

Designing for Learning Differences

Guest Lecturer: Erica Goodwin

Monday

Designing for different player
motivations

Today

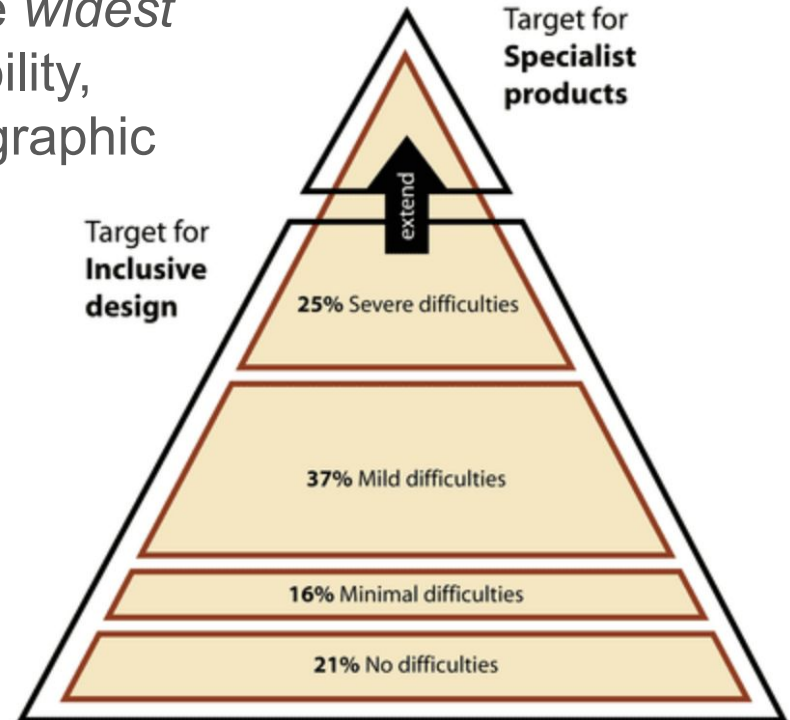
Designing for learning differences

Inclusive Design

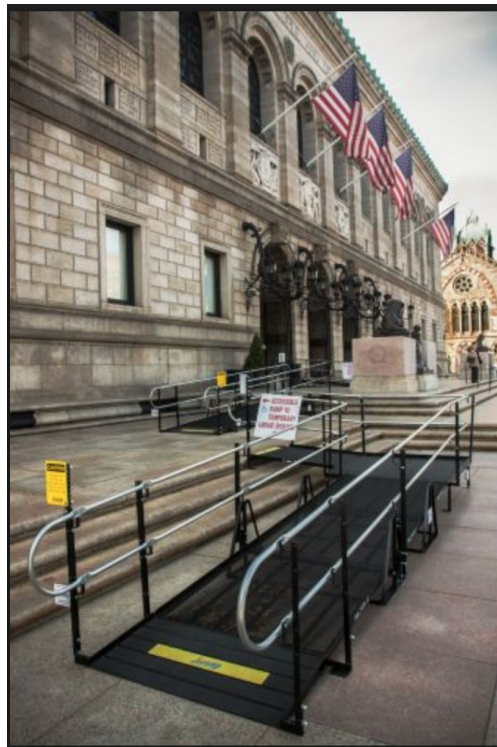
Inclusive design centers the needs of the *widest possible* group of users, regardless of ability, age, economic situation, education, geographic location, or language.

