Appendix C
Resulting Framework for Evaluating DIMs With Teacher-Generated Examples and Indicators

Research-Informed Teaching Practices from Principles to Action: Ensuring Mathematical Success for All (NCTM, 2014)	**Integration of Technology Use from RAT Framework (Hughes, Thomas, & Scharber, 2006)**		
	Replacement Description: "Involves technology used to replace and, in no way change established instructional practices, student learning processes, or content goals" (p. 2).	**Amplification** Description: "Use that amplified current instructional practices, student learning, or content goals. Increased efficiency and productivity are major effects" (p. 2).	**Transformation** Description: Through comparison with pencil/paper <u>or</u> something that is newly possible, "Use that transforms the instructional method, the students' learning processes, and/or the actual subject matter" (p. 3).
1. Establish Mathematics Goals to Focus Learning Description: *Establish clear goals for the mathematics that students are learning, situates goals within learning progressions, and uses the goals to guide instructional decisions (p. 10).*	• Display data, learning targets, and class information digitally • Show students the "plan" for the week, including objectives and big picture • Project goals and objectives with technology instead of posting them on the board or having students write them Possible Technologies: • Planbook.com	• Use videos to launch lessons • Show students and teachers the learning goals • Keep track of the progress of students on each slide to get closer to the learning target. • State or explain the objective and goal for the lesson Possible Technologies: • CCSSM Look-For App • Xtramath • PowerPoint • Keynote • Educreations • ShowMe	• The tool or device adds to or changes the goals of the learning • Goals are updated or changed based on individual student progress • Students assess themselves before, during, and after the lesson to guide instruction • Have students look at lesson or objective and then write what they think they are learning that day • Have students create their own goals Possible Technologies: • Google Form
2. Implement Tasks That Promote Reasoning and Problem Solving Description: *Engage students in solving and discussing tasks that promote mathematical reasoning and problem solving and allow multiple entry points and varied solution strategies (p. 10).*	• PDF or static screen rendering of textbook pages or worksheets Possible Technologies: • Whiteboard App • Online Computational Games or Skills	• Web tools to investigate and present solutions to tasks • Teacher shows instructional video that explains concept being taught Possible Technologies: • Tiggly • Osmos • MathTwitterBlogosphere • Interactive Whiteboard Apps • LearnZillion	• Student investigates videos to launch lessons or presents problems • Student leads video recording of work on device • Use what was created with Whiteboard App to provoke students' discussion • Showing multiple strategies and errors for students to explain or reason • Real world problems • Allowing students to tinker Possible Technologies: • Desmos • Dynamic Geometry Software • Computer Algebra Systems • Screencast Software • Dan Meyer Videos

