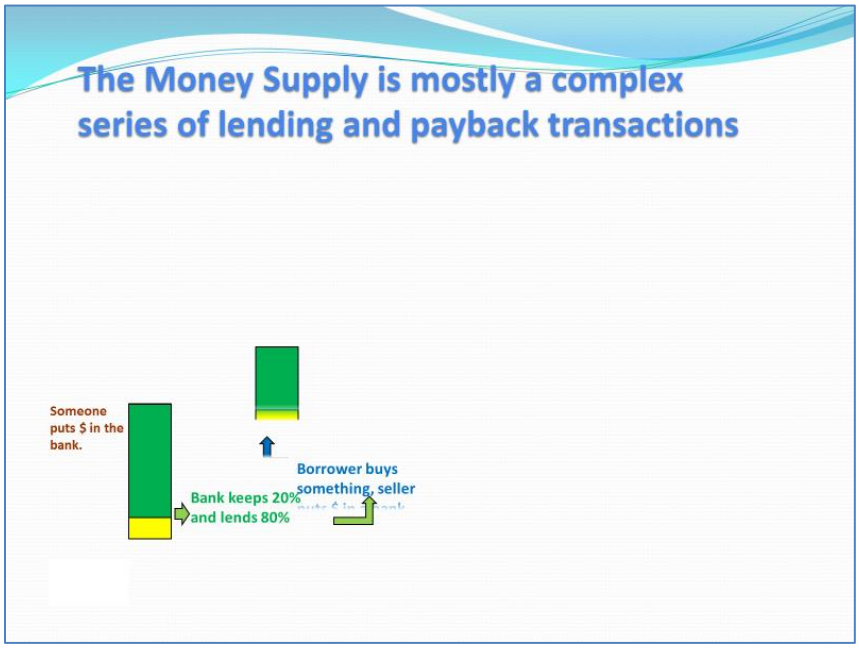
Assuming a reserve ratio of 1:10 the table below shows how $100 of interest-free *government created money* (GCM), i.e. cash, is used by the banking system to create $900 of interest-bearing *bank-created money* (BCM) in the form of loans. The reserve ratio is the ratio of cash reserves (GCM) to deposits (mostly BCM). In our example the banking system consists of 50 banks, but the money creation process would be essentially the same for any number of banks from one to infinity. (Note that if the system contained only one bank that bank could create $900 in loans immediately.)

Modern accounting uses double entry book keeping where liabilities and assets are kept exactly equal. A bank's liabilities are its deposits. Its assets are its loans (including bonds which are loans to government) and its cash reserves. Here is how the banking system creates money. In column 1 $100 of cash is deposited in Bank 1. Bank 1 creates a $90 loan in the form of a deposit as shown in column 2. This deposit is pure BCM and, because it must be paid back with interest, is an asset. With a reserve ratio of 1:10 the bank puts aside $10 in cash (column 3) to meet cash demands from the person who deposited the $100. The remaining $90 in cash covers the $90 loan. The borrower proceeds to write cheques on his $90 deposit and these cheques get deposited in Bank 2. For these cheques Bank 2 demands and gets cash from Bank 1 until eventually all $90 ends up in Bank 2. (Naturally in real life more than two banks are involved. Thus the transactions are not so simple and orderly as they must be here for explanatory purposes, but everything comes out in the wash to give exactly the same result.) However the original $100 deposit still stands to the credit of the depositor (a liability for Bank 1) even though $90 of it has moved on to Bank 2. And the $90 loan Bank 1 created when it first received the original $100 deposit also stands (an asset for Bank 1). Banks 2, 3, 4, etc. then repeat this process eventually creating $900 of BCM in the form of loans (as shown in column 2) and dispersing the original $100 as cash reserves throughout the banking system (as shown in column 3).

