# Increasing Text-to-Speech Rate

## Goal

The goal is for your student to independently read at an accelerated rate for extended periods of time with good comprehension and no fatigue. See five reasons why your students should learn to read at a rate of 600 words per minute for the lifelong benefits of learning this skill.

I suggest 600 words per minute for two reasons. First, many of the successful blind professionals I know read at approximately 600 words per minute or even faster. Second, research from the field of neuroscience suggests that 600 words per minute is well within the realm of human ability.

The maximum reading rate for any individual will vary for many reasons including the age and ability of the individual, fatigue or lack thereof, ambient noise, the reading level of the content, etc. So, let’s further refine the target reading rate to be 600 words per minute for a well-rested high school senior reading age-appropriate fiction content that fascinates them in a quiet environment.

All that said, don’t get too hung up on that specific quantitative goal. Achieving it will require months or perhaps years of deliberate practice. And, there are many benefits that can be enjoyed at lower levels of proficiency.

## Definition of Success

I think it makes sense to define success before you begin. That definition should be specific to each student and reflect their current reading ability. For example, consider a low vision student that has always been a print reader. However, she fatigues easily and is subject to headaches and nausea from reading print for extended periods of time. Success for this student may be simply to expose her to auditory reading and plant the seed that she may return to nourish when she really needs to increase their reading speed, e.g. college.

On the other hand, a blind student that already uses a screen reader on a daily basis is in a much better position to increase their reading speed. They have already overcome any aversion to computer-generated speech. Their brain is accustomed to it. Now, they just needs to deliberately and systematically increase their speed.

## Background / Pre-Requisites

### Environment

It is important to practice auditory reading speed in a quiet space. That means no human conversation or music. It also means no persistent ambient noise such as a heater, air conditioner, or traffic.

Your student will need a decent pair of speakers, ear buds, or headphones. If they are using speakers, make sure the bass is not overwhelming. The reason is that lower tones use longer wavelengths. As a result, there are fewer waves per second which can negatively impact reading speed.

### Why we favor text-to-speech over human speech

One of the major challenges faced when teaching students to increase their listening rate is an ambivalence or outright aversion to TTS over human voices. This is normal and below I outline how I work my way around this issue.

#### Why favor TTS for speeds over 1.75-2.0x typical speech rate

Text-to-speech (TTS) software generates speech programmatically. All screen readers use TTS. Your student should use it for auditory reading. They should not use live or recorded human speech. There are several reasons TTS is better.

First, It is now possible for people with print disabilities to get true text versions of almost any published material not to mention content on the world wide web. That fact, combined with TTS, means students have independent access to all the world’s knowledge. Second, your student can increase their reading speed all the way to her physiological boundaries using TTS. That is not possible with human speech. Third, TTS provides infinite control over the reading process. That means your student can read by paragraph, sentence, or word. They can read the same passage multiple times. They can spell words when needed. In short, TTS facilitates an interactive reading experience that is completely controlled by your student. Fourth, TTS can be used in conjunction with braille on a refreshable braille display or enhanced print on a screen. That means your student can eventually fluidly switch between ears, fingers, and eyes as required or preferred.

#### Start with Human Read Material

I teach speeding up human voice for 1.0x-1.75x normal speech rates because it helps build a bridge that students can take to move past their initial dependence on a human voice and slower speech patterns.

When first starting, changes a small as moving from 1.0-1.25x can feel profound. Students will likely report the higher pitch of the voices and the presence of some artifacts that come from speeding up human speech. With time however, the speech at this higher rate will sound "normal" again. And the process can continue until the voice becomes difficult to understand at an increased rate (usually about 1.75-2.0x for untrained ears).

#### If your student is already using a screen reader

If your student is already using a screen reader, keep using it for this exercise. I think their existing screen reader is the best choice for a few reasons. First, your student probably has some level of comfort with the screen reader. That should include the synthesizer/voice she is using and the basic commands/gestures that they use to read text. Second, as your student begins to increase their reading speed they will begin to reap the benefits immediately during every interaction with their device. Furthermore, screen readers offer the best user experience for fully interactive reading by chapter, section, paragraph, sentence, word, and character.

#### If your student is not currently using a screen reader

If your student is not currently using a screen reader, it is recommended that they use [Voice Dream Reader](https://www.bookshare.org/cms/help-center/reading-tools/voicedreamreader?gclid=CjwKCAiAsYyRBhACEiwAkJFKorbSU2s9gweF3TjznGsNYi6CL6ksA9vfLmb1sI81TPnLV9lt6pQsUhoCapwQAvD_BwE) to increase reading speed. Voice Dream Reader is a self-voicing reading application that is available on iOS and Android devices. It supports more than 100 TTS voices. It can be used with a screen reader, but a screen reader is not required. The simple user interface can be used by every student from pre-school to post-doc. And, it supports a wide range of file types.

