Knowledge check questions:
Is interactivity warranted during a narrated presentation?

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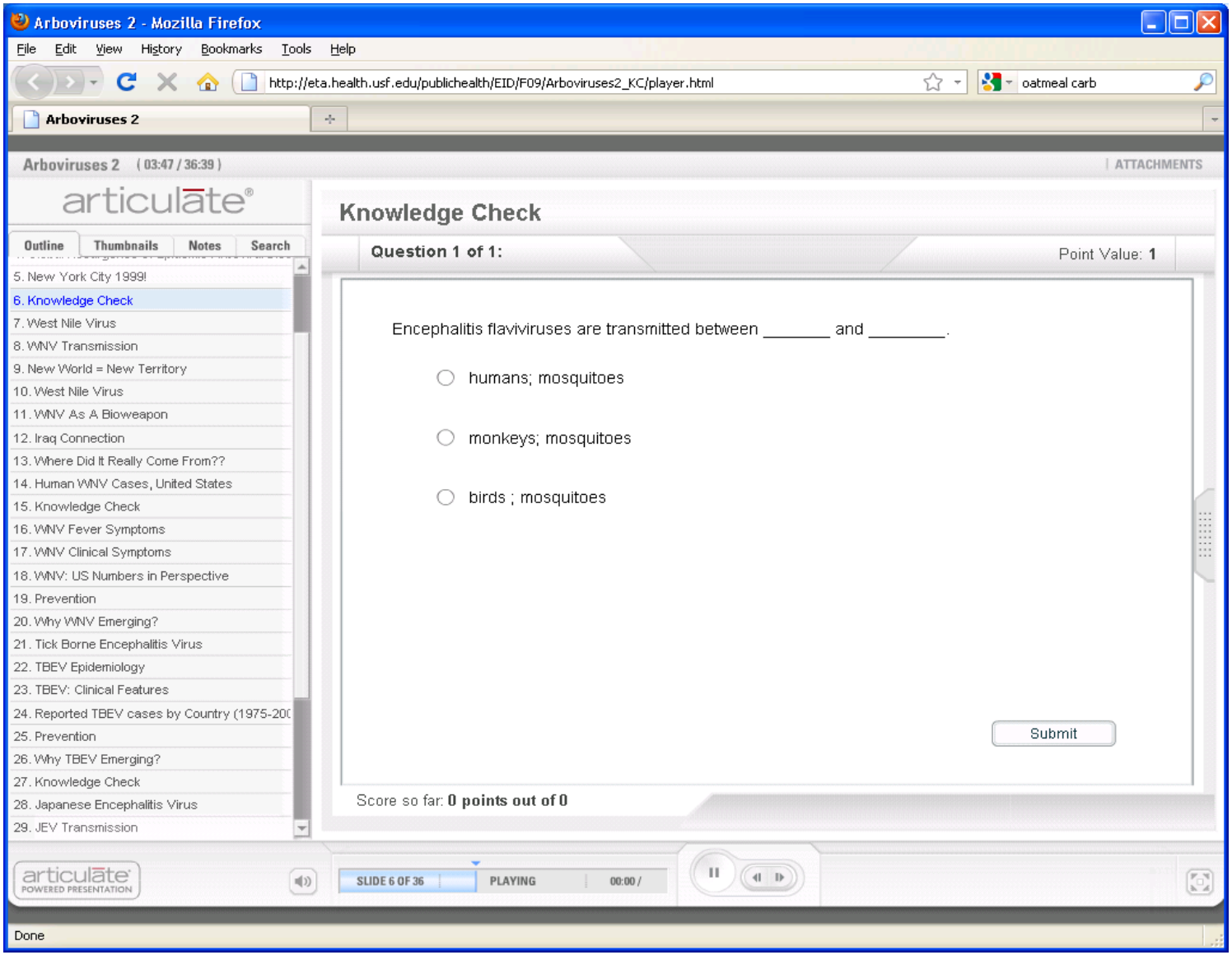
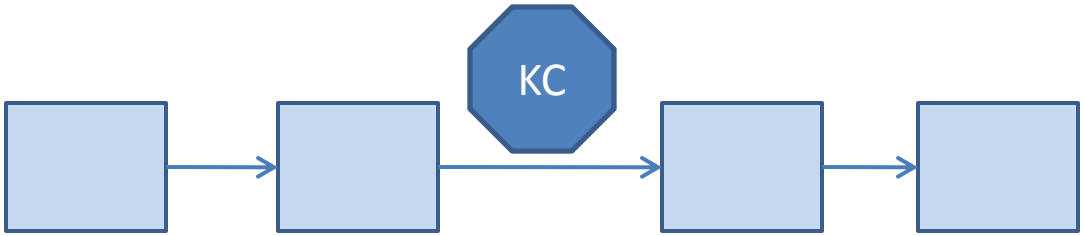
Agenda

