DOES TEXT-TO-SPEECH USE IMPROVE READING SKILLS OF HIGH SCHOOL STUDENTS?

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BACKGROUND & CONTEXT OF THE STUDY

• The No Child Left Behind Act (NCLB) of 2001 (P.L. 107-110) Title I, Part B

• Computer based AT in reading is highlighted as significant for impacting poor reading (National Reading Panel, 2000)

• Reading difficulties experienced in the K-12 system often persist into adulthood (Pressley & Harris, 2006)

• Only 22% of Hawaii’s 8th graders are are reading at the proficient or at advanced level (NCES, 2009)
Average Scores for State/Jurisdiction and Nation (public)

Score
500
280
260
240
220
200
180
160
140
120
100
80
60
40
20
0

Year
'98
'02
'03
'05
'07
'09

Nation (public)
Hawaii

Accommodations were not permitted
Accommodations were permitted

* Significantly different ($p < .05$) from 2009.
IMPACT OF POOR READING

- Reading difficulties are correlated with...
  - Low academic performance,
  - Low school attendance,
  - High suspension and dropout rates,
  - Decreased chances of employment.

(Blackorby & Wagner, 1996; Coleman, 1996; Stoddard, 1998; Torgesen, 1998; Yelin & Katz, 1994)
Lack of reading instruction/remediation in reading skills in high school (Engstrom, 2005)
PURPOSE OF THE STUDY

To determine the effectiveness of the use of Text-To-Speech (TTS) software as an intervention for improving unaided reading skills and academic performance of 9th grade struggling readers.

1. Improving reading comprehension;
2. Increase vocabulary;
3. Increase reading fluency when NOT using TTS; and
4. Change in academic outcomes
RESEARCH QUESTIONS

1. To what extent does the use of TTS software affect vocabulary of 9th grade struggling readers?

2. To what extent does the use of TTS software affect reading comprehension of 9th grade struggling readers?

3. To what extent does the use of TTS software affect reading fluency of 9th grade struggling readers?

4. To what extent does the use of TTS software affect academic outcomes (i.e., class grade and absenteeism) of 9th grade struggling readers?
CONCEPTUAL FRAMEWORK FOR THE STUDY

- Double deficit hypothesis implies the potential of TTS in reading.
- Reading encompasses multiple skills.
- Vocabulary increases with multiple exposure to the word.

Student Reader → Use of Certain TTS → Increased fluency rate of reading with steady visual & auditory input → More exposure to text (familiar & unfamiliar vocabulary words) → Increased comprehension → Increased motivation to read & improved reading when not using TTS software
INTERVENTION TOOL: TEXT-TO-SPEECH

**Kurzweil 3000™**

- Synchronized visual and auditory presentation of text.
- Study skill tools (e.g., highlighting, note taking, definition search).
- Flexibility in presentation (e.g., speed, voice pitch, quality of speech, pause in reading text, colors).
BASIC TOOLS

While some students may think that the title Of Mice and Men comes from the fact that Lennie likes to pet mice and other soft things, the title is really taken from the poem “To a Mouse” by Robert Burns. Robert Burns (1759 - 1796) is probably the most famous of all the Scottish poets. After accidentally turning up a mouse’s nest while he was plowing in 1785, he wrote an ode to this mouse expressing his sympathy for the mouse and his home.

For the average English speaker, Burns’s poetry can be quite archaic and complex. On the left is the original poem by Burns. On the right is a translation of the words into modern English.

Small, sleek, cowardly, nervous little thing.
Oh, what a panic is in your breast!
You need not run away so hastily.
With a quick scurry
I would hate to run and chase you.
With a quick scurry
I would hate to run and chase you.

As the text is being read, the highlighting moves along with the reader word by word.

Reading unit, mode, voice and speed can be adjusted based on the reader’s needs.
STUDY TOOLS

The user is able to highlight, circle, take notes on a sticky note, or add a footnote using the study toolbar while the text is being read.
METHODS

Design:
• Multi-site cluster randomized trial

Setting:
• 10 public high schools on O‘ahu, Hawai‘i
• Suburban and urban schools
• Medium to large in size
• Diverse student body
Participant: Teachers

- 30 teachers
- 9 teachers in the control; 21 teachers in the intervention group
- Teacher different content areas: Math, LA, Science, Social Science
- * Data from Spring 2011 – Spring 2012
Students:

- 164 eligible students
  - 32 control; 132 intervention

These students were...

- 9th grade students with disabilities or at risk of identification
- Reading 1.0 to 6.9 GLE on Gates MacGinitie Reading Test
- Had consent forms from parents & students
- Used TTS for one semester
METHODS: MEASURES

- Gates MacGinitie Reading Test
- Student survey
- Teacher survey
- TTS software usage log
- Fidelity checklist
- Class observation checklist
- Class grade & attendance
RESULTS

Vocabulary & Reading Comprehension:

A significant positive effect of the TTS intervention upon vocabulary and reading comprehension, after statistically controlling for students’ baseline performance on the measures, \( F (1, 148) = 4.819, \ p < .05 \) and \( F (1, 149) = 4.799, \ p < .05, \) respectively.
DIFFERENCES IN MEAN SCORES (POST-TEST)

<table>
<thead>
<tr>
<th></th>
<th>Vocabulary</th>
<th>Comprehension</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Control</strong></td>
<td>4.32</td>
<td>4.49</td>
</tr>
<tr>
<td><strong>Intervention</strong></td>
<td>4.96</td>
<td>4.98</td>
</tr>
</tbody>
</table>
RESULTS CONTINUED

Reading Fluency:
No significance was found for reading fluency.

Grades & Attendance:
The difference between the intervention and control groups in class grades and absenteeism were both non-significant ($F(1, 151) = .834, p=.363$ and $F(1, 145)=.363, p=.548$, respectively).
Table 2

*Adjusted means and standard errors for student scores on the GMRT subtests and (Name/Description) vocabulary measure.*

<table>
<thead>
<tr>
<th>Reading Outcome</th>
<th>Control Group</th>
<th>TTS Group</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>M</td>
<td>SE</td>
</tr>
<tr>
<td>Comprehension</td>
<td>4.493</td>
<td>.200</td>
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<tr>
<td>Fluency</td>
<td>198.922</td>
<td>12.964</td>
</tr>
<tr>
<td>Vocabulary</td>
<td>4.322</td>
<td>.263</td>
</tr>
</tbody>
</table>
Moderating Effects

- Significantly more effective in improving vocabulary for SWD than for students without disabilities.

- Significantly more effective in improving reading comprehension for students with prior reading software experience, students taught by novice teachers, and students taught by female teachers.

- Significantly more effective in improving both vocabulary and reading comprehension when students used it for language arts classes.
DISCUSSION

So What?
What do the results tell us about TTS use?
Lack of reading instruction/remediation in reading skills in high school (Engstrom, 2005)
Improvement in vocabulary and comprehension means

TTS as more than a compensatory tool
• Specific Features of TTS may be contributing to improvements in vocabulary
  => need further investigation
• Reading fluency should be redefined as reading rate – need different measure for reading rate and fluency
VIDEO EXAMPLE OF TTS INTERVENTION
QUESTIONS?
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