

Developing Simple Web Text for People with Intellectual Disabilities and to Train Artificial Intelligence

John Rochford



Program Director & Faculty Member

Eunice Kennedy Shriver Center



Invited Expert

World Wide Web Consortium

INDEX Staff: Representing the Diversity of our Community



Web Text Simplification Goal

Make web text so

simple

we understand it the

first time

we read it.

Machine Learning Model: Technologies

- **Neural Machine Translation**
 - Typical web text sentences and
 - simplified ones as distinct languages.
- **Eye Tracking**
 - Objective measure of cognitive load / comprehension.
- **Generative Adversarial Network**
 - **Generator** of web text examples using operationalized plain language guidelines (OPLG).
 - **Discriminator** that judges examples using OPLG.



Operationalize Plain Language Guidelines: Steps 1 & 2



Plain Language
Association
International

- Gathered **33** plain language guidelines.
- Narrowed to **19** parsable by algorithms.



Operationalize Plain Language Guidelines: Steps 3 & 4

Refined to 6 that consistently reduced reading grade levels for 4 experimenters.

Conducted trials to determine the order they should be applied.

Operationalized Plain Language Standards In Order

1. Use short, simple words.
2. Write short sentences.
3. Avoid using acronyms and abbreviations.
4. Use an active voice in the present tense.
5. Use correct grammar and spelling.
6. Remove proper nouns, test readability, replace.

Example Operationalization

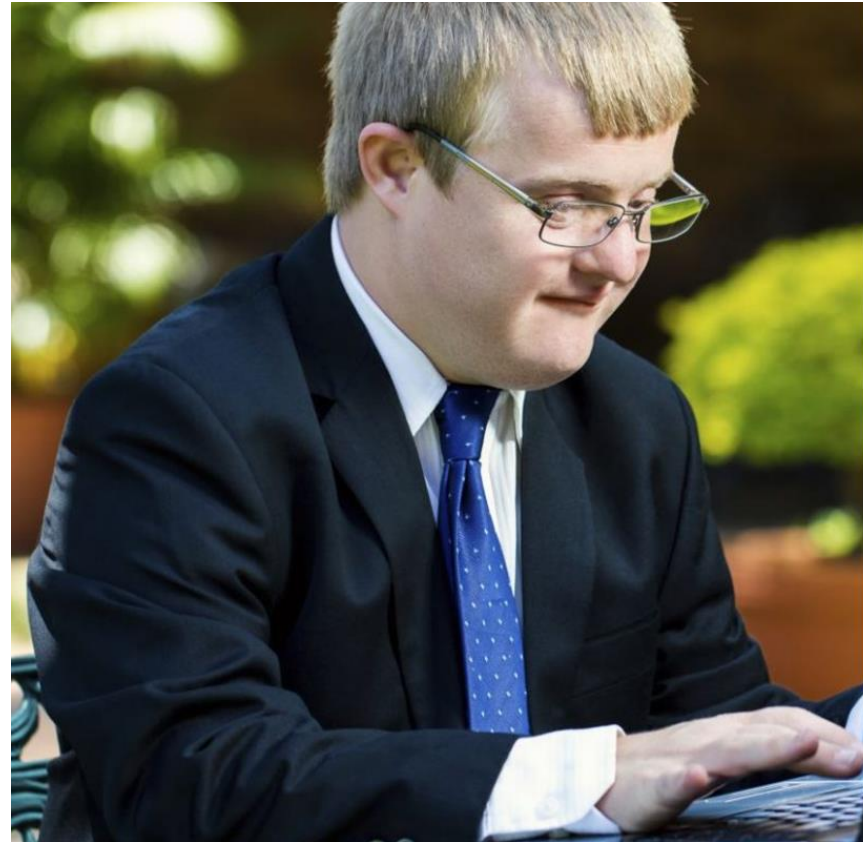
Use short, simple words.

Replace 3+ syllable words with words that:

- have 1 or 2 syllables; and
- are commonly used.

Pilot Study Participants

- 25 adults with ID.
- Tested at reading level Middle Primary.
 - (U.S. 3rd to 5th Grade)
- 17 to 63 years of age.
- Paid for their time.



Text Passages, Questions, Answers

- **8** text passages collected.
- **4** text passages simplified.
- **2** literal questions.
- **2** inferential questions.
- **3** multiple-choice answers.

Sample Typical Passage Webpage

On Miniclip you can play games to compile games statistics such as high scores, and rankings on your own player page and can receive awards for playing games. You can also create your own Miniclip avatar with clothing and accessories to represent you in our fun Miniclip games. You can play single player games or play advanced massive multiplayer games with other players from around the world.

