

**SUPPORTED VIDEO PROJECT:  
The Use of Expanded Captions to Promote Student  
Comprehension of Educational Videos on DVD**

**Final Report**

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Funded in part by a 2008 *Technology in the Works* grant award from the  
National Center for Technology Innovation (NCTI)  
Washington, DC

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**Abstract**

This study investigated the effects of *Expanded Captions* versus *Standard Captions* on the comprehension of educational video materials on DVD by students who are deaf or hard of hearing. *Expanded Captions* were designed to deepen the educational value of the videos' captions by linking unfamiliar words to one of three types of additional information: vocabulary definition, labeled illustration, or concept map. Participants in the study were nine secondary level students who were either deaf or very hard-of-hearing. The students were randomly assigned to two groups, each group experiencing both conditions (*Expanded Captions* and *Standard Captions*), in counter-balanced order. After a brief training session for all students, the students participated in two experimental sessions, all on the same day. In Session 1, students in Group A received the *Expanded Captions* while students in Group B received the *Standard Captions*. In Session 2, students in Group A received the *Standard Captions* while students in Group B received the *Expanded Captions*. All students were presented with pre-post test measures of vocabulary and informational content in the videos they observed. These assessments were designed to determine whether students with access to *Expanded Captions* had increased comprehension of the video materials on DVD when compared to students with access to *Standard Captions*.

Results for the between subjects analysis did not reveal any statistically significant differences (mean differences were quite small). In Session 1, the mean gain for Group A was only 0.05 greater than the mean gain for Group B ( $t = 0.02$ ,  $df = 7$ ,  $p = 0.98$ ). In Session 2, the mean gain for Group A was 1.3 greater than Group B, ( $t = 1.15$ ,  $df = 7$ ,  $p = 0.28$ ), which is contrary to what was expected given that Group A received the *Standard Captions* in this session. Results of direct observations of "On-Task" behavior indicated that students were "On-Task" 99% of the time. However, screen capture videos indicated that students did not always access the *Expanded Captions* available to them (Mean for Group A was 33%; Mean for Group B was 41%). *Expanded Captions* were accessed more often in the first half of each video, were rarely accessed a second time, and some were not accessed at all by any student. Nonetheless, on their exit surveys students indicated that they preferred to use videos with *Expanded Captions* because they felt *Expanded Captions* helped them to understand the meaning of unfamiliar words easily.

## Background Information

Captions are an on-screen text-based representation of what is being said in a television program, movie, or educational video. Captions can also provide descriptions of background sounds such as music or rain. Captions that are always visible are called *open captions*, and those that are only visible when selected are called *closed captions*. Since the early 1980s an increasingly large number of video materials have been captioned for individuals who are deaf or hard of hearing. Research on the use of captions by students who are deaf revealed that students learned more from captioned material than uncaptioned material (Boyd & Vader, 1972; National Captioning Institute, 1983) and that reading captions had a positive impact on vocabulary development and reading comprehension (Koskinen, Wilson & Jensema, 1986; Koskinen, Wilson et. al, 1993; Linebarger, 2001; National Captioning Institute, 1984).

### Research on Captions in Education

Over the last decade, researchers have been investigating ways to make captions optimally useful for educational purposes. Listed below are some of the variables related to captioning that have been explored in the literature, and a brief summary of the conclusions drawn from this research.

1. **Speed.** Jensema (1998) and Jensema & Burch (1999) found that the average preferred speed was 145 word/minute but that changing the speed with which captions appear on the screen has little or no effect on learning the facts presented or ability to make inferences from information in the captions.
2. **Typeface.** Kirkland (1999) found that both students and adults preferred white letters to yellow ones. However, the two groups preferred different fonts and adults preferred an opaque background, as opposed to the transparent one preferred by students.
3. **Simplification.** Gregory & Sancho-Aldridge (1998) found that captioning needs were different for deaf children below the age of 11 than older children and adults, primarily because they are still learning to read a language they have never heard spoken. They recommend simplified captions for children up to the age of 11.
4. **Graded options.** Caldwell (1973) investigated the use of captions at different readability levels and found that deaf students could benefit from captions that are written significantly above their tested reading level, suggesting the use of simplified captions may be unnecessarily limiting the information available to students and the impact of captions on improvement of reading skills.
5. **Editing.** Individuals appear to differ by age in their acceptance of edited captions (Kirkland, 1999; RNID, 1999), with younger students preferring less editing but more

information on background sounds than older users. In a study comparing different types and position of captions Kirkland (1999) found that adults wanted the captions to be centered and constructed of sentence fragments. Younger students wanted the captions to be full sentences and speaker dependent in location.

6. **Expanded information.** With the advancement and flexibility of digital technologies, suggestions have emerged about increasing the amount of information conveyed in captions. Fels (2002) and Silverman & Fels (2002) have suggested conveying non-verbal information through the use of shapes, colors, symbols, and animation, along with the original captions. For example, speech bubbles and different text styles were suggested to convey different emotions for different speakers. Treviranus (2000) promotes making the video interactive by providing options that hyperlink to definitions, background information, related material, or an instructional exercise.
7. **Mobile Devices.** Goldberg (2007), director of Media Access for WGBH, is leading an initiative to develop technical solutions for delivering captioned content to iPods, cell phones, PDAs and other mobile devices. Information about this initiative is available at: <http://ncam.wgbh.org/news/mobilemedia.html>. WGBH will also explore and develop strategies for captioning media that is streamed directly to mobile devices via wireless networks, multi-channel DTV distribution or downloaded to desktop computers and then transferred to mobile devices.

The focus of the Supported Video Project was to investigate an intervention called *Expanded Captions* – captions designed to deepen the educational value of the captions provided for educational videos by linking unfamiliar words to one of three types of additional information: vocabulary definition, labeled illustration, or concept map (see below for more details.) As such, this intervention fits within the category listed above known as “Expanded Information” – i.e. the captions were expanded with additional information related to key vocabulary terms.

## Method

### Design

The current study adopted a randomized, counterbalanced crossover design (Shadish, Cook and Campbell 2002), also known as a two-group Latin Squares design with two phases (Rosenthal and Rosnow 1991). This design called for the random assignment of students to either Group A or Group B. Students in both groups experienced both a Treatment condition and a Comparison Condition, counterbalanced for order effects. This research design combines the strengths of a between-subjects randomized trial with the strengths of a within-subjects design.

## Participants

Nine secondary students (grades 7-12) from a large urban area in the Pacific Northwest participated in the study. Criteria for participation included the following: (a) receiving services as a student who is deaf or hard hearing, (b) ability to read English at a 4<sup>th</sup> grade level or above, (c) receiving instruction at the secondary level on grade appropriate content, (d) signature by parents or guardians on the Supported Video Project *Letter of Consent* (available in Appendix A), and (e) signature by student on the Supported Video Project *Letter of Assent* (available in Appendix B.)

All students were recruited from area middle and high schools with the assistance of an audiologist from a private school that provides students who are deaf and hard-of-hearing with “oral deaf education”. Oral deaf education is a collaborative, family-centered educational approach that develops a deaf child's speech and listening abilities with the assistance of digital hearing aids, cochlear implants, early diagnosis, and early intervention. All participating students had received services through this school in the past and were now mainstreamed into general education classes in their neighborhood schools. Letters were sent to parents of former students who met the first three criteria and the audiologist served as the first point of contact for parent and student questions. All students whose parents returned signed letters of consent were accepted as participants.

Table 1 provides information about the nine participating students, using pseudonyms to protect confidentiality. Included is each student’s gender, age, grade in school, whether attending a middle or high school, degree of hearing loss in each ear, and reading level. This information was drawn from student records and obtained from parents. Three of the students were female and six were male. Students ranged in age from 12 to 17, with a mean age of 14.89. They attended grades 6 through 10, with a mean grade level of 8.56. Five of the students attended middle school and 4 attended high school. Hearing loss for all but one student was Severe to Profound in both ears, with the remaining student experiencing Mild to Moderate loss in both ears. The range in student reading levels was 6<sup>th</sup> to 10<sup>th</sup> grade, with a mean reading level of 7.55.