Inclusive Design

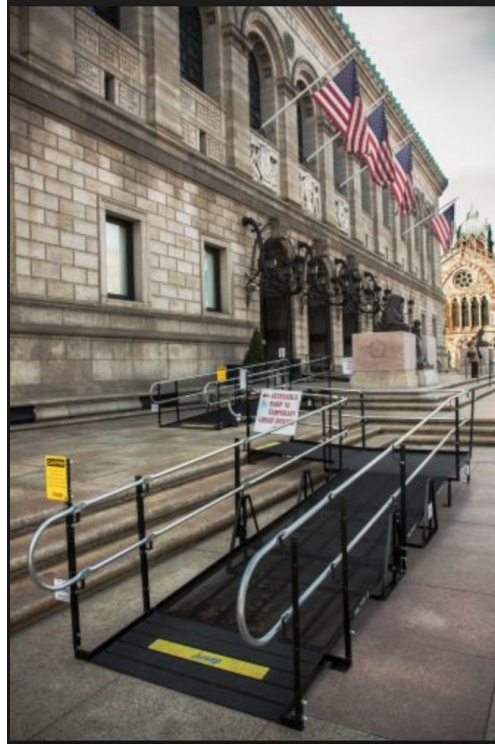
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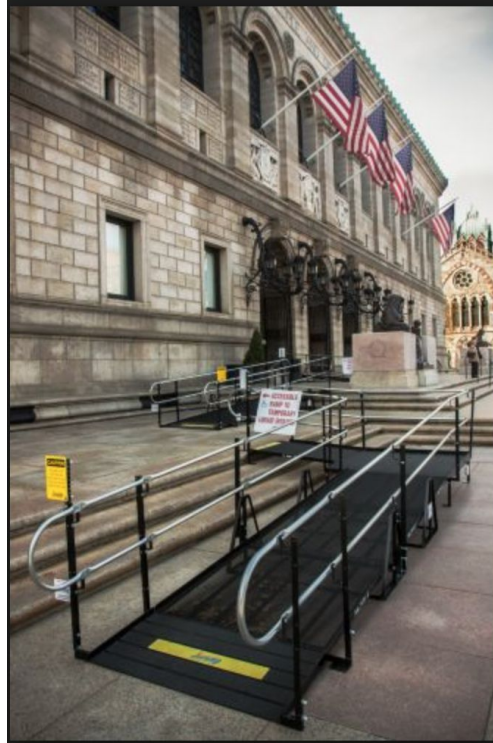
What happens when you design for equity?



What happens when you
design for equity?



What happens when you design for equity?



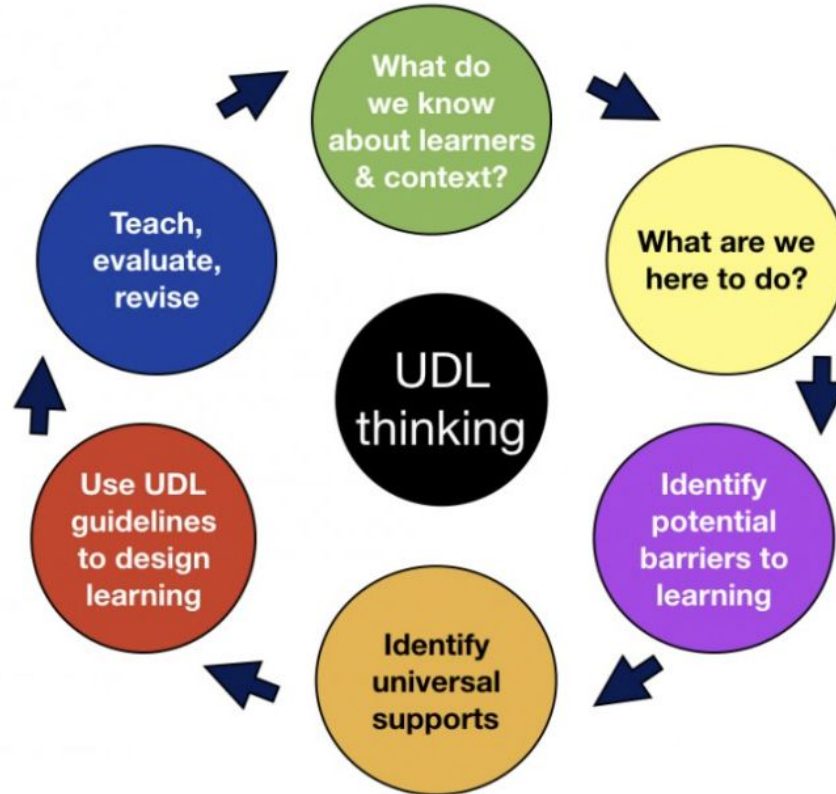
Create aspects that are:

- Necessary** for SOME,
- Beneficial** for ALL, and
- Not detrimental** to ANY.

