

Webcasts for Educators
Student Achievement Division

Viewer's Guide

**Teaching Mathematics
Through a Social Justice Lens**

Multi-media resource for professional learning

reach every student



On this DVD you will find a Print and Video Resources folder which contains WMV files for PowerPoint presentations, this Viewer's Guide (PDF) and the LNS monographs *Integrated Learning in the Classroom* and *Integrated Curriculum*.

To order:

Webcasts for Educators – Teaching Mathematics Through a Social Justice Lens

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The webcast segments and related resources are also accessible online at www.curriculum.org/secretariat/justice

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“...teachers need to spend more time and energy understanding learning through the eyes of students.”

Hattie, 2009

Overview

This resource shares one school's approach to improving student learning in mathematics – an approach called “social justice math” which involves working with real numbers to solve real problems. The video follows both the job-embedded professional learning at the school as well as an actual classroom lesson. Enthusiasm, in-depth dialogue and commitment to learning are evident during these sessions, as students and teachers take on the role of co-learners.

During the professional learning session, teachers take on the role of students as they “learn the math by doing the math.” They participate in a three-part math lesson about an autism fundraiser and gain insight into the impact of their pedagogy on student learning. The principal and staff create a culture that is open to learning, invites risk taking and celebrates the collaborative building of new knowledge.

The teachers' learning is then applied in the classroom in a three-part lesson in mathematics. Students investigate fair trade, child labour and their own role as consumers and responsible citizens. Student inquiry integrates the arts, language, social studies and mathematics. They study in various groupings, learning how to work and communicate as part of a team. What they learn changes the way they think and the way they behave.

Throughout this resource, you will hear the classroom teacher, principal and students speak of the power of teaching and learning mathematics through a social justice lens. The principal speaks of empowering teachers, the teachers speak of empowering students and the students speak of their own sense of empowerment. Students begin to understand that they can each make a difference and want to spread that sense of power to their family and community.

“When schools teach for wisdom, they teach students that it is important not just what you know, but how you use what you know – whether you use it for good or bad ends ... Students learn to think wisely and understand things from diverse points of view.”

Sternberg, 2003, pp. 7-8

From Viewing to Action

As you watch the professional learning session, what evidence do you see of a collaborative learning culture? How might your observations impact your practice? You may wish to record your thinking and the connections you are making to your own practice using the organizer depicted below.

Organizer #1 – Collaborative Learning Culture

<i>Elements of a Collaborative Learning Culture</i>	<i>Evidence</i>	<i>What actions will you take to support staff in becoming a community focused on continuous inquiry and improvement?</i>
<i>Teams are continually learning how to learn together.</i>	<i>Administrators along with teachers are learners – questioning, investigating, reflecting and seeking solutions.</i>	
<i>Teams have a core of shared beliefs and values.</i>		

**NOTE: Organizer #1 is available in Word and in PDF in the Print Resources folder on the DVD.*

VIDEO SEGMENTS

What is social justice math?

(8:47)

Grade 5 teacher Alicia Gunn speaks about the power of teaching mathematics through a social justice lens. She describes her integrated approach to engaging children with real numbers and authentic scenarios that present problems relevant to their lives.

- *Comment on the views presented by this teacher.*
- *What do you see as the benefits of this approach to teaching mathematics?*
- *What do you see as potential challenges?*
- *How might you address these challenges?*
- *How might you support students in learning how to negotiate personal meaning between existing ideas and new ideas?*

Building a Collaborative Culture of Learning

Job-Embedded Professional Learning

Setting the Context

(2:26)

The principal and teacher set the context for this professional learning session. The principal briefly welcomes the staff and the teacher highlights the importance of social justice mathematics.

- *Comment on the impact this introduction plays in this professional learning session.*

“These (authentic) tasks, when strategically coordinated, present opportunities for students to: discover new ideas; develop thinking skills; synthesize understanding; transfer knowledge and skills from one subject to another; and demonstrate what they know and think about their world and themselves as learners.”