- Reading Level: Upper Secondary Level II (U.S. 11th Grade)

Sample Simple Text Passage Webpage

On Miniclip, you can play games to collect game stats. These can be high scores and rankings on your own player page. You can get awards for playing games. You can also create your own Miniclip avatar with clothing and extras. It can be you in our fun Miniclip games. You can play single player games. Or you can play advanced, huge games with many players. Those players live around the world.

- Reading Level: Upper Primary (U.S. 5th Grade)

Sample Typical Passage, Literal Question

Lux Level is a luxurious, in-theatre dining experience at select theatres. Movie-goers can indulge themselves with premium reserved-seating, in-seat dining throughout the show, as well as other special amenities. Each seat is equipped with a server call button, so your server is always there when you need them. This truly is the finest movie-going experience available today.

Where can Lux Level be found?

1. At all theatres.
2. At a few theatres.
3. At no theatres yet.

Sample Simple Passage, Inferential Question

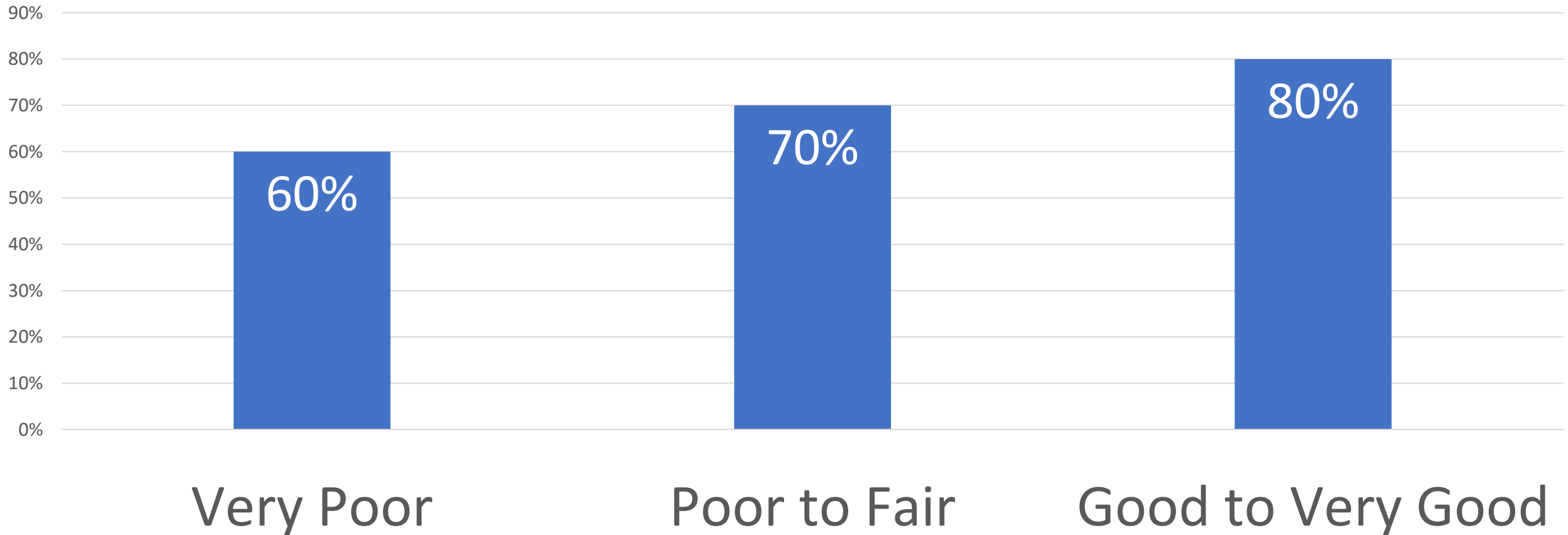
On Miniclip, you can play games to collect game stats. These can be high scores and rankings on your own player page. You can get awards for playing games. You can also create your own Miniclip avatar with clothing and extras. It can be you in our fun Miniclip games. You can play single player games. Or you can play advanced, huge games with many players. Those players live around the world.

How can you play with people who live far away?