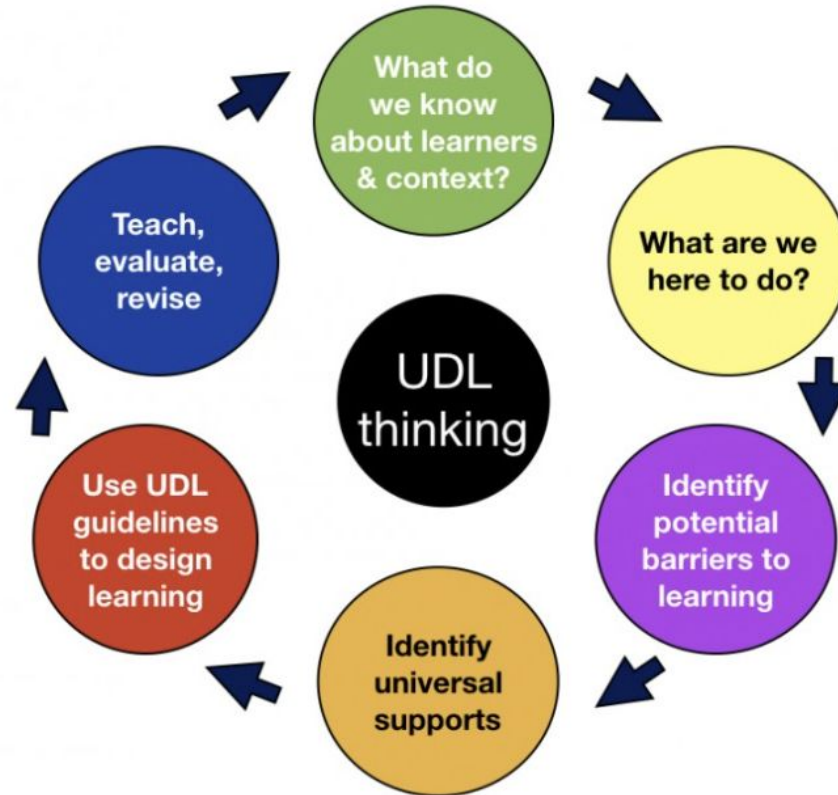
Physical and cognitive disabilities affect all users, whether temporarily or permanently, currently or eventually.



Universal Design for Learning (UDL)



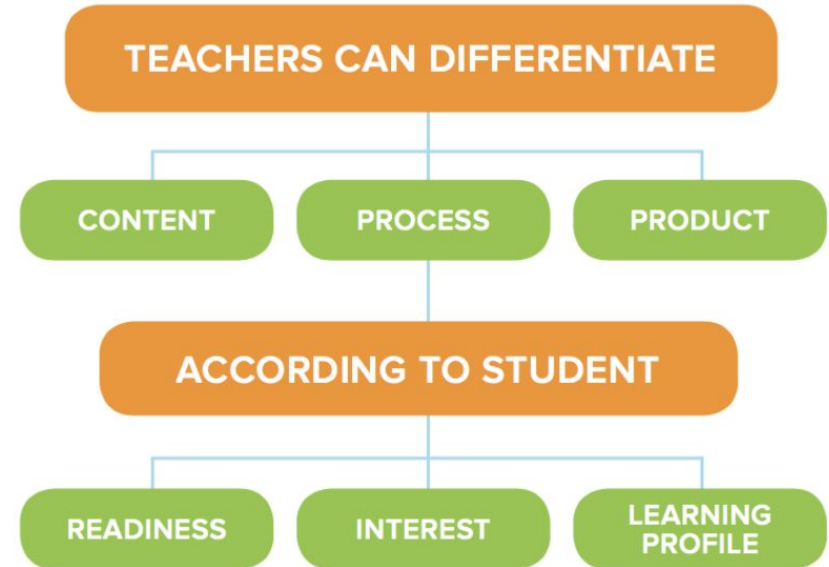
Universal Design for Learning (UDL)