Capacity Building Series – *Integrated Learning in the Classroom*

- *Discuss the above quote in light of the approach this teacher has taken.*
- *What role do curriculum expectations and the big ideas in mathematics play in problem selection/design?*

Doing the Math

(4:29)

Please take a moment to solve the following problem in a variety of ways.

The Race for Autism Problem:

The Race for Autism event is in San Diego. Your job is to design the 60 km race course. Here is a list of what we will need on the course. Label each clearly:

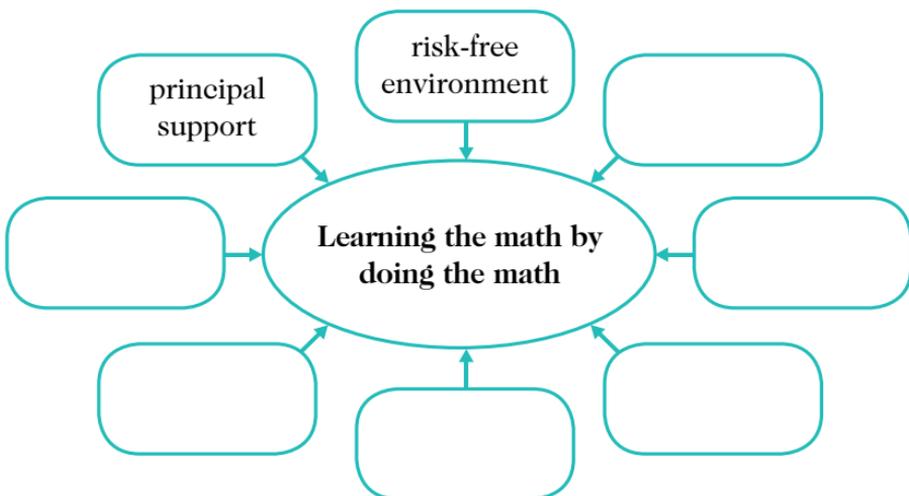
- a start line
- a hotel halfway through the course
- rest stations at every eighth of the course
- food stations at every fourth of the course
- water stations at every tenth of the course
- media stations at every fifth of the course
- kilometre markers placed along the way to indicate distance covered and distance remaining
- a finish line

- *How does solving the problem help to unpack and contribute to the development of your own understanding of the mathematics found in the problem?*

Teachers work with their math partners to “do the math.” During this experience they take on the role of students as well as teachers solving the lesson problem. Math partners continue to look through the teacher’s and the students’ lens, relating their new insights to their pedagogy and to what they know about how students learn mathematics.

- *Using the following organiser, think about the conditions that support this intense “learning the math by doing the math.”*

Organizer #2 – Conditions That Support “Learning the Math by Doing the Math”



**NOTE: Organizer #2 is available in Word and in PDF in the Print Resources folder on the DVD.*

Gallery Walk (2:33)

There are several approaches to gallery walk. This form is called a “stay and stray” strategy. One person on the team stays with the work to explain to their peers while the others circulate.

During a gallery walk, math partners examine the work of their peers, considering strategies that are similar to or different from what they used to solve the problem. During the gallery walk, participants are able to take ideas they value and use them to refine or extend their own thinking. Experiencing and debriefing the gallery walk provides teachers with insights as to the impact of this strategy on student learning.

Organizer #3 – Gallery Walk

<i>Aspects of the Gallery Walk Experience</i>	<i>Habit of Mind</i>
<ul style="list-style-type: none">• considering ideas of others• sharing ideas• altering one’s own thinking• reconsidering one’s thinking• building on the ideas of others• clearly communicating ideas in written and oral form•••	open-mindedness

**NOTE: Organizer #3 is available in Word and in PDF in the Print Resources folder on the DVD.*

- *What norms would you establish in order to set your students or staff up for a successful gallery walk?*
- *Comment on how the gallery walk experience supports the development of the habits of mind necessary for success in the real world.*
- *What opportunities for assessment does a gallery walk offer teachers as they observe their students?*

Being in the Learner’s Role

(2:30)

As teachers collaborate to solve the lesson problem, they engage in accountable talk to clarify their own thinking. Being in the learner’s role informs the teachers as to the learning challenges some students might experience. Reflecting on the problem and hearing various ways of solving the problem helps teachers unpack their mathematical understandings and the mathematics involved in the problem. These new insights help teachers improve their classroom practice.

