Math Manipulatives:
Tools to Help All Students Become Effective Problem Solvers

Viewers’ Guide
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Viewers’ Guide

Many students struggle with math; the thought of juggling algebra, geometry and fractions is enough to make them anxious. However, research has shown that achievement in mathematics increases when manipulatives are used for students with learning disabilities (LDs). This video shows how teachers at Sagonaska Demonstration School are using manipulatives to help students at all grade levels improve their mathematical reasoning and problem solving.

This guide provides viewers with the opportunity to reflect on how math manipulatives can assist students with LDs complete calculations, understand visual-spatial relationships and solve math problems; additionally, viewers are able to reflect on their thoughts and practices, both individually and as a group. The viewers’ guide includes the following sections:

- **Math Manipulatives Concept Map** is a pre-viewing activity that allows viewers to record what they know about math manipulatives, how they might use math manipulatives to support students in the classroom, and to reflect on how they can improve their use of math manipulatives to better support students with LDs in math.

- **Guided Viewing = Key Takeaways** is a viewing activity that uses guiding questions which allow viewers to record key ideas to concepts explored throughout the video.

- **Deepening Your Understanding of How Math Manipulatives Support Learning** is a post-viewing/application activity, which provides viewers with an opportunity to further reflect on their current classroom practice, the video, and to consider how math manipulatives could fit into their current practice.

- **Virtual Manipulatives in the Classroom** is an enrichment activity that extends the viewers’ knowledge on math manipulatives.

- **Appendix A** identifies key messages from the video that a facilitator may use to initiate additional discussions and to ensure that all key concepts are understood.

- **Appendix B** provides a list of related resources on the LD@school website and the internet.
Math Manipulatives Concept Map

Pre-viewing Activity

Prior to watching the video, complete the first three boxes “What kinds of math manipulatives do I have available for use”, “How are my students currently using math manipulatives”, and “How am I using manipulatives to support students with LDs in math”. Once you have viewed the video, return to this activity and respond to the question in the final box, “How might I more effectively use manipulatives to support students with LDs in math”. When you have completed the graphic organizer below, you may want to discuss your recorded points with a partner or in a small group.

- What kinds of math manipulatives do I have available for use?
- How are my students currently using math manipulatives?
- How am I using manipulatives to support students with LDs in math?
- How might I more effectively use manipulatives to support students with LDs in math?
Guided Viewing = Key Takeaways

Viewing Activity

While watching the video, use the graphic organizer below to record takeaways in answer to the guiding questions.

**What types of math manipulatives were used in the video?**

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**What are the potential benefits of using math manipulatives for students with LDs?**

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**How did the students feel about using math manipulatives?**

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**What are some new ways of using math manipulatives I want to explore after watching this video?**

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Deepening Your Understanding of How Manipulatives can Support Learning

Post-viewing/Application Activity

Guiding Questions:

*How can I incorporate the use of math manipulatives into my classroom?*
*If I am already using math manipulatives, how can I enhance their use?*

As discussed in the video, the use of manipulatives can help students with LDs in math to understand concepts and to demonstrate their learning. In the classroom, manipulatives can be used to introduce, practice or provide remediation for a concept. For this application activity, think about your students with LDs in math, look at the image of each math manipulative, and think about how specific manipulatives could support learning in a specific math strand; then, draw a line to match the math manipulative(s) to the corresponding strand(s). *Note:* more than one manipulative could match to a strand or strands.
- **Number sense and Numeration**
  - Algebra Tiles
  - Base 10 Blocks

- **Patterning and Algebra**
  - Coloured Tiles
  - Connecting Tubes

- **Geometry and Spatial Awareness**
  - Five and Ten Frames
  - Fraction Circles

- **Measurement**
  - Fraction Strips and Towers
  - Geoboards

- **Data Management and Probability**
  - Pattern Blocks
  - Tangrams
EduGAINS has created a series of math manipulatives tip sheets; the tip sheets for each of the listed manipulatives include a description of what they are, how they can help students, how many are recommended and sample activities.

Check the Resources Section of this Viewers’ Guid to access the tip sheets in PDF!
Virtual Manipulatives in the Classroom

Enrichment Activity

A newer trend in teaching students with LDs in math is to include the use of virtual manipulatives as an engaging and instructional tool. Virtual manipulatives, also known as interactive visual models, are modeled from concrete manipulatives such as base ten blocks, coins, blocks, tangrams, spinners, rulers, fraction bars, algebra tiles, geoboards, geometric plane, and solids figures – these virtual manipulatives are usually in the form of Java or Flash applets.