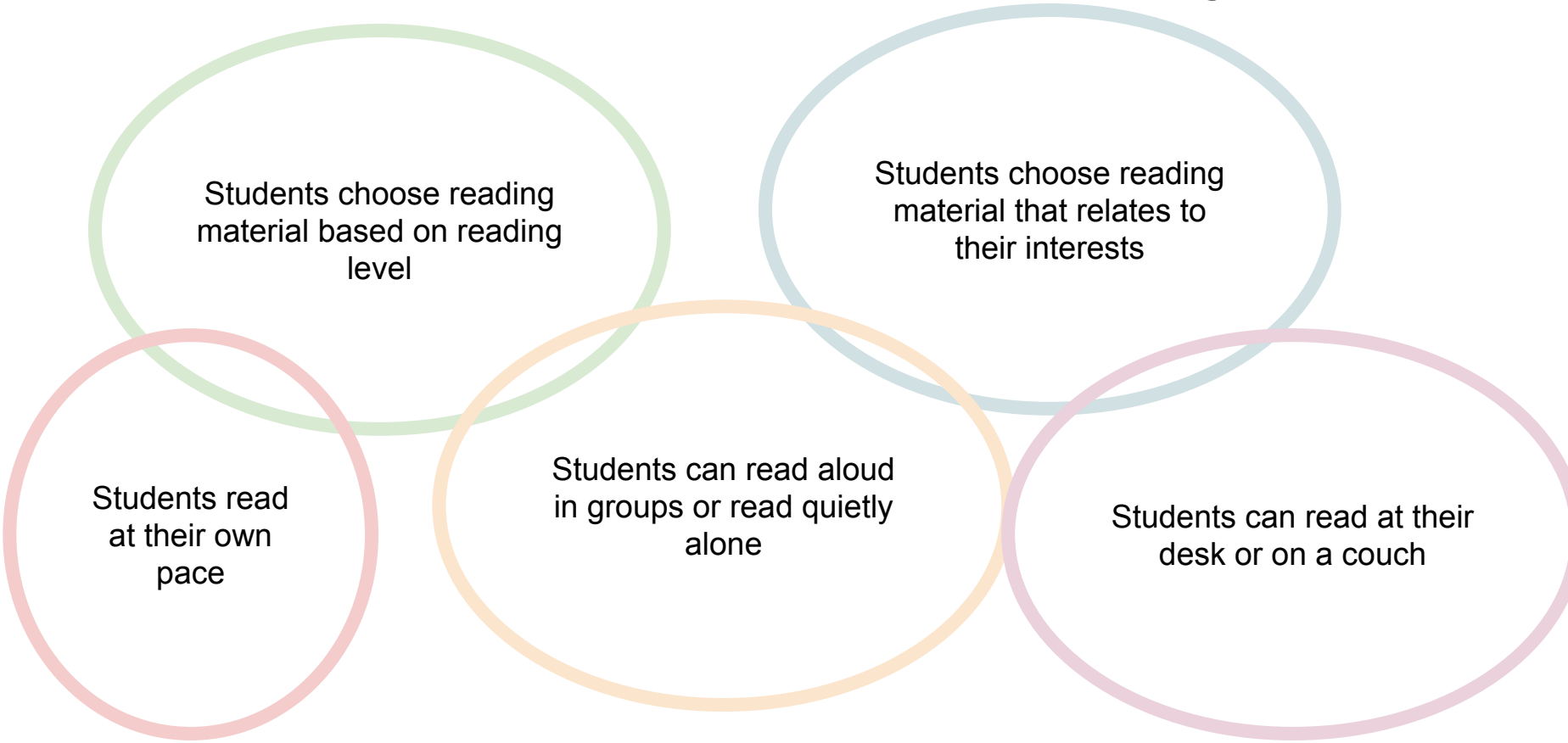
Universal does not mean **one** all-encompassing solution, it means a solution for **everyone**.

Differentiation

“A **flexible approach** to teaching in which the teacher plans and carries out **varied approaches** to **content**, **process**, and **product** in anticipation of and **in response to student differences** in readiness, interests, and learning needs” (Tomlinson 2001)