*Table 1. Student characteristics*

Student	Sex	Age	Grade	School Level	Hearing Loss Left ear	Hearing Loss Right ear	Reading Level	Group
Maryanne	F	12	6	MS	Mild-moderate	Mild- moderate	6th	A
Ariana	F	14	8	MS	Profound	Severe-Profound	6th	B
Rachel	F	14	8	MS	Profound	Profound	8th	A
Rick	M	15	8	MS	Severe	Severe	8th	A
Kory	M	15	8	MS	Profound	Profound	7 <sup>th</sup>	A
Andrew	M	15	9	HS	Profound	Profound	9th	B
Noah	M	16	10	HS	Profound	Profound	10th	B
Steve	M	17	10	HS	Profound	Profound	6th	B
Zane	M	16	10	HS	Profound	Profound	8th	B

All students' hearing was amplified in one or more ways. Seven of the nine students had cochlear implants. Five of these students used no other form of hearing amplification. Two of the students had a cochlear implant on one side and a hearing aid on the other. Two students used hearing aids for both ears. Those with hearing aids used digital hearing aids with a wide dynamic range comprehension (WDRC) system. WDRC aids try to preserve the characteristics of the acoustic signal and reproduce them in a range that is audible and comfortable to the listener. Hearing aids from at least three different hearing aid manufacturers were represented in this study, and the hearing aids varied in age and technological sophistication.

Students were randomly assigned to two groups. Table 1 indicates which students were in which groups. There were four students in Group A (two males and two females) and 5 students in Group B (four males and one female). On average, students in Group A were slightly younger (mean age = 14) than students in Group B (mean age = 15.6). All of the students in Group A attended Middle School whereas only one student in Group B attended Middle School, the remaining four attended High School. Mean reading level for students in Group A was 7.25, compared to a mean reading level for students in Group B of 7.8.

## **Intervention**

This study compared student comprehension of educational videos on DVD in two conditions: *Standard Captions* versus *Expanded Captions*. Students in Group A received the *Expanded Captions* during the first experimental session and the *Standard Captions* in the second. Students in Group B received the *Standard Captions* first and the *Expanded Captions* second.

*Standard Captions* for the deaf and hard of hearing transform the audible portion of a program into written words. Captions are carefully timed to sync up with the audio and video cuts of a program and positioned to appear with on-screen speakers, thus mirroring the pace of the program. From an educational viewpoint, standard captions are essential but limited to the informational content spoken on screen.

*Expanded Captions* are designed to deepen the educational value of captions by linking to additional information. In this study we investigated *Expanded Captions* where pre-selected vocabulary words were linked to one of three types of additional information: glossary definitions, labeled illustrations, and concept maps (see Appendix C). In addition to supporting the meaning of key technical terms, *Expanded Captions* provide a way for learners to interact with, and study, the video's content.

The three types of *Expanded Captions* in this study represent three different ways in which key vocabulary can be supported in order to improve comprehension. When a key vocabulary word in a caption is linked to a definition, that definition is a "translational resource" (Anderson-

Inman and Horney 2007). It is designed to “translate” an unfamiliar word into a word or words that are more familiar to the learner. This translation might be a synonym for the identified word, or a longer definition that explains its technical meaning.

When a key vocabulary word in a caption is linked to a labeled illustration, that illustration is an “illustrative resource” (Anderson-Inman and Horney 2007). The purpose of an illustrative resource is to provide a visual image of the concept or process under instruction. In the case of *Expanded Captions*, the video is stopped and the resulting image is labeled, using arrows, in a way that draws attention to the concept or process to which the vocabulary word is linked.

When a key vocabulary word in a caption is linked to a concept map, that concept map is a “summarizing resource” (Anderson-Inman and Horney 2007). The purpose of a summarizing resource is to provide an overview of some aspect of the content under instruction – in this case the taxonomic system used to describe the biological structure of life. The goal for using a summarizing resource linked to a word in a caption is to provide information about the targeted word’s position in relationship to related words within the same conceptual domain.

## **Materials**

Three 20-minute educational videos from the series *Branches on the Tree of Life* by BioMEDIA Associates were used for this research, one for training and one for each of the two experimental sessions. These materials already had standard captions, developed by CaptionMax, a large media access company in the United States. Representatives of CaptionMax selected the specific videos from the above series using the following criteria: (a) 15 – 20 minutes in length, (b) content independent of other videos, and (c) content not generally known by average secondary students. CaptionMax obtained permission from BioMEDIA to use the videos in this study and then turned them over to the research staff for development. A Ph.D. level science educator identified key terms in the videos that might be problematic for students. For each word, a decision was made about how best to support learning of the concept, leading to expanded captions of the three types described above, determined by the word’s meaning and the context in which it was presented. The three types of Expanded Captions are: (a) vocabulary definition, (b) labeled illustration, and (c) concept map. Each is described below and illustrated in Figure 1.

***Vocabulary definition.*** Vocabulary definitions were the most common enhancement provided to students. Key content words in the captions were highlighted in green. When students clicked on the word highlighted in green (or simply pressed enter), a new window would appear. The window repeated the target word, followed by a definition tied to the word’s use in the video. Clicking the “back button (or simply pressing enter again) returned students to the video with the original captioned sentence still on the screen.

**Labeled illustration.** Labeled illustrations were used to highlight, or draw attention to, specific features illustrated in the videos. When students clicked on the highlighted word the image would freeze, and text with arrows would be inserted to draw attention to the target concept or process. When students wanted to return to the video, they simply pressed enter, and the screen would return to normal with the original captioned sentence still on the screen.

**Concept map.** The overarching title for this series of videos was *Branches of the Tree of Life*. Thus, an important conceptual element was the relationship of targeted organisms within biology’s hierarchy of eight major taxonomic ranks: *species, genus, family, order, class, phylum, kingdom, and domain*. When understanding one of these distinctions seemed to be the focus of the video, we supported the video with a concept map showing the organism on a “tree” in relationship to other concepts of the same or neighboring taxonomic level. Again, when students clicked on the highlighted word a new window would appear containing a concept map that zoomed in on the targeted organism and then zoomed out. As with the other two supports, clicking the “back button (or simply pressing enter again) returned students to the video with the original captioned sentence still on the screen.

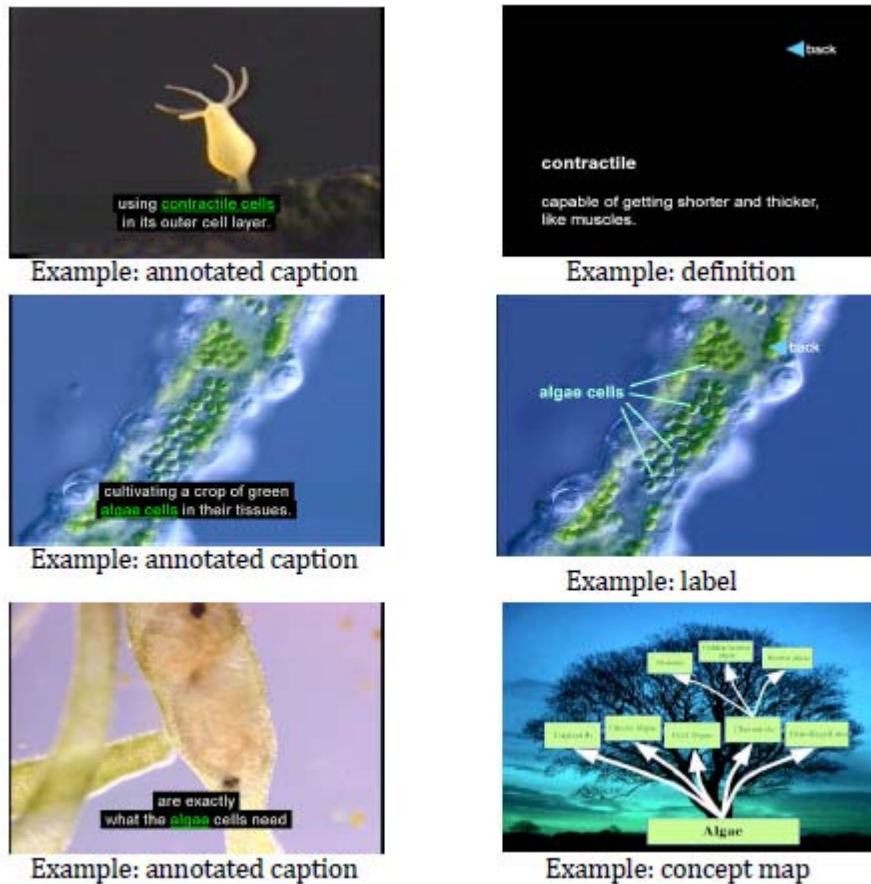


Figure 1. Screen shots illustrating three types of *Expanded Captions*.