- What is a “knowledge check question?”
- Instructional Design Guidelines
- Literature
- Study & Results

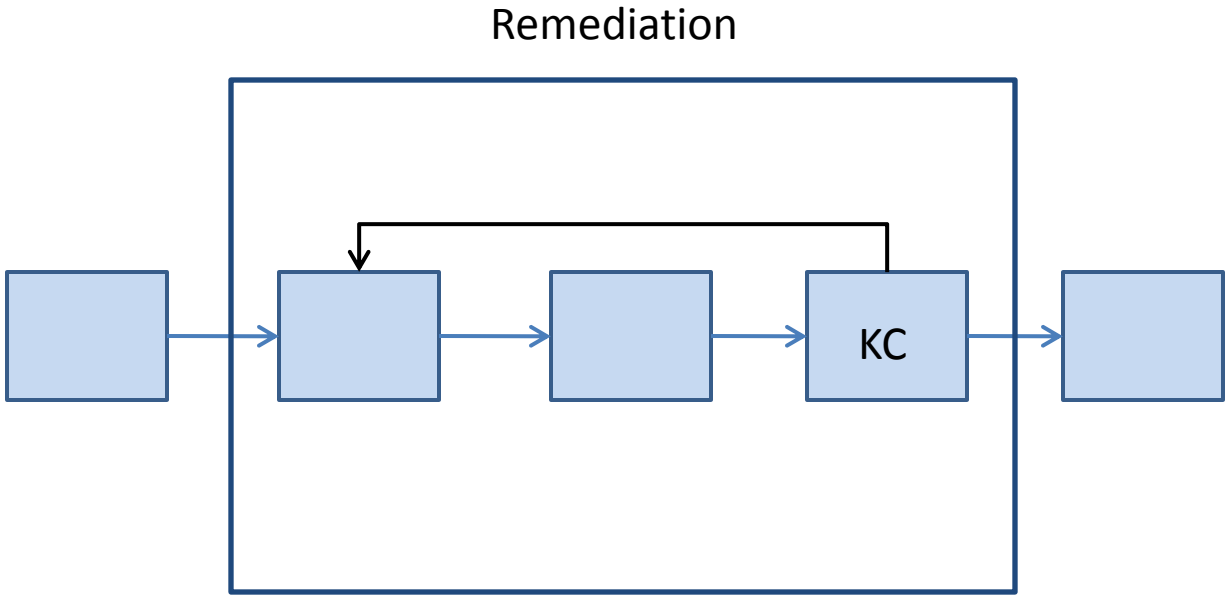
Knowledge Check Question



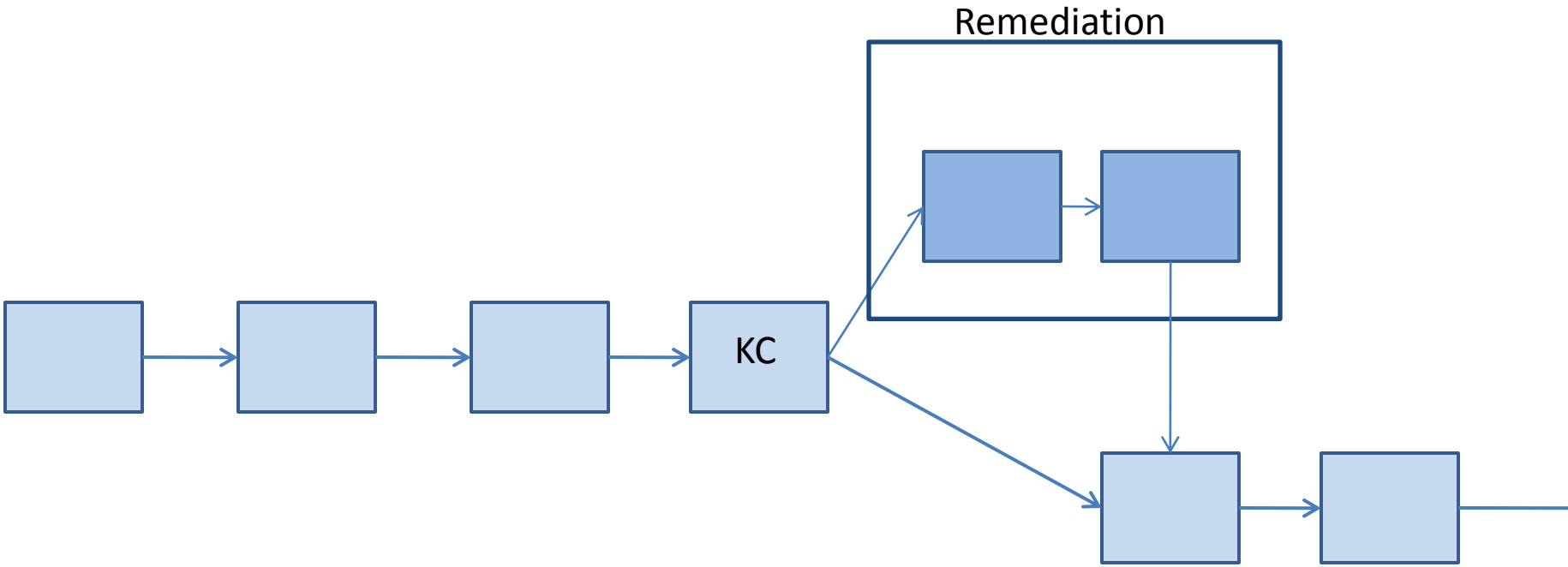
