

C-Print and Its Impact on Student Learners: Preliminary Findings from Students in Middle School through College

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Abstract

This presentation briefly reviews of C-Print Pro®'s new features and reports preliminary findings from research exploring C-Print use by students from middle school through college. Topics include student use of notes and text marking in class, learning strategies with C-Print, and teacher evaluations of student progress.

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Active learning strategies have long been considered a tool for academic success (Stanley, Slate, & Jones, 1999) and previous research with C-Print suggests that students who use more text-marking and study strategies perform better on learning tasks (Stinson, Kelly, Elliot, Liu, & Stinson, 2000; Stinson, Elliot, Kelly, & Liu, 2005). However, most computer-based speech-to-text support services do not offer students computer-based options for notetaking during real time display. Dramatic changes to C-Print Pro® software have enabled students to enhance their active learning behaviors while simultaneously using speech-to-text support services. Current versions of the software allow students to use active learning/notetaking tools during the real-time display and after class, as well as communicate more efficiently with the C-Print captionist. This presentation presents a brief review of C-Print Pro®'s new features. We also describe some preliminary research findings based on student use of the new software.

The C-Print research team is presently gathering data from two ongoing research projects that involve C-Print use by students from middle school through college. Through quantitative and qualitative measures, we are exploring how these students use the new software and the study strategies that they employ. The research also involves inquiry into the ways in which the students' classroom teachers and itinerant support teachers use and support the use of C-Print with their students. Topics discussed include student use of notes and text marking in class, learning strategies with C-Print, and factors influencing the use of C-Print in both secondary and post secondary settings.

Methods

Participants. C-Print's current research is taking place on multiple campuses across the country. The middle school-high school (secondary school) study includes participants from 4 public school districts—one on the West Coast, one in the Midwest, and two in the East. The number of deaf students served in each school district ranges between 35 students and 450. The college (postsecondary) study includes two campuses, including one state college and one private college. One of the colleges is located in the South and one in the East, with deaf student populations of approximately 40 students and 1100, respectively.

For the secondary school study, mainstreamed students have been nominated to participate by their itinerant teachers. Students, with the consent of their teachers, select one course for the C-Print trial. In the postsecondary study, students have been randomly selected and invited to participate based on classes that are served with C-Print by the colleges. Students are randomly chosen to participate in one of three conditions: C-Print ASR, C-Print abbreviation, or interpreter only (students in the interpreter only condition do not receive C-Print.)

While data collection is ongoing, thus far, participants in the C-Print trials for two studies include: 17 students in the secondary school study (with an expected maximum participation of 40 students) and in the postsecondary study, 36 students (with an expected maximum participation of 80 students.) In the secondary school study, C-Print trials have been conducted in such classes as

biology, computer skills, English, social studies, physics, and Spanish. In the postsecondary study courses included art history, bioethics, chemistry, communication, computer programming, education, engineering, European history, management science, political science, and social work.

Procedure. Prior to the start of each trial, the captionist meets with individuals who will be participating in the trial to explain the software and what will take place during the trial. For the secondary school study, this meeting usually includes the student, the student's itinerant teacher, and the classroom teacher. Parents are also invited to attend the meeting as well as other support staff (e.g. notetakers, interpreters) and school administrators. For the postsecondary study, captionists only meet with the student. Professors are notified by e-mail and in writing that they will have a student participating in the trial; they are given contact information for additional questions as well. When possible, the captionist makes contact with the professor to obtain additional information about the class and to make sure that all the professor's questions are answered.

For the secondary school study, the trial period is a total of 10 weeks in one class of the student's choice. Students receive 5 weeks of C-Print and 5 weeks without C-Print. The timing of the C-Print portion of the trial is counterbalanced, so half the students receive C-Print first and half receive C-Print for the second 5 weeks. In addition, half the students in the study will be receiving C-Print with Automatic Speech Recognition (ASR) and half will be receiving C-Print done with the abbreviation system and typing. The distribution of ASR or abbreviation inputs is also counterbalanced. Captionists use one laptop computer to produce the C-Print speech-to-text display and students receive a second laptop for use during class time. The student laptop allows students to view the real-time display, communicate with the captionist (and teacher if desired), highlight the text, and take one's own notes. Student software is also installed either at school or at home for use after class. Students can save the real time text (unedited version) themselves on a floppy or flash disk to use with the software after class. Students receive the edited version of C-Print text after class, distributed either electronically or in hard copy. The student has the choice to receive the C-Print text only or the C-Print text plus notes that the student has taken during class merged into the original C-Print text.

For the postsecondary study, the trial period is an entire marking period in one course in which the student is enrolled and C-Print can be provided as a support service (10 week quarter or 15 week semester).

Materials. In both studies, we are collecting information from all students about students' degree of hearing loss, reading ability, communication preferences, and motivation for the course. All students who participate in the C-Print trials also answer a questionnaire related to their experience during the trial using C-Print, including using the C-Print display, C-Print text, and educational tools. In the secondary study, we gather similar information for the part of the trial during which C-Print is *not* in use. In addition, in the secondary study, we are gathering teachers' assessments of their students' performance with and without C-Print. In the postsecondary study, parallel information is gathered for the students who are in the interpreter-only portion of the trial and all students' (C-Print trial or not) final course grades are being gathered.