## Instruments

Information on student use of the videos and their impact on comprehension was measured in the following four ways: (a) pre and post tests on important concepts in the videos, (b) screen capture recordings of students' interactions with the videos, (c) classroom observations of students during the experimental sessions, and (d) an exit survey used to gauge students' reactions to the use of *Expanded Captions*. Each is described in greater detail below.

***Pre and Post Tests.*** Three sets of pre-post tests (one set for each educational video) were developed to measure students' comprehension of the vocabulary and informational content presented in the videos. Each test consisted of a total of 10 multiple-choice questions, each with three answers from which the student was expected to select one. The tests were initially constructed by a Ph.D. level science educator and then reviewed for format and content by two additional Ph.D. level researchers. Two versions of each test were created, using random assignment of questions to order. One version of each set was used as the pretest and one was used as the posttest. In addition, random assignment was used to create the order of possible answers under each question. There was no time limit for the completion of either the pretest or posttest. The tests used in this study are presented in Appendix D.

***Screen Capture Recordings.*** Snapz Pro X, a screen capture tool by Ambrosia Software, Inc., was installed on each laptop used for this study. The tool was programmed to start simultaneously with each video, recording the entire screen and all student interaction with the video's contents. In other words, the screen capture program made a visual recording of each student's session with each of the two educational videos. When a student completed the viewing of a video, the Snapz Pro X recording was saved by a member of the research staff onto the student's laptop, a process that lasted for approximately 10 minutes, depending on the length of the student's session. After all experimental sessions were completed, the recordings made by the screen capture program were copied onto a desktop iMac for data analysis purposes.

***Student Observations.*** Eight of the nine students were observed at random times across both intervention sessions for a total of three minutes for each student. The purpose of these observations was to identify the percentage of time that students were "on-task". A whole (20-seconds) interval recording instrument (with alternating of students every 60-seconds) was designed in order to record whether students were engaged with the video. "On-task" behavior was defined as students looking toward their computer screens without turning their heads to talk or observe other students. (See Appendix E for an illustration of this observation tool).

***Student Exit Survey.*** An open-ended question survey (see Appendix F) was designed to gather additional information regarding the students' preferences and experiences with expanded and standard captions, as well as additional information they could provide for improving the project and its materials. Specifically, students responded to the following questions:

- Choose the type of video captions that helped you learn the content best:
  - a) Standard captions, b) Expanded captions.
- Why do you feel this type of caption worked best for you?
- What did you **like** about the **expanded** captions?
- What did you **NOT like** about the expanded captions?
- How can the developers **make the expanded captions better**?

## Procedures

The study had three major phases, and all occurred on the same day. The three phases were Training, Experimental Session 1, and Experimental Session 2. Each phase is described briefly below. For more detail, please see the Study Protocol in Appendix G.

**Training.** The purpose of the Training Session was to provide students with information and experience on the procedures used in the study, as well as instruction and practice with both the *Standard Captions* and *Expanded Captions*. Students participated in the training as a single group, all asked to do the same things at the same time on laptop computers provided for their use. The training session used a video DVD entitled *Cnidarians*, which was part of the same series as the two DVDs used during the experimental sessions.

The training was comprised of five steps. In the first step a researcher provided background information about the study and its purpose. Students were told that they would be watching three educational videos related to Biology, that the videos were from a series call the *Tree of Life*, and that each video was about a different species on the biological Tree of Life. It was also explained that the videos had captions of two types - *Standard Captions* and *Expanded Captions* – and that each student would watch one video with *Standard Captions* and one video with *Expanded Captions*. It was explained that the *Standard Captions* look like captions they had probably already seen and used when watching videos, and that *Expanded Captions* had links to additional information designed to help students understand the content. And finally it was explained that the purpose for conducting the study was to learn if there was a difference in student learning from *Expanded Captions* as compared to *Standard Captions* and therefore they would be asked to take short tests before and after each video.

In the second step, the researcher gave an explanation of *Standard Captions*, demonstrated how they worked to the whole group (using a projected image from the computer), and then provided students with approximately 10 minutes of individual practice with the *Cnidarians* video using *Standard Captions*. Students inserted the *Cnidarians* DVD with *Standard Captions* into the DVD slots on their laptop computers and started the video by pressing the “Enter” button. When the practice session was complete, students were told how to eject the DVD.

In the third step, the teacher gave an explanation of Expanded Captions and demonstrated their use to the group. Students were shown how the word in green links to one of three types of

additional information: (a) a definition, (b) a focused illustration drawing attention to some aspect of the picture with arrows, or (c) a diagram, showing where the concept is in the Tree of Life. Students were told to press the enter key when a caption with a green highlighted work appeared on the screen and shown how they could go back and forth between the original caption and the expanded part. Students were provided with the *Cniderians* DVD with *Expanded Captions*, asked to insert the DVD into their laptops, and then provided with approximately 10 minutes of individual practice on *Expanded Captions*. When the practice session was complete, students were asked to eject their DVDs.

In Step 4, students were given a paper copy of the post-test for *Cniderians*. They were instructed to answer each of the 10 questions by circling the letter next to the correct answer. They were instructed to choose an answer to the question even if they were not sure of the correct response. Students were told that (a) this was a practice test, so that they would be familiar with the tests they would take on the other videos; and (b) it was not a timed test.

In the last step, students were given an opportunity to ask questions about the two experimental conditions or anything in the procedures that was not clear. Students were then given a brief break, after which they came back together for the two experimental sessions.

***Experimental Session 1.*** In the first experimental session, students were pre-tested on the vocabulary and informational content in the *Algae* video. Following completion of the pretest, students in Group A watched the *Algae* video with *Expanded Captions* while students in Group B watched the *Algae* video with *Standard Captions*. All students then took the post-test.

***Experimental Session 2.*** After a 15-minute break, students were pre-tested on the vocabulary and informational content in the *Flatworms* video. Following completion of the pretest, students in Group B watched the *Flatworms* video with *Expanded Captions* while students in Group A watched the *Flatworms* video with *Standard Captions*. All students then took the post-test for the *Flatworms* video

During both experimental sessions, Snapz Pro was used to capture a screen-based video of each student's experience with the *Expanded Captions*. The recordings showed which expanded captions were accessed, as well as other interactions with the DVD (e.g., pause, fast-forward, and back-forward). This information documented whether or not students used the expanded captions and the frequency of their use. Additionally, observations of "on-task" behavior were gathered by an experienced school psychologist, who was also the researcher in charge of conducting of the experiment. At the completion of both experimental sessions, all students took the brief *Student Exit Survey*, writing their answers on paper. (For detailed information about training and Intervention conditions please refer to the Protocol for Implementation available on Appendix G).

## Data Analysis

To identify differences in comprehension of video content by students with access to *Enhanced Captions* in comparison to *Standard Captions*, we conducted an analysis of gain scores on the pre and post-tests from both experimental sessions (Fitzmaurice, Laird, & Ware, 2004). The analysis of gain scores required only a t-test to compare to compare the two conditions. We used an independent group's t-test to compare average gains among students in the treatment condition (*Enhanced Captions*) to average gains among students in the comparison condition (*Standard Captions*). We had originally intended to conduct an analysis of variance (ANOVA) to test for moderators, but were unable to do this due to the small sample of participants in this study.