3. Use and Connect Mathematical Representations Description: *Engage students in making connections among mathematical representations to deepen understanding of mathematics concepts and procedures and as tools for problem solving (p. 10).*	• Have access to virtual forms of student materials or teacher instructional materials • Students explain their thinking by projecting manipulatives • Use document camera or Smartboard instead of writing on white board Possible Technologies: • Virtual Manipulatives	• Connecting a mathematical concept to a technological tool • Share access and collaboration • Show a visual to help explain a concept Possible Technologies: • SolveMe Mobile • Pieces Basic • Algebra Tiles • Touch Counts • Braining Camp • Osmo • Google Image and Video • Tiggly	• The tool allows for student to explore and/or discover relationships independently or in small groups • Write over pictures taken • Multiple representation comparison through student explanations • Present the concept and have students interact with it Possible Technologies: • Desmos • Dynamic Geometry Software • Computer Algebra System • NearPod • PearDeck • Screencast Software
4. Facilitate Meaningful Mathematical Discourse Description: *Facilitate discourse among students to build shared understanding of mathematical ideas by analyzing and comparing student approaches and arguments (p. 10).*	• Launch images and maybe videos to set the context for problems • Use discussion boards especially in online environments • Build taken-as-shared understanding using student questions Possible Technologies: • Formative Assessment tools such as Clickers	• Orchestrate discussions using digital photos of student work • Access to other student thinking in a gallery walk • Students to comment and give feedback to others • Digital tools to help scribe student thinking • Build taken-as-shared understanding using student questions • Access student responses quickly Possible Technologies: • Screencast Software • Educreations • VoiceThread • Plickers	• Shared student workspaces • Collaborative environments with many “hands” on the work • Get at relationships and different representations • Have students discuss answers and why they got them • Collaboratively work out the problem and explain/justify answers Possible Technologies: • Google Docs • Groupboard • Mathematical Tools • Plickers • Interactive Whiteboard App
5. Pose Purposeful Questions Description: *Use purposeful questions to assess and advance students’ reasoning and sense making about important mathematical ideas and relationships (p. 10).*	• Using a virtual version of asking questions • Video of modeling effective questions • Posting on document camera or Smartboard Possible Technologies: • Edmodo • Socrative • #mtbos Scavenger Hunt • Online Webquest • Project Sentence Stems	• Real-time summary data • Ask questions • Present math images to students to form questions Possible Technologies: • Clickers • Discussion boards • Plickers • Wouldyourathermath.com	• User-controlled scaffolding • Advancing students based on thinking and reasoning • Students pose purposeful questions and decide which questions have value • Interactive presentations • Supports for students to develop questions • Allow students to ask questions they were not able to ask without the technology • Show pictures and have students develop questions Possible Technologies: • Three Act Math • Gletchy.com • Dan Meyer’s blog • Nearpod • PearDeck • 101 Questions • GeoGebra • TinkerPlots • Number Talk Images

6. Build Procedural Fluency from Conceptual Understanding Description: *Build fluency with procedures on a foundation of conceptual understanding so that students, over time, become skillful in using procedures flexibly as they solve contextual and mathematical problems (p. 10).*	• Individual manipulatives to see number partners Possible Technologies: • Virtual Manipulatives • Drill and Practice Apps • Base 10 Block App • XtraMath • Math Playground • Quizlet • IXL	• Include a variety of models and representations with accompanying facts • Teacher use manipulatives to show student work or to manipulate blocks in more than one way Possible Technologies: • Base 10 Block App • Llama Drama • Todo math	• Students procedural fluency leads to discussion of properties • Allow students to lead discussions about their processes or to new concepts • Show and discuss different student strategies to see how they relate, different, or have errors • Use sliders with mathematical tools • Students are the teacher – record themselves doing a problem and explaining it to others Possible Technologies: • Base 10 Block App • Braining Camp • Ten-frame Fill • GeoGebra • Desmos
7. Support Productive Struggle in Learning Mathematics Description: *Consistently provide students, individually and collectively, with opportunities and supports to engage in productive struggle as they grapple with mathematical ideas and relationships (p. 10).*	• Allows students to interact with a problem • Challenging problems online • Warm up task or brainteasers projected on screen Possible Technologies: • Desmos • Openmiddle.com • Visualpatterns.org	• Graduate release of guiding information • Support for individual and group work for all levels • Allow predictions, conjectures, and discussions Possible Technologies: • SolveMe Mobiles • Number Puzzles – Which One Doesn't Belong? • Video Brainteasers • Three Act Math	• Tools that give different levels of "hints" depending on how much information is provide – user controlled scaffolding • Gamification or games that could change individual pacing Possible Technologies: • Three Acts • Solve Me Mobiles
8. Elicit and Use Evidence of Student Thinking Description: *Use evidence of student thinking to assess progress toward mathematical understanding and to adjust instruction continually in ways that support and extend learning (p. 10).*	• Use of tablet as personal whiteboard • Replace paper and pencil time tests Possible Technologies: • Drill and Skill Apps	• Immediate student feedback Possible Technologies: • Clickers • Teachers dashboards associated with textbooks	• Students create own prompts • Allows you to change instruction in the moment or during the lesson for whole group individually • Students discuss mistakes • Students justify their reasoning Possible Technologies: • ActivePrompt • Screencast Software • Would you rather/Which one doesn't belong?