“The biggest effects on student learning occur when teachers become learners of their own teaching and when students become their own teachers.”

Hattie, 2009

- As you view this video, record what you notice about the existing culture that permits authentic job-embedded learning.
- What actions would you take as a facilitator to help teachers articulate their own learning, so that they continue to become consciously skilled?
- What steps might you take to involve staff in collaborative, inquiry-based professional learning?

Consolidation

(4:06)

During the consolidation phase of the lesson, facilitators select key mathematical learning that they noticed in the teachers' work. Math partners share with the group their thinking with reference to their written work. During the sharing, the facilitators ask probing questions to deepen the thinking of the presenters and the class. They highlight and summarize the key points.

- How might doing the math and predicting student responses support teachers in remaining flexible during the consolidation phase of the lesson?
- How might the teacher determine whether his/her teaching has been successful?
- How might the teacher help students to determine their own success?

Teacher Reflections

(5:42)

Math partners talk about how it feels to be a doer of math. They reflect on how doing the math helps them to be more empathetic to their students.

- How do these teachers feel about being doers of math?
- How might the experience of doing the math help you give your students a voice in the mathematics classroom?
- As you watched this segment, what resonated with you?
- What actions might you take as a result of this viewing experience?

“What makes strategies successful ... teachers talking with other teachers about teaching and planning, deliberate attention to learning intentions and success criteria and ... feedback information as to the success of their teaching on their students.”

Hattie, 2009

Professional Learning Session Debrief

This collaborative learning session was focused on a problem of practice identified by the staff. Participants included the administrators, teachers, support staff and also external staff. After the session, participants met to reflect on the culture of their school, their own learning and possible next steps.

Shared Leadership

(2:48)

- *What conditions do you think need to be in place in order for a shared leadership approach to be successful?*
- *What key messages might you share with your staff that would promote shared leadership?*

Collaborative Inquiry

(2:06)

- *What do you see as the benefits of teachers assuming an inquiry stance as part of their daily practice?*

Building a Culture of Learning

(2:31)

- *How might you continue to build partnerships for learning within and beyond your school environment?*

Social Justice Math Lesson

Activating Prior Knowledge

(12:41)

The teacher sets the context for the lesson problem by activating prior knowledge about child labour and the cost of goods, minimum wage and fair working conditions. The problem becomes relevant to students when talk centres on the origin of the shoes they are wearing and the impact of their decisions as consumers. Students are actively involved in examining their shoes, noting information on a world map and then analyzing their data.

- *Comment on how this task addresses diverse learning styles.*
- *How might you broaden the scope of this inquiry at this stage of the learning?*
- *As you explore the social justice issue at hand, how might you dialogue with students in a way that avoids framing people as “the other”? How might you make students aware of the danger of this tendency so that they can self-regulate?*

Solving the Lesson Problem

(6:08)

Students work with their math partners to collaboratively solve the lesson problem. They respectfully listen to each other and record their thinking in order to share with their peers during their accountable sharing time. Students practise their math communication skills as they express their ideas orally and in written form. They check their work and try to discover the most efficient way to solve the problem. The teacher circulates and collects data to assist in determining next steps. She asks probing questions to stretch student thinking.