Creates a “stop” to the Instruction



KC Question in Narrated Presentation



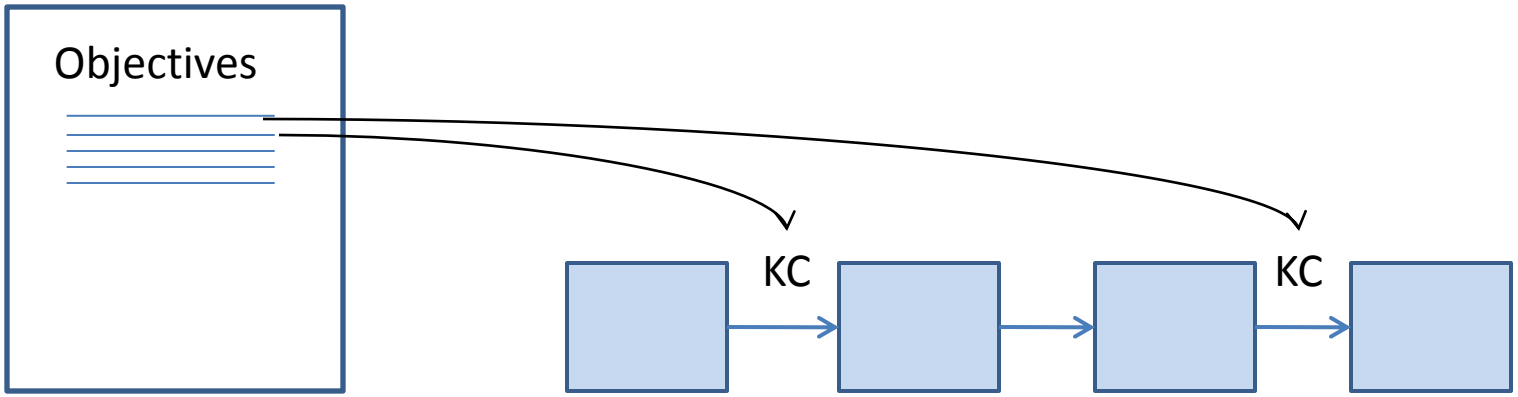
Remediation via branching



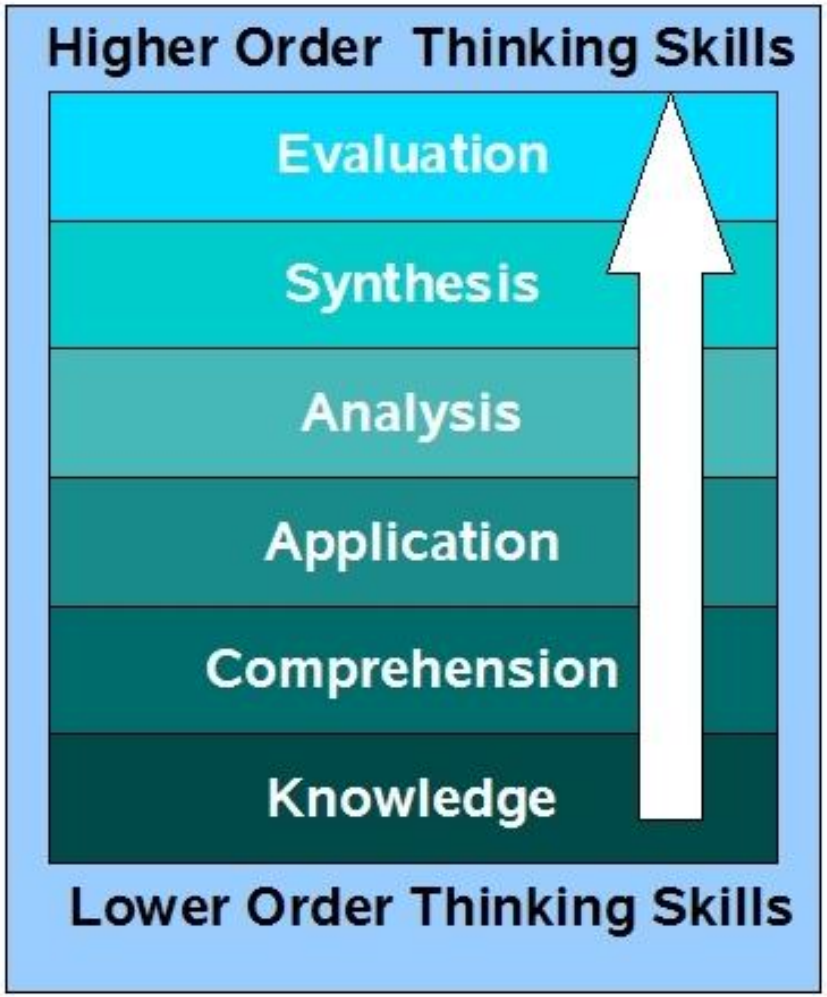
Where to use KC questions?

