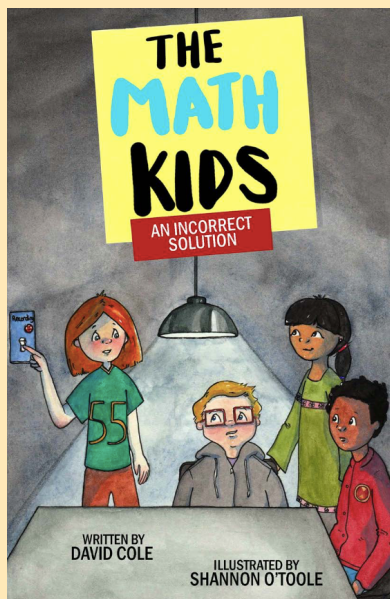


An Incorrect Solution

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Grade Level

This teacher guide is recommended for students in grades 4, 5, and 6.

About the Author

David Cole has been interested in math since he was a very young boy. He pursued degrees in math and computer science and has shared this love of math at many levels, including teaching at the college level, coaching elementary math teams, and running a summer math camp. He also has a love of writing and has written a number of plays that have been performed. *The Math Kids* was born of a desire to combine his interests and exercise both sides of his brain at the same time.

About the Illustrator

Shannon O'Toole is a Toronto based illustrator, painter, and elementary school teacher. Her playful illustration work is inspired by the unique and humorous characters in her life. Aside from illustrating books for children, Shannon has exhibited her artwork in galleries across Ontario. When she is not drawing, Shannon can be found curled up with her dog, Edgar, watching old movies.

Book Summary

Fifth grade is off to a terrible start for the Math Kids. Jordan and Justin are in a different class from Stephanie and Catherine. Worse, they have Miller the Killer for math, and he hates math! Even more troubling, Jordan witnesses Robbie, the class bully, in an angry confrontation with his father and wonders if Constable Colson might be doing more than yelling. People problems suddenly seem a lot more challenging than homework, but maybe with the right plan—and some math—the four Math Kids can find a way to deal with their classroom woes and make sure Robbie stays safe.

How to Use this Teaching Guide

The purpose of this teaching guide to *The Math Kids: An Incorrect Solution* is to help teachers take concepts from the book and create lessons and activities that allow students to engage in critical thinking and creative problem-solving.

The content of this book lends itself strongly to the math curriculum but can also be used to develop cross-curriculum lessons. Some of the lessons in this guide connect to specific chapters of *An Incorrect Solution* but the lessons/activities themselves are more generalized and can be modified to fit the strengths, interests, and needs of students.

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Adjective-itis

Grade 4 Language Arts - Reading

Lesson Summary:

In this lesson, students will learn about the use of adjectives in writing. Students will then brainstorm a list of characters from the book and create a list of adjectives that best describe each character. This lesson ties well into the Grade 4 language arts curriculum and can easily be altered to incorporate other subjects such as art or drama.

Instructions:

1. Read the first two chapters of *An Incorrect Solution* with the class.
2. After reading with the class, introduce adjectives to the students. Ask if students know what adjectives are, ask them for examples of adjectives, and explain what adjectives are and the role that adjectives play in parts of speech and text.
3. Have students create a list of characters that have appeared in the first two chapter of the book. Some characters include: Justin, Jordan, Catharine, Stephanie, Mr. Miller, Robbie Colson, and Mrs. Wilson.
4. Students can work individually or in groups. Have students choose one character and create a list of adjectives that best describe that character. Encourage students to think about what they know about the character so far and about creative/descriptive word choice.
5. Once students have created their adjective lists (of roughly 5-6 adjectives), have students or groups share their lists with the class!

Expansions and Extensions:

- Students could be asked to go back through the first two chapters of the book and highlight examples of adjectives they find. Students could determine if the adjectives are used to describe the characters or something else in the book, such as scenery. They could then add these adjectives to their lists.
- If working in groups, students could create adjective lists for all of the characters on the class created character list.
- Student could revisit their lists once the class has finished reading the book. Ask students if they would add or change any of the adjectives in their character lists. Why would they make these changes?

Technological Integrations:

- Technology could be integrated into this lesson by using Google Slides. Students can add their chosen words to a blank slide which can then be presented to the class. This would also allow the adjective lists to be saved so that students could review and edit them when they have finished reading the book.



Prisoner's Dilemma

Grade 5 Mathematics - SEL Skills in Mathematics

Lesson Summary:

In this lesson, students will recreate the activity done in chapter 3 of *An Incorrect Solution*. In this activity, students work as a team to solve the "prisoner's dilemma" problem and get the most points in the class. This lesson connects strongly with strand A of the Grade 5 mathematics curriculum which is social-emotional learning (SEL) skills as well as a variety of the math processes. This activity asks students to both communicate effectively with their group members and think creatively and critically, which is in alignment with the curriculum's SEL skills. This activity also requires students to draw on their math processing skills, including problem solving, reasoning, and proving.