Utah State University has developed The National Library of Virtual Manipulatives, a trilingual online resource (English, French and Spanish). The NLVM provides an extensive variety of manipulatives, in a virtual library, in 5 strands that correspond to the Ontario curriculum and which are divided into age/grade ranges from pre-K to grade 12.

On your own, or with a partner, think about the specific age/grade of students with LDs in math, whom you teach, select one of the math strands, and take about 10 minutes exploring the corresponding virtual manipulatives on the NLVM website:

[Click here to access the NLVM website (http://nlvm.usu.edu/en/nav/vlibrary.html).]

Record key thoughts on how you could use these virtual manipulatives with your students:

✓
✓
✓
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✓
Students with LDs may have trouble learning number facts, doing calculations, understanding visual spatial relationships or solving math problems.

Students with LDs may perceive “math on paper” to be a series of abstract symbols.

Manipulatives - concrete materials like algebra tiles, snap cubes and coloured rods – help students at all grade levels improve their mathematical reasoning and problem solving.

Manipulatives also provide students with a means to demonstrate their thinking.

Many students with LDs have strong visual reasoning, so being able to see math concepts right in front of them helps them build a deeper understanding of math.

Manipulatives also allow students to start thinking of themselves as problem solvers which helps them gain confidence in their abilities.

Digital portfolios provide students with a means to document their learning and work.

Using manipulatives and digital tools in math class may also benefit students without LDs.
Appendix B: Resources

Related Resources on the LD@school Website

- Click here to access the evidence-based summary, LDs in Mathematics: Evidence-Based Interventions, Strategies, and Resources. (http://www.ldatschool.ca/math/evidence-based-interventions-for-math/)

- Click here to access the evidence-based summary, Math Heuristics. (https://www.ldatschool.ca/math/math-heuristics/)

- Click here to access the evidence-based summary, Visual Representation in Mathematics. (http://www.ldatschool.ca/math/visual-representation/)

- Click here to access the evidence-based summary, Helping Students with LDs Learn to Diagram Math Problems. (https://www.ldatschool.ca/math/diagrammath-problems/)

- Click here to access the learning module Concrete, Representational, and Abstract Strategies for Mathematics Instruction. (http://www.ldatschool.ca/learning-modules/cra-strategies-overview/)

- Click here to access the video, Using Collaborative Teacher Inquiry to Support Students with LDs in Math. (https://www.ldatschool.ca/math/video/)

- Click here to access the recording of the webinar, Understanding Developmental Dyscalculia: A Math Learning Disability. (https://www.ldatschool.ca/math/understanding-developmental-dyscalculia-a-math-learning-disability/)

- Click here to access the answer to the question: How are LDs in mathematics typically diagnosed? (http://www.ldatschool.ca/math/ate-mathematics-diagnosed/)

- Click here to access the article, Using Straws to Help Students Understand Place Value. (https://www.ldatschool.ca/math/using-straws/)
Relevant Resources on the Internet

- Click here to visit the EduGAINS website and access the manipulatives tip sheets, in PDF. (http://www.edugains.ca/newsite/math/manipulative_use.html)

- Click here to access a tip sheet for teachers on manipulatives management, produced by the Ontario Ministry of Education. (https://www.edu.gov.on.ca/eng/studentsuccess/lms/files/ManipulativesManagement.pdf)

- Click here to access a webinar produced by the Ontario Teachers’ Federation, “Using Manipulatives for Problem-Solving in the Junior Classroom”. (http://www.otffeo.on.ca/en/learning/pd-calendar/events/using-manipulatives-problem-solving-junior-classroom/)

Thank you for watching Math Manipulatives: Tools to Help All Students Become Effective Problem Solvers and for using this viewers’ guide.

At this time, we invite you to share your thoughts and comments relating to this video; the feedback we receive will assist in the development of future videos and future content for the LD@school website.

Please click here to share your thoughts and comments by completing our short survey. (https://www.surveymonkey.com/r/Video_Math_Manipulatives)

Here is an opportunity to help out other educators!

Do you have any information on math manipulatives to support students with LDs that you would like to share with LD@school? Or do you know of a specific strategy, practice or approach that has worked well in supporting the needs of students with learning disabilities in the area of math at school?

Click here to send your ideas to info@LDatSchool.ca

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