Academic Instruction through Captioned and Interactive Videos: Usability Testing of ACTIV 1.0

Anya Evmenova, Heidi Graff, Michael Behrmann
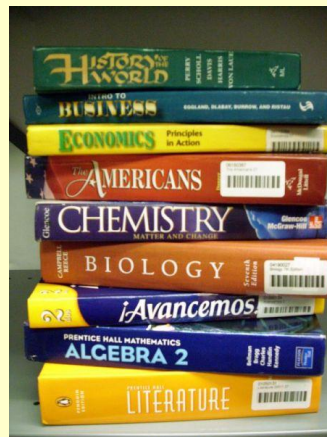
George Mason University

Technology in the Classroom

Increase in video use in general ed.

Evidence-based strategies for academic education for students with disabilities

Age appropriate technology

Literature: Video Meta-Analysis

- Videos effectively present academic content to ALL students

- Teaching functional, social, and behavioral skills to students with intellectual disabilities;

- May have to be adapted for cognitive needs

Literature: Adaptations Meta-Analyses

- Closed captioning

- Highlighted text

- Picture symbols

- Interaction

Initial Research Study

- 11 students with intellectual disabilities from the Mason LIFE program at GMU

- Repeatedly watched regular and adapted videos (1,5-2 minutes long)

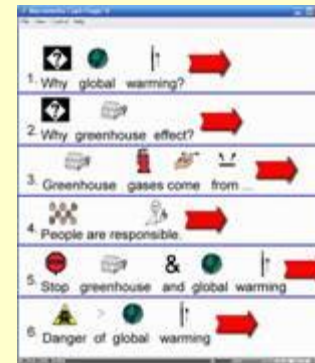- Answered 3 factual and 3 inferential questions about the video

Video Materials

- – Editable videos from *Unitedstreaming* aligned with VA SOLs
- – Comprehension questions asked by the researcher

- – Altered narration via natural synthesized voice
- – Video with highlighted text captions
- – Video with picture/word-based captions
- – Prompted interactive video searching for answers

Study Results

- Significantly improved factual comprehension

- Significant improvements in both factual and inferential comprehension after searching the video for answers

- No difference between highlighted text captions and picture-symbol based captions;

- Students LOVED adapted videos!

Practical Ideas

- Access to videos aligned with curriculum standards (e.g., Unitedstreaming)

- Videos with regular closed captioning (e.g., CNN)

- Video 'chunking'/stopping for discussion or narrating;

- Hyperlinks to segments corresponding to comprehension questions with *MovieMaker*

- Video chunks with picture symbol-based captions embedded into *PowerPoint*
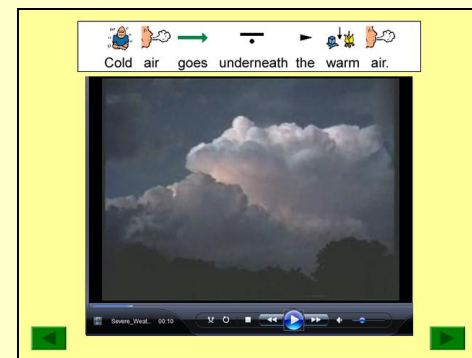
Practical Implications

- Too time consuming and labor intensive to adapt existing videos with various adaptations

- VIDEO ENHANCEMENT PROGRAM IS NEEDED!

2008-2010 Steppingstones of Technology Innovation for Children with Disabilities grant:

**Adapted Captions through Interactive Video (ACTIV)
Innovative Overlay Program**

ACTIVE 1.0
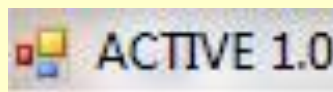
What can ACTIV 1.0 do? (1)