## Results

**Pre-Post Test Measures.** A within-subjects or paired t-tests was conducted to compare gains from pre-test to post-test for each combination of group and session. From this analysis, we found that in Group A, Session 1 (*Algae with expanded captions*), students made a small gain of 0.80 (95% *CI* = -4.50 to 6.10, *SD* = 4.27), which was not statistically significant ( $t = 0.42$ ,  $df = 4$ ,  $p = .6965$ ). Group A students in Session 2 (*Flatworms with standard captions*) made marginally significant gains, with a mean of 1.8 (95% *CI* = -0.24 to 3.84; *SD* = 1.64,  $t = 2.45$ ,  $df = 4$ ,  $p = .0705$ ). Among those students in Group B, we found no statistically significant gains. For Session 1 (*Algae with standard captions*), students made a small gain of 0.75 (95% *CI* = -2.53 to 4.03, *SD* = 2.06,  $t = 0.73$ ,  $df = 3$ ,  $p = .5195$ ). Their Session 2 (*Flatworms with expanded captions*) gains were even smaller, 0.50 (95% *CI* = -2.26 to 3.26, *SD* = 1.73,  $t = 0.58$ ,  $df = 3$ ,  $p = .6042$ ).

The descriptive statistics are shown in Tables 2 and 3. The *Variable* column indicates the variable of interest, and the *Gain* variable is the same as those reported above. The "Diff" Group represents the difference between the two previous rows. Lower CL Mean and Upper CL Mean represent the lower and upper 95% confidence limits (CL) or confidence intervals (CI).

Table 2. Session 1 Descriptive Statistics

Variable	Group	N	Lower CL		Upper CL		Std Dev	Min.	Max.
			Mean	Mean	Mean	Mean			
Pre	A	5	1.68	4.00	6.32	1.87	1	6	
Pre	B	4	1.86	4.25	6.64	1.50	3	6	
Pre	Diff		-2.98	-0.25	2.48	1.72			
Post	A	5	1.71	4.80	7.89	2.49	3	9	
Post	B	4	1.82	5.00	8.18	2.00	4	8	
Post	Diff		-3.84	-0.20	3.44	2.29			
Gain	A	5	-4.50	0.80	6.10	4.27	-3	8	
Gain	B	4	-2.53	0.75	4.03	2.06	-2	3	
Gain	Diff		-5.50	0.05	5.60	3.50			

Table 3. Session 2 Descriptive Statistics

Variable	Group	N	Lower CL		Upper CL		Std Dev	Min.	Max.
			Mean	Mean	Mean	Mean			
Pre	A	5	0.54	3.40	6.26	2.30	1	7	
Pre	B	4	2.45	5.50	8.55	1.91	4	8	
Pre	Diff		-5.50	-2.10	1.30	2.14			
Post	A	5	2.81	5.20	7.59	1.92	2	7	
Post	B	4	2.56	6.00	9.44	2.16	4	9	
Post	Diff		-4.02	-0.80	2.42	2.03			
Gain	A	5	-0.24	1.80	3.84	1.64	0	4	
Gain	B	4	-2.26	0.50	3.26	1.73	-2	2	
Gain	Diff		-1.37	1.30	3.97	1.68			

In the between-subjects analysis (t-test Tables 4 and 5 below) we compared groups for each session. We assumed that for Experimental Session 1 (*Algae*), Group A would outperform Group B. For Experimental Session 2 (*Flatworms*), we expected that Group B would outperform Group A. For these analyses, we were primarily interested in differences in student gains across the session. The analyses did not reveal any statistically significant differences. Indeed, the mean differences were quite small. For example, in Session 1, the mean gain for Group A was only 0.05 greater than the mean gain for Group B ( $t = 0.02$ ,  $df = 7$ ,  $p = .9836$ ). In Session 2, however, the mean gain for Group A was 1.3 greater than Group B ( $t = 1.15$ ,  $df = 7$ ,  $p = .287$ ), which is contrary to expectations given that Group B, during Session 2, had access to the *Expanded Captions*.

Table 4. Session 1 T-Tests

Variable	Method	Variances	DF	T Value	Pr >  t
Pre	Pooled	Equal	7	-0.22	0.8348
Post	Pooled	Equal	7	-0.13	0.9002
Gain	Pooled	Equal	7	0.02	0.9836

Table 5. Session 2 T-Tests

Variable	Method	Variances	DF	t Value	Pr >  t
Pre	Pooled	Equal	7	-1.46	0.1878
Post	Pooled	Equal	7	-0.59	0.575
Gain	Pooled	Equal	7	1.15	0.287

**Snapz Pro X and other Direct Observations.** Results of direct observations of “On-Task” behavior indicated that students were “On-Task” 99% of the time. However, analysis of the video recordings produced by *Snapz Pro* indicated that, in general, students did not access all, or even most, of the *Expanded Captions* presented in the videos. On average, students in Group A, Session 1, only accessed about 33% (range = 27% - 44%) of the expanded captions provided in the *Algae* video. Students in Group B, Session 2, on average only accessed 41% (range = 33%-49%) of the expanded captions provided in the *Flatworms* video. A more detailed examination of which *Expanded Captions* were accessed by students revealed that: (a) some of the *Expanded Captions* were never requested by students, (b) any given *Expanded Captions* was seldom requested twice, and (c) *Expanded Captions* were requested more often in the first half of each video than the last half.

The fact that students chose not to use the *Expanded Captions* consistently may explain why there were no significant differences on pre and post-test scores between the *Expanded Captions* condition and the *Standard Captions* condition. Although students made small gains (Group A, Session 1, Gain = 0.80,  $p > .05$ ; Group B, Session 2, Gain = 0.50,  $p > .05$ ) when using the videos with *Expanded Captions* these gains were not statistically significant and in some cases they were even smaller than the gains observed when students used the videos with *Standard Captions* (Group A, Session 2, Gain = 1.8,  $p = .0705$ ; Group B, Session 1, Gain = 0.75,  $p > .05$ ); however, these gains were not significant either.

**Student Exit Survey.** Students’ final surveys indicated that 7 of 9 students preferred to use videos with *Expanded Captions*. The reason most frequently given was that they liked being able read the meaning of unfamiliar words easily. One student stated that he/she liked expanded captions “mostly because I am able to see the definition of the most difficult or main words, it helps a lot”. Another student indicated that the selection of words was “good, but maybe too

repetitive”. Students indicated that they liked expanded captions because: “the definitions of highlighted words were short and easy to remember”, “they were very helpful and easy to use”, he/she liked “learning new words without getting a dictionary”, and because “they gave helpful definitions”. Two students indicated that they preferred videos with *Standard Captions*. Unfortunately, the explanation given by one of these two students was not legible. The other student stated that he/she did not like *Expanded Captions* “because the expanded captions made me forget what I was watching because of the life tree and definitions standard captions was nice and easy.”

Even students who said they liked the *Expanded Captions* had suggestions for improving the intervention. Students indicated that the video often went too fast, resulting in insufficient time to hit the Enter key in order to access the *Expanded Captions*. One of the students indicated that he/she already knew most of the words defined. Other students indicated that some of the words they did not know were not defined. One student suggested to “try to erase some glitches that slow the film down, everything else is good”. Students also would have liked to: “make it more fun, like definitions a little easier to understand”, “have the option to choose any word and read up on it! That would be awesome, maybe some interactivity”, “make a list of upcoming words at the start for us to learn early”, and “add more details in the definitions”.

## **Discussion and Recommendations for Future Research**

This study explored the effects of *Expanded Captions* versus *Standard Captions* on deaf and hard of hearing students’ comprehension of educational videos on DVD related to Biology. The results of this investigation did not reveal any statistically significant differences in either the within-subjects or between-subjects analyses. While most participants indicated that they preferred videos with *Expanded Captions* and thought that *Expanded Captions* helped them to learn the content better, the gain score data from their pre and post-tests did not support their perceptions.

