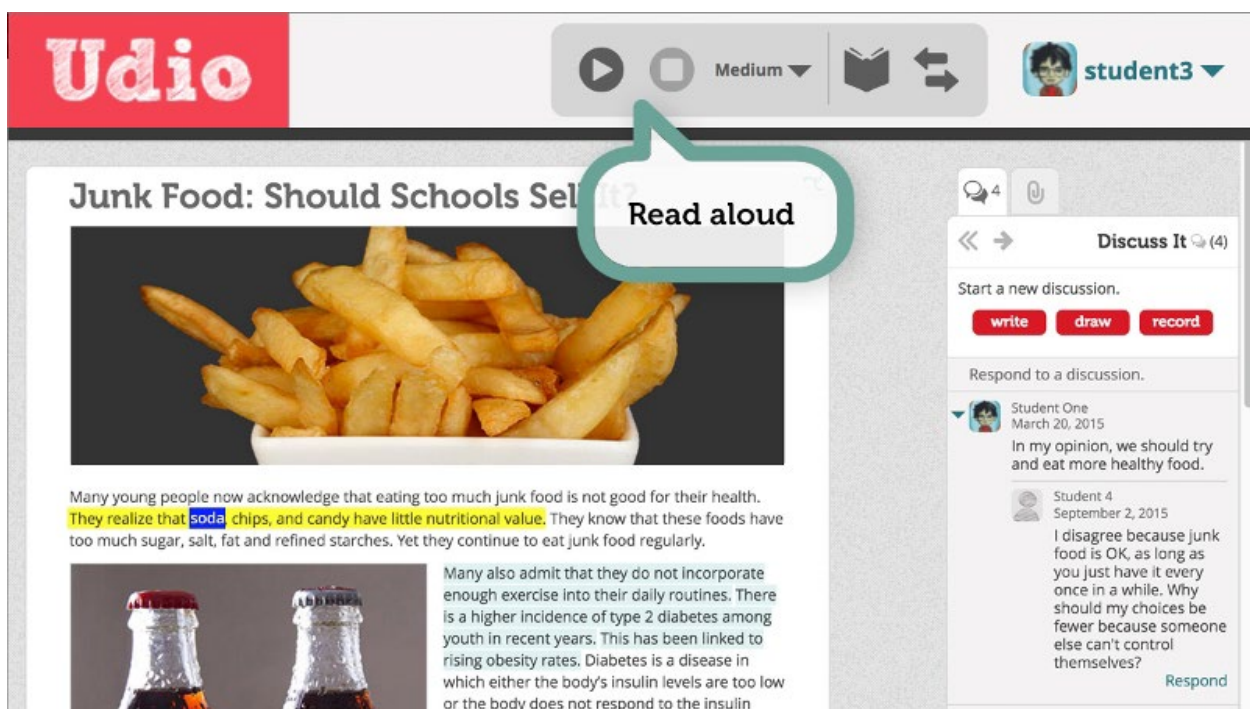


# Technology Feature Brief

## Read Aloud

The ability to have text read aloud is a vital access point for many students and a helpful support to others. Oftentimes, tools that read text aloud will also highlight the text as it is read. Students who may have challenges seeing or decoding text, including those with visual impairments, dyslexia, or learning a second language, use text-to-speech technology as well as recorded and in-person human voice to access rigorous academic content. Other students note that they would use read-aloud to stay focused on reading a text when in a noisy environment.



The screenshot displays the Udio application interface. At the top left is the 'Udio' logo. The top navigation bar includes a play button, a volume icon, a 'Medium' dropdown menu, a book icon, a refresh icon, and a user profile for 'student3'. The main content area features an article titled 'Junk Food: Should Schools Sel...'. The article includes an image of french fries and a paragraph of text: 'Many young people now acknowledge that eating too much junk food is not good for their health. They realize that soda chips, and candy have little nutritional value. They know that these foods have too much sugar, salt, fat and refined starches. Yet they continue to eat junk food regularly.' Below this is another paragraph: 'Many also admit that they do not incorporate enough exercise into their daily routines. There is a higher incidence of type 2 diabetes among youth in recent years. This has been linked to rising obesity rates. Diabetes is a disease in which either the body's insulin levels are too low or the body does not respond to the insulin'. A speech bubble with the text 'Read aloud' is overlaid on the article. On the right side, there is a 'Discuss It' section with a 'Start a new discussion' area containing 'write', 'draw', and 'record' buttons, and a list of student comments.