For both the secondary and postsecondary studies, classes in the C-Print trials have been randomly selected for class observations and interviews with students, classroom teachers, and captionists. To date, we have conducted 18 observation/interview sets, including 9 at the secondary level and 9 at the postsecondary level. In the secondary school study, itinerant teachers and administrators of the C-Print programs are also being interviewed. Classroom observations involve a researcher observing one class period. Items that are observed include classroom layout, student use of software, student and teacher interactions. Interviews are conducted after the class

observation and include open-ended questions about learning about C-Print, the real-time experience, use of notetaking software, and use of C-Print notes. When possible, interviews were conducted face-to-face, with a sign language interpreter when necessary. Interviews with out of town participants were conducted in-person, over the phone, or through e-mail. In person and phone interviews are audio-tape recorded and transcribed verbatim. E-mail interviews were saved as text files.

Results

This presentation will focus on the preliminary findings for the C-Print trial students only, in both the secondary and postsecondary studies.

Use of C-Print in real time. In the secondary school study, 70% of the students (12/17) used the C-Print display most of the time or every class. Of those students who used C-Print regularly, about half of them used the display to help them fill-in missing information (occasional glance at screen) and half switched off between the teacher or interpreter and the C-Print display. In the postsecondary study, 92% (33/36) used the C-Print display most of the time or every class. College students' usage patterns were distributed relatively evenly; 11 students used C-Print just to fill in missing information (occasional glance), while another 11 only watched C-Print exclusively. The remaining 14 students alternated between watching the interpreter or teacher and using C-Print. In the secondary school study, we asked teachers to evaluate student performance with and without C-Print. Teachers were asked to consider their student's academic achievement, new vocabulary acquisition, and class participation on a 5-point scale, with 1=much less than average progress, and 5=much better than average progress. For each rating, teachers evaluated students' performance more positively with C-Print than without, as shown in the table below:

Secondary School Teachers' Ratings of Student Performance
with and without C-Print

Teacher Performance Rating	Without C-Print	With C-Print
Academic achievement	3.17	3.82
Learning new vocabulary	3.12	3.94
Class participation	3.17	4.12

Use of C-Print in real time with notetaking tools. One aspect of C-Print software that is being tested during these trials is the educational tools which allow students to take notes during class and after class. C-Print offers three different educational tools that can be used during real time or after class: highlighting, "tagging" (copy and paste), and writing one's own notes. About half (7) of the students at the secondary school level used the software very frequently—more than 5 times during the 5 week trial. Only two students did not use the software at all, and 8 students used the software between 1-3 times.

Among those secondary school students who did use the tools, highlighting was most popular (n=7), while writing one's own notes was least popular (n=2). Students also judged the ease of using each of the tools. Most students ranked each tool as being either very easy to use or "ok" to use. Only one student said that writing one's own notes was a little difficult and that "tagging" (or "cut and paste") was very difficult. Below is a quote from one of the high school students about his experiences using the software to take notes for himself:

Student (11th grade): ... Every time I use C-print, I always have ideas ... for ... You know like, for example, ... a quiz or something all typed out and notes next to it saying ... “study these quiz”. I typed out like vocabulary words for English, vocabulary words. I studied this one and I write down this vocabulary the definition for it and make my own sentences for it.

Teachers also noticed the benefits of the educational tools for their students. In the quote below, a seventh grade classroom teacher explains how C-Print helped his student to develop highlighting skills:

Well, that's the most positive thing I think that occurred. I had been trying to get her to keep up in the classroom by taking notes by hand. Listening to what was going on and there were certainly times where she was out of focus, off task and etc. The C-Print certainly allowed her to focus more, and to use notetaking skills that she normally would not have used. For example, she began to find out how to highlight on the C-Print.

Among the college students, 83% tried to use the software at least once and 47% (17/36) used the software very frequently. With this population, the tool that was used most often was writing one's own notes (14/36), while the cut and paste option was used least often (7/36). Here's what one college student had to say about using the C-Print software:

College Student: I feel that C-Print did help me to do my job as a student. It let me feel that I was getting all the information and let me learn how to be independent at the same time. Other software, such as voiceprint software, would leave the teacher feeling frustrated and often me because I would be left wondering what the teacher had said when he had not programmed a word into the software. The C-Print software let the teacher do what he normally would with no hindrance or out of class obligations and it also let me take an active role in what I wanted to take notes on. I could take my own notes and not have to rely on someone else to help me. In that sense, if I felt that I knew something, then I could decide to take less notes on it, and vice versa.

C-Print's educational tools help students to stay focused and alert during class as well. As one college student described her experience:

I like typing my own notes because it keeps me awake. And because when I type something, I remember it better. Same of when I write something, I remember it better.

