# How Closed Captioning & Interactive Transcripts Impact Student Learning

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Next, we would like to extend genuine thanks to the University of South Florida St. Petersburg (USFSP) faculty who not only opened their courses for inclusion in the study, but also shared their valuable time to assist in administering the study. They ably assisted with student communication as well as ensured study documentation was included on their course pages, among other duties. Participating faculty included Tiffany Chenneville, Ph.D., AnnMarie Gunn, Ph.D., and Nicole Stowell, J.D. MBA. Lastly, we would be remiss if we did not also recognize the significant contribution made by the students who agreed to participate in the research program. Their willingness to share their valuable time and communicate their experiences gives teaching professionals opportunities to improve learning for all students.

# Definitions

**Video** – Video recordings of lectures used for instructional purposes.

**Closed Captioning** – Text versions of the spoken portions of video. Displayed within the video player. Captions appear as the words are spoken. Can be turned on or off.

**Interactive Transcripts** – Full-text versions of the spoken portions of video. Displayed below the video player. Words are highlighted as they are spoken. The transcript is searchable. Can be turned on or off.

**Retention/Recall** – The ability to remember previously learned material.

**Understanding/Comprehension** - The ability to grasp the meaning of material.

**Transfer/Application** – The ability to apply learned facts, rules, concepts, and ideas across various situations.

# Study Summary

*Study Goals*

This study was designed to shed light on the educational value of both closed captioning and interactive transcripts in lecture-based online courses. We explored the effectiveness of closed captioning and interactive transcripts with a correlation study that examined the relationships between captioning, interactive transcripts, student demographics, student behaviors, and student comprehension of course material in an applied context. The study research questions follow.

*Research Questions*

1. How do students use captions and transcripts to support their learning?

2. Do students who use captions and transcripts at a higher level learn more than those who use the tools at a lower level? This question addresses the overall amount that participants learned.

3. Do students who use captions and transcripts at a higher level comprehend the content better than those who use the tools at a lower level? This question addresses the depth of learning along three distinct levels: (1) retention/recall, (2) understanding/comprehension, and (3) transfer/application.

*Methodology*

All students were provided a text and video overview of the study via an announcement posted to the class by the instructor. Once they clicked to view the first video lecture within the course, all students were prompted to opt in or out of the study with a form that opened in their browser. Students who opted in were randomly assigned to one of two groups: videos with closed captioning (CC) or videos with closed captioning and interactive transcripts (IT). Students who opted out received all course videos with closed captioning. Once assigned to a treatment condition, participating students received a short orientation video to show how to make use of the video player and support features for their respective group. The study treatment was applied only to the videos for the first module in each participating course, and from that point forward all videos only had closed captioning. Student participants completed a pre-assessment, three checkpoint quizzes at regular intervals throughout the course, and a post-assessment to measure content knowledge. The post-assessment also included a student survey to obtain demographics and student perceptions of benefits and uses.

Upon completing the module activities, which contained video and assignments specific to each course, the students took a brief assessment to determine their abilities to recall and apply the information from the module. At bi-weekly intervals, students completed quizzes that assessed their abilities to recall and apply the content from the first module. At the culmination of the course, participating students completed a posttest assessing mastery of the same learning objectives, to allow for comparison. They also completed a survey to collect attitudinal feedback on the use of their assigned media.

Throughout the course, tracking software recorded how students interacted with the videos and interactive transcripts. The study team tracked when students played and paused lectures, when they activated or deactivated captions and interactive transcripts, and when they used the search and navigation capabilities of interactive transcripts.

Based on answers to a survey question about how often they used either closed captioning or interactive transcripts, depending on their treatment condition, participants were grouped into “low usage,” “medium usage,” and “high usage” cohorts. Participants who said they used either closed captioning or interactive transcripts “never” or “seldom” were considered “low usage,” those who said they used these tools “sometimes” were considered “medium usage,” and those who said they used the tools “often” or “always” were considered “high usage.” Overall, 46 participants were classified "low usage," 21 participants “medium usage,” and 31 “high usage.”

The instructional modules included in this study addressed the specific learning objectives of the respective course. The modules consisted of reading assignments, video lectures, and an assessment. Students received the same module content, whether they opted into and out of the study.

