



JOHNS HOPKINS
SCHOOL of EDUCATION

Center for Research and
Reform in Education

ALAN J. REID, PHD
STEVE ROSS, PHD

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Cascade Reading

INSTRUCTIONAL DESIGN REVIEW

CASCADE READING

INTRODUCTION

Cascade Reading is a new reading technology that reformats text into a cascading format using a linguistically-driven algorithm to break chunks of text into separate lines of more manageable syntax that is easier for readers to comprehend. This text formatting product leverages Natural Language Processing (NLP) to identify and define the syntactic relationships between words and then present them in a consistent, organized and meaningful way via a proprietary algorithm. This process produces a visual mapping of each sentence for the reader, creating an alternative to traditional left-justified block text formatting where all sentences are treated the same way regardless of syntax.

Cascade Reading is a valuable tool for individuals who seek to understand increasingly complex content and for educators working with learners. Published research on this breakthrough text format has demonstrated improved reading comprehension, both for native English speakers as well as English Language Learners (ELLs). Teachers, tutors, reading specialists and ELL instructors across the U.S. have used it to help augment their Literacy curricula.

The technology can be accessed via an API which facilitates integration with digital literacy, learning and language products. Examples of this capability can be found as a web application, available online, from the company website and a browser extension via download from the Chrome Extension Store. The company is actively working with partners to integrate Cascade functionality into their offerings.

The design review that follows is focused on the Cascade Reading product as a learning tool for improving reading comprehension. A senior researcher from the CRRE reviewed the product using a registered guest account plus several materials provided by language scientists, researchers and developers, including live and recorded demonstrations of the tools, case studies, testimonials, evidence-backed research articles and manuscripts, and inputted responses to an instructional design-inspired online questionnaire to investigate the technology, its design framework, product development process, user experience and content reformatting output. Criteria from an additional rubric – the Evaluation Rubric for eLearning Tools – was also used to assess the product’s functionality, accessibility, technical aspects, and its privacy and data protection.

DESIGN REVIEW

The Design Review rubric includes eleven evaluative criteria organized into four broad categories. For each criterion, a rating of Limited, Moderate, or Strong, is indicated by one, two, or three stars, respectively.

Product Design & Framework

Specific ToA or Logic Model 

Systematic Design Process 

Instructional Design Features

Comprehensive Design Plan 

Educator, Tutor, or Trainer Support 

Addresses Individual Learners 

Multicultural & Diverse Perspectives 

Product Evaluation

Formative Evaluation 

Summative Evaluation 

Materials Interface & Design

Costs/Resources are Specified 

Support for Partners & End Users 

Student Feedback 

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PRODUCT DESIGN & FRAMEWORK

The design clearly specifies a systemic Theory of Action (or Logic Model).

The product's automatic syntactic scaffolding is rooted in research that demonstrates that syntactic knowledge of text improves reading comprehension. The company has synthesized this research into an algorithm which consistently applies core linguistic principles to shape the format and visually cue the reader. This process is known as Linguistically-Driven Text Formatting (LDTF).

A systematic design process was used to develop, evaluate, and refine features.

Product designers collaborated during the research and development phase, which lasted several years and involved rapid prototyping and iterative testing. An expert team continues to formatively evaluate and refine the patented product for improvement. The continued use of Tier 4 research & formal documentation of the design process is recommended moving forward as more languages are added.

INSTRUCTIONAL DESIGN FEATURES

A comprehensive design plan was employed in development.

A comprehensive design plan uses a needs analysis to identify and articulate instructional objectives, strategies, and methods to meet specific curricula needs. Cascade's core design objective was to provide visual cues to the reader which would support the comprehension process. The team incorporated research results, along with specific academic standards with regards to teaching reading & how the brain learns language into the final product, which is aligned to the Science of Reading. The product design approach, supported by NLP and enhanced by the LDTF algorithm, results in a new reading technology that educators and learning organizations can implement to meet the needs of a diverse learner audience.

The product design addresses Educator or Trainer Support as well as diverse individual learner needs.

Cascade Reading provides their partners' end users with a variety of LDTF iterations

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[Cascade Reader, Explorer, & Web views] through integrations with digital learning platforms via a RESTfulAPI. These options allow for flexibility and customization to support learners across a wide range of needs and abilities. Additionally, the Company offers educator lesson plans to be used with the Cascade Reading tools, along with a library of individual passages written for specific grade levels and for specific units in the Core Knowledge Language Arts (CKLA) program.