Based on Learning Objectives

- Reinforce the content of the objective
- Ensure the learning objectives have been met



Knowledge Check Questions & Blooms Taxonomy



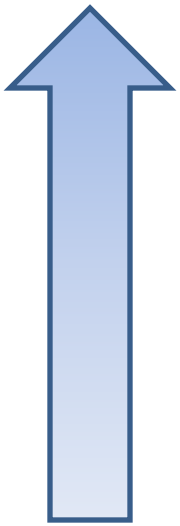
Bloom, B. S. (1956). *A taxonomy of educational objectives*. New York: David McKay.

Learning? … from a KC Question?

- learning results from:
  - the narrated presentation;
  - the presentation of the question and;
  - the feedback.

Types of feedback

- Elaborative feedback
- Diagnostic feedback
- Explanatory feedback
- Corrective feedback
- No Feedback – right/wrong



Specificity increases

Fleming, M. & Levie, H. W. (1993). *Instructional message design*. Englewood Cliffs, NJ: Educational Technology Publications, Inc.

No Feedback- Right/Wrong

X Your answer was incorrect.

- the student still doesn't know why they were incorrect

Fleming, M. & Levie, H. W. (1993). *Instructional message design*. Englewood Cliffs, NJ: Educational Technology Publications, Inc.

Corrective feedback

x Your Answer was incorrect. The correct answer was Jefferson

- Tells the correct answer

Fleming, M. & Levie, H. W. (1993). *Instructional message design*. Englewood Cliffs, NJ: Educational Technology Publications, Inc.

Explanatory feedback

X Your answer was incorrect because Carter was from Georgia, only Jefferson called Virginia home.

- provides additional information

Fleming, M. & Levie, H. W. (1993). *Instructional message design*. Englewood Cliffs, NJ: Educational Technology Publications, Inc.

Diagnostic feedback

- x Your answer was incorrect. Jefferson was the correct answer. *Your choice of Carter suggests some extra instruction on the home states of past presidents*.

- also provides suggestions of what the learner might study next

Fleming, M. & Levie, H. W. (1993). *Instructional message design*. Englewood Cliffs, NJ: Educational Technology Publications, Inc.

Elaborative feedback

- ✓ Your answer, Jefferson was correct. The University of Virginia, a campus rich with Jeffersonian architecture and writings, is sometimes referred to as Thomas Jefferson's school.

- provides information about particular responses

Fleming, M. & Levie, H. W. (1993). *Instructional message design*. Englewood Cliffs, NJ: Educational Technology Publications, Inc.

Elaborative feedback

- address the topic
- address the response
- discuss the particular error(s)
- provide worked examples, or;
- give gentle guidance.

Shute, V. J. (2008). Focus on formative feedback. *Review of Educational Research, 78(1), 153*–189.

Literature

Literature

- Extensive literature base
- Pressey (1920's)
- Skinner (1958) – Teaching machines
- Decades of clinical trials & classroom studies
- Literature
  - positive for more specific or elaborative feedback
  - mixed on the timing of feedback

Skinner, B. F. (1958). Teaching Machines. *Science. 128*(3330) 969-977.