Voice Dream Reader integrates very nicely with [Bookshare](https://www.bookshare.org/cms/). Bookshare is a large and growing library of books. Anyone with a qualified print disability can join. It is free for students in the United States.

The integration between Voice Dream Reader and Bookshare means your student can easily search the Bookshare library within the Voice Dream Reader application. They can download a book in seconds and then immediately start reading it. Remember that the ultimate goal of this exercise is to light a spark in your student’s mind. The Bookshare library contains more fuel than they can ever burn. Voice Dream Reader is a shovel they can use to throw fuel on the fire. Their reading rate dictates the size of the shovel. Make sure that you enter your student’s Bookshare username and password in Voice Dream Reader so your student can quickly download books of interest. That will ensure they have plenty of fuel for her fire.

#### Choosing a voice

Before you begin to deliberately increase reading speed, help your student find a voice they like. This should be a fun and playful process. There are lots of fun voices with different accents, etc. Choosing a voice provides some autonomy and enables your student to personalize her reading experience which can help themtake ownership of the process.

I do believe that certain voices are more amenable to fast reading speeds than others. This could be universal or specific to each individual’s auditory system. Many people report they prefer the "Tom" voice on iOS and Voice Dream Reader because it is easiest for me to hear that voice at higher speeds. It is also available as part of Vocalizer Expressive for JAWS and is available on the [Freedom Scientific website](https://support.freedomscientific.com/Downloads/synthesizers). Many prefer to use the Eloquence synthesizer with JAWS and NVDA for the same reason (typically this gets referred to as the "JAWS voice", even though it is the "Reed" option within the Eloquence synthesizer). Eloquence is built-in and the default synthesizer within JAWS. It must be purchased and installed as an NVDA add-on. [RHVoice](https://rhvoice.org/en-voices/) is also available as an NVDA add-on as well as a Windows SAPI-5 library to use with JAWS. Some prefer the espeak-ng synthesizer within NVDA, and others feel it is too robotic. Windows comes with One-Core voices that can be used in Narrator as well as with all screen readers.

All that said, your student doesn’t need to pick the perfect voice to get started. It is easy to change voice and/or synthesizer at any time. As you start this process with a new student, let them choose a voice they like and get on with it. I have seen a number of students prefer British English at first because the vowels are very consistent and easy to understand. When they get used to the rate, they switch to the Reed voice from Eloquence or Tom from Vocalizer Expressive. Students that select a British English female TTS voice seem to be more consistent with their decision. It is worth the bit of trial-and-error when working in speeds of 1.0-2.0x typical speech rate.

* *The one warning I will give is to motivate the student to not change voices too often, as this can interfere with intelligibility. You may find a student is being challenged one day more than the day before because they have selected a Scottish or Irish TTS voice and the built-in accent is unfamiliar.*

## Choosing Content

### Use content that fascinates

The most important criterion for choosing content that your student will use to practice reading speed is the degree to which the content fascinates your student. Ideally, your student should be totally enthralled by the subject of the content. That high level of interest and engagement will offset any monotony of the exercises I’ll discuss in the next post in this series.

Don’t use assigned reading material from a class. Find content that is unexpectedly fun for your student.

### Use content that sounds good when read aloud

The second most important criterion is that the content sounds good when read aloud. That typically means a series of paragraphs of medium length, e.g. 5-10 sentences. Also, the language should be easily spoken. This feature is hard to quantify and describe. So, try reading the content out loud yourself. If it is difficult to read aloud, avoid it.

* *Don’t use content with dialog.* Dialog breaks up the flow and requires the reader to keep track of which character is speaking.
* *Don’t use content with unfamiliar jargon or technical terms.* The goal of this exercise is to increase reading speed not increase vocabulary.

### Use content that is popular

I’m using the term “popular” to serve as a heuristic for “good”. If content is popular, then we can assume it is engaging and entertaining. In other words, the fact that it is popular implies that the content survived the selective publishing process and that a certain number of readers thought the content was good enough to read and recommend.

Don’t use content that was developed specifically for K-12 education. Use the wisdom of the global audience of readers to identify content that tells a compelling story. In other words, Harry Potter works much better than Six-Minute Solutions or a class basal reader.

### Use content that is a short passage from a larger work

I think the ideal length for content that your student uses to practice reading speed is between approximately 500 and 1,000 words. Of course, the length will vary based on your student’s age. The rationale behind this length is that the content can be read within a few minutes. You can use Microsoft Word to measure word count.

A chapter from a fiction or compelling non-fiction book might be perfect. The fact that the content is a passage from a larger work creates the possibility for your student to get pulled into the story. If your student acts on their inherent interest in the story then your job will be much easier.

### Use content that creates unresolved tension

Ideally, your student will want to continue reading the broader work from which the content was selected. An inherent interest in the subject increases the chances that will happen. Another way to do that is to choose a passage that creates tension yet fails to resolve that tension.