Differentiation Examples: Reading



Students choose reading material based on reading level

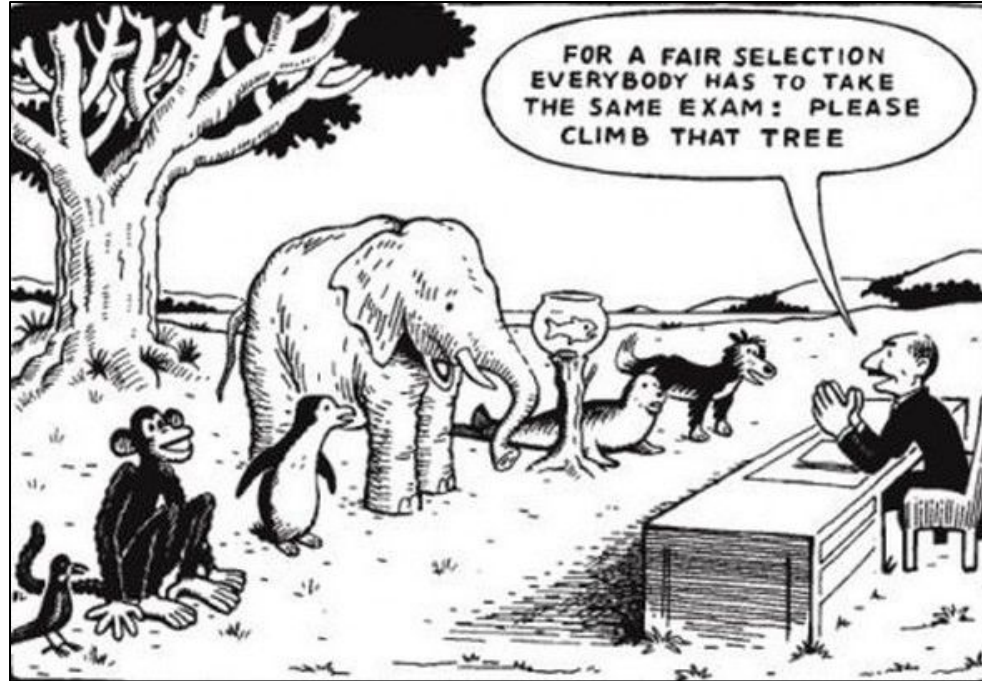
Students choose reading material that relates to their interests

Students read at their own pace

Students can read aloud in groups or read quietly alone

Students can read at their desk or on a couch

Differentiation



Not like this!

DIFFERENTIATING FOR DIVERSITY:

USING UNIVERSAL DESIGN FOR LEARNING IN COMPUTER SCIENCE EDUCATION

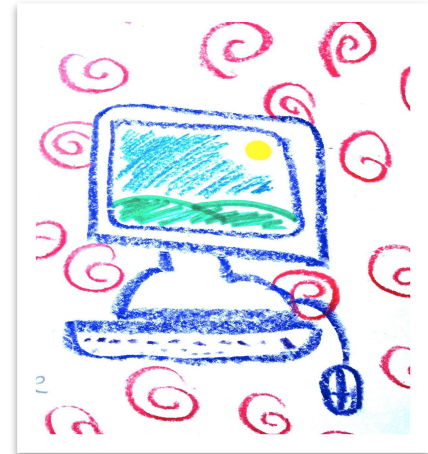
Alexandria K. Hansen, UC Santa Barbara

Eric R. Hansen, SPED Educator

Hilary A. Dwyer, University of Colorado Boulder

Danielle B. Harlow, UC Santa Barbara

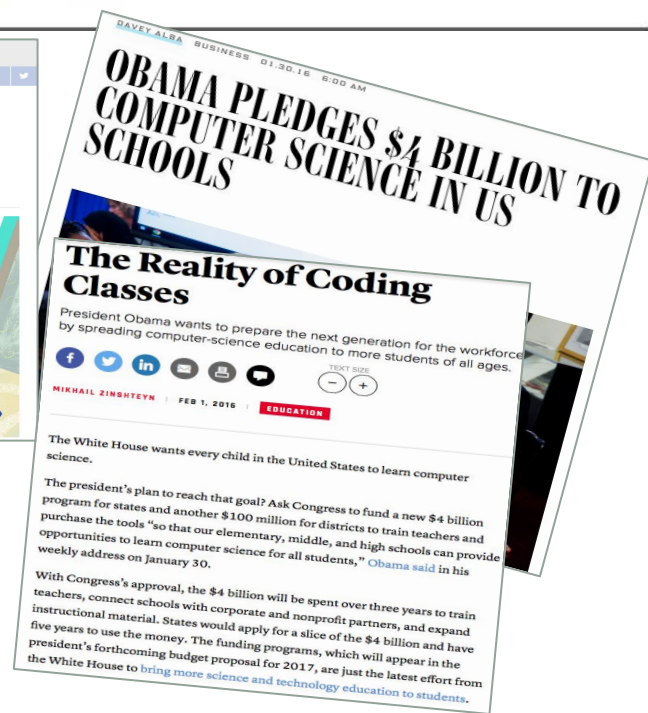
Diana Franklin, University of Chicago



Case study: Computer Science for ALL

In the coming years, we should build on that progress, by ... offering every student the hands-on computer science and math classes that make them job-ready on day one.