Instructions:

1. Divide the class into equal groups.
2. Give each student two objects of different colours (such as poker chips).
3. Explain the rules of the game to students: there are three rounds in this game with the goal of accumulating the highest amount of points as a team.
4. Rules that can be written or projected on a whiteboard for students can be found on page 17 of the novel.
5. Give students time to make a group decision at the start of each round.
6. Have students display their choices and then keep track of the points going to each team.
7. At the end of the rounds, add up the points for each team and determine a winner.
8. Once the game is over and a winner has been determined, discuss the outcome with the class. A chart showing the best and worst options can also be found on page 23 of the novel.

Expansions and Extensions:

- Students can be given time before the game to individually think about what their best option would be. Have students make predictions on what they think they will do and what their best option would be before playing the game. After, have students revisit their predictions. Were they right or wrong? How would they change their strategy now?

Technological Integrations:

- There are numerous videos available online that discuss the prisoner's dilemma and can apply to this version of the puzzle. A video can be shown to help reinforce students' learning after the game has been played and discussed.



Here's another way to do it...

Grade 5 Mathematics - Number Operations

Lesson Summary:

This lesson is based on chapter 6 of *An Incorrect Solution* and ties into the Grade 5 number sense and number operations unit of the mathematics curriculum. In the book, Jordan and Justin's teacher, Mr. Miller, was originally opposed to letting students explore different methods of solving two and three digit multiplication problems. The book showed that this is not the best method of teaching students new skills; teachers should allow students to explore different methods of solving problems. In this lesson, students will work in small groups to discover and practice different methods of solving two and three digit multiplication problems.

Instructions:

1. After reading chapter 6 of *An Incorrect Solution*, introduce students to two and three digit multiplication problems and the methods used in the book (traditional long multiplication method and lattice method).
2. Start a class discussion; explain that there is often more than one correct way to solve a problem.
3. Encourage students to share any methods they may already know or think may work. Tell students that this is a time for them to explore different ideas and it is okay to get answers wrong.
4. Divide students into small groups and have them try to find different methods of solving two and three digit multiplication problems. Remember to stress the fact that a method is only correct if it works in all problems.
5. After giving students ample time to explore, bring them back and have another discussion. Ask students what different methods they found. Did they find or create any that didn't work? What are their personal favourite methods?

Expansions and Extensions:

- Once students have found methods that work for two and three digit multiplication problem solving, have them create posters in small groups that demonstrate how the problem is solved step-by-step, using their method. These posters can then be laminated and hung up around the classroom for students to use as reference.

Technological Integrations:

- If laptops or Chromebooks are available for students to use individually or in small groups, students can research multiplication methods online.
- Students can take pictures of their methods and upload them to a class document (using Google Slides or Google Jamboard) or to a shared class board using sites like Padlet (<https://padlet.com/>).
- In the resources section, there are a variety of links to math manipulatives that can be given to students to help them create problem solving methods.



Poetry Bookmarks

Grade 6 Language Arts and Art - Reading and Visual Arts

Lesson Summary:

In this lesson, students will create a bookmark that relates to a poem of their choosing. Students will select a poem that interests them or resonates with them and, using their knowledge of elements of writing and elements of design, will create a dynamic illustration of the poem. This activity is drawn from chapter 8 of *An Incorrect Solution* in which Mr. Miller asks his students to analyze the poem *The Road Not Taken* by Robert Frost.

Instructions:

1. Have students do some research and find a poem that they enjoy or is about a topic that interests them; some notable artists or poems could be suggested.
2. Ask students to select a poem that they feel has strong imagery. Encourage students to look for other elements of writing in their poems such as figurative language, symbolism, and allegory (as discussed in chapter 8 of *An Incorrect Solution*). If students have not worked with poetry before, these elements may need to be explained and discussed.
3. Give students a strip of cardstock paper. Instruct students to write some of the most important words of the poem on the bookmark. Encourage students to pay attention to elements of design from the arts curriculum (space and form, colour, value, space, etc.).
4. Have students create an illustration on the opposite side of the cardstock. Have students reread the poem and circle or highlight parts of the poem that use descriptive language that they could use to inspire their illustration.
5. When finished, the bookmarks can be laminated and handed back to students to use!

Expansions and Extensions:

- Students who finish quickly can be encouraged to create another bookmark. Challenge students to look at different genres or forms of poetry and how that can change the theme of their illustration.
- Students could also find another poem by the same poet and compare the second poem to the first. Does the poet's style change? What would a bookmark made about the second poem look like?

Technological Integrations:

- Students could use YouTube to look up videos of their selected poem being read aloud. Encourage students to listen to how the poem is being read. Students can listen to what words and parts of the poem are being emphasized to help them determine the most important parts of the poem that should be included in their illustration.



"Please Welcome My Next Guest..."