The product design embraces multicultural and diverse perspectives.

Published research, along with field-study feedback, has demonstrated that the Cascade Format helps all readers, and is particularly beneficial for challenged readers and English Language Learners (ELLs) who struggle to grasp meaning from traditional left-justified block text. When they read the Cascaded Text, learners find the technology improves their implicit prosody (e.g., intonation, stress, phrasing, pauses, and rhythm) improving their comprehension. The syntactic cues provided by Cascade are useful for all: developing readers, those with all types of learning challenges e.g. Neurodivergence, developmental disabilities, cognitive limitations like attentional limitations (and acquired neurogenic communication

disorders), Emergent Bilinguals and all foreign language learners. older readers with age-related decline can also benefit from Cascade Format.

PRODUCT EVALUATION

Formative evaluation was used to develop and refine product.

Formative evaluations were conducted in school and lab settings to investigate whether the Cascade Format improved reading comprehension. Based on positive results, recommendations for using the Cascade Format emerged and features were refined. For example, recommendations for frequency and duration of reading Cascaded Text were established as well as use cases for the Explorer View in instructional settings.

Summative evaluation was used to obtain evidence & refine

Summative evaluations of Cascade Reading have been performed, and scholarly research on its effectiveness has been published in a peer-reviewed publication demonstrating improved reading comprehension.

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MATERIALS & INTERFACE DESIGN

Costs and resources needed for using the program are clearly specified.

Cascade Reading is available for free for users who register online with an email address and no additional resources are required. Business Partnerships offer more services and features for clients seeking technical support and integration with existing platforms. The costs for tiered plans are not explicitly stated on the website, but there is ample opportunity to contact a representative for more information.

Support for users is timely and effective.

Partner and End-User support is readily available and provided through direct contact with the program developers via an online contact form, email, phone number and social media. Multiple user interfaces for the Cascade Format are now available. Reader View, Explorer View (provides detailed grammatical breakdown of each sentence) and a Web View are the current product renderings of this technology.

Self-directed training content is offered online, along with webinars led by a team of in-house experts. EdTech, Language Apps, Professional Learning platforms, Publishers & Libraries are all supported through Cascade Reading's published API documentation for custom integrations. and onboarding

Students receive clear and relevant feedback about their performance.

By nature of the product design, learners have a high level of interactivity with the tool, can use it with digital content and receive real-time feedback. Sentences can be instantly reviewed for their grammatical structure, enabling students to see how changes in word order impact meaning. Readers will be able to use the Cascade Format as they begin to decode sentences and well into their education and on into the workplace. Furthermore, lesson planning materials such as the Comprehension Lessons provided online are well-structured and guide educators and the learner towards an improved understanding of the text and of core principles of language structure.

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ESSA TIERS OF EVIDENCE

According to the Every Student Succeeds Act (ESSA), Tier 4 evidence demonstrates a rationale in the form of a clearly articulated logic model and current or future plans to study the effects of an intervention.

Logic Model

Well-defined logic model based on rigorous research



Research Intervention

Planned effort to study the effects of an intervention.



SUMMARY

A third party evaluation was conducted by senior researchers in the Center for Research and Reform in Education at Johns Hopkins University. Based on this review, it has been determined that Cascade Reading satisfies the criteria for meeting ESSA Tier 4 evidence.

APPENDIX: LOGIC MODEL

RESOURCES (INPUTS)	STRATEGIES & ACTIVITIES (OUTPUTS)
• Cascade Reading digital platform ◦ Cascade Reader, Explorer, and Web views • Natural Language Processing (NLP) and proprietary algorithm • Sample Teacher Comprehension Lessons • Library of Reading Passages specific to the Core Knowledge and Language Arts (CKLA) program	• Four Core Principles of linguistically-driven text formatting (LDTF) ◦ Subjects and predicates are aligned ◦ Dependents are embedded under their grammatical heads ◦ Introductory information is indented ◦ Words in a group are aligned and the entire group moves together • Direct instruction of reading skills via Comprehension Lessons

PROGRAM OUTCOMES	
SHORT-TERM	LONG-TERM
• Increased motivation to read • Increased recognition of the rules of grammar • Better understanding of the relationship between characters and concepts within sentences	• Improved reading comprehension and the ability to read with natural expression. • Improved syntactic knowledge • Increased confidence in reading