The use of Snapz Pro X as a method for documenting student use of *Expanded Captions* was an important tool in this study, revealing that a relatively small percentage of the *Expanded Captions* were actually accessed by participating students. This was true in spite of the fact that students received careful training on how to use the *Expanded Captions* and a detailed explanation as to the intended purpose of the study. The fact that students tended to access the *Expanded Captions* more during the first half of each video suggests that students grew weary of the additional task of reading or examining the content in the *Expanded Captions*. The absence of an authentic assignment or instructional reason for actually learning the biology content may also have influenced their willingness to continue accessing the *Expanded Captions*. Lastly the mean scores on students’ post-tests in both conditions were relatively low, suggesting that the content was fairly difficult for them. Given the highly technical nature of the content, the

information may have been too difficult for students to learn in one pass through the video, even with access to additional information designed to support comprehension of the captions.

Recommendations for future research include the following. First, it is important to gather empirical data on whether each type of *Expanded Caption* used in the study has the power to influence student comprehension of the captions they modify. And if so, under what conditions is its use optimal? In this study we grouped three types of *Expanded Captions* into one study, which may have confused participating students and/or muddied the interpretation of resulting data. On the other hand, the videos used in the study seemed to require different types of support for different words. If *Expanded Captions* are to be useful to students, we need evidence-based guidelines on how to create them well.

Second, it is important to establish an instructional context that places primacy on meaningful learning from the video content. Comparing conditions where the experimental condition is only slightly different from the comparison condition due to student choice suggests we need to find ways to promote better choosing. To some extent this is a motivational issue: i.e., identifying a set of instructional expectations that would entice students to actually access the supportive information provided to them in the *Expanded Captions*. Prior research with students who are deaf and hard of hearing suggests that many students in this population have a history of not understanding the text well – and hence fail to appreciate the advantages of supports built into the reading environment designed to improve comprehension (Horney & Anderson-Inman, 1995).

Third, it may be that video captions are not the best place to try to improve students' understanding of key vocabulary in difficult material, such as the videos used in this study. As one student described – accessing the *Expanded Captions* seemed distracting, leading the student to forget, or be distracted from, learning the video's content. What was designed to be helpful, may in fact lead to cognitive overload – more information about a brief segment of the video than can be absorbed. The suggestion by another student to “make a list of words” in the video so that students can learn them in advance seems to echo the notion that studying key vocabulary within a captioned video may not be the most effective approach. Research on second language vocabulary learning emphasizes the importance of direct and explicit instruction, as well as the need for repeated exposure to target words (Schmitt, 2008). For future studies, we suggest exploring the use of *Expanded Captions* in combination with more direct and explicit instruction of target words, as well as activities that maximize repeated exposure. Studies that emphasize this approach include those by Peters (2007), Peters et al. (2009), Schmitt (2008), and Yoshii (2006).

And lastly, some students seemed to feel that our *Expanded Captions* did not go far enough in taking advantage of the digital environment to provide supportive information about the vocabulary in the videos. Calls for more “interactivity”, “more fun”, “a little easier to

understand”, “more details”, the option to choose any word and “read up on it” suggests students have an idea for the type of instructional environment that would entice them to access the *Expanded Captions*. Kids today have high expectations of their instructional materials, particularly when those materials are media-rich and in digital form. Perhaps the way in which we chose to present the supportive information was found to be boring, more effort than it was worth – and hence not sufficiently enticing. The work by Treviranus (2000) on providing students who are deaf and hard of hearing with captions containing expanded information suggests that making videos interactive with options that hyperlink to definitions, background information, related materials, and instructional exercises is an effective approach for meeting the needs of this population. In short, the results of this study should be viewed as a starting point, and perhaps a cautionary tale, for further exploration into the use of *Expanded Captions* with educational video materials for students who are deaf and hard of hearing.

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## Appendix A

### *Parent/Guardian Letter of Consent*

Dear Parent or Guardian:

Your child is invited to participate in a research study conducted by the Center for Advanced Technology in Education at the University of Oregon. We hope to learn if using expanded captions is better for understanding educational videos than standard captions. Your child was selected as a possible participant in this study because your child normally uses captions when learning from educational videos.

If you decide to let your child participate we will ask your child to:

1. learn to use expanded captions for videos;
2. watch eight videos on different types of plants and animals;
3. use the captions to understand the content in the videos
4. take multiple-choice tests on information in the videos;
5. answer some questions about his/her experience using the captions

The study will take place at your child's school at a time and place determined by your child's teachers or principal. The videos are on DVD and will be presented using a computer. Your child will be asked to sit at the computer, watch the video, and read the captions so that he/she can learn the information in the video. For the expanded captions, your child will be able to click on some words to get more information about them. We will do this eight (8) times, two times for training and six times to evaluate which type of audio description works best for your child: standard captions (ones that your child is already familiar with) or expanded captions (where your child will be able to click on some words to get more information about them.) Each session will be 30 - 40 minutes long and each will take place on a different day.

The risks of participating in this study are small. It is possible that your child might find it uncomfortable to focus on the videos for an extended time. To manage this possibility, all videos will be 15-20 minutes long and your child may ask to rest at any time. If your child finds it too uncomfortable he/she may ask to stop, at any time. If your child decides not to continue with the study your child will not suffer any loss of privileges for choosing to stop. There is also a small risk of loss of confidentiality. To manage this possibility, your child will be given a pseudonym (fake name) to be used for all tests completed as part of this study. Your child's test scores will never be associated with your child's real name.

There are three benefits to your child for participation. First, the educational videos will provide your child with new information about plants and animals in an interesting and up-to-date way. Second, information learned in this study may affect how the developers of educational videos provide captions for students in the future. Third, in appreciation for your child's time and effort, we will provide your child with a \$20.00 gift certificate to a local department store (e.g., Target or Walmart) when the study has been completed.

Any information that is obtained in connection with this study and that can be identified with your child will remain confidential. All test data will use pseudonyms or numbers to protect your child's confidentiality. The data (without names) will be stored in a locked file cabinet and a password protected computer file at the Center for Advanced Technology in Education. Upon completion of the study's data analysis, all printed and electronic files will be destroyed.

Your child's participation is voluntary. Your decision whether or not to allow your child to participate will not affect your relationship with your child's teachers or school. If you decide to allow your child to participate, you are free to withdraw your consent and discontinue your child's participation at any time without penalty.

If you have any questions about your child's participation in the project, please feel free to call, write, or email us using the following information:

Dr. Lynne Anderson-Inman  
Center for Advanced Technology in Education  
College of Education,  
University of Oregon  
Eugene, Oregon 97403 - 2056  
[Lynnei@uoregon.edu](mailto:Lynnei@uoregon.edu)  
Phone: 541-346-2657

Enclosed are two copies of this form. If you choose to allow your child to participate, **please sign one copy and return it to your child's school and keep the other copy for your records.**

If you have questions regarding your child's rights as a research subject, please contact the Office for Protection of Human Subjects, University of Oregon, Eugene, OR 97403, (541) 346-2510.

Your signature indicates that you have read and understand the information provided above, that you willingly agree to let your child participate, that you may withdraw your consent at any time and discontinue your child's participation without penalty, that you have received a copy of this form, and that you are not waiving any legal claims, rights or remedies.

Date \_\_\_\_\_

Name of Child \_\_\_\_\_

Print Your Name \_\_\_\_\_

Signature of Parent/Legal Guardian \_\_\_\_\_

## Appendix B

### *Student Assent Form*

We are trying to learn what type of captions work best for students when they are watching videos for school. You are invited to help us.

We would like you to:

1. learn to use a new form of captions for videos;
2. watch three videos on different types of plants and animals;
3. use the captions to understand the content in the videos
4. take multiple-choice tests on information in the videos that you will watch;
5. answer some questions about your experience using the captions.

The videos are on DVD and will be presented using a computer. All you need to do is to sit at the computer, watch the video, and read the captions so that you learn the information in the video. For the new captions, you will also click on some words to get more information about them. We will do this eight (8) times, two times for training and six times to evaluate which type of caption works best for you: old captions (ones that you are already familiar with) or new captions (ones where you to click on words to get more information.) Each session will be 30 - 40 minutes long and each will be on a different day.

