

CMS.594/894- EDUCATION

TECHNOLOGY STUDIO



SPRING 2019



ACCESSIBILITY

MODULE OVERVIEW

- **Part 1: Implementation and Research**
 - Garron will share insights about Universal Design for Learning and provide tools and resources for the mini-project
- **Part 2: Demo**
 - CAST will provide expert feedback on your projects
- **Part 3: Final Project Demo**
- **Part 4: End of Unit Survey/ Accessibility**
 - Garron will review rubric for mini-project 3

CLASS OUTLINE

- **Part 1: Universal Design and the Rubik's Cube**
 - Identify accessibility features
 - Distinguish accessibility and universal design
 - Connect Universal Design to UDL
- **Part 2: Universal Design for Learning and Reading**
 - Outline “undesirable difficulty” for reading
 - Identify how design can support reading
- **Break**
- **Part 3: Mini-Project**
 - Groups on the How/What/Why of learning
 - Identify content and strategy for project

ACCESSIBLE DESIGN
FROM A UNIVERSAL
PERSPECTIVE

EXAMPLE: ACCESSIBILITY AND UNIVERSAL DESIGN

A DESIGN MEDITATION ON THE RUBIK'S CUBE

WHAT IS A RUBIK'S CUBE?



3

EXAMPLE: ACCESSIBLE DESIGN

THE BRAILLE RUBIK'S CUBE

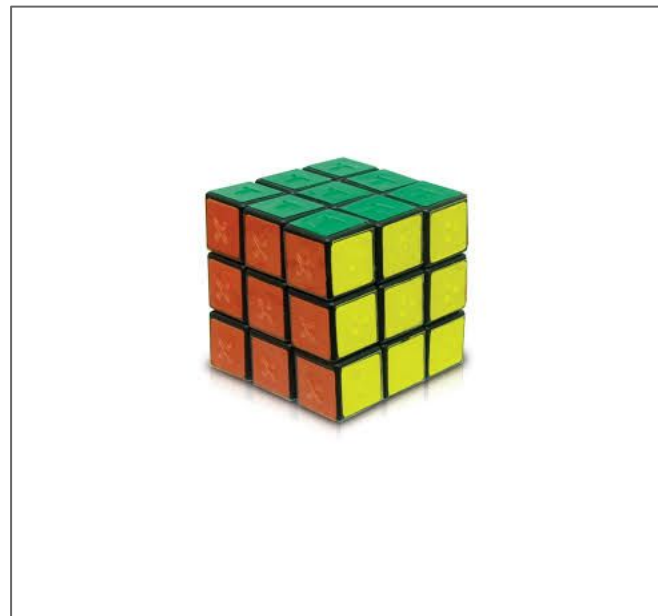
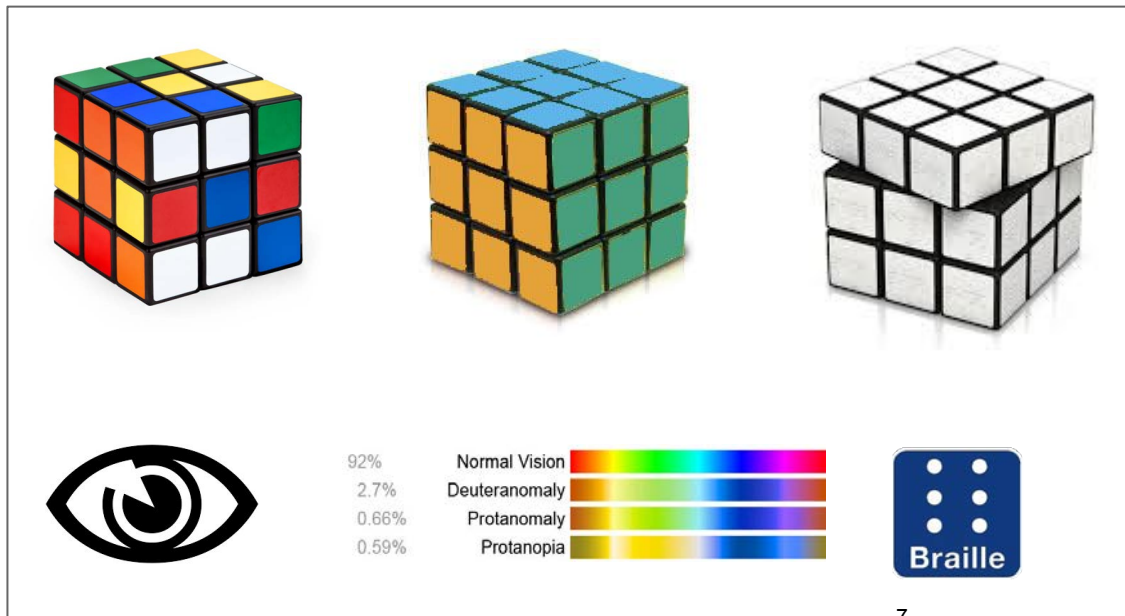


