

# Virtual ramps for invisible disabilities: One district's approach to assistive technology for students with learning disabilities

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All students deserve equal access to public education, and students with learning disabilities are no exception. The Boulder Valley School District (BVSD) Assistive Technology Team (Boulder, Colorado) found a comprehensive approach to providing assistive technologies for students with learning disabilities across the district, rather than simply problem solving student needs one student at a time, as students were brought to their attention. Originally providing access stations at each district high school, the program is being expanded to students at all age levels through the district's web.

The program started by providing a comprehensive software package for literacy support, and expanded by incorporating reading comprehension software being developed by researchers at the local university. WYNN literacy support software by Freedom Scientific is a comprehensive software package that includes a sophisticated screen reader, scanning OCR (optical character recognition) technology, word

prediction, talking spell checker, talking dictionary and numerous other tools that support reading, writing, and comprehension. Summary Street essay feedback software, under development at the University of Colorado (CU), is Web-based software that gives immediate feedback on the content of students' summaries. These software programs can be used alone or in combination. This article describes the Virtual Ramps program educational rationale, project implementation, software used, and preliminary results.

### Educational rationale

Reading and writing skills are critical to academic and vocational success, and despite the challenges imposed by learning disabilities, all students are held to the same standards in our competitive world. Meeting national, state, and district standards is increasingly important. This project responds to the need of one public school district to address the multiple needs of its students. Using the software provided, the students are demonstrating that they can successfully:

- utilize age and grade appropriate content materials
- produce written text that accurately demonstrates their level of knowledge and understanding
- develop skills in which they are lacking

Students with disabilities deserve equal access to information. In the 1960's, a group of college students with disabilities at Berkeley, California started to work for equal access for people with disabilities. They demanded curb cuts and building ramps so that students in wheelchairs could take the same classes as other students. That movement has continued into the present and has been responsible for extensive changes throughout U.S. society. Many changes have had unexpected benefits. For example, mothers with baby strollers and bicyclists can also use ramps and curb cuts.

In our age of information and technology, electronic access to information has become essential. For people with disabilities, this is both a challenge and a benefit. While they must be able to access and utilize the plethora of information available, technologies now exist that can help them overcome

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their difficulties (Hitchcock et al. 2002, U.S. Department of Education 2001). Providing solutions that help one population (i.e. students with learning disabilities) may even inadvertently assist others (e.g. students with visual disabilities can use computer screen reading capabilities and students with physical disabilities can use features that ease typing demands).

Learning disabilities include a variety of conditions that prevent students from accessing and utilizing standard text. While not immediately obvious (“invisible”), these disabilities can be severely debilitating. Learning disabilities are neurological in nature, part of the “hard wiring” of the person, and may not be able to be fundamentally changed. Termed “perceptual/communicative disabilities” (PCD) in BVSD, learning disabilities are generally defined by a discrepancy between intellectual potential and academic performance. In other words, neurological processing differences prevent these students from performing at the level of their intellectual capacity. These disabilities present a variety of challenges such as the inability to understand and decode the meaning of symbolic language (text) and the inability to organize thoughts on paper in order to assemble them in written format (Willard 1994). Despite these challenges, these students must be held to the same standards as other students. Beyond school, in the world of work, students with learning disabilities will have to compete with their non-disabled peers. Having the skills they need to compete will advance them academically and in their careers. National, state and district standards to which they must be held accountable include not only language arts, but also mathematics, music, physical education, science, civics, economics, geography, history, visual arts, and world languages. Reading and writing skills are essential to learning and demonstrating knowledge in all of these content areas. The importance of literacy has also received much attention through such national initiatives as “No Child Left Behind” (No Child Left Behind Act of 2001) and the “Title I” reading program (Title I of the Elementary and Secondary Education Act of 1965). Students with disabilities must overcome barriers to the use of written language either through compensatory strategies that allow them to perform at the level of their intellectual capacity, or by acquiring new skills.