You may start and stop the video any time you want. You may also start the video over from the beginning whenever you want. You can also decide that you do not want to continue, even after you have already started.

Also, if you have any questions about what you should do, just ask your teacher. Your teacher will explain what is expected. If you want to rest, or stop completely, just tell your teacher. You won't get into any trouble. Your answers to the tests will not affect your grades, but we hope that you will do your best work.

If you want to help us learn what type of captions work best, please sign your name on the line below. Your parent or guardian has told us that it is okay with them if you help us by watching the videos and taking the tests. Remember, you don't have to, and once you start you can rest or stop whenever you like.

Date: \_\_\_\_\_

Print Your Name: \_\_\_\_\_

Sign Your Name: \_\_\_\_\_

Appendix C  
*Definitions Used to Support Vocabulary*

Word	Definition
<b>absorb</b>	to take something in through the surface.
<b>alga (algae, algal)</b>	green living things (like plants) but with no roots, stems, or leaves.
<b>amoeba</b>	a one-celled living thing with no definite form.
<b>amphibian</b>	an animal that spends part of its life on land and part in water (toad, frog, salamander).
<b>annelid</b>	a worm (earthworm, leech).
<b>anus</b>	the opening where solid waste leaves the body.
<b>asexual reproduction</b>	the process of making living things of the same kind without male and female sex cells.
<b>bacteria</b>	small, one-celled living things.
<b>bilateral</b>	relating to both the right and left sides of the body.
<b>bilateral symmetry</b>	a thing where the right and left halves are exactly the same.
<b>bladder</b>	a body part that receives and holds urine.
<b>capillary</b>	a very small blood vessel.
<b>carbon dioxide</b>	a colorless, odorless gas produced during breathing and necessary for plant life.
<b>cell</b>	the smallest structural unit of life.
<b>cercaria</b>	early stage of a worm inside a host animal.
<b>chlorophyll</b>	green substance found in plants.
<b>chloroplast</b>	a microscopic green structure in a cell.
<b>chromista</b>	a type of algae, usually brown or golden-brown.
<b>cilia</b>	tiny hairs on the outside of some cells.
<b>circulatory system</b>	parts of the body used to move blood (heart, veins, arteries).
<b>cluster</b>	a group of the same or similar things.
<b>cnidarian</b>	a type of water animal that can sting (jellyfish, hydra, sea anemone, coral).
<b>cocoon</b>	a protective case spun by some worms and insects.
<b>colony (colonial)</b>	a group of animals that are the same.
<b>contractile</b>	capable of getting shorter and thicker, like muscles.
<b>copepod</b>	a crustacean with a long body and forked tail.
<b>crustacean</b>	a water animal that has a segmented body and outside skeleton ( lobster, crab, shrimp).
<b>cyst</b>	a small sac filled with fluid .
<b>cytoplasm</b>	water-like part of a cell, containing the cell's other parts .
<b>diatom</b>	a type of algae, with cell walls of silica.
<b>digest (digestion, digestive)</b>	process for changing food into simpler stuff that can be absorbed by the body.
<b>digestive enzyme</b>	substance that speeds up changing food into something easier to absorb.
<b>digestive system</b>	parts of the body used for eating and absorbing food (mouth, stomach, intestine).
<b>dinoflagellate</b>	a group of living things, that drift or float in water.
<b>DNA fingerprint</b>	the part of DNA that is unique to each living thing.
<b>dorsal</b>	relating to the back of an animal.
<b>ectoparasite</b>	an animal that lives on the surface of another animal.
<b>embryo</b>	a living thing in the early stages of the growth process, before birth.
<b>encapsulated</b>	covered by a protective coating.
<b>enzyme</b>	a protein that speeds up chemical reactions in the body.
<b>esophagus</b>	tube that carries food to the stomach.
<b>euglenid (euglena)</b>	a tiny living thing with a whip like tail for swimming.
<b>eukaryote (eukaryotic)</b>	cells that have a nucleus.
<b>evolution</b>	changes in an animal or plant species over time.

<b>(evolutionary)</b>	
<b>excretory</b>	the process of getting rid of waste products from the body.
<b>feces</b>	body waste eliminated from all living beings (e.g., poop, manure, scat).
<b>fertilize</b>	occurs when a female sex cell meets a male sex cell (conception).
<b>filament (filamentous)</b>	a thin thread.
<b>filamentous algae</b>	algae that looks like threads.
<b>flagellum (flagella)</b>	a long, slender tail coming from some types of cells.
<b>flatworm</b>	a worm with a symmetrical body (e.g., tapeworm).
<b>fluke</b>	a flat worm that lives in another animal's body and causes diseases.
<b>fungi (fungus)</b>	living things such as yeasts, molds, and mushrooms.
<b>gamete</b>	a special sex cell for reproduction.
<b>genetic (genetically)</b>	determined by heredity.
<b>genetic analysis (testing)</b>	a test to examine the DNA inside a cell.
<b>germinal cell</b>	the original cell, a cell from which other cells are formed.
<b>gonad</b>	an organ that produces male and female sex cells.
<b>gypsum</b>	a mineral that is colorless, white, or yellow.
<b>habitat</b>	the area where an animal or plant normally lives.
<b>hemoglobin</b>	the red substance in blood that carries oxygen.
<b>hermaphroditic</b>	a living thing with both male and female sex organs.
<b>heterotroph</b>	a living thing that cannot make its own food using sunlight.
<b>hydra</b>	a tiny animal with a tube body and an oral opening with tentacles.
<b>hydrozoan</b>	a type of water animal (hydra, hydroids, hydrocorals).
<b>ingesting</b>	the process of taking things into the body as food.
<b>intermediate host</b>	an animal in which a worm lives while it turns into an adult.
<b>larva (larvae, larval)</b>	the earliest stage of animal growth, (very different from the adult stage).
<b>luxuriant</b>	a lot of growth.
<b>metabolism</b>	processes in a cell that turn food into energy.
<b>metamorphose</b>	to change form or appearance.
<b>molecule</b>	the smallest particle of a compound.
<b>mollusk</b>	a type of small animal that has a soft body and a shell (shellfish, snail).
<b>monogenetic</b>	having a single host animal through the life.
<b>mussel</b>	a type of shellfish, raised for food.
<b>nucleus (nuclei)</b>	sphere within a cell that controls all cell activity.
<b>nutrient</b>	the part of food that is useful.
<b>oligochaete</b>	a worm, such as earthworm.
<b>organelles</b>	parts of a cell, each with a specific function.
<b>ovary</b>	body part that produces female sex cells.
<b>oxygen</b>	a colorless gas that makes up 20 % of the air and is vital for life.
<b>parapod</b>	flaps on the body, which the worm uses for moving.
<b>parasite</b>	an animal that feeds on another animal but does not help it.
<b>peristalsis</b>	wavelike motions that force material through a tube (e. g., food through the intestine).
<b>photosynthesis (photosynthetic)</b>	a process plants use to make food using sunlight.
<b>phylum (phyla)</b>	the biggest unit in animal classification, bigger than classes.
<b>pigment</b>	a substance that produces color.
<b>plankton (planktonic)</b>	a collection of small living things that float on and in water.