1. Pick an advanced game.
2. Pick a single player game.
3. Pick an award.

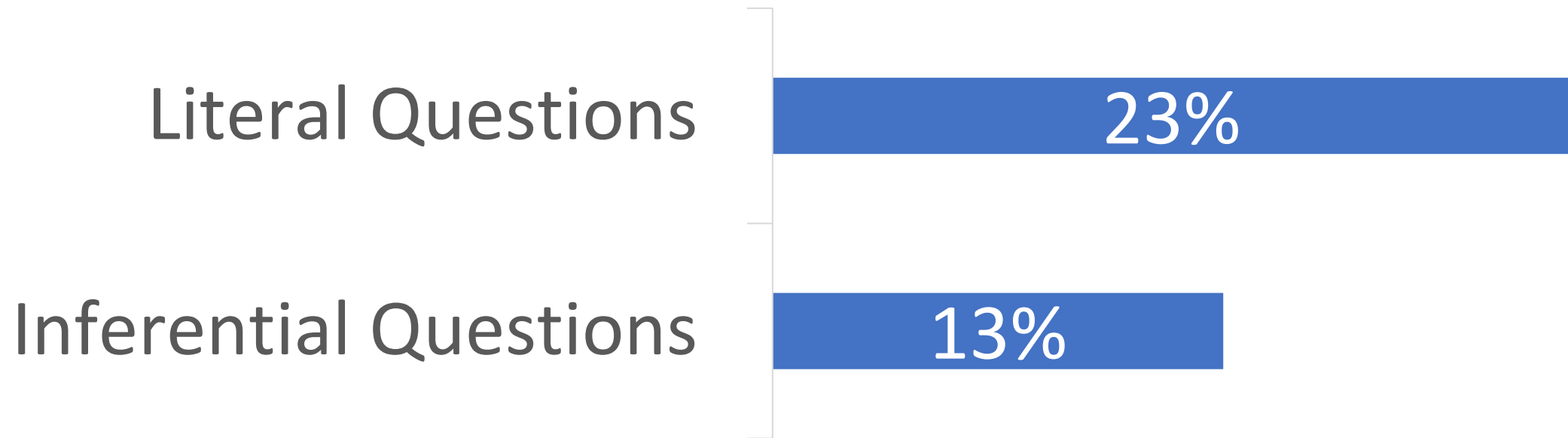
Study Results: 3 Groups

% Correct Answers – Typical Text Passages



Study Results: All Participants: Answers

% Improvement of Simple- Over
Typical-Text Passage Answers



Study Results: Simplified Text By Group

% Comprehension Improvement

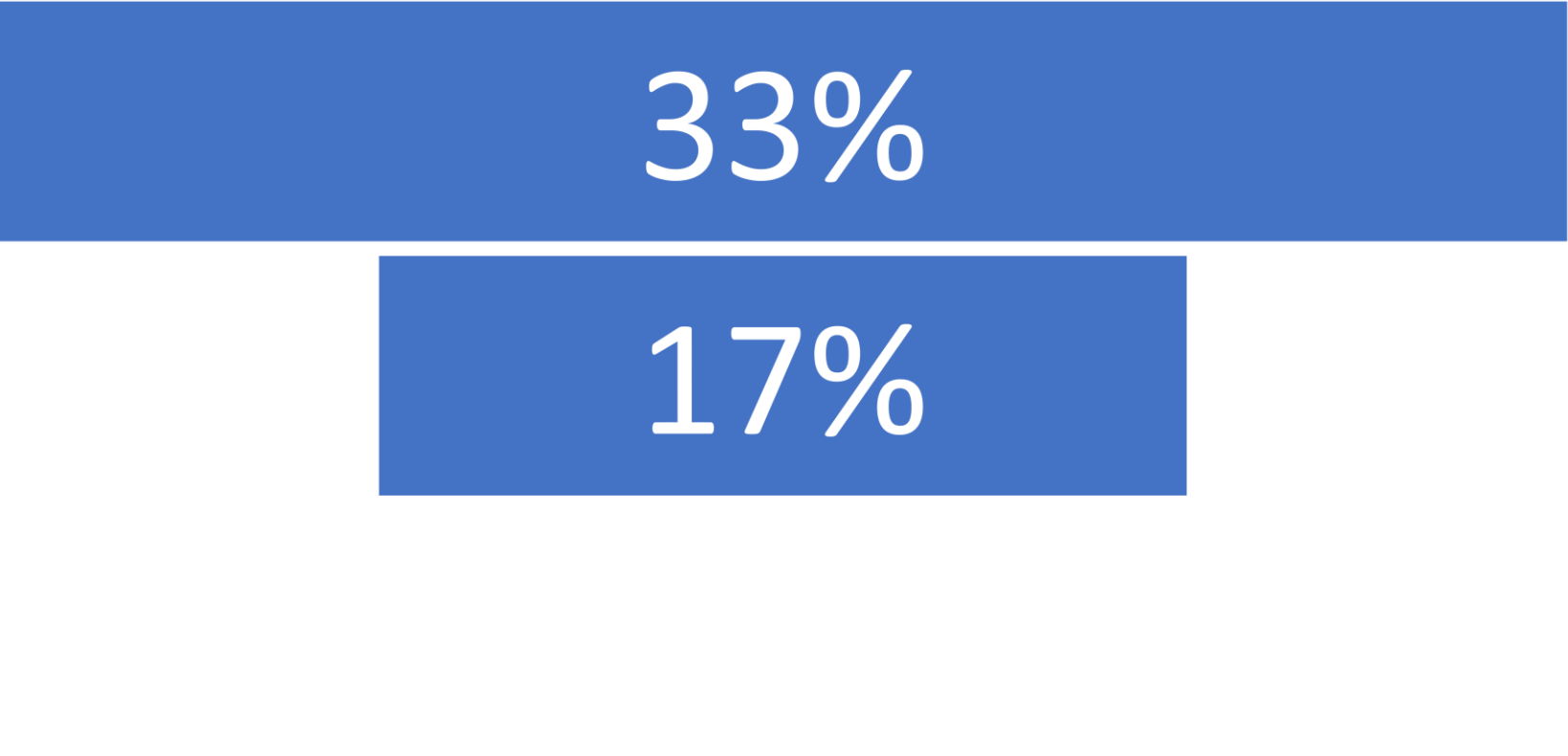
Very Poor

33%

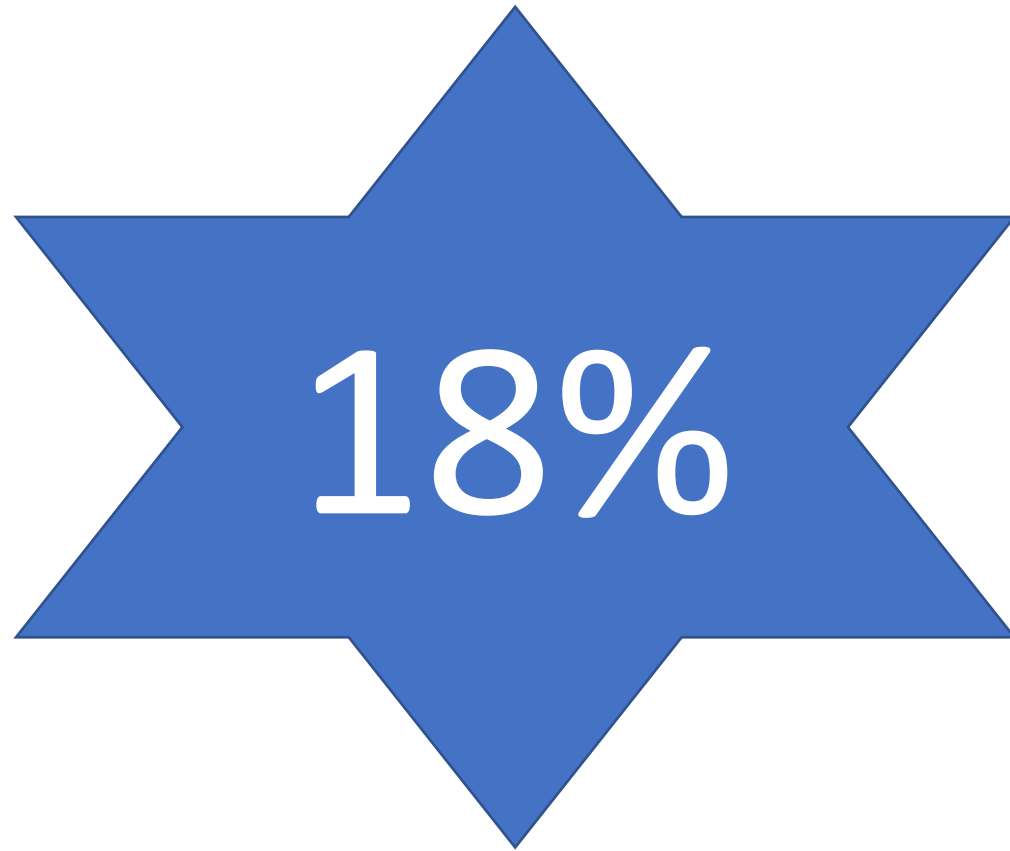
Poor to Fair

17%

Good to Very Good



Study Results: Overall Comprehension Improvement



Reason # 1 Why Study Result Is Important (1 of 2)

Reasonable assumption: people with higher levels of executive functioning will also benefit from text simplification.

Examples: people with Dyslexia, ADHD, functional illiteracy, non-native language.

Why Study Result Is Important (2 of 2)

Parallel between people with ID and AI: both have a very-limited understanding of the world.

Despite that, our operationalized plain language guidelines help people understand simplified text.

Our OPLG also helps our Generative Adversarial Network create simple text and judge its readability.

Contact Information

- John.Rochford@umassmed.edu
- LinkedIn: [john-rochford](#)
- Twitter: [@ClearHelper](#)
- Presentation: bit.ly/INFORSID2021