Timing of feedback

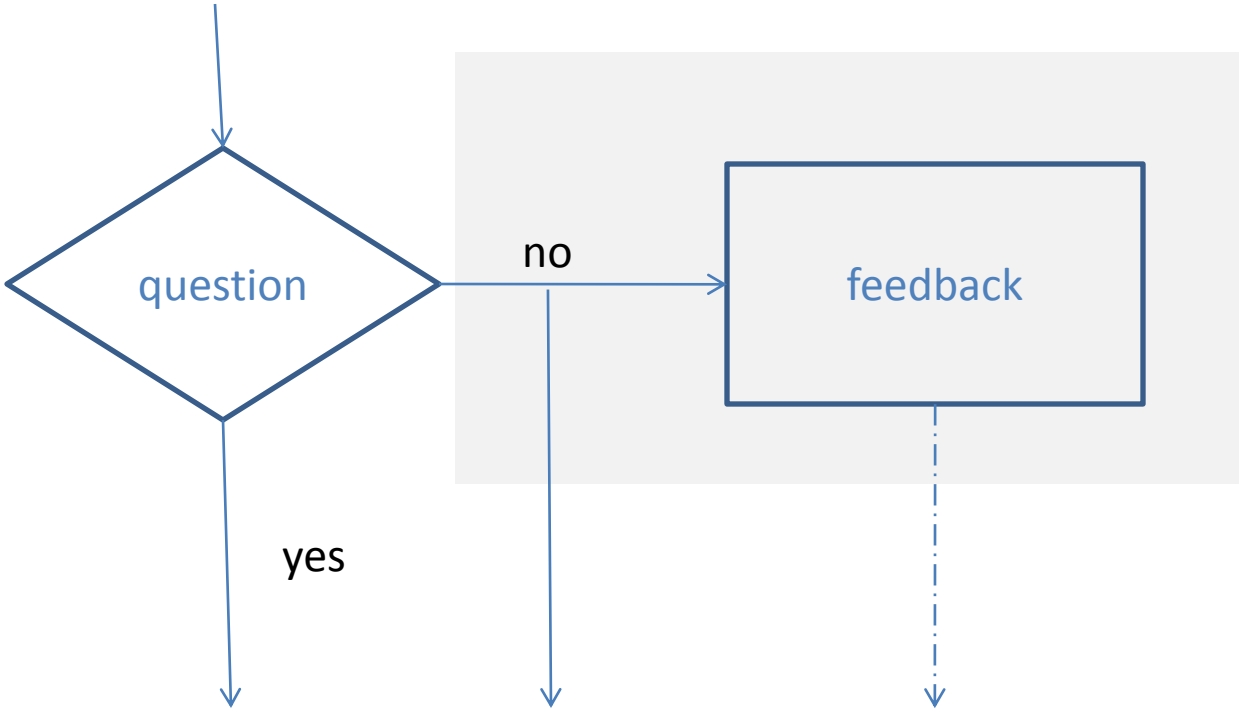
- Feedback ***immediately*** following the presentation of a question may be **detrimental to learning**

  (Brackbill et al., 1962; Kulik & Kulik, 1988; Kulhavy & Anderson, 1972; Mory, 2004)

References at the end of the presentation

Kulhavy and Anderson (1972)

- "Interference-preservation theory"
- Incorrect response too close in time to feedback



Kulhavy, R. W., & Anderson, R. C. (1972). Delay-retention effect with multiple-choice tests. *Journal of Educational Psychology, 63(5), 505–512.*

Delayed retention effect (DRE)