- Upload any existing video (.wmv; .avi) in the user or design view
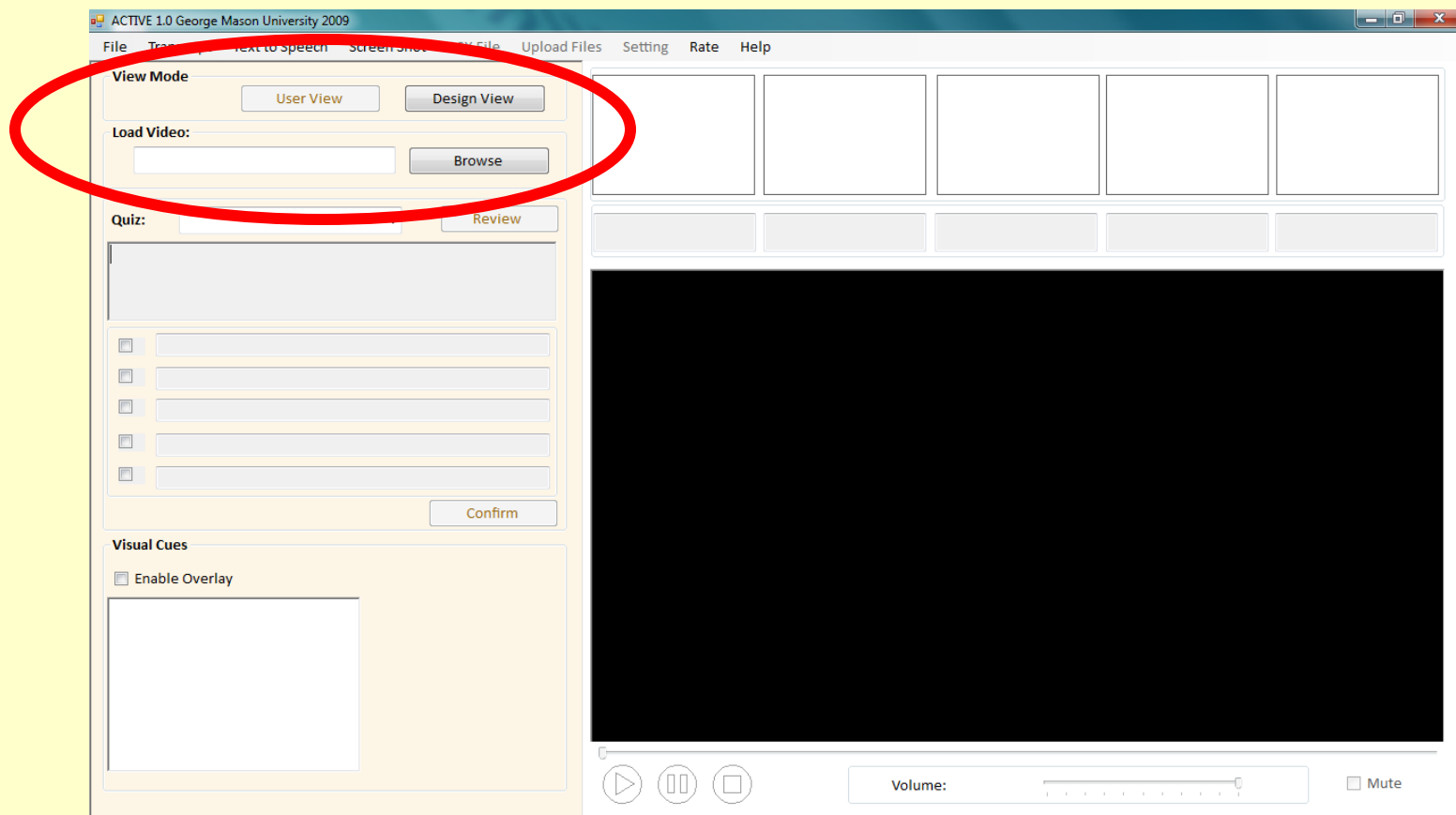
What can ACTIV 1.0 do? (2)

- Automatically create video transcript by converting speech to text and adding time stamps to each word in the video (providing regular captions)

ACTIV 1.0 Efficiency

- It does not take long to create a transcript from the video.

Video Length (min.)