Students who opted in completed a pre- and post-assessment, and some students received an interactive transcript, in addition to closed captioning. The content of the pre- and post-assessments was developed by the instructors of the courses, and the attitudinal survey portion was developed by the research team. These two assessments took place through a web interface outside the learning management system (LMS), and the instructors did not see the responses.

Nine online courses were included in the study and represented multiple academic disciplines, including business, education, and the social sciences. Courses examined included the following:

- DEP 4053: Developmental Psychology
- BUL 3320: Business Law
- BUL 6652: Regulation & Reporting (2 sections)
- MMC 6936: Digital Production
- MMC 3602: Mass Communication
- VIC 3001: Visual Communication
- EEX 4764: Instructional/Adaptive Technology
- LAE 4414: Children's Literature (2 sections)
- MMC 4936/6936: Introduction to Blogging

*Participant Recruitment*

Students were recruited from USFSP courses in the College of Arts and Sciences, the College of Education, and the College of Business. The recruitment script was provided when students initially began the course. It was provided to students online and on the day the students began the course. At that time, students opted in or out of participation.

*Participant Demographics*

The University of South Florida St. Petersburg, the institution at which the study was conducted, is an independently accredited university and one of three universities that make up the University of South Florida system. USFSP is situated in downtown St. Petersburg and currently enrolls approximately 6,500 full- and part-time students. In a typical fall or spring semester, online enrollment accounts for approximately 30% of earned student-credit hours, and this number rises to approximately 60% of earned student-credit hours in the typical summer term.

Overall, 199 students agreed to participate in the study. Of that number, 181 completed the pretest, and 99 completed the posttest. Six participants (9%) self-identified as having a disability in the captioning group, and two (6%) did so in the interactive transcript group. Of those, three participants in the closed captioning group indicated they were registered with Student Disability Services, and both participants in the interactive transcript group indicated being registered with that office. Remaining demographic characteristics are noted below in Table 1.

**Table 1. Participant demographics.**

| Variable | Group | Frequency | | % | |
|---|---|---|---|---|---|
| | | CC (n=65) | IT (n=34) | CC | IT |
| Gender | Male | 15 | 8 | 23% | 24% |
| | Female | 50 | 22 | 77% | 65% |
| | Trans male/Trans man | 0 | 0 | 0% | 0% |
| | Trans female/Trans woman | 0 | 4 | 0% | 12% |
| | Genderqueer/Gender non-conforming | 0 | 1 | 0% | 3% |
| | Prefer not to identify | 0 | 1 | 0% | 3% |
| | Different identity | 0 | 0 | 0% | 0% |
| Ethnicity | African-American | 3 | 2 | 5% | 6% |
| | Asian-American | 9 | 3 | 14% | 9% |
| | White | 34 | 20 | 52% | 59% |
| | Hispanic | 14 | 5 | 22% | 15% |
| | Bi-Racial | 3 | 2 | 5% | 6% |
| | Prefer not to identify | 0 | 1 | 0% | 3% |
| | Different ethnicity | 2 | 0 | 3% | 0% |
| Age | 18-22 | 33 | 10 | 51% | 29% |
| | 23-27 | 6 | 8 | 9% | 24% |
| | 28-32 | 6 | 5 | 9% | 15% |
| | 33-37 | 5 | 3 | 8% | 9% |
| | 38-42 | 5 | 2 | 8% | 6% |
| | 43+ | 5 | 4 | 8% | 12% |

| | | | | | |
|---|---|---|---|---|---|
| **Class Rank** | **Freshman** | 1 | 1 | 2% | 3% |
| | **Sophomore** | 4 | 1 | 6% | 3% |
| | **Junior** | 20 | 9 | 31% | 26% |
| | **Senior** | 21 | 10 | 32% | 29% |
| | **Graduate** | 19 | 13 | 29% | 38% |
| **Major** | **Biology** | 6 | 0 | 9% | 0% |
| | **Business** | 2 | 2 | 3% | 6% |
| | **Criminology** | 2 | 0 | 3% | 0% |
| | **Education** | 3 | 2 | 5% | 6% |
| | **English** | 2 | 2 | 3% | 6% |
| | **Integrated PR & Advertising** | 4 | 2 | 6% | 6% |
| | **Interdisciplinary Social Sciences** | 2 | 0 | 3% | 0% |
| | **Marketing** | 3 | 0 | 5% | 0% |
| | **Mass Communication** | 17 | 7 | 26% | 21% |
| | **MBA** | 9 | 4 | 14% | 12% |
| | **Other** | 7 | 8 | 11% | 24% |
| | **Psychology** | 7 | 6 | 11% | 18% |

# Results

*(1) How do students use captions and transcripts to support their learning?*

*(a)* How often did you use the closed captioning / interactive transcripts with the video lessons throughout the semester?