The use of computer-based accommodations is essential in teaching students with learning disabilities (McMurdo 2002, Monaghan 1995, Raskind 1993). Teachers need tools that allow students to develop skills while compensating for areas of deficit (Boyle et al. 2002, Hecker et al. 2002, Larsen 1995, Payne & Sachs 1994, Poplin 1995). Such compensatory technologies are generally termed “assistive technologies”. United States law defines assistive technologies as “any item, piece of equipment, or product system, whether acquired commercially off the shelf, modified, or customized, that is used to increase, maintain, or improve functional capabilities of a child with a disability” (Individuals with Disabilities Education Act Amendments of 1997). Learning to use assistive technologies independently is important not only to success in post-secondary education but in adult employment and life (Elkind 1996, Gerber et al. 1996, Halpern 1994, Raskind 1994, Wille-Gregory et al. 1995).

BVSD makes every effort to provide students with the assistive technology tools they need, but resources are sadly lacking (Boulder Valley Public Schools 2002). Before initiation of the present project, these technologies were provided only on a case-by-case basis, often in remote locations. This project was implemented by the district’s Assistive Technology Team, to help fill a void and offer a more comprehensive approach to meeting students’ needs. By providing standardized access stations at each of the district high schools, students gained electronic access to text and teachers received much needed tools to help students improve their skills. Students are acquiring skills that can be used academically and vocationally. WYNN literacy support software is also available at the local community college (Front Range Community College) and through the CU disabilities office. As part of the implementation plan, equivalent access was promoted at community libraries and area businesses. This interface can offer the students additional opportunities, as well as benefit other members of the community, such as those with visual and physical disabilities.

### Implementation

As an initial and critical component of successful project implementation, every district high school provided a contact

person or “steward” to be responsible for equipment and software, and to arrange for technical support and training as needed at their school. After initial input from these “stewards”, a grant from a local foundation, the Foundation for Boulder Valley Schools, provided seed money for the project by providing computers and WYNN reading and writing support software. A research project being conducted at CU contributed additional computers and scanners as a means to introduce their Web-based software program, Summary Street, and their developmental research project into all of the district high schools. Therefore, in the initial year, the project provided two computers with WYNN software and net access, and a scanner to every district high school. A community open house invited collaboration and participation by the local library system, local college disabilities offices and area businesses.

### Technology components

WYNN literacy support software provides tools that improve text comprehension. It includes such features as the following:

**Text-to-Speech** reads text aloud while it is simultaneously being spotlighted word by word. This helps students with decoding difficulties understand the material. Text can be read from the Internet, electronic documents such as Microsoft Word, or can be scanned in from class texts and handouts. Passages may be repeated as often as necessary and vocal pitch, speed, and quality of feedback can be easily changed for students with auditory processing problems. Hearing each word spoken as it is spotlighted reinforces reading skills and supports comprehension.

**Exact View and Text View** allows students the option to view text as it appears in the original documents they are reading (including graphics, charts, etc.) or reading from a highly customizable text-only view. In this way, students with decoding and visual processing issues can easily customize text size, spacing, and background color to simplify and improve visual presentation.

**Study Tools** that support comprehension, retention, and learning include a talking dictionary, thesaurus and spell-checker. Additionally, colored highlight pens and bookmarks are used to isolate key information, and text and voice notes allow students to make notes and reminders in context.

**Word Prediction** allows students with spelling and typing problems to write by choosing words from a list rather than having to type words out letter by letter. The word list is “predicted” according to frequency of word use, grammar and syntax, or first letter typed. Using this feature reinforces correct spelling and expands written vocabulary.

**Outlining** helps students organize thoughts for writing.

**Teacher Lockout** allows the teacher to control which features the students have available in any given situation, such as a test.