As a general rule, the first chapter of a popular work of fiction should meet this criterion. The sole purpose of the first chapter of any work of fiction is to create a reason for the reader to read the second chapter. The fact that the work is popular implies that the first chapter fulfilled this purpose.

Don’t use content that ties together all the loose ends of the story. For example, a complete short story should not be used for this exercise.

## Let the student drive

It is important to let your student be the person interacting with the device during practice sessions. The ability to control when speech starts and stops will empower your student to stay engaged with the exercise.

### Focus exclusively on auditory skills

While your student is actively learning to increase their reading speed it is important to only allow them to use their hearing when practicing that skill. After they’ve achieved their maximum auditory reading speed, it is perfectly acceptable for them to use residual vision to read certain types of content that are highly visual such as equations or images. However, while learning to increase their auditory reading speed residual vision will only distract your student from fully engaging with the auditory mode of perception.

How do you make sure your student is only using their hearing during practice sessions? If they are using VoiceOver on an iOS device or a screen reader, turn on the screen curtain. If they are using a desktop computer with a standalone display, power off the display. Another option is to physically block the student’s line of sight by covering the screen.

### View auditory reading as a physical skill

The methods we use to increase reading speed are similar to the methods that are used by athletes and performing artists. That’s because auditory reading is more a physical skill than a rational skill. In other words, do not think about auditory reading as a logic problem or a computational problem.

We are building stamina and learning to consciously engage out attention. This can be hard and exhausting - which is why it is important we move slowly and keep high levels of engagement.

## Generic Instructional Session

### Regular practice

Learning any skill requires regular practice over an extended period of time. I suggest that your student deliberately practice improving their reading speed for about 15 minutes at least three times per week. In addition, your student should be using a comfortable speed to read for work or pleasure on a daily basis. That daily reading speed should be increased gradually over time.

### Use interval training methods

Athletes use interval training methods to increase their speed and endurance. The methodology of interval training is variation in the intensity of effort during training. For example, rather than running five miles at a constant speed, an interval workout breaks the five miles into intervals and requires the runner to vary their speed throughout the workout. The variation may range from a full sprint all the way down to walking. The variation of intensity provokes the physiological changes that enable the runner to run faster for longer periods of time.

*This workout is intended only to increase the listening rate by a single unit in a session. Trying for multiple units of increased speed will result in student frustration - which we are trying to avoid. The structure of this exercise is to gain exposure to audio that is too fast, so as to make the increase of a single unit of listening speed feel like less of a jump.*

#### Sample workout:

1. Select a paragraph that contains 5-10 sentences of medium length and copy the paragraph into a separate document.
2. Read the paragraph at the student’s normal speed.
3. Increase the speed by one unit (whatever that may be in the tool being used) and read the same paragraph again.
4. This means moving from 1.0x to 1.1x, not to 2.0x
5. Pause for 10-20 seconds of silence.
6. Repeat steps 3 and 4 until the speech is completely unintelligible or the speed of the tool is maximized.

*Once we hit the frustration point where text is unintelligible, I use humor to make sure the student knows I am also struggling, and it is not actually a problem and they are not alone. Sometimes I try to speak as fast as the TTS to show how ridiculous the speed is*

1. Now, reduce the speed by one unit and read the same paragraph again.
2. Pause for 10-20 seconds of silence.
3. Repeat steps 6 and 7 until the speed is *one unit above where it was at the beginning of this exercise*.

After performing this exercise, your student should be able to use the new slightly elevated speed to read an entire piece of content (typically 500-1,000 words). The exposure to the higher speeds changes her perception of the new slightly elevated speed. This is a short-term effect. However, performing this exercise several times per week will provoke the physiological changes required to permanently increase their daily auditory reading speed over a period of months.

### Use repetition with the same content

I think reusing content in multiple practice sessions is helpful. If nothing else, it will help your student feel comfortable with the content simply because they have heard it before. However, it is also important to introduce new content on a regular basis. So, find a happy medium between new and existing content during practice sessions.

### Use games to improve attention

Your student needs to learn how to focus their attention on the words being read over an extended period of time. Obviously, you could just tell the student to focus their attention, but that is like telling an athlete to run faster … it’s easier said than done. So, create little games or challenges that require the student to focus their attention. For example, challenge the student to knock on the desk at the end of every sentence. Or, challenge the student to count the number of times a particular word appears in a passage.

### Keep a log

Make sure you record every practice session. Include a description of the content that was used, details of the exercises such as the speeds used during the session, and observations of your students behavior during the session. Use the log to demonstrate progress and motivate your student.

### Have the Student Plot Their Data

Have the student keep a simple log of what they read and at which rate. Then have them plot each day their progress. Seeing that they are constantly improving is often a much better motivator than any external incentive. They can also use their plots to make goals for subsequent weeks learning sessions.