EXAMPLE: MULTIPLE MEANS OF REPRESENTATION

A SPECTRUM OF CUBES

VS.

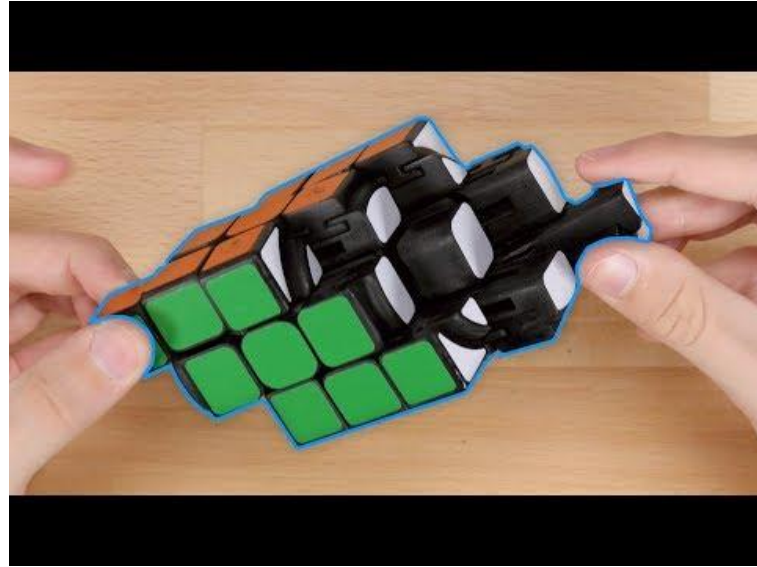
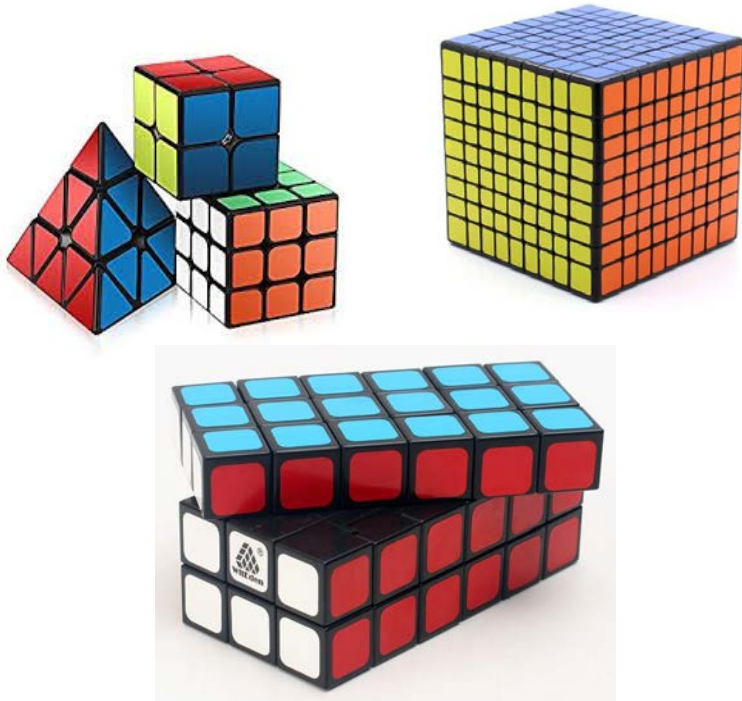
A CUBE FOR THE SPECTRUM



Color blindness chart courtesy of [Nanobot](https://nanobot.com/) on Wikipedia. Used with permission.