In the captioning group, 55% of participants reported employing the feature "sometimes," "often," or "always," and 29% noted utilizing the feature "often" or "always." The interactive transcript group noted that they utilized the transcript tool "sometimes," "often," or "always" 47% of the time, with 27% indicating use of transcripts "often" or "always."

*(b)* To what degree were the closed captioning distracting or helpful?

Among participants in the closed captioning group, 45% said the tool was "moderately helpful" or "extremely helpful," and 60% said it was at least "slightly helpful." In the interactive transcript group, 53% of participants found the tool "moderately helpful" or "very helpful," and 59% said it was at least "slightly helpful."

*(c)* Why do you use closed captioning or interactive transcripts?

Participants cited a variety of reasons for using assistive technologies. For participants in the closed captioning group, the most popular reasons were "They help me focus" (42%), "They help with information retention" (37%), and "They help when audio quality is poor" (28%). For

participants in the interactive transcript group, the most popular reasons were “They help with information retention” (38%), “I use them as a study guide” (29%), and “They help me find information” (29%). About a third of respondents in each group reported not using the tools.

**Table 2. Why participants used either closed captioning or interactive transcripts.**

| | **Frequency** | | **%** | |
|---|---|---|---|---|
| | **CC (n=65)** | **IT (n=34)** | **CC** | **IT** |
| **I did not use them.** | 21 | 13 | 32% | 38% |
| **English is my second language.** | 4 | 3 | 6% | 9% |
| **I have difficulty with hearing.** | 3 | 1 | 5% | 3% |
| **I watch videos in sound sensitive settings (e.g., library).** | 16 | 7 | 25% | 21% |
| **They help me focus.** | 27 | 7 | 42% | 21% |
| **I use them as a study guide.** | 7 | 10 | 11% | 29% |
| **They help with difficult vocabulary.** | 11 | 4 | 17% | 12% |
| **They help when audio quality is poor.** | 18 | 10 | 28% | 29% |
| **The instructor is hard to understand.** | 6 | 2 | 9% | 6% |
| **They help with information retention.** | 24 | 13 | 37% | 38% |
| **They help me find information.** | 8 | 10 | 12% | 29% |

*(d)* How helpful was it for the course to have video lectures?

Among participants in the closed captioning group, 62% indicated that the use of video lectures was “very” or “extremely” helpful, and 80% said it was at least “moderately” helpful. In the

interactive transcript group, 56% of participants found the use of video lectures “very” or “extremely” helpful, and 77% said the videos were at least “moderately helpful.”

*(e)* Student Remarks: Participants were asked to provide open-ended responses to a question about why assistive technology helped or hindered their course-taking experience. Table 3 provides a summary of responses indicative of the statements received.

**Table 3. Selected qualitative remarks from participants on the benefits of assistive technologies.**

| |
|---|
| I am a visual person, so having the text there helped me better memorize the material. Also when taking notes, it was extremely helpful. |
| I can focus better when I read what is being said. |
| I’m not exactly sure how to explain how it helps, but I know for certain that it does … I felt as though I was retaining information a lot more readily than just following a PowerPoint. |
| Just having a visual of what is being said helps me to better comprehend. |
| The closed captioning helped me, since English is not my first language, to better comprehend the content of the class and follow the professor. |
| Useful in noisy households where it can be a struggle to hear the videos, and quiet environments where I didn't want to disturb others. |
| Because the class uses technical law terms, the transcripts help grasp what the professor was talking about. |
| Having the information provided in two formats, audibly and visually, helped with retention and even understanding. |

I prefer reading over listening because it's more convenient if I'm in a public space and have no headphones.

I'm not a native English speaker, so it helps me to understand better.

It made it easier to keep track of what was going on and helped me focus on what was being said.