- President Obama in his 2016 State of the Union Address

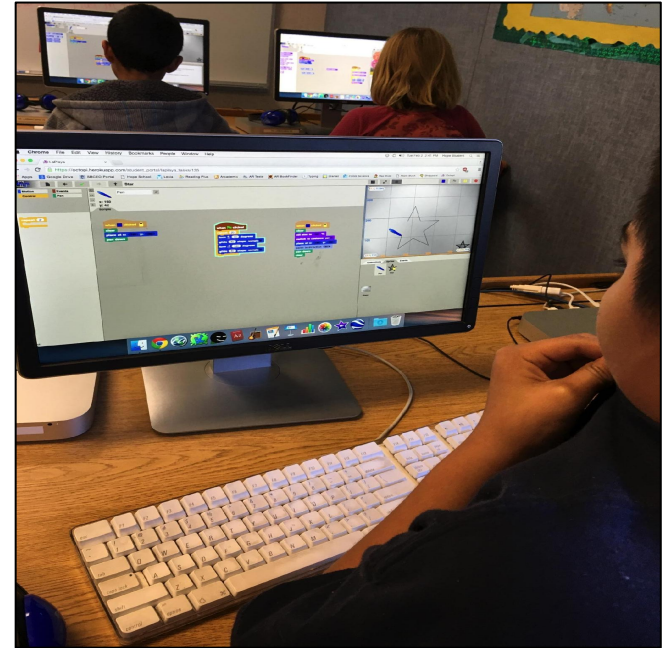


What does FOR ALL really mean?

How do we actively support students who do not *already* have opportunities to learn computer science?

This includes, but is not limited to:

- Students learning English
- Students from historically marginalized groups
- Students with learning differences
(and/or diagnosed learning disabilities)
- Students below grade level
- Students raised in low-income families
- Without regular access to technology
- With low motivation or perseverance



Ways to Differentiate for ALL Students

1. Universal Design for Learning (UDL)



TIPP&SEE Worksheet

Start by Playing (mindfully)

Play: Run the project and see what it does! Look at which sprites are doing the actions.

What happened when you played the project? Circle the action(s) that happened for each event.

1. When I clicked the green flag:		
<u>Monkey</u> talked waved flag	<u>Snake</u> talked hissed wiggled moved down moved right	<u>Bee</u> talked buzzed wiggled moved down moved right

4. Which block detects that the snake cheated by going through the middle?



5. Which code makes the program constantly check for the sprite winning or cheating?

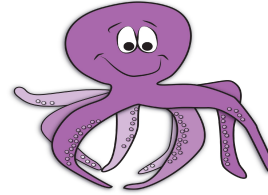


Highlights the need to design aspects of instruction that are:

- Necessary** for SOME,
- Beneficial** for ALL, and
- Not detrimental** to ANY.

Designing for English Proficiency

- Simplified & clarified instructions.
- Reduced required reading/writing on student worksheets.
- Embedded more text within the interface.
- Added audio read-aloud function