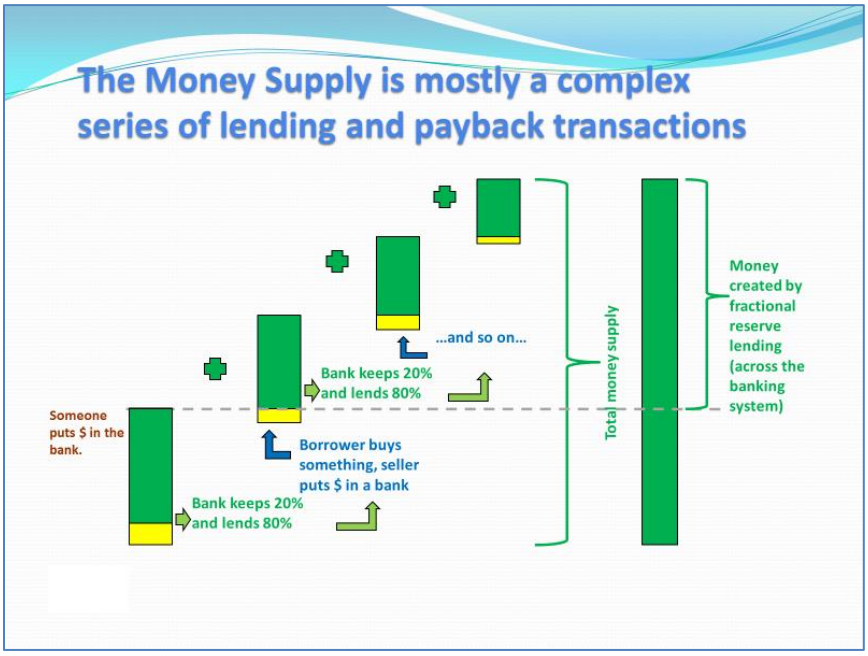
Note that $900 of the $1000 of deposits in column 1 is BCM, i.e. credit created by the banks in the form of loans. (Banks make loans by "depositing money" in your account which you must pay back with interest. Thus they are loan/deposits.) Only the original $100 cash deposit is GCM. One other point. As a loan/deposit gets spent, a deposit in some other bank grows in inverse proportion. Thus the banks have increased the money supply by $900 and not by $1800. That would be double counting. The important points, however, are as follows: this ingenious system is called fractional reserve banking; it creates debt for the sole purpose of enriching the banking class; it is a subtle form of theft; historically it was condemned as a form of usury.

	Column 1 LIABILITIES		Column 2 ASSETS		Column 3
	Deposits (90% BCM)	=	Loan/Deposits (100% BCM)	+	Cash Reserves (100% GCM)
Bank 1	$100.00		$90.00		$10.00
Bank 2	90.00		81.00		9.00
Bank 3	81.00		72.90		8.10
.	.		.		.
.	.		.		.
.	.		.		.
Bank 49	0.64		0.57		0.06
Bank 50	0.57		0.52		0.06
Totals	$994.85		$895.56		$99.43
Max Amount	**$1000.00**	=	**$900.00**	+	**$100.00**

Assertion-Visual Evidence Approach using animations ex. 2: step 3 of 7 (mid-animation)