## Research

Read-aloud features may support students with reading and other disabilities on reading tasks:

- **Researchers have combined read-aloud with other features to support reading comprehension in grades 5 and 6.** A study tested a system of physical, sensory, and cognitive supports for reading that included on-demand read-aloud features, marking key words or concepts, and providing background knowledge. Among 30 5th and 6th graders with reading disabilities, reading comprehension increased after using this system. [Ko, Chiang, Lin, Chen, 2011](#)

- **Read-aloud features may support reading comprehension for high school students.** A study of seven high school students with disabilities found that quiz performance and reading comprehension improved when students used text-to-speech assistive technology in an online high school transition course. However, the technology did not have a significant impact on students' reading grade levels.  
[Izzo, Yurick, McArrell, 2009](#)
- **Researchers have combined read-aloud features with other supports to improve reading speed in college students.** A study of 43 college students found that students with and without reading impairments demonstrated the greatest reading speed when using a combination of forcibly accelerated visual presentation and auditory text-to-speech.  
[Schneps, Chen, Pomplun, Wang, Crosby, Kent, 2018](#)
- **However, another study of 29 children aged 8-12 with reading difficulties found that text-to-speech benefited students with higher language and reading skills, regardless of whether or not highlighting was utilized.** Researchers included text-to-speech with highlighting versus text-to-speech with no highlighting and found that children's language and reading abilities had stronger effects on children's reading comprehension than highlighting. However, they also noted that text-to-speech provided substantial benefits to the children's reading rate and comprehension.  
[Keelor, Creaghead, Silber, Breit-Smith, Horowitz-Kraus, 2018](#)

The intelligibility of text-to-speech is critical if it is to be used to aid children's reading comprehension and research shows multiple factors can influence intelligibility.

- **Longer passages and shorter sentences may lead to increased intelligibility.** A study of 12 young adults and 12 older adults found intelligibility increased when longer passages (5 - 9 sentences) were read by synthesized speech versus a single sentence. The authors hypothesized that shorter sentences would further increase intelligibility versus longer sentences.  
[Drager Reichle, 2001](#)
- **Providing students with the ability to alter the rate of speech might help optimize their use of text-to-speech software.** Research as early as 1985 has shown that the rate and pitch of synthesized speech also affects intelligibility. A study with 48 undergraduate students found that if the speech rate is too fast or if the pitch does not sound similar to human speech, there can be negative effects on reading performance.  
[Slowiaczek Nusbaum, 1985](#)
- **Text-to-speech systems should make efforts to provide synthesized speech as close to a natural human voice as possible to increase intelligibility.** Two studies conducted more recently compared people's preferences regarding the naturalness of text-to-speech

systems. Both studies found people preferred voices that sounded more natural, choosing a live human or a recorded human voice over synthesized speech.

[Couper, Singer, Tourangeau, 2004](#)

[Stevens, Lees, Vonwiller, Burnham, 2005](#)

There may be other ways to increase users' satisfaction with read-aloud features that are not directly related to intelligibility:

- **One option is to use professional human voices.** A study of 826 Amazon Mechanical Turk participants found that professional human voices are perceived as better than amateur human voices and synthesized voices, and that some types of synthesized voices are perceived as better than amateur human voices.

[Georgila, Black, Sagae, Traum, 2012](#)

- **If users are able to choose the gender of the read aloud voice, they may be more motivated to engage with the reading.** Two studies conducted with undergraduates on the effects of gendered voices in synthesized speech found that gender stereotypes did in fact extend to synthesized speech. Additionally, Lee, Nas, and Brave (2000) demonstrated that male listeners identified more strongly with the male computer voice, while female listeners identified more strongly the female computer voice.

