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Re-Envisioning Reading in English as a Foreign Language

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1. Introduction

Though traditional block formatting of text has existed for thousands of years, there are reasons to believe that it is not the most efficient way to promote reading comprehension, retention, and proficiency. This paper presents an alternative means of formatting texts, called visual-syntactic text formatting, reviews prior research on it, and discusses its significance for reading in English as a foreign language.

2. The Syntactic Basis of Reading

For the past several decades, researchers and educators have sought to improve reading through alteration of text format. These alterations have varied from simple changes in letters, line space, or capitalization (Marks & Taylor, 1966), to insertion of additional spaces between phrases (Bever, Jandrea, Burwell, Kaplan, & Zaenen, 1990; Jandrea & Bever, 1992; Jandrea, Muncer, & Bever, 1986; O'Shea & Sindelar, 1983), to linguistically-informed text reformatting using computer software (Straub, 2009). All these changes have been motivated by a simple fact: conventional text formatting does not correspond to the limits of human eye span and carries more information than is helpful for comprehension. Due to limitations of the human eye span, readers can typically only take in nine to fifteen characters at a time before moving to the next fixation (Demb, 1997). Everything else outside this limited space competes for visual attention, leading readers—especially struggling readers or readers in a second language—to get lost in a sea of words (Walker et al., 2007). Reading thus consists of a series of saccades, that is shifts in glance to the next fixation. Because of skipped words at the edge of fixations (Rayner & Sereno, 1994), combined with limitations of working memory (Garrod, 1992), readers often have to re-examine previously viewed words as they engage in saccades while reading block text. This not only slows down reading, but also impedes reading comprehension, especially for non-native speakers of English and others with reading challenges.

One way to overcome this problem is by grasping words in clausal or phrasal units, a process that helps skilled readers anticipate what comes next and thus avoid confusion at fixation boundaries. In contrast, poor readers read one word at a time (Croft, 1970) and rarely parse words into phrases or clauses (Fuchs, Fuchs, Hosp, & Jenkins, 2001). This value of understanding phrase and clausal structure of sentences helps explain why students’ syntactic knowledge is significantly related to both fluency and comprehension (Ravid & Mashraki, 2007; Mokhtari & Thompson, 2005). In other words, the ability to decode individual phonemes and words is a necessary skill for
effective reading but not a sufficient skill (Cain, Oakhill, Barnes, & Bryant, 2001; Catts, Fey, Zhang, & Tomblin, 1999; Nation & Snowling, 2000). Syntactic awareness is also extremely important for reading comprehension (Bowey, 1986; Gaux & Gombert, 1999), especially as readers move up in grade level and encounter texts of greater variety and complexity. Syntactic parsing seems to free up working memory for semantic processing, because the sequential encoding of information in a linear format quickly exhausts the limited capacity of working memory (Larkin & Simon, 1987; Webb, Thornton, Hancock, & McCarthy, 1992). For all these reasons, formatting changes that provide syntactic clues have consistently been shown to improve reading fluency and speed (e.g., Bever et al., 1990; Jandrea & Bever, 1992; Jandrea, Muncer, & Bever, 1986; LeVasseur, Macaruso, & Shankweiler, 2007).

The value of syntactic awareness in reading is closely related to that of prosodic awareness, which interacts with syntax at the phrase level and with semantics at the passage level (Esser & Polomski, 1988). A number of studies have found that knowledge of prosody is highly correlated with learners' reading rate, accuracy, and comprehension (see, e.g., Dowhower, 1987; Miller & Schwanenflugel, 2006). Prosody in oral communication is indicated in a variety of ways, including through pauses, word stress, and changes in pitch, pacing, and flow. Unfortunately, in written communication, most of these clues are either absent or substituted with much more limited orthographic conventions, such as punctuation and typographic emphasis (e.g., italics, underlining, or bold typeface).

Just as native speakers carry out syntactic parsing while reading, aided by their knowledge of prosody, so do English learners. However, this process is much more challenging for non-native speakers of English, who either lack explicit knowledge of the target language syntax or, in more cases, may know the rules but cannot automatically use those rules to mentally process language. Due to this lack of syntactic knowledge or skill, as well as interference from their first language, learners make significantly more parsing errors when reading in a foreign language (Mack, 1986; White, 1989). Thus, not surprisingly, knowledge of syntax has been proven as one of the most salient factors in determining second language reading ability (Shiotsu, 2011), and the more dissimilar the syntactic rules of a target language are from one’s native language, the more difficult reading in the target language becomes (Frenck-Mestre & Pynte, 1997). All these reasons explain why visual syntactic cues embedded in texts can potentially be of greater benefit to English language learners than more typical approaches of text modification such as simplification or elaboration of content (see, e.g., Oh, 2011).