It's helpful to visually see what the professor is saying. If I can't understand them or miss something, I can find it on the screen.

*(2) Do students who use captions and transcripts at a higher level learn more than those who use the tools at a lower level?*

Participants in the closed captioning group scored an average of 64.24 points on the pretest and 70.56 points on the posttest. Participants in the interactive transcript group showed slightly more improvement, increasing from 63.60 points on the pretest to 71.17 points on the posttest. Average posttest scores correlated with participants' use of the tools. Those who used closed captioning at a low level scored an average of 64.90 points on the posttest; those who used the tool at a medium level scored an average of 70.06; and those who used the tool at a high level scored an average of 79.64. Likewise, those who used interactive transcripts at a low level scored an average of 66.78 points on the posttest; those who used the tool at a medium level scored an average of 74.58; and those who used the tool at a high level scored an average of 76.62. The closed captioning group showed greater gains from pre- to posttest among low-usage participants, and the interactive transcript group showed greater gains from pre- to post- among medium- and high-usage participants.

**Table 4. Overall learning at different levels of closed captioning and interactive transcript usage.**

| | Pretest | Posttest | Difference |
|---|---|---|---|
| **Low Usage** | | | |
| Closed Captioning | 57.64 | 64.90 | 7.26 |
| Interactive Transcripts | 61.03 | 66.78 | 5.75 |
| **Medium Usage** | | | |
| Closed Captioning | 63.66 | 70.06 | 6.40 |
| Interactive Transcripts | 62.22 | 74.58 | 12.36 |
| **High Usage** | | | |
| Closed Captioning | 74.50 | 79.64 | 5.14 |
| Interactive Transcripts | 67.92 | 76.62 | 8.70 |

*(3) Do students who use captions and transcripts at a higher level comprehend the content better than those who use the tools at a lower level?*

For recall-type items that prioritized memorization, the closed captioning group improved by 6.63 points from pre to post for low-usage participants. Low-usage interactive transcript group participants showed a slight decline of -5.56 points from pre to post. Medium-usage participants in the closed captioning group improved by 5.88 points from pre to post. Medium-usage participants in the interactive transcript group improved by 4.17 points. High-usage participants in the closed captioning group improved by 5.26 points from pre to post. High-usage participants in the interactive transcript group improved by 8.33 points.

**Table 5. Recall learning at different levels of closed captioning and interactive transcript usage.**

| | Pretest | Posttest | Difference |
|---|---|---|---|
| **Low Usage** | | | |
| Closed Captioning | 57.74 | 64.37 | 6.63 |
| Interactive Transcripts | 75.93 | 70.37 | -5.56 |
| **Medium Usage** | | | |
| Closed Captioning | 59.80 | 65.69 | 5.88 |
| Interactive Transcripts | 50.00 | 54.17 | 4.17 |
| **High Usage** | | | |
| Closed Captioning | 77.19 | 82.46 | 5.26 |
| Interactive Transcripts | 80.56 | 88.89 | 8.33 |

For comprehension-type items that prioritized understanding of course content, the closed captioning group improved by 6.91 points from pre to post for low-usage participants. Low-usage interactive transcript group participants improved by 8.72 points from pre to post. Medium-usage participants in the closed captioning group improved by 4.31 points from pre to post. Medium-usage participants in the interactive transcript group improved by 6.66 points. High-usage participants in the closed captioning group improved by 3.94 points from pre to post. High-usage participants in the interactive transcript group improved by 13.33 points.

**Table 6. Comprehension learning at different levels of closed captioning and interactive transcript usage.**

| | Pretest | Posttest | Difference |
|---|---|---|---|
| **Low Usage** | | | |
| Closed Captioning | 57.17 | 64.08 | 6.91 |
| Interactive Transcripts | 55.57 | 64.29 | 8.72 |
| **Medium Usage** | | | |
| Closed Captioning | 64.90 | 69.22 | 4.31 |
| Interactive Transcripts | 66.67 | 73.33 | 6.66 |
| **High Usage** | | | |
| Closed Captioning | 73.83 | 77.77 | 3.94 |
| Interactive Transcripts | 58.61 | 71.94 | 13.33 |

For transfer-type items that prioritized the ability to apply course concepts to novel scenarios, the closed captioning group improved by 4.05 points from pre to post for low-usage participants. Low-usage interactive transcript group participants improved by 3.33 points from pre to post. Medium-usage participants in the closed captioning group improved by 12.16 points from pre to post. Medium-usage participants in the interactive transcript group improved by 28.33 points. High-usage participants in the closed captioning group improved by 5.61 points from pre to post. High-usage participants in the interactive transcript group declined by -2.78 points.