[Nass, Moon, Green, 1997](#)

[Lee, Nass, Brave, 2000](#)

- **Emotional tone and pitch also play a role in listeners' perceptions of content and its credibility.** The two studies below explore how synthetic speech affects listeners. In one with 56 university students, researchers investigate if adding emotion to synthesized speech could affect listeners' perceptions of the content. They found happy voices made both happy and sad content seem happier than when a sad voice was used. However, there was less of an effect with text-to-speech software than with human-recorded speech. There was also an effect on listeners' perception of the credibility of the voice. A neutral voice was perceived as more credible even though listeners preferred the happy voice. The other study looks at how software interprets the connotation of text compared to humans. Researchers found that there was poor alignment between how text was interpreted by humans and the software, where the software would tend to interpret text as more negative. They hypothesize that this could be a reason that synthetic TTS voices are seen as inferior to human voices and are often interpreted as "sounding off" by listeners.

[Nass, Foehr, Brave, Somoza, 2001](#)

[Hillaire, Iniesto, Rienties, 2019](#)

- **Another option is to pair read-aloud audio with computer-generated faces.** Researchers developed a text-to-audiovisual speech synthesizer in which a computer-generated face

reads text aloud, and its features and emotional expressions correspond to speech. Seven high school and graduate students, some of whom had dyslexia, pilot tested the system. Researchers reported that all participants found the system useful.

[Mendi Bayrak, 2013](#)

Having assessments read aloud by a person or text-to-speech technology may improve scores:

- **Human read-aloud may boost middle school students' test scores.** A study asked 260 middle school students with and without disabilities to take tests in multiple subjects. It found that students scored higher when tests were read aloud by a researcher compared to when tests were not read aloud.

[Meloy, Deville, Frisbie, 2002](#)

- **A read-aloud option may raise test scores among high school students with learning disabilities.** A study of ten high school students with learning disabilities reported higher scores on a history and civics test administered in a computer-based system with an optional text to speech feature, compared with the same test in a paper-and-pencil format.

[Dolan, Hall, Banerjee, Chun, Strangman, 2005](#)

- **Students' preferences for read-aloud options vary.** In one study, two high school students with vision impairments who opted to use a read-aloud feature on an assessment reported they liked it. In interviews for another study, 5 of 12 students with dyslexia said that they did not like to use a screen reader because it was distracting or it read too quickly. Another study of 7 children with dyslexia examined the accessibility features of digital texts, including text highlighting synchronized with audio. These authors found it was easiest for students to read along when highlighting was blue and used for whole sentences. Results also showed students with dyslexia preferred blue highlighting over yellow highlighting.

[Chen, Keong, Teh, & Chuah, 2015](#)

[Shute, Hansen, Almond, 2007](#)

[Ikeshita, Yamaguchi, Morioka, Yamazoe, 2018](#)

## Related Guidelines

Read-aloud is a feature related to existing guidelines and best practices, including the Web Content Accessibility Guidelines (WCAG) and the Universal Design for Learning (UDL) Guidelines. Connections include:

- UDL Guidelines
  - [UDL Checkpoint 1.3](#): Offer alternatives for visual information

- [UDL Checkpoint 2.3](#): Support decoding of text, mathematical notation, and symbols
- [UDL Checkpoint 4.2](#): Optimize access to tools and assistive technologies
- WCAG does not require that a read-aloud feature be provided, but many of its guidelines are aimed towards making sure that content will work with read aloud software that the user might have (i.e., a screen reader). For instance, guidelines about avoiding images of text, providing expanded forms for abbreviations, and so forth will allow a screen reader to work smoothly with the content.

## Read Aloud Examples

- See how [TextHelp's Read&Write for Education](#) provides read-aloud and other supports.
- Screen readers like [JAWS](#), [VoiceOver](#), and [NVDA](#) make it possible for people with visual impairments to access the internet, emails, and computer documents.
- [Raising the Floor](#) compiled a list of over 75 read-aloud tools, as well as some supporting research.
- Understood.org has compiled [a list of assistive technology software](#) that can help students who struggle with reading, including several programs that utilize TTS software that allows students to have webpages and documents read aloud to them by computer voices.



This content was developed under a grant from the US Department of Education, #H327A170002. However, the contents do not necessarily represent the policy of the US Department of Education, and you should not assume endorsement by the Federal Government. Project Officer, Celia Rosenquist.



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