Virtual Manipulatives

Base Ten Blocks

Pearson eTools: http://www.pearsonsuccessnet.com/snp_swf/tools/math/en/player.html

Math Learning Center: https://apps.mathlearningcenter.org/number-pieces/

Coolmath4kids: https://www.coolmath4kids.com/manipulatives/base-ten-blocks

Fractions

Math Learning Center: https://apps.mathlearningcenter.org/fractions/

ABCYA: https://www.abcya.com/games/fraction_percent_decimal_tiles

Math Playground: https://www.mathplayground.com/mathbars.html

Math Toybox: http://mathtoybox.com/numblox/NumBlox.html#.XKIjyZi6OCp

Geoboards

Math Learning Center: https://apps.mathlearningcenter.org/geoboard/

Math Playground: https://www.mathplayground.com/geoboard.html

NRICH: https://nrich.maths.org/virtualgeoboard

Number Balance

NRICH: https://nrich.maths.org/4725

Number Frames (5 frames, 10 frames, 20 frames)

Math Learning Center: https://apps.mathlearningcenter.org/number-frames/

Number Lines

Math Learning Center: https://apps.mathlearningcenter.org/number-line/

Pattern Blocks

Math Learning Center: https://apps.mathlearningcenter.org/pattern-shapes/

Place Value Disks

Geogebra: https://www.geogebra.org/m/awS83JcY

SMART: http://exchange.smarttech.com/details.html?id=8cd88c08-522c-4984-bf99-c01f9dd49ba3

Teaching & Assessing with Virtual Manipulatives

Rekenrek

Math Learning Center: https://apps.mathlearningcenter.org/number-rack/

ictgames: http://www.ictgames.com/brilliant_beadstring_with_colour.html

General

Math Learning Center Apps: https://www.mathlearningcenter.org/resources/apps

National Library of Virtual Manipulatives: http://nlvm.usu.edu/en/nav/vlibrary.html

Glencoe: http://www.glencoe.com/sites/common_assets/mathematics/ebook_assets/vmf/VMF-Interface.html

Instructional Management

Lesson Delivery

ClassFlow: https://classflow.com/

Nearpod: https://nearpod.com/

Screen Capture

Apple (one button screen recording with iOS 11 or higher)

- iPhone, iPad and iPod touch: https://support.apple.com/en-us/HT207935

PC

- Screen-Cast-O-Matic: https://screencast-o-matic.com/
- Nimbus Capture (Chrome Extension): https://chrome.google.com/webstore/detail/nimbus-screenshot-screen/bpconcjcammlapcogcnnelfmaeghhagj?hl=en

References & Research

Burris, J.T. (2013). Virtual Place Value. *Teaching Children Mathematics, 20*(4), 228-236.

Litster, K., Moyer-Packenham, P.S., & Reeder, R. (2019). Base-10 Blocks: a study of iPad virtual manipulative affordances across primary grade levels. Mathematics Education Research Journal: https://doi.org/10.1007/s13394-019-00257-2

Moyer-Packenham, P. S. (2010). Teaching mathematics with virtual manipulatives. Rowley, MA: Didax.

National Council of Teachers of Mathematics. (2014) *Principles to Action: ensuring mathematical success for all.* Reston, VA: NCTM.

Assessment

C-P-A Rubric

Representing & Connecting Concrete Models	The student included a mathematically accurate representation of concrete models.	The student included a somewhat accurate representation of concrete models.	The student had little or no mathematically accuracy of the representation of concrete models.
Representing & Connecting Pictorial Models	The video included a mathematically accurate representation of pictorial models and is aligned to the concrete model.	The video included a somewhat accurate representation of pictorial models that may or may not be aligned to the concrete model.	The video had little or no mathematically accuracy of the representation of pictorial models or the pictorial model is not connected to the concrete model.
Representing & Connecting Abstract Models	The video included a mathematically accurate representation of abstract models that is aligned to the pictorial model.	The video included a somewhat accurate representation of abstract models that may or may not be aligned to the pictorial model.	The video had little or no mathematically accuracy of the representation of abstract models or the abstract model is not connected to the pictorial model.
Mathematical Communication	The student communicates mathematical ideas clearly using math vocabulary and mathematical language.	The student somewhat communicates mathematical ideas clearly using math vocabulary and mathematical language.	The student does not communicate mathematical ideas clearly and does not use math vocabulary and mathematical language.
Conceptual Understandings	The student connects all three representations (concrete, pictorial, abstract) and can explain how each are connected.	The student connects two representations (concrete, pictorial, abstract) and can somewhat explain how each are connected.	The student does not connect the three representations (concrete, pictorial, abstract) and cannot explain how each are connected.

Conceptual/Procedural Rubric

	Description	Evidence
Conceptual	The student is focused on problem solving and thinking. The student connects the concrete, representational and abstract model and can explain the strategies.	
Procedural/Conceptual	The student is focused on problem solving and thinking but only a few concepts are mentioned. Students are beginning to connect models.	
Procedural	The student describes a procedure and lacks the conceptual underpinnings in his/her explanation.	
Misconception/Fragile	Focus is on the correct answer. Student cannot show or explain their thinking or strategy.	

Teaching & Assessing with Virtual Manipulatives

Student Self-Assessment

	I am very confident. I can teach/coach someone else.
	I can do this on my own. I can show I understand with concrete, pictorial and abstract models.
	I can do this with help or with an example.
	I am still thinking. I will need some help. I will try my best and not give up.

Student Self-Assessment Classroom Example