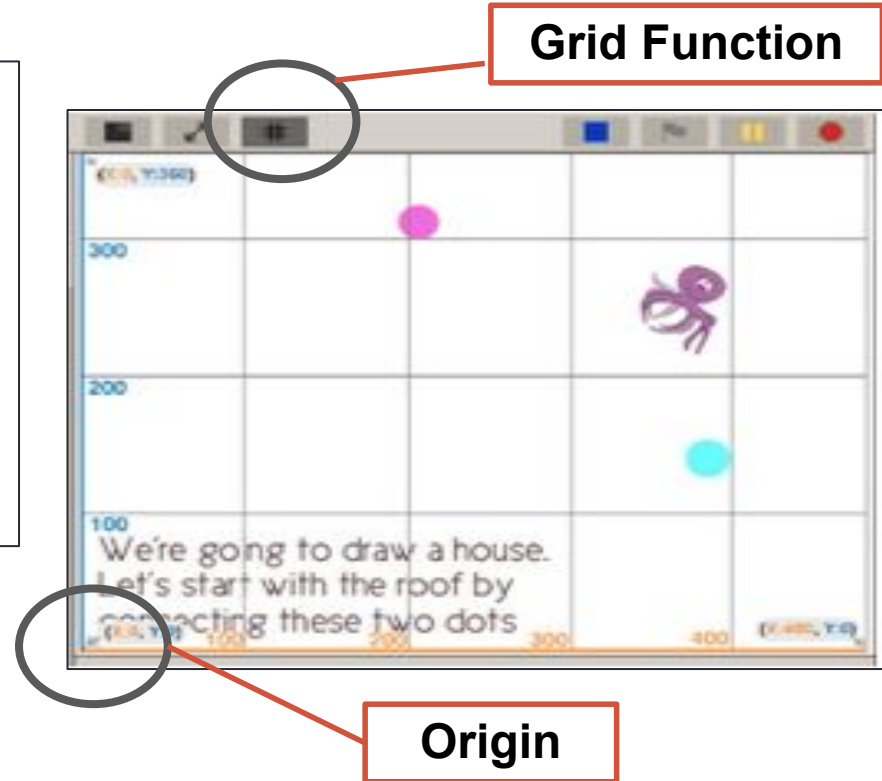


**Audio
Read
Aloud
Function**

Now you are ready to make a triangle - the roof of the house! We gave you a "Get Ready" script starting Alga on the blue dot. Now make a green flag script to draw the triangle!

Designing for Math Proficiency

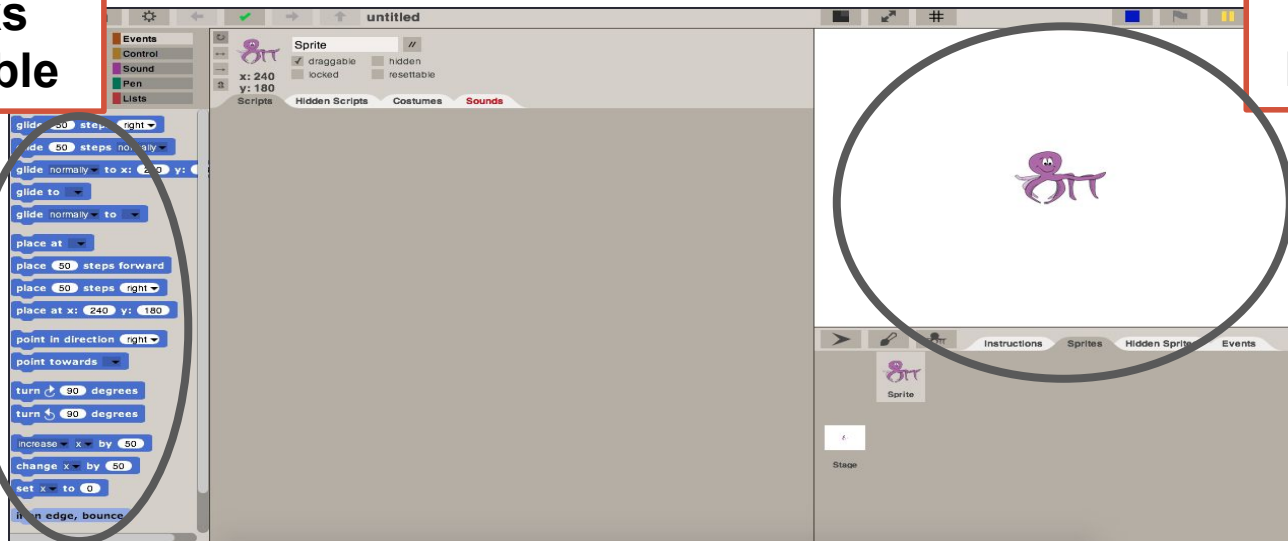
- Removed negative numbers, decimals and percentages.
- Changed location of origin within coordinate plane system and added a grid function.



Designing for Varied Student Pace

Created the **Sandbox** – a designated, open-ended play area to experiment and practice for students who finished assigned tasks early.

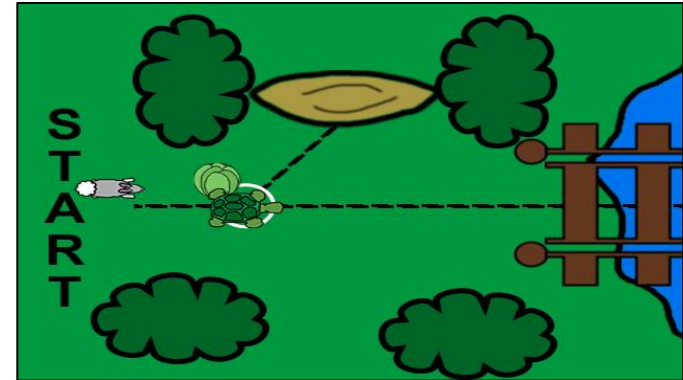
All blocks
are available



Opens a
blank project

Designing for Culture

- Conducted interviews with students to ensure examples were culturally-relevant (e.g., piñatas, quesadillas).
- Ensured programmable characters of every ethnicity were available.
- Changed language of the “tortoise and hare” project, and included the story.