<b>plastid</b>	green particle in a cell where food is made and stored.
<b>polychaete</b>	a type of marine worm.
<b>polyp</b>	an animal with tube body and a mouth with tentacles around (hydra, coral).
<b>predator (predatory, predation)</b>	an animal that lives by eating other animals.
<b>predigested</b>	food that has been changed into something easier to eat.
<b>prey</b>	an animal hunted or caught for food.
<b>proboscis</b>	the feeding tube of insects and worms.
<b>proglottid</b>	part of a tapeworm with both male and female sex organs.
<b>prokaryote (prokaryotic)</b>	cells that do not have a nucleus.
<b>protein</b>	large molecules involved in all important life functions.
<b>protist</b>	single-celled living thing that is not a plant or animal.
<b>radially symmetrical</b>	a thing where all parts are arranged around a central point.
<b>reproduction (reproductive)</b>	making new living things of the same kind.
<b>rotifer</b>	a worm with hair that looks like revolving wheels.
<b>scolex</b>	the knob and hooks at the end of a tapeworm, that help it hook onto a host animal.
<b>segment</b>	a distinct or separate part of an animal.
<b>setae</b>	stiff hair or bristles on an animal.
<b>sexual reproduction</b>	the process of making offspring by combining male and female sex cells.
<b>silica</b>	small white or colorless crystals such as sand.
<b>species</b>	a unit in animal classification, smaller than genus.
<b>sperm</b>	male sex cells.
<b>stinging cell</b>	cells able to stick and cause pain.
<b>symbiosis (symbiotic)</b>	a union of living things, benefitting each member.
<b>testes</b>	a body part that produces male sex cells.
<b>tubular</b>	shaped like a tube.
<b>unicellular</b>	a thing that has only one cell.
<b>UV (ultra violet) radiation</b>	invisible rays of light, close to violet in the rainbow.
<b>vacuole</b>	a cavity in a cell, containing water, food, or waste.
<b>zygote</b>	a fertilized egg cell that has not yet divided.

Appendix D  
**CNIDARIANS (Training Session Post Test)**

**Directions: Circle the letter next to the correct response.**

1. Anemones are a perfect place for \_\_\_\_\_ to live because anemones cannot tell them apart from themselves.
  - a) Most fish
  - b) Anemone fish
  - c) Jellyfish
  
2. When a hydra pours out an undigested meal, she has \_\_\_\_\_ her food.
  - a) Swallowed
  - b) Regurgitated
  - c) Digested
  
3. What class of water animals commonly live in a boat harbor?
  - a) Obelia
  - b) Hydrozoans
  - c) Plankton
  
4. This Cnidarian is an organism that looks like green flowers and can eat a large crab.
  - a) Sea anemone
  - b) Hydra
  - c) Daphnia
  
5. All Cnidarians:
  - a) Have two openings
  - b) Are photosynthetic
  - c) Have a body composed of two cell layers
  
6. What happens when hydra and daphnia meet?
  - a) Daphnia runs away
  - b) Hydra stings daphnia
  - c) Daphnia kills hydra
  
7. A group of the same kind of Cnidarians is called a \_\_\_\_\_.
  - a) Species
  - b) Colony
  - c) House
  
8. Obelia differs from \_\_\_\_\_ because it has polyps for feeding and reproducing.
  - a) Annelids
  - b) Daphnia
  - c) Hydra
  
9. Hydras reproduce using a process that is \_\_\_\_\_.
  - a) Heterosexual
  - b) Asexual
  - c) Bisexual
  
10. What living thing uses Chlorohydra waste in order to grow and reproduce?
  - a) Flatworms
  - b) Amphibians
  - c) Algae

## ALGAE PRE-TEST

**Directions: Circle the letter next to the correct response.**

1. What do the different types of algae have in common?
  - a) Prokaryotic cells and silica
  - b) Eukaryotic cells and plastids
  - c) Oblong shape
2. Which single-cell algae can be seen floating in water?
  - a) Plants
  - b) Diatoms
  - c) Dinoflagellates
3. The small animal that feeds on dinoflagellates (making it dangerous to humans) is called:
  - a) Mollusks
  - b) Larvae
  - c) Ants
4. Diatoms extract this crystal from surrounding water.
  - a) Salt
  - b) Silica
  - c) Pigments
5. These female sex cells will produce Spirogyra algae.
  - a) Zygotes
  - b) Plankton
  - c) Sperm
6. One example of an oblong diatom is:
  - a) Centric
  - b) Tadpoles
  - c) Pinnate
7. Algae make and store food in their:
  - a) Stomach
  - b) Plastids
  - c) Nuclei
8. Select the one that is an example of golden-brown algae:
  - a) Sea palms
  - b) Shellfish
  - c) Euglena
9. Euglenids are a type of \_\_\_\_\_ found in water.
  - a) Red algae
  - b) Green algae
  - c) Compound
10. These organisms are not plants or bacteria.
  - d) Streptococcus
  - e) Algae
  - f) Roses

## ALGAE POST-TEST

**Directions: Circle the letter next to the correct response.**

1. Select the one that is an example of golden-brown algae:
  - d) Euglena
  - e) Shellfish
  - f) Sea palms
2. One example of an oblong diatom is:
  - d) Pinnate
  - e) Tadpoles
  - f) Centric
3. These female sex cells will produce Spirogyra algae.
  - d) Zygotes
  - e) Plankton
  - f) Sperm
4. Diatoms extract this crystal from surrounding water.
  - d) Pigments
  - e) Salt
  - f) Silica
5. Algae make and store food in their:
  - d) Stomach
  - e) Plastids
  - f) Nuclei
6. Which single-cell algae can be seen floating in water?
  - d) Diatoms
  - e) Plants
  - f) Dinoflagellates
7. Euglenids are a type of \_\_\_\_\_ found in water.
  - g) Compound
  - h) Red algae
  - i) Green algae
8. What do the different types of algae have in common?
  - d) Eukaryotic cells and plastids
  - e) Oblong shape
  - f) Prokaryotic cells and silica
9. The small animal that feeds on dinoflagellates (making it dangerous to humans) is called:
  - d) Larvae
  - e) Mollusks
  - f) Ants
10. These organisms are not plants or bacteria.
  - a) Roses
  - b) Algae
  - c) Streptococcus

## FLATWORMS PRE-TEST

**Directions: Circle the letter next to the correct response.**

1. These flatworms live in the bladder and lungs of animals.
  - a) Amphibians
  - b) Embryos
  - c) Flukes
2. The segments of a tapeworm that have both male and female sex organs are called:
  - a) Mammalia
  - b) Proglottids
  - c) Scolex
3. Human beings function as hosts for a flatworm called:
  - a) Taenia solium
  - b) Earthworm
  - c) Flukes
4. These flatworms are able to avoid bright sunlight.
  - a) Monogenea
  - b) Tapeworm
  - c) Planarian
5. On what surfaces do ectoparasites live?
  - a) rocks
  - b) water
  - c) fish and amphibians
6. What do large flatworms eat?
  - a) Crustaceans
  - b) Insects
  - c) Algae
7. Flatworms are organisms that have the following form:
  - a) Triangular
  - b) Bilaterally symmetrical
  - c) Radially symmetrical
8. What happens when human beings eat tapeworm eggs?
  - a) The eggs turn into worms that kill
  - b) The eggs are digested
  - c) The eggs are regurgitated
9. One of the surviving branches of flatworms is called:
  - a) Snakes
  - b) Cestoda
  - c) Jellyfish
10. Larvae that live on snail tissue develop into sacs called:
  - a) Germinal cells
  - b) G cells
  - c) cells

## FLATWORMS POST-TEST

**Directions: Circle the letter next to the correct response.**

1. These flatworms live in the bladder and lungs of animals.
  - a) Amphibians
  - b) Embryos
  - c) Flukes
2. One of the surviving branches of flatworms is called:
  - a) Cestoda
  - b) Jellyfish
  - c) Snakes
3. Human beings function as hosts for a flatworm called:
  - a) Flukes
  - b) Earthworm
  - c) Taenia solium
4. What happens when human beings eat tapeworm eggs?
  - a) The eggs are digested
  - b) The eggs are regurgitated
  - c) The eggs turn into worms that kill
5. What do large flatworms eat?
  - a) Algae
  - b) Insects
  - c) Crustaceans
6. On what surfaces do ectoparasites live?
  - a) rocks
  - b) water
  - c) fish and amphibians
7. Flatworms are organisms that have the following form:
  - a) Triangular
  - b) Bilaterally symmetrical
  - c) Radially symmetrical
8. These flatworms are able to avoid bright sunlight.
  - a) Planarian
  - b) Monogenea
  - c) Tapeworm
9. The segments of a tapeworm that have both male and female sex organs are called:
  - d) Mammalia
  - e) Proglottids
  - f) Scolex
10. Larvae that live on snail tissue develop into sacs called:
  - a) Tendon cells
  - b) G cells
  - c) Germinal cells

## Appendix E

Session 1 (Algae video)											
90403 (A)			06791 (B)			44232 (A)			34477 (B)		
20'	40'	60'	20'	40'	60'	20'	40'	60'	20'	40'	60'

Session 2 (Flatworms video)											
24338 (A)			26519 (B)			77870 (A)			08229 (B)		

## Appendix F

## Student Survey

1. Choose the type of video captions that helped you learn the content best (one only).

Standard captions                       Expanded captions

Why do you feel this type of caption worked best for you?