Summary Street is Web-based software that gives students immediate feedback about the content of their written summaries at <[www.pearsonkt.com](http://www.pearsonkt.com)>. This tool is designed to improve reading comprehension, as well as writing skills. Students submit their summaries on-line, and the software analyzes their writing using a mathematical system, called Latent Semantic Analysis (LSA), available through Knowledge Analysis Technologies at Pearson Education (Landauer & Dumais, 1997; Landauer et al., 1998; Landauer & Psotha, 2000). Students receive feedback almost instantaneously on several content dimensions: whether the main ideas were adequately covered and whether there was any plagiarism or redundant or irrelevant information. The Summary Street interface is user-friendly: The content feedback is displayed by horizontal bars corresponding to the section headings of the text. Content coverage is considered adequate when the bars turn green and pass a vertical black line that represents the threshold for each section of the text. This interface has a game-like appeal that keeps students engaged over repeated attempts to improve their summaries (Wade-Stein and Kintsch, 2004). Students can submit summaries for feedback several times. Summary Street has been shown to increase time on task (Wade-Stein & Kintsch 2004), and to improve the content coverage of students’ summaries, compared to summaries written on a word processor without Summary Street feedback (Wade-Stein & Kintsch, 2004; Frankzke, Kintsch, Caccamise, & Johnson (submitted). Summary Street grading compares to human graders but is faster, more consistent, and affords the students multiple opportunities to revise their work.

Summary Street and WYNN reading and writing support software can be used alone or in combination. WYNN allows students with learning disabilities to fully utilize the features of Summary Street. Instructions for using the two programs together are available on the Freedom Scientific Web site under “tip sheets” <[www.freedomscientific.com](http://www.freedomscientific.com)>. Students can hear all instructions, guidelines, and summaries spoken aloud while live on the Summary Street Web site. Additionally, WYNN provides tools to support comprehension of the original text and tools to aid in creation of the summary. Suggestions for how to utilize WYNN’s various study tools to support comprehension and learning are available on the Freedom Scientific Web site under “WYNN Tip Sheets” <[www.freedomscientific.com/lsg/products/index.asp](http://www.freedomscientific.com/lsg/products/index.asp)>.

### Data collection

Informal surveys at the beginning and end of the 2003-04 school year compared student grades before and after program participation, and provided qualitative feedback on program components. According to the small and informal sample, the number of students on teachers’ caseloads receiving a C or better in regular education classes was reported by the teachers as increasing in Social Studies, Science and English. Teachers felt the most useful elements of the WYNN software were their students’ ability to have text from the Internet and scanned texts read aloud, and their ability to highlight the important points on screen. Few teachers had tried the Summary Street software and several commented that programs were generally more useful when introduced at the beginning of the school year. Like the teachers, the students felt that it was useful to have text from the Internet and scanned texts read aloud, and they appreciated the ability to highlight the important points on screen. Students also valued the talking spell check, word prediction, and the ability to leave written and voice notes. Furthermore, they indicated that they finished work faster, turned in papers with improved spelling, liked the ability to see everything they were doing on one program (WYNN), and the overall simplicity of the programs. Both teachers and students felt that more time to use the programs would be beneficial.

The biggest shortcoming of the project was that WYNN was initially available only

at the high school level. Therefore, a 2004-05 grant project is expanding the project to provide WYNN software through the school district server, for students at all grade levels, at all schools, throughout the district. Additionally, implementation of Summary Street, as an adjunct to regular coursework, has not been practical for special education students who are struggling to keep up in their general education classes. In response to that concern, the program is being implemented in some regular education classes so that the success of students with special needs within those classes can be evaluated.

### Conclusions

The district’s initial project points to some promising results and warrants further evaluation. Use of WYNN literacy software may be beneficial for students with learning disabilities and their teachers, and may have helped improve students’ grades. Teachers have shown interest in using Summary Street software, but limited time presented an obstacle. Summary Street allows for multiple revisions and has been shown to increase time on task and improve content coverage for regular education students (Wade-Stein & Kintsch, 2004). A joint BVSD-CU study is planned to explore the extent to which students with learning disabilities may benefit from using Summary Street. Currently, Summary Street is being used at one BVSD high school as one approach toward improving students’ writing skills, possibly raising students’ standardized test scores, thereby helping to demonstrate “adequate yearly progress” as defined by the “No Child Left Behind Act” (No Child Left Behind Act of 2001). Further use of both software programs and evaluation of their efficacy is needed.

For more information about WYNN, please visit <[www.freedomscientific.com/lsg](http://www.freedomscientific.com/lsg)> or contact Freedom Scientific, Learning Systems Group at 888-223-3344.

For more information about Summary Street, please contact <[www.pearsonkt.com](http://www.pearsonkt.com)>.

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