Breakout — Discussion

Think about one of your favorite video games.

Does this game present any usability **barriers** for users with different cognitive or physical abilities?

Does this game have any features that **support** a wide range of users' abilities?

Breakout — Inclusive Design Process

As designers...

What are some of the **challenges** of following inclusive design practices?

What are some potential **solutions** and/or **approaches** to these challenges?

Inclusive Design Challenges and Approaches

Challenges:

- games are often visual
- default color palette might not be color-blind friendly
- designers may not know what it's like to have a cognitive or physical disability
- tradeoffs between game mechanics and inclusive design

Approaches:

- audio-based cues
- there are palettes online, so you don't have to come up with it yourself!
- learn from others with the lived experience!
- different, customizable modes

Inclusive Design Challenges and Approaches

Challenges:

- some games depend on a certain pre-existing knowledge
- some games (later levels) are supposed to be harder/quicker
- can be challenging to adjust existing game after it's already developed
- budget constraints
 - voice overs cost money
- some features could be good for some users but bad for other users
- sometimes there are pre-existing platform constraints

Approaches:

- focus group to design game features with
- don't require to complete all levels to win
- practice environments, interactive tutorials
- consulting with an expert about what impairments to design for, and how
- incorporate/center usability from the start
- different game modes

Breakout — Inclusive Design Solutions

In small groups, brainstorm and/or research inclusive solutions for users with:

- Vision impairment
- Hearing impairment

Are there any best practices or examples specific to the video game context?

Vision impairment – Inclusive Design Suggestions

- colorblind settings
- read-aloud instructions
- dyslexia-friendly font
- present information through audio
- rich audio effects
- AI tutor to help with gameplay

Vision impairment – Inclusive Design Suggestions

- Make sure colors are visible for different types of color blindness
- Make icons large with bold lines
- Don't clutter the interface
- Use an easily readable font
- Ensure no information is conveyed only by color
- Ensure screen reader support

Hearing impairment – Inclusive Design Suggestions

- make information visual instead of auditory-only
- add subtitles for everything that's happening
- add vibrations / tactile cues

Hearing impairment – UDL Suggestions

- Don't depend only on music or background sounds – change coloring or provide other visual cues as context
- Provide subtitles for speech that occurs in game, at an appropriate words-per-minute for target age-group
- Keep background noise to a minimum during speech
- Separate volume controls for speech and background noise
- Support text chats for multiplayer games

Breakout — Inclusive Design Solutions

In small groups, brainstorm and/or research inclusive solutions for users who:

- are English language learners or have low literacy
- have low attention span
- have cognitive impairment (poor memory or task processing skills)

Are there any best practices or examples specific to the video game context?

English language learners — inclusive design suggestions

- subtitles in different languages
- less language-based instructions, more visual instructions
- break down long instructions into smaller steps

English Language Learners:

- Check the reading level of your text and make sure it is below grade level
- Include images with text to give extra cues to meaning
- Make sure spoken text is spoken very clearly
- Allow option to read out text
- Structure page in a traditional format so that people can figure out where to put their eyes

Low Attention Span:

- instant feedback (sound effects, visual cues)
- different, small mini games or levels
- progress bar
- skip button
- timer to make game more interesting

Low Attention Span:

- Don't have long blocks of text without images
- Have the option to replay things in case they miss them
- Forms / submitting text – say how long they will take and have option to save progress
- Require user input to advance so user is ready
- Break up game into small chunks / levels
- Simplify user interface
- Don't make time limits too important

Cognitive Impairment:

- more hints
- difficulty option
- repeated, concise instructions
- opportunities to replay
- review of what's happened so far

Cognitive Impairment:

- Split into steps and provide instructions for different steps
- Include interactive tutorials when possible
- Allow access to previous levels (with instruction)
- Checklists
- Hint button
- Organize it well so they aren't overwhelmed by information

Project Group Discussion

In your project groups, brainstorm specific design additions to **your game** for users with learning differences including (but not limited to):

- English language learners
- Students below grade level
- Students with low attention span
- Students with cognitive impairments
- Students with visual impairments
- Students with auditory impairments

If you work solo, pair with someone who also works solo!