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EXAMPLE: MULTIPLE MEANS OF ACTION AND EXPRESSION



EXAMPLE: MULTIPLE MEANS OF ENGAGEMENT

Surface Changes (adds complexity)



Varying demands (aligned with learning goals)



EXAMPLE: VARY DEMANDS IN PRACTICE



Rubik's cube one-handed
average: 14.19 seconds
@ World Championships
2013

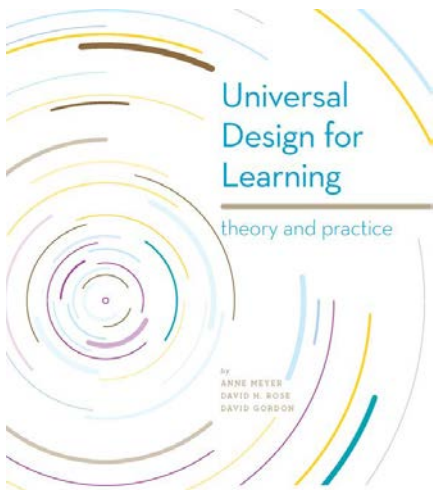
WHAT IS A RUBIK'S CUBE?



UNIVERSAL DESIGN FOR LEARNING

EXAMPLE: UDL THEORY AND PRACTICE

WHAT IS READING?



UDL Theory & Practice

SUPPORT: UDL GUIDELINES

The Universal Design for Learning Guidelines			CAST Until learning has no limits
	Provide multiple means of Engagement Affective Networks The "WHY" of Learning	Provide multiple means of Representation Recognition Networks The "WHAT" of Learning	Provide multiple means of Action & Expression Strategic Networks The "HOW" of Learning
Access	Provide options for Recruiting Interest <ul style="list-style-type: none">Optimize individual stress and autonomyOptimize rewards, goals, and challengeMinimize threats and distractions	Provide options for Perception <ul style="list-style-type: none">Offer ways of sustaining the display of informationOffer alternatives for auditory informationOffer alternatives for visual information	Provide options for Physical Action <ul style="list-style-type: none">Vary the methods for response and navigationOptimize access to tools and assistive technologies
Build	Provide options for Sustaining Effort & Persistence <ul style="list-style-type: none">Heighten salience of goals and objectivesVary prompts and resources to engage challengeFoster collaboration and communityIncrease sensory-oriented feedback	Provide options for Language & Symbols <ul style="list-style-type: none">Clarify vocabulary and symbolsClarify syntax and structureSupport decoding of text, mathematical notation, and symbolsProvide understanding across languagesFluency through multiple media	Provide options for Expression & Communication <ul style="list-style-type: none">Use multiple media for communicationAddress needs for structural and compressionBuild fluencies with graduated levels of support for practice and performance
Learnable	Provide options for Self Regulation <ul style="list-style-type: none">Provide expectations and beliefs that optimize motivationFacilitate personal coping skills and strategiesDevelop self-assessment and reflection	Provide options for Comprehension <ul style="list-style-type: none">Activate or supply background knowledgeHighlight patterns, critical features, big ideas, and relationshipsGuide information processing and evaluationMaximize transfer and generalization	Provide options for Executive Functions <ul style="list-style-type: none">Guide appropriate goal settingSupport planning and strategy developmentFacilitate managing information and resourcesEnhance capacity for monitoring progress
Goal	Purposeful & Motivated	Resourceful & Knowledgeable	Strategic & Goal-Directed

udlguidelines.cast.org | © CAST, Inc. 2018 | Suggested Citation: CAST (2018). Universal design for learning guidelines version 2.2 [graphic organizer]. Wakefield, MA: Author.

Guidelines 2.2


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↑ Home Content My Tags Notebook Glossary

Chapter 4: Universal Design for Learning > Provide Multiple Means of Engagement ▶ 53 of 98

Provide Multiple Means of Engagement (the “why” of learning)

Engaging with Algebra: iSolveIt



Engaging students with algebraic reasoning

In the iSolveIt project (<http://isolveit.cast.org>) CAST is exploring ways to address the pervasive problem of failure in algebra. Success in algebra has been linked to success in postsecondary education and the workforce.¹⁶ Yet efforts to improve algebra performance have been largely unsuccessful. Algebra 1 courses have been described as “an unmitigated disaster for most students” by the National Research Council (1998) and more recently as a class that can make students math-averse (Russell M. Gersten as cited in Cavanagh, 2008). Most programs focus on describing and calculating, not on the underlying thinking that is essential to truly understanding and applying algebra.¹⁷