3. Visual Syntactic Text Formatting

Over the last 15 years, a group of researchers has developed an alternate form of textual organization called visual-syntactic text formatting (VSTF). VSTF uses software to automatically parse sentences and present them in a way that highlights meaning. Specifically, VSTF breaks sentences up at salient clause and phrase boundaries, fits each row of text into one or two fixation eye spans, denotes syntactic hierarchies via a cascading pattern, and creates clusters across multiple rows that help readers retain combinations of phrases in their mind. VSTF also puts active verbs
in a colored font to further highlight meaning. The result is a narrower column of text that allows more efficient eye movement and improved syntactic processing. VSTF would thus format the first sentence of this paper as follows (with the highlighted words colorized instead of bolded):

```
Though traditional block formatting of text has existed for thousands of years, there are reasons to believe that it is not the most efficient way to promote reading comprehension, retention and proficiency.
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*Figure 1. Visual-syntactic text formatting*

VSTF can be accessed by readers in several ways. First, a software program called ClipRead is available for free from Live Ink, the company that developed VSTF. Students can then copy and paste any digital text into ClipRead for quick conversion to VSTF, and then read through it. Second, educators can prepare materials for their classes using the same ClipRead program. Third, some publishers have begun to collaborate with Live Ink to have their digital textbooks pre-converted to VSTF, so that readers of the digital texts have the option of reading the VSTF version simply by clicking on an icon.

4. Research on Reading with VSTF

VSTF has been investigated in both classroom and laboratory settings with very promising results (Vogel, 2002; Walker, Schloss, Fletcher, Vogel, & Walker, 2005; Walker & Vogel, 2005; Walker et al., 2007).

4.1 Reading Comprehension

Several studies among college students have found a benefit for VSTF in improving reading comprehension (see, e.g., Walker, Schloss, Fletcher, Vogel, & Walker, 2005). In one study, 48 college students read six 500-word expository passages on a computer: three in block format and three in VSTF. The order and format of passages was randomized across participants. After reading the passages, students took a 48-question written test on the passage. An analysis of variance (ANOVA) revealed that comprehension scores were 40% higher for the passages read in VSTF as compared to those read in block format (p = .0024).
4.2 Reading Speed and Efficiency

In a recent study, similar to that described above, the participants also wore eye-tracking equipment which measured total eye fixation time per word. Participants spent an average of 780 milliseconds per word in reading block text, but only 630 millisecond per word reading in VSTF, resulting in a 20% increase in reading speed in VSTF. This difference was due to more frequent regressions while reading block text. Participants carried out an average of 3.15 eye movements per word in block text format, but only 2.25 eye movements per word in VSTF.

The combination of comprehension data and reading speed data in the same study allows us to calculate the difference in reading efficiency (defined as amount of comprehension per unit of reading time) between the two main conditions. As the participants scored 25% higher in comprehension in this most recent study, and read at a 20% faster rate, we calculate the increase in reading efficiency due to use of VSTF at 50%.

4.3 Reading Retention

Reading comprehension, speed, and efficiency are all important, but it is also critical that students are able to retain academic content. Retention has been examined through two studies of high school students using VSTF to read academic texts (Walker & Vogel, 2005; Walker et al., 2007). Both studies showed that students remembered information better in VSTF.

In 2003–2004, a study was carried out in six tenth-grade World History classes, with three teachers teaching two classes each. The 84 students in the classes were randomly assigned to one of the six classes. Then, the teachers were randomly assigned to teach one experimental course and one control course. A pretest showed that the students in the experimental and control groups were equal in academic ability.

The history textbook used in the course was digitally converted to VSTF. In each class, students read the textbook on computer in twice weekly 25-minute sessions. The experimental group read the material in VSTF, and the control group read the material in block format. Other than the reading condition, all other instruction for the the two groups was the same. Students had identical assignments and took the same ten unit exams and final exam. The unit exams covered material taught over the previous few weeks and the final exam covered material taught over the academic year.

Exam scores of students in the VSTF and block format groups were analyzed with a test of repeated measures multivariate analysis of variance, with pretest reading comprehension as an independent variable. Students in the VSTF classes scored significantly higher on both the unit exams and the final exam.

Figure 2 shows the differences between the VSTF group and the block format group on the unit exams. Students reading with VSTF scored higher on each of the tests. Also, the average gap between the scores of the VSTF group and the block format group was higher in the second half of the year than the first half.