Assertion-Visual Evidence Approach using animations ex. 2: end

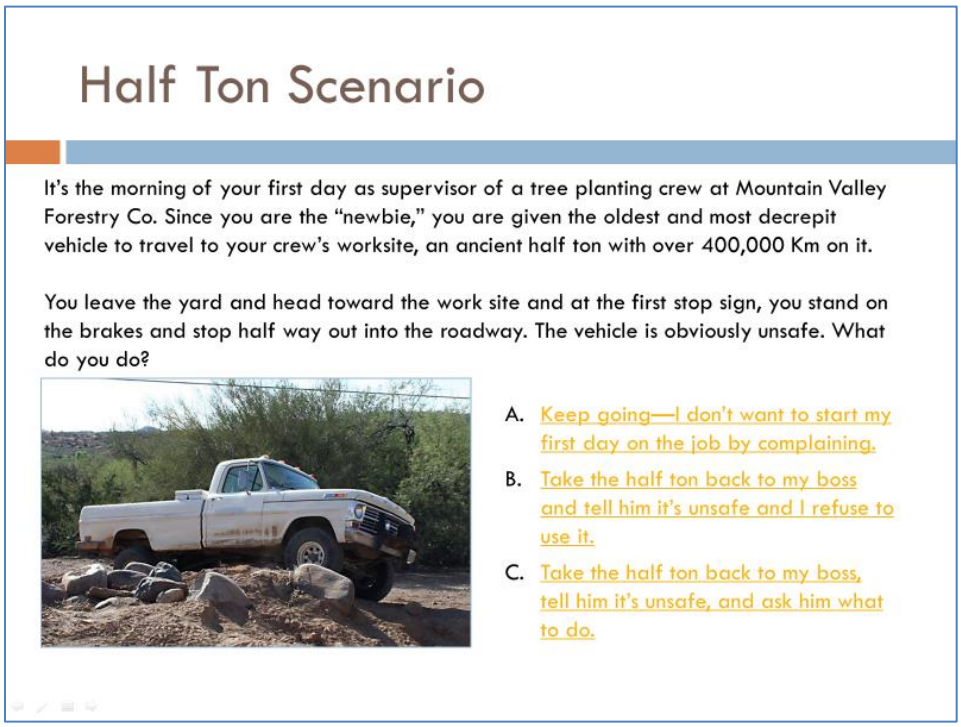


PowerPoint Hotspot Linking to Create Scenarios

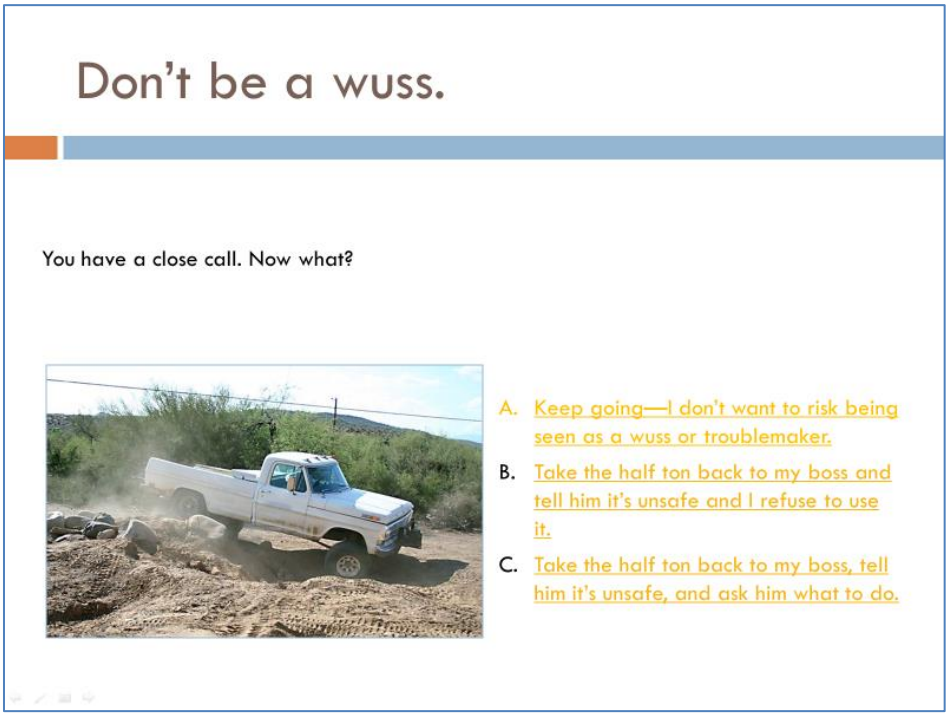
This form of slide deck has an "ill structured" scenario (one in which relevant and irrelevant information is given without indicating which is which) and the response options represent typical reactions, the correct one of which is unclear. The three slides below show only the logic branch for picking response A each time. To create a scenario, first create a logic structure, then design slides for each part and link

them back and forth with hotspots. The slide presentation then involves application, discussion, and deeper learning.