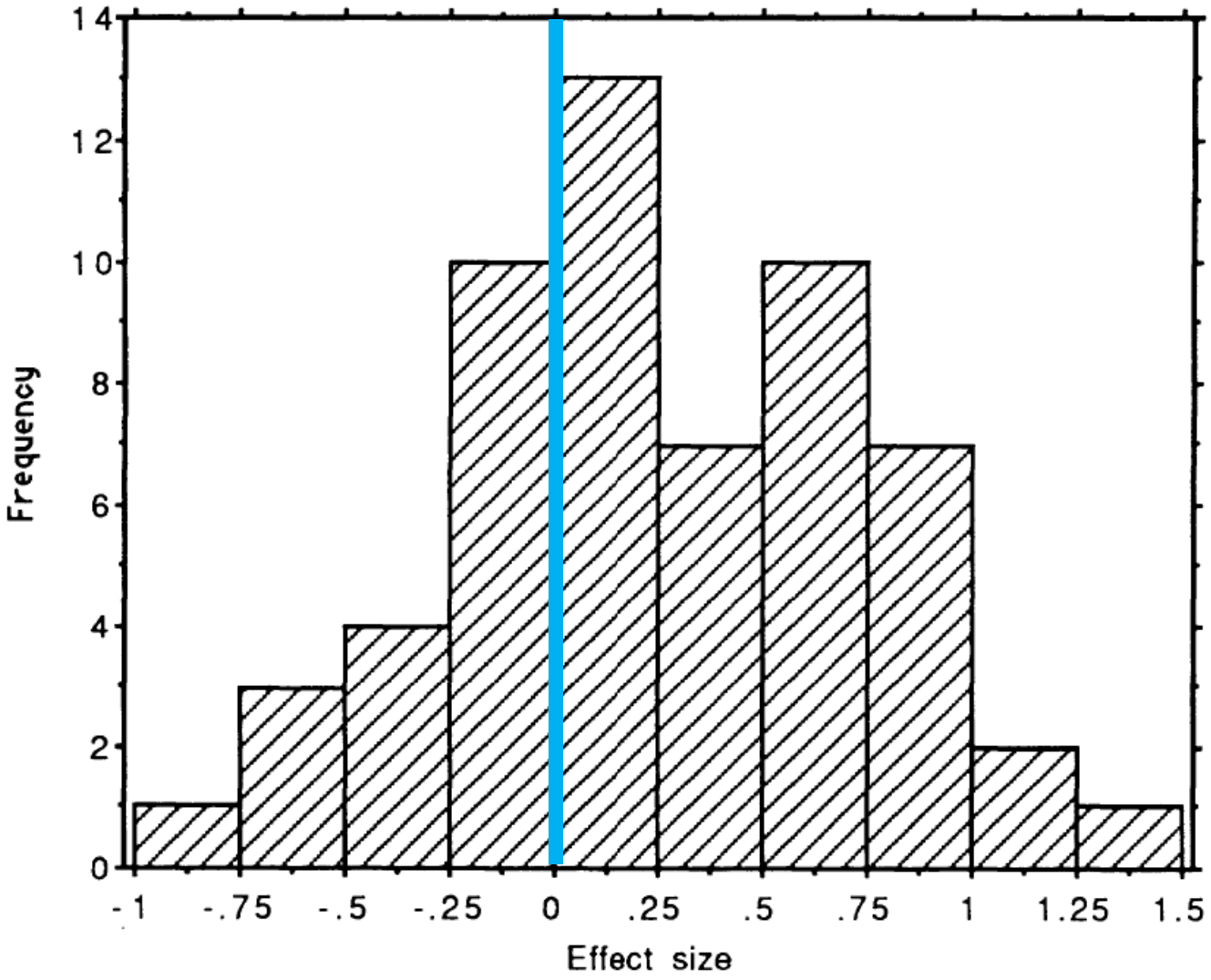
- Kulhavy and Anderson (1972)
- Found a positive learning effect for delaying feedback (a day or more)
- Controversial
  - Withholding information from the learner

Kulhavy, R. W., & Anderson, R. C. (1972). Delay-retention effect with multiple-choice tests. *Journal of Educational Psychology, 63(5), 505–512.*

“the feedback hypothesis”

- “law of effect”
- S->R animal studies
- humans react differently with language-based materials (Brackbill et al., 1962)