Students in the VSTF group also scored significantly higher than those in the block format group on the final exam. The mean final exam score was 81 in the VSTF group and 64 in the block format group. Figure 3 graphically shows the range of final exam scores of students in both the VSTF group and the control group.

![Figure 3. 10th grade final exam (mean +/−2 S.D.)](image)

4.4 Reading Proficiency

The benefits of VSTF for reading comprehension and retention are not surprising. The more challenging question is the effect of VSTF use on long-term reading proficiency. Do students who read regularly with VSTF transfer skills learned and become more proficient readers of material in traditional block format? Or do they suffer in reading proficiency because they have become dependent on the scaffolding provided by VSTF?

This question has been examined through multiple studies of students in secondary schools (Vogel, 2002; Walker, Schloss, Fletcher, Vogel, & Walker, 2005; Walker & Vogel, 2005; Walker et al., 2007). In all studies, students who read textbook material in VSTF for 50 minutes per week over an academic year were compared to students who read the same textbook material in traditional block format. However, two different study designs were used. In two high school studies, students in both the VSTF and block format groups read social studies textbook material digitally, as described in the retention study above (see also Walker et al., 2007).
In the middle school study, reading VSTF on computer was compared to reading the same material in block format in ordinary printed textbooks. In this study, 6th, 7th, and 8th grade students read social studies or language arts material in VSTF on laptops in their classrooms for about 50 minutes per week. For each student in the VSTF group, a counterpart student who had similar attributes in terms of grade, baseline reading scores, English language learner status, and gender, was selected elsewhere in the district. These control students read the same social studies and language arts material, but out of their ordinary printed textbooks.

A total of 528 student participated in these studies: 384 in the middle school grades and 184 in the high school grades. In all grade levels, reading proficiency was measured by scores on standardized tests that were formatted in conventional block text. Pretest-posttest comparisons were performed with an analysis of covariance.

In all grade levels from sixth to tenth, students in the VSTF groups made significantly greater improvement in their reading proficiency than did their counterparts in the block format groups (see Figure 4). Students in the block text format groups generally made small gains throughout the year, advancing less than one grade level when compared to national averages. In contrast, students reading in VSTF made approximately two years' worth of gains in a single year.

![Figure 4. Growth in reading proficiency in one academic year](image)

This growth of reading proficiency appeared to be due to learners becoming better able to grasp the syntax of passages they read, even in block text. As Vogel (2011) explained, "Students will tell me that they can 'pull out the phrases' and 'see the verb' easier with other [block text] reading after working with the [VSTF] format."

### 4.5 Effects with English Language Learners

What do we know about the particular effects of VSTF reading among English language learners? In a study with high school students, greater gains were seen with lower aptitude students than among those who were already good readers (Walker et al., 2005). Many of these were English language learners who were able to achieve the same reading proficiency level at the end of the year as the control group of native English speaking readers. Walker and Vogel (2005) reported that the use of VSTF had a positive effect on English language learners' reading development across all
secondary grades; though, compared to native English speakers, it took more sessions until their quiz scores gained an increase over control students. By the end of the year in most grades, English language learners in the VSTF cohort closed between one-half and all the gap between themselves and the native English language students in the control groups.

Fisher and Newbury (2009) report that English learners at their college find use of VSTF very helpful, as it simplifies the reading process and makes difficult passages easier to understand. Recently, a high school in Colorado implemented a program for test preparation for low-performing students, two-thirds of whom are English language learners. To prepare for the Colorado student assessment program (CSAP), students participated in daily 20-minute sessions for four weeks, reading sample test passages in VSTF. All of the students, who began the preparation program at less than proficient level, were able to improve their reading proficiency (Vogel, 2011). Most recently, 81% of the participants met the state standard for acceptable growth in one year after four weeks of daily 20-minutes sessions, and 62% met the school goal of reading at a proficient level by the end of the school year.

5. Conclusion

Both poetry and computer programming have shown us the value of organizing texts syntactically, rather than in block formatting. Research suggests that the same approach is valuable for improving reading comprehension, retention, and proficiency, at least among native speakers of English and speakers of English as a second language in the United States. Further studies in EFL settings will be of value to determine if the same effects are evident there. If so, VSTF can be a valuable tool for promoting reading of English as a foreign language.

6. References