**Table 7. Application learning at different levels of closed captioning and interactive transcript usage.**

| | Pretest | Posttest | Difference |
|---|---|---|---|
| **Low Usage** | | | |
| Closed Captioning | 62.62 | 66.67 | 4.05 |
| Interactive Transcripts | 71.11 | 74.44 | 3.33 |
| **Medium Usage** | | | |
| Closed Captioning | 62.74 | 74.90 | 12.16 |
| Interactive Transcripts | 63.34 | 91.67 | 28.33 |
| **High Usage** | | | |
| Closed Captioning | 76.14 | 81.75 | 5.61 |
| Interactive Transcripts | 81.67 | 78.89 | -2.78 |

# Conclusions and Opportunities

*Implications for Students*

- Based on the outcomes of this study and a previously completed pilot study, students appear to benefit more from the use of interactive transcripts than closed captions on comprehension items, somewhat less on recall items, and about the same on application items. It is important to note that student performance improved under both conditions.
- Student learning outcomes at all levels correlate highly with the extent to which students actively use the interactive transcript tool; the higher the usage, the greater the learning outcomes. It is important to note that moderate- and high-usage participants also scored higher, on average, on the pretest assessments, suggesting students who avail themselves of assistive video technologies are predisposed to perform better.
- Conversely, high usage of closed captioning coincided with a slight drop in improvements, except in the case of application-type learning. At the recall and comprehension levels, however, participants showed more modest improvements as their reported usage increased.
- When students have the option of turning off tools such as captions or transcripts, they rarely do so. Most students employed the tools during their coursework.

*Implications for Instructional Design*

- Students benefit from both closed captioning and interactive transcripts. Therefore, providers, when possible, should make both tools available to users.
- Students perform better when they use assistive technologies more fully, and these benefits are particularly evident with interactive transcripts. Instructors should, therefore, encourage students to make use of such tools, orient students to their use, and highlight their benefits. Emphasizing that assistive technologies can help a wide swath of learners, including those without identified disabilities, could prove valuable. For example, instructors should share how to employ such tools as study aids.
- Based on our experience, instructional designers can help faculty improve the quality of their online coursework, thus resulting in improved student course experiences and student course outcomes.
- The study results provide continued support for the use of universal design principles by course developers and instructors when devising learning methods in college-level coursework. Students not only use the tools but can also articulate the benefits of their use. Moreover, their course performance improves.

*Institutional Commitment and Opportunities*

- Colleges and universities, if they are not already doing so, can articulate a vision for innovative teaching. An aspect of that vision can include enhanced teaching practices including the use of universal design approaches, such as closed captioning and interactive transcripts.

- Colleges and universities can also establish and support committees or task forces that are provided the opportunity to examine and subsequently articulate the value of innovative and evidence-based teaching.
- Colleges and universities can regularly convene institutional functions highlighting the value of and guidance for the use of innovative and evidence-based teaching practices.
- Colleges and universities should contemplate embarking upon a process in which e-learning guidelines are articulated, subsequently supported through campus professional development, and eventually specifying expectations regarding the quality of online coursework.

*Future Opportunities*

- The current study revealed that the amount of and length of video watched by students should be further explored. It is possible that modifications of these elements could result in improved student performance.
- The performance by students in courses employing these tools should be examined through the lens of student demographic profiles.

# Appendix A: Post-Study Survey, Closed Captioning Group

**Closed Captioning Questionnaire**

**Instructions:** Please choose one answer for each statement or question below.

1) Do you have a disability? YES| NO

2) If YES, what is your disability type? (checkboxes, multiple answer)

   **Hearing Impairment**
   **Visual Impairment**
   **Chronic Medical Disorder**
   **Learning Disability**
   **Sensory Disability**
   **Physical Disability**
   **Mental Illness**
   **Intellectual Disability**
   **Developmental Disability**
   **Other _____**

3) Are you registered with Student Disability Services? YES|NO

4) Do you ever struggle with focusing or maintaining attention in class?