2. What did you **like** about the **expanded** captions?

3. What did you **NOT like** about the expanded captions?

4. How can the developers **make the expanded captions better**?

## **SUPPORTED VIDEO PROJECT**

### **Protocol for Implementation**

April 25, 2009, Tucker-Maxon School, Portland OR

#### **Step 1: Unpack all materials and set up computers.**

Materials for this study include:

- 12 laptop computers with 12 mice and powercords (Computers must be ready with DVD player on screen)
- 12 headsets
- 1 Projector
- 2-3 power strips
- 12 pretests for each of three videos
- 12 posttests for each of three videos
- 12 copies of the survey instrument (see below)
- Copies of research protocol (this document)
- 12 \$50 gift certificates for Target
- 1 copy of eCove on either Palm or laptop for observations
- 1 research laptop for recording general observations
- Name tags for computers?

If possible, set up the computers so that the students are in two groups. If possible, face students away from the center of the room (e.g., along the outside) so that helpers can easily get to the students and observers can see all students easily.

#### **Step 2: Welcome students and assign them to groups.**

Use the following list of students to place participants in two experimental groups, and seat them in front of the computers that contain materials appropriate for their group (Group A and Group B.) The two groups should be seated on opposite sides of the room to the maximum extent possible. After the training session (see below), students in Group A will read and learn from a DVD with expanded captions, while students in Group B will read and learn from the same DVD with standard captions. After the break, students in Group A will read and learn from a second DVD, this time with standard captions. Students in Group B will read and learn from the same DVD with expanded captions.

Students in Group A (Expanded Captions 1 <sup>st</sup> )	Students in Group B (Standard Captions 1 <sup>st</sup> )
#03254 11	#35710 14
#29777 S	#34477 N
#90403 R	#24338 Z L
#26519 M	#63441 12
#44232 K	#77870 A
#08229 R	#76031 Z S
#35558 13	#06791 A

### Step 3: Conduct Training Session.

The purpose of this session is to provide students with training in the procedures to be used in this study, as well as practice with both the standard video captions and expanded video captions. All students will participate in the training as a single group. This session includes three phases where the intervention teacher explains, models, and guides students through the procedures for using the DVDs and taking the pre and posttests. During the training session students will access the DVD entitled *Cnidarians* to learn how to read and use both the “standard captions” (SC) and the “expanded captions” (EC). The sequence for the training session is:

- a. Administer pretest
- b. Provide explanation and demonstration on standard captions, followed by approximately 10 minutes practice
- c. Provide explanation and demonstration on expanded captions, followed by approximately 10 minutes practice (*should this be the same section of the DVD or a new section?*)
- d. Administer posttest
- e. Take a break

### Directions to Students:

1. **Explain.** Tell students that they will be watching two educational videos related to Biology. The videos are from a series call the *Tree of Life*. Each video is about a different species on the Tree of Life. Both videos will have captions, but the captions will be of two types: *standard captions* and *expanded captions*. Each student will watch one video with standard captions and one video with expanded captions. Standard captions look like captions they have probably seen before. Expanded captions have links to additional information designed to help students understand the content. Explain that our purpose of doing this activity is to learn if expanded captions help students understand educational videos better than standard captions. Explain that, to answer this question, students will take short tests before and after each video.

## 2. *Demonstrate and Practice*

### *Standard captions*

- a. *Show a brief section of the video with standard captions.*
  - Indicate that students should read the captions while watching the video. They can pause, move back or forward, and re-play anytime they want in order to read or repeat the information (demonstrate this on the projector). **Emphasize that the goal is to learn the content.**
- b. *Hand out the Cnidarians video with Standard captions for practice.*
  - Ask student to insert the video on the DVD drive and let them wait until the video shows up in the computer monitor.
  - Have students start the video by pressing the enter button, and practice reading the captions for about 5 - 10 minutes.
  - If no problems are present move in to the practice section of the video with expanded captions. Before that be sure to ask students to eject the video out of the DVD by pressing the upper right button labeled F12 and set it aside.

### *Expanded captions*

- a) *Use the projector to show a brief section of the video with expanded captions.*
  - Explain that the word in green links to one of three types of additional information: (a) a definition, (b) a focused illustration drawing attention to some aspect of the picture with arrows, or (c) a diagram, showing where the concept is in the Tree of Life.
  - Show students how to press enter on the key board to have access to the additional information of the highlighted words.
  - Explain that they can look at the expanded part (eg., the definition) as long as they want.
  - When they are ready to return to the video, they are to press the enter button again (illustrate this). This takes them back to the same section of the video they were watching when they clicked on the word in green. If they want to see the expanded part again (e.g., revisit the definition or diagram), students can press enter newly.
- b) *Hand out the Cnidarians video with Expanded captions for practice.*
  - Ask student to insert the video on the DVD drive and let them wait until the video shows up in the computer monitor.
  - Have students start the video by pressing the enter button, and practice reading the captions for about 5 - 10 minutes. If no problems are present move in to the test practice.

3. **Test Practice.** Give students a hard copy of the post-test and tell them they are to circle the letter of the correct response of each question. Indicate that they are to choose an answer to each question, even if they do not know the correct answer. Tell them that there is no time limit to respond to the questions. Tell them this is a practice test, so they will have experience with the type of pre and post tests they will have for the other videos.
4. **Questions and Clarifications.** Ask the students if they have any questions before starting the “real” experimental sessions. Go over the procedures as needed.

Break (For trainers, prepare the computers for the first experimental session, have the appropriate videos for each group and have the Snapz Pro X ready).

#### **Step 4. Experimental procedures.**

##### **Session 1.**

**Pre-test:** Give students a hard copy of the pre-test and tell them they are to circle the letter of the correct response of each question. Indicate that they are to choose an answer to each question, even if they do not know the correct answer. Tell them that there is no time limit to respond to the questions.

**Intervention:**

- Group A watches the Algae video with expanded captions
  - Group B watches the Algae video with standard captions
1. *Have students start the video by pressing the enter button twice (but not very fast).* Indicate to the students that they can take their time to watch the video and open the highlighted words by pressing the enter button. They can watch the video as many times as they want before taking the post-test.
  2. Ask students to raise their hands when they are done and do nothing to the computer.

**Post-test:** Give students a hard copy of the post-test and tell them they are to circle the letter of the correct response of each question. Indicate that they are to choose an answer to each question, even if they do not know the correct answer. Tell them that there is no time limit to respond to the questions.

**Break** (For trainers, Save the Snapz Pro X data from session 1 for each computer and then prepare the computers for the second experimental session, have the appropriate videos for each group and have the Snapz Pro X ready).

##### **Session 2.**

**Pre-test:** Give students a hard copy of the pre-test and tell them they are to circle the letter of the correct response of each question. Indicate that they are to choose an answer to each question, even if they do not know the correct answer. Tell them that there is no time limit to respond to the questions.

**Intervention:**

- Group A watches the Flatworms video with standard captions
  - Group B watches the Flatworms video with expanded captions
1. *Have students start the video by pressing the enter button twice (but not very fast).* Indicate to the students that they can take their time to watch the video and open the highlighted words by pressing the enter button. They can watch the video as many times as they want before taking the post-test.
  2. Ask students to raise their hands when they are done and do nothing to the computer.

For trainers, Save the Snapz Pro X data from session 2 for each computer.

**Post-test:** Give students a hard copy of the post-test and tell them they are to circle the letter of the correct response of each question. Indicate that they are to choose an answer to each question, even if they do not know the correct answer. Tell them that there is no time limit to respond to the questions.

**Data Collection:**

**Survey:** Ask all the students to complete the short survey about their experience watching the videos.