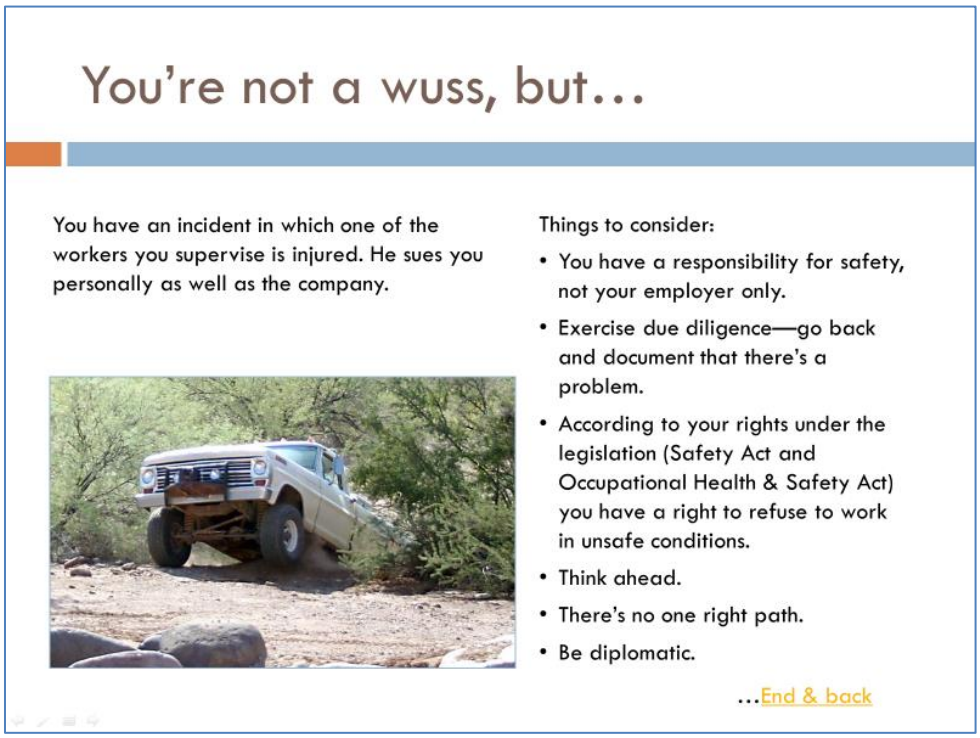
Scenario setup



Further scenario development after selecting response A:

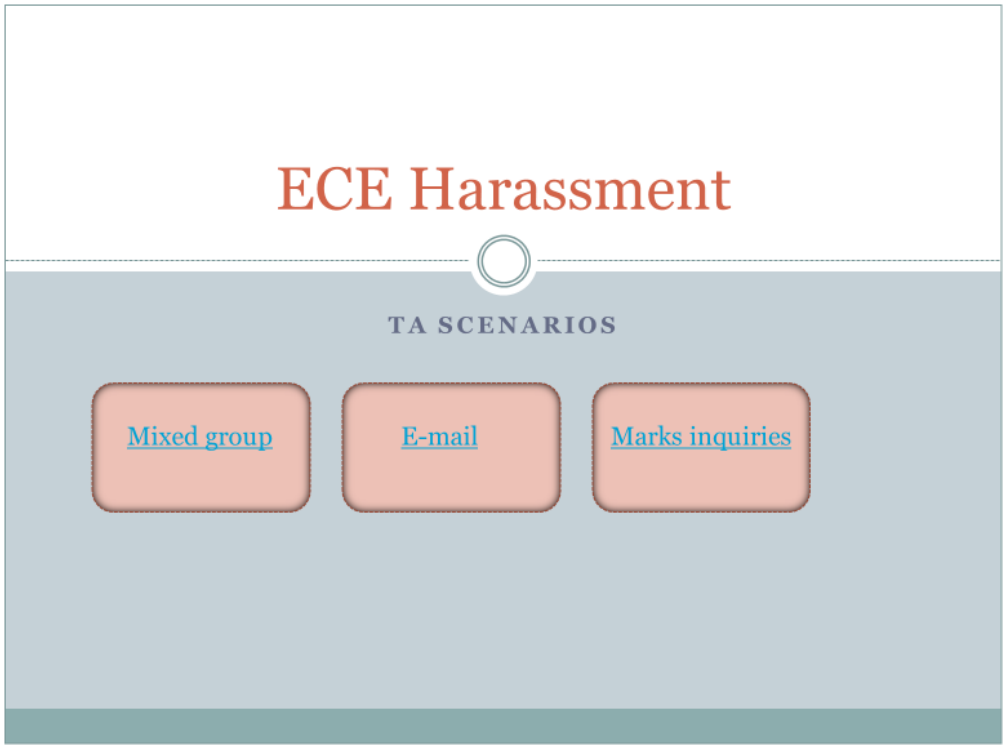


The end of logic branch 1A:



End and back takes students back to the first slide so they can try again. This allows students to explore all options and reinforce the best one.

Have several scenarios in one slide deck with a linkable menu:



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