



Welcome fellow Recovering Traditionalists to Episode 59. Today we are looking at The Harmful Effects of Algorithms.

Welcome to Build Math Minds the podcast, where fidelity to your students is greater than fidelity to your textbook. I'm your host, Christina Tondevold, the recovering traditionalist and BuildMathMinds.com Founder, where my mission is to change the way we teach elementary math to our kiddos. Are you ready to start building math minds and not just creating calculators? Let's get started.

It's hard to not just teach kids algorithms because honestly, parents are expecting you to teach that to their kids and it's also difficult if you yourself have only ever solved math problems using algorithms. But true fluency in math doesn't come just by following rules and procedures it comes from being a flexible thinker. I have an upcoming webinar where I will be giving you 3 Keys To Building Elementary Students' Math Fluency. It's all about how to help kids develop their own ways of solving problems and not be reliant upon algorithms or strategies taught by the teacher.

If you want to register for that webinar go to buildmathminds.com/webinar.

In the meantime, I thought I'd share a part of a book by one of my favorite authors, Constance Kamii, that describes why we don't want kids learning algorithms. All of Constance's books and articles are amazing, but today I'm reading from the book [Young Children Continue to Reinvent Arithmetic - 3rd Grade: Implications of Piaget's Theory](#).

Chapter 3 of the book is called The Harmful Effects of Algorithms and on page 33 she lists out 3 reasons why teaching algorithms in the primary grades is harmful:

1. *Algorithms force children to give up their own numerical thinking.*
2. *They "unteach" place value and hinder children's development of number sense.*
3. *They make children dependent on the spatial arrangement of digits (or paper and pencil) and on other people.*

Throughout the chapter she goes on to discuss each of those three and provide data to back up her claims. I'm going to share a small part about each one of those three that I found interesting as I read the book and like always I highly recommend you getting this book so you can get more detail and the book is full of great information about how to help kids build their thinking around mathematics.

On page 33 she talks about how algorithms force kids to give up on their own numerical thinking, she says:

*"When children are not taught any algorithms and are, instead, encouraged to invent their own procedure, their thinking goes in a different direction from the algorithms they are taught. For example, in addition, subtraction, and multiplication, the algorithms specify to proceed from right to left, but children's initial inventions **always** go from left*

to right. In division, on the other hand, the algorithm goes from left to right, but third graders' own thinking **always** goes from right to left."

Then on page 36 when Kamii is discussing how algorithms 'unlearn' place value and hinder their development of number sense she goes into detail about a study done where they gave 2nd graders computation problems that were written down but asked the children to solve them without paper and pencil. There were groups of kids who were in classrooms where algorithms were taught (17), kids in classrooms where no algorithms were taught (20), and kids in classrooms where some algorithms were taught (19). One problem was $7 + 52 + 186$ and she shows data about how kids attempted to solve that problem and the percentages of kids who got it correct, but on page 36 she says:

*"The important difference, however, lay in the **incorrect** answers the children gave. The dotted lines in Tables 3.1, 3.2, and 3.3 were drawn to highlight the unreasonable large and small incorrect answers the children gave. These answers revealed inadequate knowledge of place value and poor number sense. For example, two children in the 'Algorithms' class got 29 for $7 + 52 + 186$! These children added all the digits as 1s ($7+5+2+1+8+6=29$). Those who gave answers in the 900s did this by adding 7 to the 1 of the 186 and carrying 1 from the 10s column. All the incorrect answers of the 'Algorithms' class fell in the range above and below the dotted lines.*

The class labeled 'Some Algorithms' came out between the other two. The percentage getting the correct answer was 26, which was between 12% (Algorithms group) and 45% (No Algorithms group) of the other classes. The range of incorrect answers was not as outlandish as in the 'Algorithms' class but not as reasonable as in the 'No Algorithms' class, where only two outlandish answers were given, i.e. 617 and 138."

In that section she goes on to share more data of different ages of kids and also about how the way problems were written can make a difference. The spatial arrangement played a role for many kids. In the study they wrote a problem with the digits lined up vertically (like an algorithm) but then later gave the same problem but wrote it out horizontally. That's what she is meaning by 'spatial arrangement.'

To back up her final point about kids becoming dependent on the spatial arrangement of digits and on other people, on pages 47-48, Kamii writes:

*"In interviews, children in 'Algorithms' and 'No Algorithms' classes gave different reasons for not **trying** to compute an answer. Most of the reasons given in 'Algorithms' classes were: 'I need a pencil,' 'We haven't had this kind yet,' or 'I can't remember what the teacher said.' While these students revealed their dependence on pencil and paper, the spatial arrangement of digits, and other people, children who have never been taught algorithms said, 'I can't do it,' 'I don't know how,' or something else that expressed their own inability to compute the answer.*

Some children in constructivist classes indeed cannot solve certain problems. However, these children have at least not learned to be dependent on paper and pencil, the spatial arrangement of digits, and other people to solve problems. Algorithms enable children to produce correct answers, but the side effect is the erosion of self-reliance."

Teaching kids an algorithm is like having a personal trainer who lines out all your workouts for you. You become reliant upon that person to do it and you don't really know why you are doing these specific exercises together. Then when you don't have that personal trainer there to design your workouts you don't know how to do it so you might choose to not even try. If you do try to put together a series of exercises, do you know if they are the right ones that will get you to that end goal you are wanting?

Helping kids build their place value and number sense, gives them the ability to create their own ways of solving problems and helps them become self-reliant. They are not waiting on you to tell them how to solve a problem. They can use their own numerical thinking.

If you want to learn more about how to help your students do that, come join me for my [webinar](#) and also go get this book. I'll link to both over at [buildmathminds.com/59](https://www.buildmathminds.com/59)

Stay safe and stay mentally healthy.