Learning strategies with C-Print. Both secondary and postsecondary study groups were surveyed about the purposes for which they used the C-Print text and educational tools. Among the secondary students, all but one (16/17) used the C-Print text and software. The student who did not choose to use C-Print was in a physics class. The teacher relied heavily on Power Point presentations, graphs, mathematical formulas, etc. and the student felt that the greater priority was to focus on the teacher's presentation. Among the rest of the secondary students who used the C-Print text and software, popular reasons given for using the system included: remembering important examples, remembering details, identifying main ideas, learning vocabulary, and preparing for a test. In the college group, again with one exception, everyone else used the system (35/36). In the case of the student who did not use the software, it appeared that extenuating

circumstances not associated with C-Print might have influenced the student's lack of use of C-Print (professor was ill and student seemed unmotivated to do well in the class). For the remaining students, reasons for using C-Print included remembering details, reviewing what happened in class, test preparation and identifying main ideas.

Study strategies. We also asked students to identify exactly what strategies they used with the C-Print text and software when they were studying. Among secondary students, strategies included: using C-Print software to highlight information, using C-Print text with friends, using C-Print text with parents, underlining information found in the C-Print text, and making maps or charts with information from the C-Print text. College students also used the C-Print software to highlight information. In addition, college students underlined information in the C-Print text, wrote outlines from C-Print text, and wrote summaries from C-Print text. While both secondary and postsecondary students used C-Print software to highlight as their main study strategy, from this point onward, study strategies diverged. Younger students used more "social strategies" (e.g. using text with friends or parents) while older students strategies that relied more on text-generated strategies (e.g. underlining, writing summaries, creating outlines.)

Factors associated with use of C-Print

Following are some findings that are based on the classroom observations and interviews with students and their teachers. Observations and interviews suggested certain physical characteristics of the classroom and student skills that may be associated with the use of C-Print.

Physical characteristics of the classroom. A perennial complaint concerns the size of the laptop students use to for the C-Print display. We have found that the use of C-Print by students varies depending on the available desktop space. For example, students are more inclined to use the educational tools of C-Print when the laptop can be on the desk or table directly in front of the student and optimally, when an external mouse can be attached and manipulated. Students have been successful using C-Print even if they have to use a laptop stand adjacent to their desk or without a mouse, but having the laptop at hand with additional room for mouse and papers is ideal.

Student skills. We have identified several skill sets that are desirable, but not necessary, for success with C-Print and especially for success with the educational tools. For example, **familiarity with the computer** is desirable. At the start of these studies, we assumed that all students were knowledgeable about computers. Some students are, but some are not. Familiarity with computers is helpful, but **a lack of fear about harming the computer** is important as well. Younger students and less affluent students had less computer experience, but more importantly, a willingness to touch the computer was helpful in C-Print's full use. **Typing skills** are also important, as are **spelling skills**. Typing skills kept some students from writing their own notes; spelling skills influenced this type of software use, too. However, the highlighting feature, as well as the "tagging" (copy and paste) feature were available to students in lieu of having to write their own notes, and thus a lack of typing or spelling ability did not totally deter students from using C-Print with success. Finally, a word about **cognitive processing skills**. We did not directly assess processing skills in this study, but clearly, students process information at different rates. Students who talked about the pace of the class being too fast tended not to use the educational tools during class as often as other students.

Discussion

Preliminary results from ongoing research with C-Print at the secondary and postsecondary levels shows that students are responding to the new software additions in positive ways. New

software allows students to interact with C-Print-produced text both during and after class. Most students used the interactive software at least once, and many used it frequently. At the secondary school level, students preferred to use the highlighting feature, while college students were more likely to use the “writing own notes” feature.

Students enjoyed the opportunity to engage in active learning with their notes in ways not previously possible. Teachers also found that students were more engaged during class time and that the software allowed students to strengthen their learning skills.

With respect to how students used C-Print text after class, the highlighting tool in C-Print software is frequently used by all students. Among younger students, studying often involved interactions with tutors, friends, or parents. College students used their C-Print text to develop summaries, outlines, etc.

Based on classroom observations and interviews, we have found that such factors as classroom furniture, as well as student skills and attitudes, play a role in the effective use of C-Print.

While these are only preliminary findings, we are looking forward to hearing more from the students and teachers as we continue to gather data about C-Print and its educational tools. Results point to the desirability of including features in speech-to-text support services that permit students to interact with the text that they are receiving, encouraging active learning behaviors and reinforcing study skills for students.

References

- Stanley, B., Slate, J.R., & Jones, C.H. (1999). Study behaviors of college preparatory and honors students in the ninth grade. *The High School Journal*, 82(3), 165-171.
- Stinson, M. S., Elliot, L.B., & Kelly, R., & Liu, Y. (2005) Deaf and Hard-of-Hearing Students' Memory of Lectures with Speech-to-Text and Interpreting/Note Taking Services. Manuscript submitted for publication.
- Stinson, M., Kelly, R., Elliot, L., Liu, Y., & Stinson, S. (2000, April). *C-Print, interpreting and notes, and memory of lectures*. Paper presented at the Annual Meeting of the American Educational Research Association, New Orleans, LA.