Feedback Literature



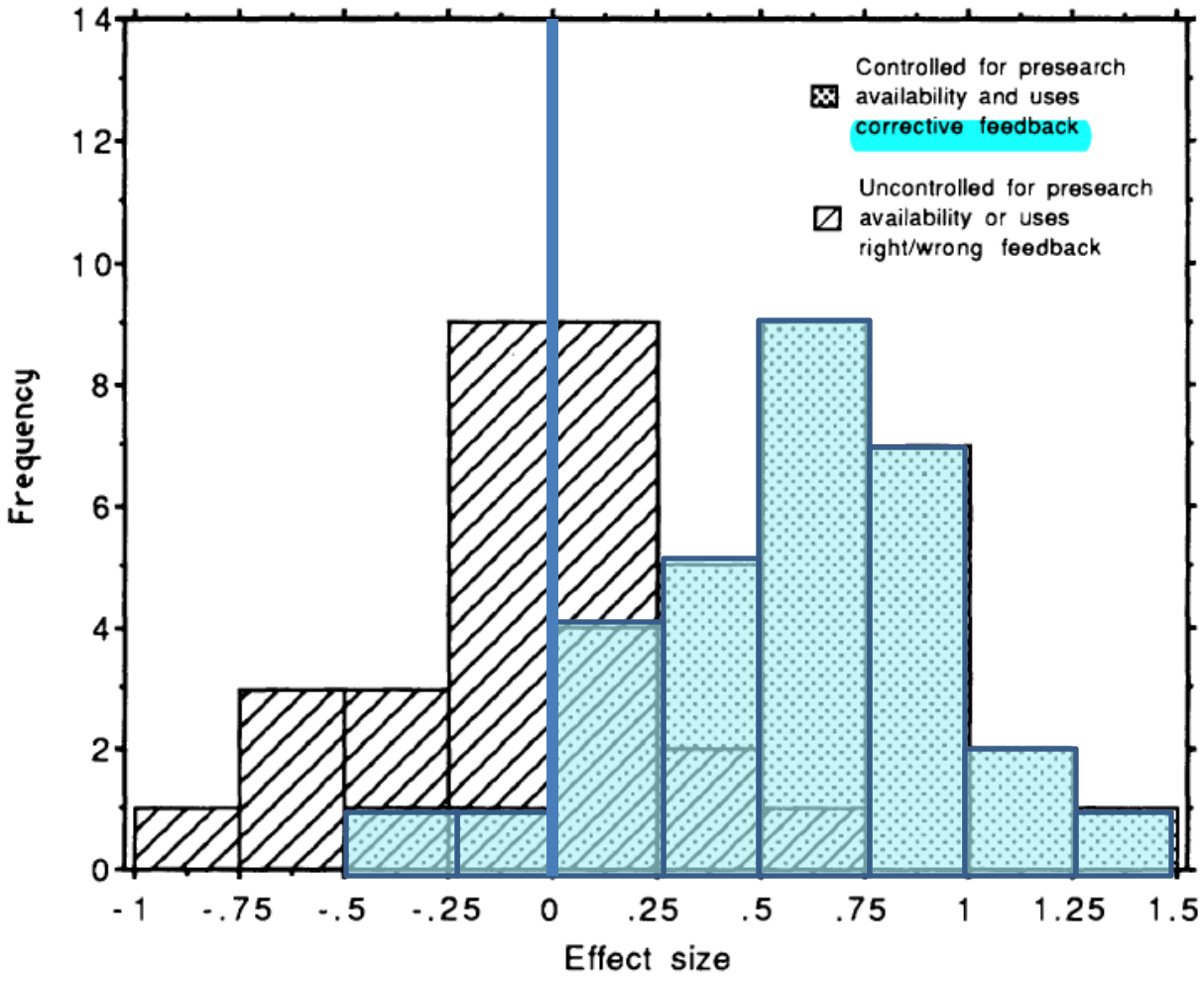
Source : Bangert-Drowns, Kulik, Kulik, Morgan, 1991

Components of Feedback

- Verification
- Other information acts as elaboration

Kulhavy, R. W., & Stock, W. A. (1989). Feedback in written instruction: The place of response certitude. *Educational Psychology Review, 1*(4), 279 — 308.

Need for specificity in feedback



Source : Bangert-Drowns, Kulik, Kulik, Morgan, 1991

Instructional Design Guidelines

- Align KC questions with lesson objectives
- Raise the Bloom level (kick it up notch!)
- Provide detailed feedback for both correct and incorrect answers
- Use both components of feedback
  - Verification
  - Elaboration

Study & Results

Research Question & Hypotheses

Do knowledge check questions during a multimedia presentation impact student learning?

H_o Learner performance would be improved given the presentation of knowledge check questions

H_a Learner performance would not change given the presentation of knowledge check questions

Sample

Undergraduates in an online course (Introduction to Public Health) (*n*=284)