   **Never | Seldom | Sometimes | Often | Always**

5) How often did you use the closed captions with the video lessons throughout the semester? **Never | Seldom | Sometimes | Often | Always**

6) To what degree were the closed captions distracting or helpful?

   **NA (Didn't Use)** | **Very Distracting | Moderately Distracting | Slightly Distracting | Slightly Helpful | Moderately Helpful | Very Helpful**

7) If the closed captions helped, please explain, briefly, how. If it hindered you, please explain why:

8) Why do you use closed captions? (check all that apply)

**I did not use them**
**English is my second language**
**I have difficulty with hearing**
**I watch videos in sound sensitive settings (e.g., library)**
**They helps me focus**
**I use them as a study guide**
**They help with difficult vocabulary**
**They help when audio quality is poor**
**The instructor is hard to understand**
**They help with information retention**
**They helps me find information**
**Other (please describe)**

9) How helpful was it for the course to have video lectures?

**Not at all | Slightly | Moderately | Very | Extremely**

10) What is your anticipated grade? (radio buttons)

11) Aside from this course, how many online or hybrid classes have you taken?

**None | 1-2 | 3-4 | 5-6 | 7+**

12) Outside of this course, describe your experiences with closed captions in an academic setting:

*Demographic Items:*

**GENDER**

❍ Male
❍ Female
❍ Trans male/Trans man
❍ Trans female/Trans woman
❍ Genderqueer/Gender non-conforming
❍ Different Identity (please state) _____
❍ Prefer not to identify

**ETHNICITY** African- Asian- Native-White

American American Hispanic American Bi-Racial

**AGE (In years) _____**

**CLASS RANK** Freshman Sophomore Junior Senior Graduate

**MAJOR** **_____**

# Appendix B: Post-Study Survey, Interactive Transcript Group

**Interactive Transcript Questionnaire**

**Instructions:** Please choose one answer for each statement or question below.

1) Do you have a disability? YES| NO

2) If YES, what is your disability type? (checkboxes, multiple answer)

   **Hearing Impairment**
   **Visual Impairment**
   **Chronic Medical Disorder**
   **Learning Disability**
   **Sensory Disability**
   **Physical Disability**
   **Mental Illness**
   **Intellectual Disability**
   **Developmental Disability**
   **Other _____**

3) Are you registered with Student Disability Services? YES|NO

4) Do you ever struggle with focusing or maintaining attention in class?

   **Never | Seldom | Sometimes | Often | Always**

5) How often did you use the interactive transcript with the video lessons throughout the semester? **Never | Seldom | Sometimes | Often | Always**

6) To what degree was the interactive transcript distracting or helpful?

   **NA (Didn't Use)** | **Very Distracting | Moderately Distracting | Slightly Distracting | Slightly Helpful | Moderately Helpful | Very Helpful**

7) If the interactive transcript helped, please explain, briefly, how. If it hindered you, please explain why:

8) Why do you use an interactive transcript? (check all that apply)

**I did not use it**
**English is my second language**
**I have difficulty with hearing**
**I watch videos in sound sensitive settings (e.g., library)**
**It helps me focus**
**I use it as a study guide**
**It helps with difficult vocabulary**
**It helps when audio quality is poor**
**The instructor is hard to understand**
**It helps with information retention**
**It helps me find information**
**Other (please describe)**

9) How helpful was it for the course to have video lectures?

**Not at all | Slightly | Moderately | Very | Extremely**

10) What is your anticipated grade? (radio buttons)

11) Aside from this course, how many online or hybrid classes have you taken?

**None | 1-2 | 3-4 | 5-6 | 7+**

12) Outside of this course, describe your experiences with interactive transcripts in an academic setting:

*Demographic Items:*

**GENDER**

❍ Male
❍ Female
❍ Trans male/Trans man
❍ Trans female/Trans woman
❍ Genderqueer/Gender non-conforming
❍ Different Identity (please state) _____
❍ Prefer not to identify

**ETHNICITY** African- Asian- Native-White

American American Hispanic American Bi-Racial

**AGE (In years) _____**

**CLASS RANK** Freshman Sophomore Junior Senior Graduate

**MAJOR** **_____**

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