- *How might you help students develop their questioning skills to reflect a critical stance?*
- *Talk and interaction are essential for learning to take place. How might you ensure that the talk is on-task and the math partner interaction is pushing everyone’s learning forward?*
- *Comment on how you might help students become more aware of the relevance of their learning.*
- *Identify and discuss the dynamics that exist between the mathematics content and the social justice context.*

Accountable Talk

(4:39)

During this sharing time, students clarify their thinking and consider multiple ways of solving the lesson problem. One member of the math team stays with the work to offer explanations and receive feedback. All other math partners circulate to examine the math work of their peers. During this walk-about, students ask questions, make recommendations or gather ideas to improve their own work. The teacher walks around, listening in on the conversation and occasionally joining in to ask a probing question for clarification or to push student thinking forward. During this observation, the teacher gathers information on which students need extra support or greater challenge.

The teacher determines which students will share their work during the consolidation part of the lesson. At the end of the sharing time, partners return to their own work, discuss their findings with their partner and make adjustments based on peer feedback and their walk-about observations. They prepare to share their work with the class.

- *What lifelong habits of mind do you think this strategy helps students develop?*
- *How would you ensure that each student has a voice in this phase of the learning?*
- *How might you help students assess when ideas have substance and relevance and when they do not?*

“It is through interactions with other students as well as with the teacher, and with the opportunity to articulate their own thoughts, that students are able to construct new mathematical knowledge.”

Small, 2009

Analysis of Student Work

(11:11)

The teachers analyse student work to determine the degree of mathematical understanding reflected in the samples. The teachers select which work will be shared and in which sequence – during the whole-group, highlight or summary part of the lesson. This analysis also provides the teacher with valuable insight into the learning needs of her students.

- *Discuss the role of mathematical big ideas and curriculum expectations in supporting teacher analysis of students' work in mathematics.*
- *What advice might you give to someone just beginning to analyse student work?*
- *What questions might you ask of the work, of the student, of yourself as you analyse student work to determine next steps?*

Consolidation

(9:39)

Students come together as a whole class to discuss their new learning. They talk about what they think is fair for workers to earn in order to meet their basic needs. The teacher then invites several math partners to share their work.

“Students’ actual opportunities to learn depend not only on the type of mathematical tasks that teachers pose but also on the kinds of classroom discourse that takes place during problem solving, both between the teacher and students and among students. Discourse refers to the ways of representing, thinking, talking, and agreeing and disagreeing that teachers and students use to engage in instructional tasks.

Students develop, represent, and justify their mathematical and strategic thinking, deepening their conceptual understanding as they do so. In support of these learning processes, the role of the teacher becomes one of a ‘mathematical mediator’ who supports, probes, and negotiates valid mathematical thinking. Through questioning, the teacher aims to illuminate and clarify student thinking, and helps students identify any errors in reasoning while making sense of alternate strategies.”

National Council of Teachers of Mathematics, 2010

- *Comment on the consolidation phase of the lesson in light of the above quote.*
- *What actions would you take to ensure that students at varying stages of understanding all benefit from the consolidation phase of the lesson?*
- *From the social justice aspect of the learning, how might you help students recognize and take action against existing bias and stereotypes in our everyday language and thinking?*

Insights into Intense Learning

Student Reflections

(3:29)

Students discuss the ideas about learning mathematics through a social justice lens. They feel empowered that they as individuals can make a difference.

Having confidence and feeling empowered are states of mind that need to be balanced with a common-sense understanding of what is age-appropriate and possible.

- *What have you done or might you do to ensure that your students' learning is action-oriented with safe and attainable goals?*
- *How might you further support these students in developing the skills with which to communicate their ideas clearly and effectively?*

Teacher Reflections

(8:19)

Alicia Gunn speaks about the power of teaching mathematics through a social justice lens.

- *Which ideas from her reflections resonate with you in light of your own practice?*
- *What questions do you have that you would like to investigate further?*

Resources and Related Reading

Hattie, J. (2009). *Visible learning*. London: Routledge.

Literacy and Numeracy Secretariat. (2010). Capacity Building Series No. 14 – *Integrated learning in the classroom*.

Sternberg, R. (2003). *What is an expert “student”?* Educational Researcher, 32(8).

National Council of Teachers of Mathematics (NCTM). (2010). *Why is teaching with problem solving important to student learning?* Reston, VA.