Grade 6 Language Arts - Oral Communication

Lesson Summary:

In this lesson, students will create a "talk show" about *An Incorrect Solution* and take on different roles to discuss themes from the novel. This book touches on a lot of topics that students may be familiar with: struggling in school, not getting along with a teacher, classroom bullies, math and math puzzles, and, sadly, abuse. This activity is a fun and creative way to hold a class discussion about students' feelings and ideas about the book as well as their interpretation of the characters' actions.

Instructions:

1. After finishing *An Incorrect Solution*, organize student roles for the talk show and create a list of characters that students could play.
2. After assigning or allowing students to choose their roles, give students time to practice. Students who don't have a role are "audience members" and can help the "host" think of questions to ask the characters.
3. After students have had time to practice and prepare (which could take a few periods or days), begin the talk show.
4. As this is an activity that allows students to discuss themes and important ideas from the book, it does not have to be as structured as other activities. Allow audience members to ask questions and voice their opinions.
5. Remember that this book does deal with examples of abuse; students should be reminded to take this topic seriously and be respectful if this topic comes up in the talk show conversation. The appendix of the novel also contains resources that can be used to discuss abuse with students.

Expansions and Extensions:

- Students could be asked to submit a question to be asked during the talk show. Encourage students to create complex questions using a Q-chart (an example of which can be found in the resource pages at the end of this document).

Technological Integrations:

- Students interested in technology could be given the chance to record the talk show as if they are a camera operator or producer, thus creating another role in the discussion.

Prisoner's Dilemma Rules from Lesson 2

- 1) *If everyone on the team selects a white chip, everyone on the team wins 10 points*
- 2) *If only one person shows a black chip, that person wins 30 points and everyone else on the team wins nothing*
- 3) *If two people choose black chips, they each win 15 points and everyone else wins nothing*
- 4) *If three people choose black chips, they each win 10 points and the remaining person wins nothing*
- 5) *If everyone on the team chooses a black chip, everyone gets zero points*

	Chip color / winnings				
Player 1	○ 10	○ 0	○ 0	○ 0	● 0
Player 2	○ 10	○ 0	○ 0	● 10	● 0
Player 3	○ 10	○ 0	● 15	● 10	● 0
Player 4	○ 10	● 30	● 15	● 10	● 0
Team	40	30	30	30	0

URL Links, Resources, and References:

Resources about Child Abuse

- <https://www.protectchildren.ca/en/>
- <https://www.canada.ca/en/public-health/services/health-promotion/stop-family-violence/prevention-resource-centre/children/child-maltreatment-what-guide-professionals-who-work-children.html>
- <https://www.redcross.ca/how-we-help/violence-bullying-and-abuse-prevention/educators/child-abuse-and-neglect-prevention/child-abuse-and-neglect-prevention-programs>
- <https://ccaa.org/>
- <https://www.justice.gc.ca/eng/cj-jp/fv-vf/ca-me.html>
- <https://kidshelpphone.ca/>

Manipulatives and Math Resources

- Toy Theatre Math Manipulatives: <https://toytheater.com/category/teacher-tools/virtual-manipulatives/>
- Mathigon Math Manipulatives: <https://mathigon.org/polypad>
- Geogebra: <https://www.geogebra.org/>
- Didax Math Manipulatives: <https://www.didax.com/math/virtual-manipulatives.html>

Two and Three Digit Multiplication Method Ideas

- <https://shelleygrayteaching.com/effective-strategies-teach-multi-digit-multiplication/>
- <https://www.mathcoachscorner.com/2013/09/alternate-strategies-for-multi-digit-multiplication/>
- <https://mathgeekmama.com/how-to-multiply-double-digits/>

Curriculum Documents

- Math (2020) Curriculum: <https://www.dcp.edu.gov.on.ca/en/curriculum/elementary-mathematics>
- Language Arts (2006) Curriculum: <http://www.edu.gov.on.ca/eng/curriculum/elementary/language18currb.pdf>
- Art (2009): <http://www.edu.gov.on.ca/eng/curriculum/elementary/arts18b09curr.pdf>

Other

- Common Deer Press: <https://www.commondeerpress.com/>
- *An Incorrect Solution*: <https://www.commondeerpress.com/an-incorrect-solution>
- Padlet: <https://padlet.com/>



Q-Chart

This Q-Chart can be used in connection to lesson five's talk show. The chart demonstrates how questions can be created using a word from the left hand column and a word from the top rows. The farther down and to the right students go, the more complex their questions will be. Give this Q-Chart to students or post it in the classroom for students to use while creating questions.

Question Creation Chart

	What (event)	Where/When (situation)	Which (choice)	Who (person)	Why (reason)	How (means)
is (present)						
did/does (past)	<i>Remembering and Understanding</i>			<i>Understanding and Applying</i>		
can (possibility)						
could (probability)	<i>Applying, Analyzing & Creating</i>			<i>Evaluating, Analyzing & Creating</i>		
will/would (predictability)						
might (imagination)						