Even students with previous **success** in math may struggle with algebra as it is often the first course that requires abstract reasoning. Students with a history of math failure face a steeper challenge. Those who have not **mastered**—let alone **automatized**—basic computations usually find the computational demands of algebra a barrier.¹⁸ Even more significant than competence issues are confidence issues. Past experiences of repeated failure in math tend to lead students to see themselves as inherently “poor at math.”¹⁹ This in turn raises their sense of threat when faced with algebra, narrowing the available mental resources to engage in new kinds of reasoning, and leading to failure in this important arena.²⁰

CAST’s iSolveIt project is a proof-of-concept project focused on the development and formative research of two prototype games. iSolveIt is aimed at helping students overcome the typical barriers to algebra by decoupling algebraic reasoning from calculation and symbolic components of algebra. The environment will eventually include a growing collection of tablet-based puzzles that have been designed using the principles of Universal Design for Learning (UDL) and enable active, open exploration of differing aspects of algebraic reasoning. They provide multiple entry points into the experience, allowing students to start from their strengths or level of comfort. By teaching algebraic reasoning skills in a context that does not appear to be math-specific, puzzles offer greater flexibility for addressing **affective** barriers to learning (e.g., math anxiety).

Algebra is not an extension of arithmetic—it is, in a real sense, a different way of thinking that moves away from the ‘one right answer’ that is prevalent in elementary arithmetic. iSolveIt puzzles are designed to support multiple pathways to solve a problem, and many have more than one correct solution. We feature two sets of puzzles: MathSquared and MathScaled.

MathSquared

TextHelp Toolbar Listen: [Speaker] [Play] [Pause] [Stop] | Lookup: [Search] [Help]

IS THIS READING?

Universal Design for Learning
Theory and Practice. By Anne Meyer, David H. Rose

Home Content My Tags

Chapter 4: Universal Design for Learning > Provide Multiple Means of Engagement

Provide Multiple Means of Engagement with Algebra: iSolveIt

Engaging students with algebraic reasoning

Even students with previous success in math failure face a steeper challenge in algebra a barrier.¹⁸ Even more so, they see themselves as inherently "poor" and engage in new kinds of reasoning.

CAST's iSolveIt project is a proof of concept that students overcome the typical barriers and eventually include a growing collection of active, open exploration of different strengths or level of comfort. By addressing affective barriers to learning algebraic reasoning.

Algebra is not an extension of arithmetic. iSolveIt provides two sets of puzzles: MathSquared and MathCubed.

MathSquared

Engaging students with algebraic reasoning

Garron Hillaire, CAST
Wakefield, MA

>> First puzzle that I wanted to talk about is Math Squared

53 of 98

TextHelp Toolbar Listen: [play] [stop] [mute] [volume] Lookup: [search] [help]

BREAK - PLEASE RETURN IN
10 MINUTES

MINI-PROJECT

GET GOING ON THE MINI PROJECT

- **Step 1: Break into three groups**
 - Engagement - The Why of Learning
 - Representation - The What of Learning
 - Action & Expression - The How of Learning
- **Share out**
- **Step 2: Select Material (by the end of class)**
 - **OER** - http://www.openculture.com/free_ebooks
 - **OER** - <https://ocw.mit.edu/index.htm>
 - **Mini-projects** (Get going on the final project!)
- **Step 3: Select Design Revisions and Authoring Tool**
 - Focus on 1-3 checkpoints from the Guidelines
 - Authoring tools: Book Building¹⁸, UDL Studio, Microsoft Word

AUTHORING TOOLS

- **Microsoft Word as a UDL tool**

- <http://www.institute4learning.com/2018/04/30/15-ways-to-use-microsoft-word-as-a-universal-design-for-learning-tool/>

- **Book Builder**

- <http://bookbuilder.cast.org/>

- **UDL Studio**

- <http://udlstudio.cast.org/>

DESIGN JOURNAL: MINI-PROJECT PROPOSAL

A short description (200 words, Images, etc.) describing your proposal for mini-project #3.

Be sure to identify which barrier to learning you believe your design will address by explicitly stating the UDL guideline checkpoint(s) you will focus on using in your design

PREPARING FOR THE
NEXT CLASS

NEXT CLASS

We will discuss how current assessment practices may not be ideal in determining the impact of UDL by discussing a paper which examines how game based learning

The emphasis of next class will be on presenting prototypes of a UDL implementation and getting feedback on the design

WRAP UP

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