$y = 0.2777x + 0.4754$

$R^2 = 0.9733$

Transcript Load (min.) vs. Video Length (min.)
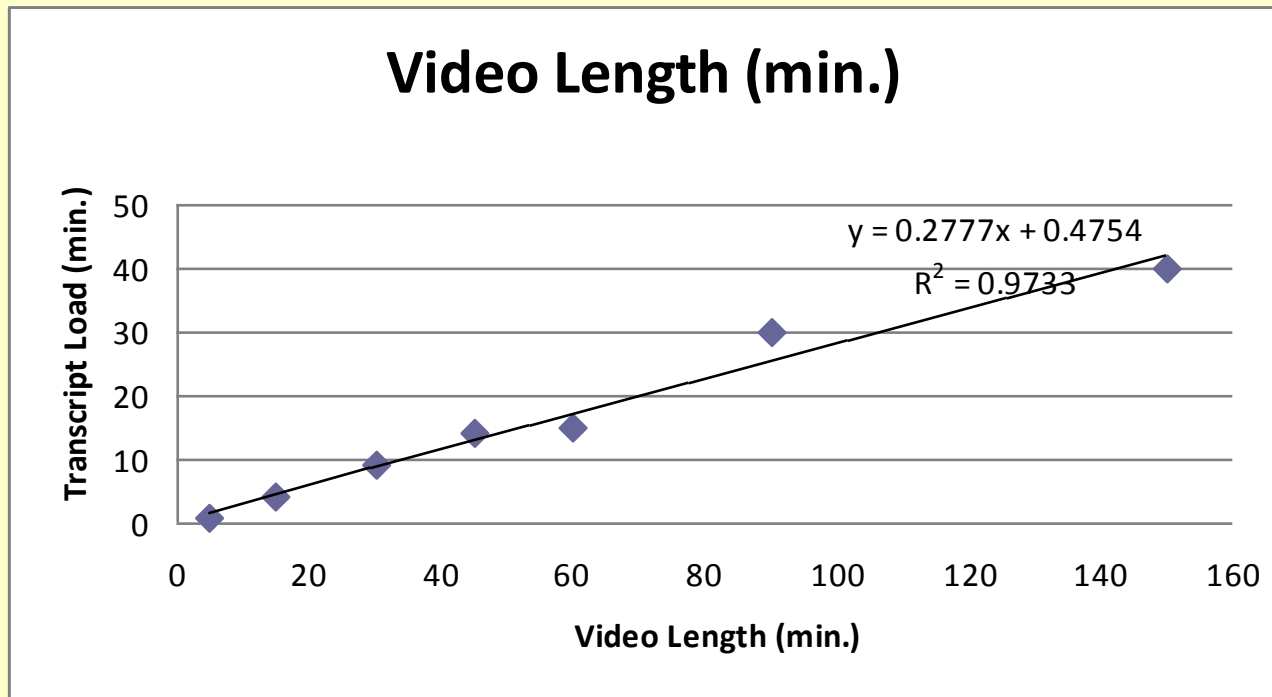
ACTIV 1.0 Accuracy

- ACTIV speech-to-text accuracy keep increasing.
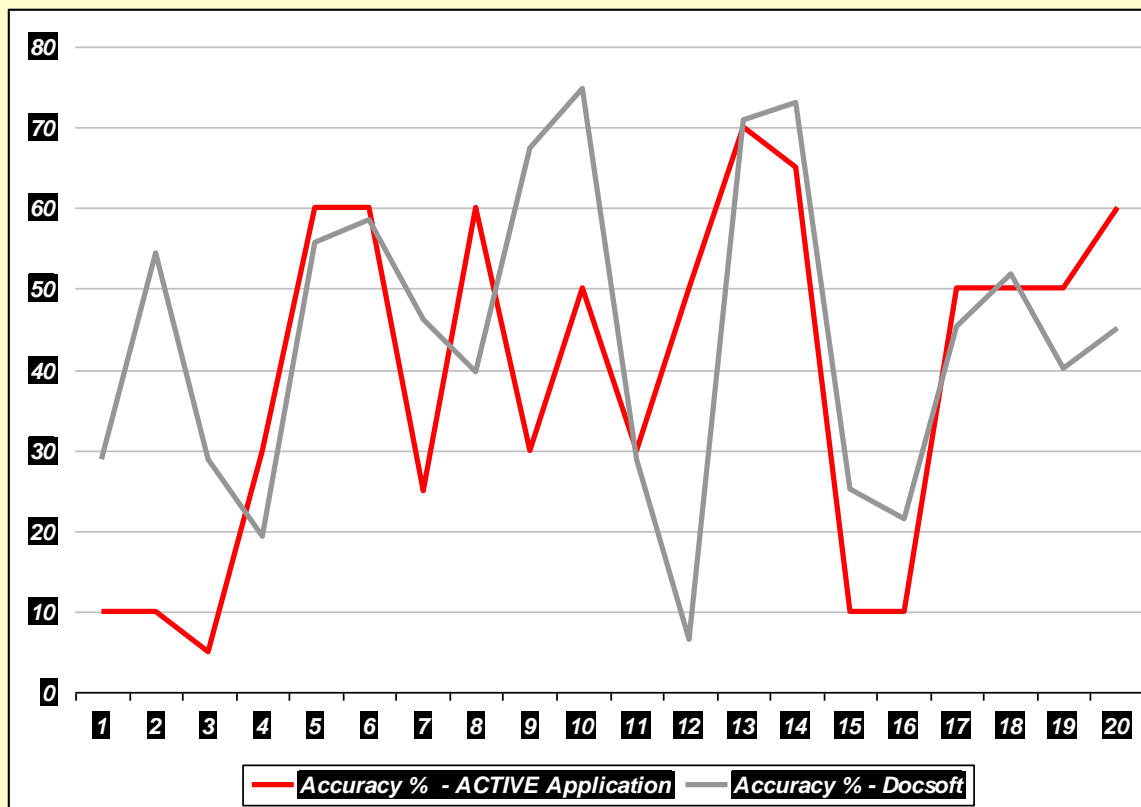
What can ACTIV 1.0 do? (3)

