UDL Implementation in the PK-12 Math Classroom: Practical Applications for Monday's Lessons

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Abstract

It is relatively simple to articulate the three broad core principles of Universal Design for Learning to the PK–12 mathematics educator: Provide multiple means of engagement, multiple means of representation, and multiple means of action and expression for all students on a regular basis. Application of these principles, however, is arguably more difficult, particularly when one attends to the detailed guidelines they encompass or attempts to focus exclusively on the teaching of a specific content area. Educators and their contexts are as unique as their fingerprints, and the idea of differentiating instruction in UDL-inspired ways on a consistent basis in every aspect of teaching within the confines of those unique contexts can be quite challenging. In a pre-session workshop as well as during a poster session, the presenters will provide practical examples to educators attempting to apply core UDL tenets to their teaching of mathematics in particular at all levels of PK–12 education. The emphasis will be on how the flexible differentiation that UDL generates can help all learners, especially those struggling or receiving services for disabilities, gain the access to quality mathematics learning at high levels that they may otherwise be denied.

Keywords

Implementation; Application; Mathematics; PK–12

INTRODUCTION

There are three broad guidelines of Universal Design for Learning (UDL; CAST, 2011) that are of utmost importance to the intentional PK–12 educator. In whatever order they are addressed, these guidelines inspire regular flexibility and creativity in terms of the educator's provision of multiple means of:

- Engagement,
- Representation, and
- Action and Expression.

Within the context of teaching mathematics, there are numerous explicit evidence-based and research-based practices that are consistent with the UDL principles and guidelines. These presentations are an exploration of some of the key strategies and practices that will help motivated mathematics educators begin to regularly and meaningfully apply UDL principles and guidelines in practical ways to their planning and teaching. Below is a video introduction to give you an idea of what the presenters will discuss. Following the introductory video are the ideas they will share, organized by overarching UDL principle, links to digital resources, and general references.

Video Introduction URL/link: https://tinyurl.com/ybzoqbr2

The video above is the introduction that will be shown during the poster session. It is relevant for all levels of instruction as an introduction to UDL in the math classroom. This l video will be presented again in shorter segments within each of the grade-band Google Slides presentations found in the Digital Resources section below.

MULTIPLE MEANS OF ENGAGEMENT

To inspire *purposeful and motivated learners*, the intentional math educator needs to attend to the affective networks of the brain (the "why" of learning). To do so, the educator can provide options for:

- **Recruiting interest** by using real-world contexts for math tasks, incorporating student-motivated and generated problems, and providing choice;
- **Sustaining effort and persistence** by incorporating effective group work (i.e., Complex Instruction), flexible groupings, rich and accessible mathematical tasks (i.e., low floor, high ceiling), formative feedback, and physical activity, all while teaching a Growth Mindset; and
- **Self-regulation** by teaching and modeling productive mindsets (i.e., encouraging risk-taking, celebrating mistakes) and meaningful reflective practices (inspiring metacognitive awareness).

MULTIPLE MEANS OF REPRESENTATION

To inspire *resourceful and knowledgeable learners,* the intentional math educator needs to attend to the recognition

networks of the brain (the "what" of learning). To do so, the educator can provide options for:

- **Perception** providing a variety of customized displays, presentations, and experiences of information and content that engage all of the senses, thus ensuring accessibility of content to all learners in multiple contexts;
- **Language, mathematical expressions, and symbols** through a continual focus on the CPA continuum (concrete, pictorial, abstract) and the creation of a vocabulary-rich environment using multiple media; and
- **Comprehension** through intentional focus on patterns, big ideas, the eight Standards for Mathematical Practices, process, alternate algorithms and paths, and the CPA continuum.

MULTIPLE MEANS OF ACTION AND EXPRESSION

To inspire *strategic and self-directed learners*, the intentional math educator needs to attend to the strategic networks of the brain (the "how" of learning). To do so, the educator can provide options for:

- **Physical action** constantly, whether through active brain breaks, intentional movement from one place to another, acting out of content and vocabulary, or the use of various assistive technologies;
- **Expression and communication** through the use of flexible and intentional groupings, tiered assignments, authentic and alternate assessments, student-generated and selected assignments, and a variety of media and tools for students to demonstrate their learning; and
- **Executive functions** through regular focus on goals and purpose, teaching and celebrating each of the eight Standards for Mathematical Practice, constant reflection on strategies and tools employed, and involving students in the process of reflecting on meaningful formative assessments and feedback.

DIGITAL RESOURCES

The following QR codes and URLs/ links will take you to Google Slides presentations with additional resources, suggestions, and examples, differentiated by grade bands: PK, K-2, 3-5, 6-8, HS:

Preschool presentation:
https://tinyurl.com/ydg3hs37

Grades K-2 presentation:
https://tinyurl.com/y7fwsez5

Grades 3-5 presentation:
https://tinyurl.com/y7usjapw

Grades 6-8 presentation:
https://tinyurl.com/y8nl5o24

High School presentation:
https://tinyurl.com/y8zjv7me

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