Small, M. (2009). *Making math meaningful to Canadian students, K–8*. Toronto: Nelson Education.

Technical Instructions

How to Access the Print and Video Resources

To access the Print and Video Resources folder in Windows, insert the DVD into the DVD drive of your computer and:

1. Click on the Start menu.
2. Select My Computer.
3. Right-click the mouse on the DVD icon titled SOCIAL_JUSTICE_MATH_DVD to open a drop-down options list.
4. From the drop-down list, select and click on the Open option.
5. Double-click on the folder titled Print and Video Resources to access the files. Ignore the folders titled Audio_TS and Video_TS.
6. Select the resources you wish to use directly from this folder, OR Copy onto the Desktop and open files from the Desktop.

Alternatively, when the DVD is inserted and the options box opens:

1. Select the option Open Folder to View Files.
2. Click on the Print and Video Resources folder.
3. Select the files you wish to use directly from this folder, OR Copy the files onto the Desktop and open them from the Desktop.

To access the Print and Video Resources folder in Mac OS X, insert the DVD into the DVD drive of your computer and:

1. Exit from the DVD player (which typically opens automatically when a DVD is inserted in the drive).
2. Double-click on the DVD icon titled SOCIAL_JUSTICE_MATH_DVD
3. Select the files you wish to use directly from this folder, OR
4. Copy the files onto the Desktop and open them from the Desktop.

How to Save the Video Files to Your Computer

The video files can all be copied and saved to your computer using either of the following methods for copying and pasting files.

Method 1

1. Right-click on the file and choose the Copy option.
2. Right-click within any computer folder into which you would like to save the file, and choose the Paste option.

Method 2

1. Left-click the mouse on the file you want to save, so that the file is highlighted.
2. Simultaneously press the Ctrl and C keys (or, for Macintosh users, the Command and C keys) to copy the file.
3. Left-click within any computer folder in which you would like to save the file, and simultaneously press the Ctrl and V keys (or, for Macintosh users, the Command and V keys) to paste the file there.

For Macintosh users, the Command key is the one with the following

symbol: 

NOTE: If you want to insert video files into a PowerPoint presentation, you must save these video files in the same folder that contains your PowerPoint file. If you save a PowerPoint presentation to another location (e.g., a memory stick, CD-ROM, etc.), you must also save the video files in the same location in order for the video to play. So, if you transfer the presentation to another computer, you must also transfer the video files with it, or else the video will not link to the PowerPoint presentation.

How to Insert Video Clips (WMV files) into a PowerPoint Presentation

On this DVD, you will find WMV versions of all segments of the webcast. To insert a clip into a PowerPoint presentation, follow the directions below:

1. Open your PowerPoint program.
2. Create a new PowerPoint presentation OR open an existing PowerPoint presentation, and within it, open the slide on which you would like to add the video.
3. Insert the webcast DVD into the DVD drive of your computer.
4. If a new window opens asking how you would like to view the files on the disk, choose the option Open Folder to View Files; OR

If a new window does not open, open the My Computer window from the Start menu. In the My Computer window, double-click on the icon that is shaped like a disk, which will likely be labelled D: or E:.

5. Save the video segment that you want to insert in a PowerPoint into the same folder that contains your PowerPoint presentation.

NOTE: Video files that have been saved to your computer can be cropped and edited into smaller segments using Movie Maker (free on PCs) or iMovie (free on Macintosh).

6. Open the PowerPoint slide on which you would like to insert the video, and click on the Insert menu in the PowerPoint menu bar.
7. From the Insert menu, select Movies and Sounds, and click on the Movie from File option.
8. A window opens, prompting you to select the video file that you would like to add. Find and select the video file that you saved in step 5.
9. Once you have chosen the video file you need, another window opens and asks whether you want your movie to play either automatically when you enter the slide, or only when it is clicked. Choose your preference. (You will notice that the starting image of your movie is not displayed on the slide.)



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