- Text in the transcript (right in the transcript or through the advanced screen) can be edited while maintaining time stamps (improving accuracy and creating key word captions)

What can ACTIV 1.0 do? (4)

- Each word in the text-based captions is automatically highlighted as it is spoken out (can turn this feature off).

What can ACTIV 1.0 do? (5)

- Picture symbols from Symbolstix are automatically added to each word in the captions (can turn this feature off)

What can ACTIV 1.0 do? (6)

- Graphics can be added to the video (as the overlay) to focus user's attention on important stimuli.

What can ACTIV 1.0 do? (7)

- Teachers can mute the video, narrate, or use text-to-speech feature.

What can ACTIV 1.0 do? (8)

- Multiple-choice quizzes can be easily created to test user's comprehension of the video content.

What can ACTIV 1.0 do? (9)

- Each question can be tagged in the video, so that the user can preview/watch a segment containing the correct answer before or after answering each question.

What can ACTIV 1.0 do? (10)

- Each question and answer choice can be read out loud to the student

- ACTIV 1.0 collects mouse clicks data

DEMONSTRATION

Usability Testing
Expert Panel

Questionnaires, observations, and interviews with 6 experts in

- teaching students with intellectual disabilities
- instructional design/assistive technology
- content instruction for students with disabilities

- Functional changes
  - E.g., Be able to edit text within transcript window

- Interface changes
  - E.g., Increase captioning font and decrease words per line

Usability Testing Classroom Research

- Three single-subject research studies in:

  – Middle school science classroom
  – Middle school history classroom
  – High school transition classroom

- 4 students with intellectual disabilities in each classroom

Conditions

Baseline   Treatment

Regular videos   ———→   Alternate between highlighted verbatim captions vs. highlighted key idea captions

Regular videos   ———→   Alternate between picture-symbol verbatim vs. picture-symbol key idea captions

Each Session

1. Students watched 3-5 minutes videos (regular or adapted) from Unitedstreaming

2. Students answered 6 factual questions embedded in the video

3. In treatment condition, students could review the video for answers to adjust their original responses

Quiz:	What? ▾	Review

What do criminals NOT steal from unsuspected victims?

☐ Social Security numbers

☐ Credit card information

☐ Cars

☐ Private data

☐

Confirm

Results

- No functional relation between watching videos adapted with captions and factual comprehension

- Similar performance with verbatim and key word captions

- Significantly increased factual comprehension of the video content after reviewing/searching captioned clips for answers

- Students loved the videos but did not look at the captions because "they were small and moving too fast"

Future Developments

- Improving transcript accuracy

- Creating multiple text options for each picture symbol

- Synchronizing text-to-speech option to slow down the narration speed

- Exploring ways to automatically adjust transcript's readability levels

Conclusions

Adapted and interactive videos offer innovative, universally designed solutions that can be used effectively for teaching academic content to students of all abilities, including those with disabilities.