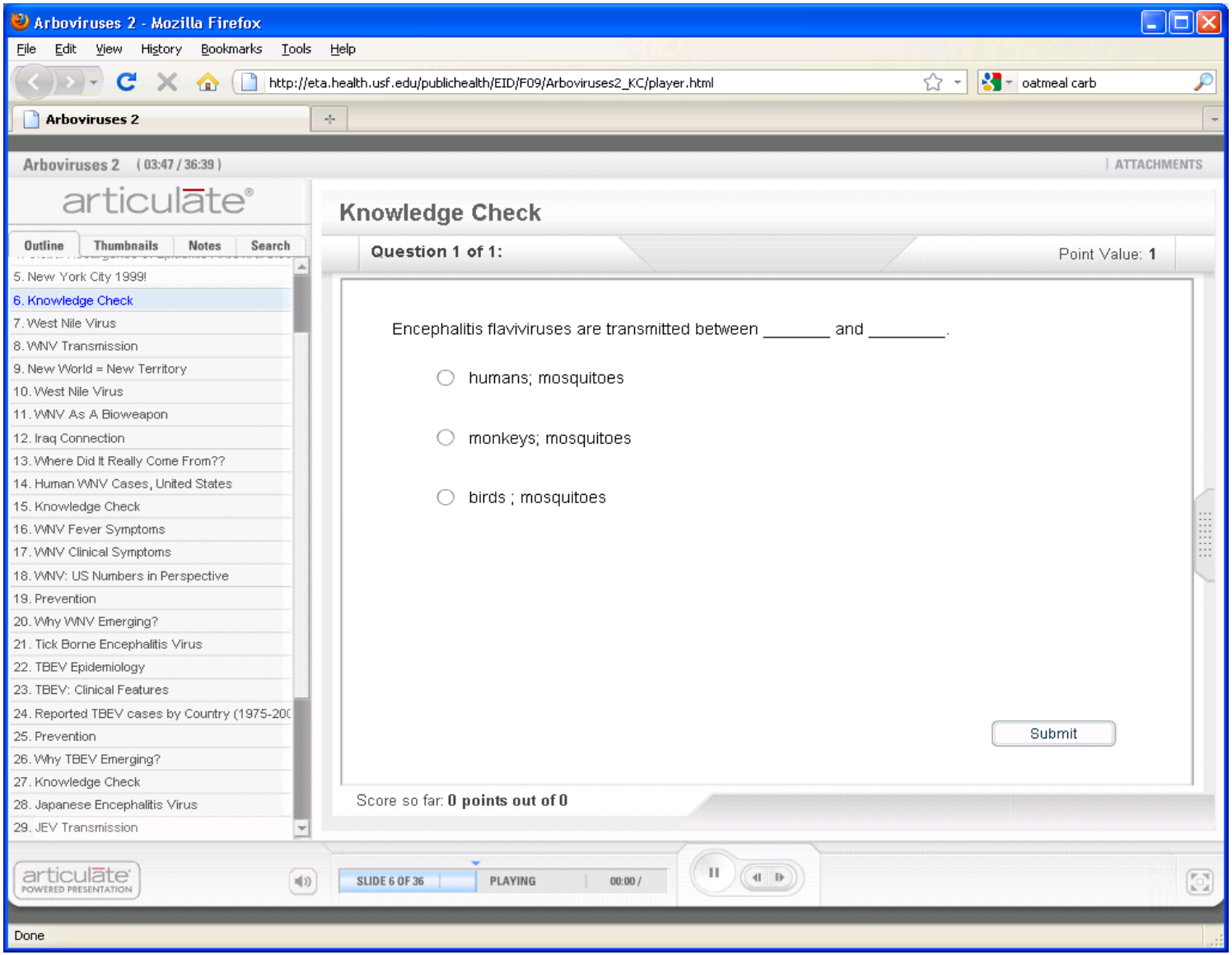
Randomly assigned

- experimental group (*n*=141)
- control group (*n*=143)

Attrition

- experimental group (*n*=136) - 5
- control group (*n*=140) - 3

Knowledge Check Questions



Narrated presentations

- ranged in length from 34 to 72 minutes
- Subject matter
  - Tobacco
  - Diet
  - Health behaviors
  - Psychosocial Factors of Health behaviors
  - Poor health & Physical Inactivity
  - Injuries are not accidents

Results

Post-test scores

	Experimental group	Control group
n	136	140
post-test score		
M	**38.44**	**37.07**
SD	30.74	42.33

$t\ (269) = 1.88,\ p = 0.061\ \alpha{=}0.05$

not significantly different

Discussion

Is interactivity warranted during a narrated presentation?

- Results
  - not a significant difference
- IF you use KC Questions
  - Give learners multiple chances to interact with the materials

Examples

- Security and Privacy Awareness
- Arboviruses 1: Yellow Fever & Dengue Virus
- Chapter 15: Tobacco - Public Health Enemy #1

http://davidlewisphd.com

References (in the paper)

Bloom, B. S. (1956). *A taxonomy of educational objectives*. New York: David McKay.

Bangert-Drowns, R.L., Kulik, C.C., Kulik,J.A., Morgan, M. (1991). The Instructional Effect of Feedback in Test-like Events. *Review of Educational Research 61* (2) 213-238

Brackbill, Y., Bravos, A., & Starb, R. H. (1962). Delay improved retention of a difficult task. *Journal of Comparative and Physiological Psychology* 55 (6) 947-952.

Kulik, J. A., & Kulik, C. C. (1988). Timing of feedback and verbal learning. *Review of Educational Research, 58*(1), 79–97.

Fleming, M. & Levie, H. W. (1993). *Instructional message design*. Englewood Cliffs, NJ: Educational Technology Publications, Inc.

Merrill, M.D. (1965). Correction and review on successive parts in learning a hierarchical task. *Journal of Educational Psychology 56*(5) 226-234

Mory, E. H. (2004). Feedback research review*. In D. Jonassen (Ed.), Handbook of research on educational communications and technology* (pp. 745–783). Mahwah, NJ: Erlbaum Associates.

Kulhavy, R. W., & Stock, W. A. (1989). Feedback in written instruction: The place of response certitude. *Educational Psychology Review, 1*(4), 279 — 308.

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