

KIDS COUNT!

First Steps in Counting

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Republic of Mathematics



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Introduction

This book is based on years of research and experience with many children.

By sharing with you the stories of these many children, we want to help you be awesome: to help your child develop powerful skills in counting, that will serve them well for the rest of their lives.

Understanding and accepting the distilled ideas in this book takes some time and some effort. Is that effort worth it? Will you gain enough benefit that the time spent working through these ideas is worthwhile? We think the answer is: “Yes!”

You’ve picked up this book, or someone bought it for you, because you, or they, feel a need to help your child with counting. You or they want to help your child to develop strong mathematical skills, to get ahead of the game, to lay strong foundations for their future education.

In this book we place an emphasis on where your child is, and where they could move to from there. We help give you the tools to look carefully at their current counting skills, and figure how to move them to more productive and powerful ways of counting.

This might seem like a simple thing - how hard is counting after all? - but in fact it is not simple. Successful children go through many stages of counting. Many children stay stuck in

unproductive strategies. Staying stuck is not helpful as they progress in their education: poor counting skills will hamper them in most subjects and worse, will leave them feeling inadequate.

Let us help you be an awesome parent, one who listens to their kids attempts to count, who knows some things that will help, and who implements helpful means to assist their children develop more productive counting strategies. Happy, confident and skillful children are the result of this awesomeness. It's up to you to be your child's counting hero.

It's our job in writing this book to help you, the heroes, and to give you some extra tools to be as awesome as we know you are.

This book is based on a network of researchers who have studied how young children develop in their counting skills. It is based on experience with hundreds and thousands of children, teachers and parents who have contributed to this study - who form part of a network of millions upon millions of young children who, daily, learn to count and apply those counting skills in their studies and in everyday life; a network of the millions of parents and teachers who care about these young children and who want the best for them

Gary E. Davis & Catherine A. Pearn, October 2018

Chapter 1

The Importance of Counting

You want to give your child a head start in mathematics.

You can do this by helping your young child develop deeper counting skills, and deeper understanding of numbers.

At colleges and universities throughout America, and throughout the world, mathematics is the biggest stumbling block for students pursuing higher education, in all disciplines.

If you want your child - your two year old, three year old, four year old, five year old - to succeed in college later you will need to help them lay strong mathematical foundations now. These strong mathematical foundations begin with, and are based in, counting.

We help parents engage deeply with the emotional and intellectual excitement of seeing their children develop efficient numerical skills. The emotional foundations you lay in these early years, through positive feelings of success, will help your child feel confident as they progress through school mathematics and into college.

The ideas we share with are not nearly as widely known as they should be, not even to teachers. Leading educators in the U.S. and Australia have researched these ideas over the many years. Recently they have been tested in schools in the United

States, Australia, and England.

Few elementary teachers, and few college and university faculty who train new teachers, know about the profound impact of this research on young children's counting and mathematical skills.

Teachers who have been exposed to the ideas presented here have responded enthusiastically and have seen the positive impact these ideas have in children's mathematical development.

We work closely with elementary and secondary school teachers. We regularly see students in elementary school, secondary school, and in college, whose counting strategies are inefficient and unsystematic, which bog students down and make mathematics harder than it should be.

Many college students struggle with basic mathematics including algebra.

The groundwork for a deeper understanding of numbers, that underpins all later success in mathematics, lays in efficient counting strategies developed in the early years of life.

Success in obtaining a strong sense of numbers at an early age does not guarantee success at college, but it lays a solid foundation for that later success.

Children who are exposed to a variety of helpful ways of counting in the early years have a better chance of succeeding later at mathematics.

Without some help in counting, children often end up stuck in unhelpful ways of learning mathematics. This can affect their entire school and college development.

Without a firm number sense many older students are doomed to stay at the lower levels of their intended profession.

Daily we see business majors who cannot cope with algebra and calculus at a level required to understand finance.

We see engineering majors who cannot do the algebra required to succeed with calculus.

These sad facts are the basis of much of the failure of young

people in college courses - as much as 40% in some engineering courses. Too many students fail in their first choice of professional study because their mathematical skills are woefully deficient.

Teachers at all levels - elementary, secondary, and college - often do not know how to help these students, because they have not been taught the fundamentals of how young children develop numerical skills.

Teenagers and young adults need as much mathematics as they can get to succeed in most professional areas of life. The foundations of their mathematical understanding begin in the earliest years, and it is you - their parents - who can provide the necessary support.

In this book we discuss typical difficulties many children have in counting and arithmetic, and we show how parents can assist children to develop counting skills, and mathematical thinking skills.

Counting is an under-estimated skill. Some people see it as the sort of thing very young children do prior to their moving onto serious topics such as adding, subtracting, multiplying, dividing and more complicated operations with numbers. However counting is a skill that is used in many branches of mathematics, even at an advanced level. It is a skill as important and fundamental as reading, but often not emphasized with the same importance.

Recent research shows that an advanced level of counting is required if children are to be able to learn from current teaching methods in school. But most teachers do not know how to appropriately assess counting skills, and do not know how to tackle deficiencies in counting skills.

You will give your child an advantage if you learn how to assess their counting skills and help them develop more efficient ways of counting. Only then will your child be able to take advantage of current teaching methods common in all schools.

We help you assess your child's current way of counting, and assist you to help them develop the more advanced forms of counting they need to take advantage of school instruction.

Even in the earliest years of school some children find mathematics easy, and some find it hard. The gap between those who find it easy, and those who do not, seems to widen as children get older.

Those who find mathematics hard seem to have a different way of thinking about mathematics that hinders rather than helps them. A deep analysis of what some children do, and others do not, can show us a way forward in helping our children.

We will show you to help your children fulfill their potential with regard to numbers.

We will show you how to observe carefully the ways children count, and how they engage with the adult world of number.

We will show you how to listen to children, and help them progress in their numerical development.

Parents want their children to develop into capable happy adults. Learning to engage with the world of number is part of that development, and begins with children's earliest steps in counting.

We now understand that children progress through clearly defined types of behavior and thinking about counting. These types lead one into the other to a sophisticated ability to count.

Remarkably, recent research shows that many older children, teenagers, and even adults, retain a strong preference for the simpler types of counting behavior that they used in early childhood. These are limited types of counting with which they were comfortable and successful. This restricts their ability to engage more deeply with arithmetic and more advanced mathematics such as high school and college algebra.

So what you do now with your very young child will have a profound effect on their mathematical skills in later years.

We show parents how to help children progress to a more

skilled understanding of numbers.

As children develop in their ability to count, they also develop an understanding of the ways in which we express our number system in speech and writing. Initially, at an early age, this is a parallel development to a child's counting, and comes about mainly because of exposure to written and spoken numbers in a child's environment.

Gradually, around the time a child begins school, these two lines of development come together to form a child's understanding of counting and the system of numbers used by adults.

Not all children develop equally with respect to counting and ways of writing numbers. Many children develop a strong preference for visualizing concrete objects as they count. These children often do not see a need to progress to more efficient ways of counting.

Similarly, many children do not easily see, or grasp, the logical regularities in the numeration system of our culture. For example, many commonly fail to grasp the essence of the base 10 in our numeration system.

Research has shown that practice on procedures alone will not help a child develop an efficient understanding of number. To the contrary, evidence suggests that an exclusive focus on taught procedures and routines for counting, for arithmetic, and for understanding place value, lead only to failure. This is the way to produce only inflexible robots, and not supple, agile minds.

Children begin by doing things in their own way. They learn the adult culture's ways by imitation and by use in context. As in other aspects of human life, so it is in counting and arithmetic.

We will assist you to look at, and listen to, children as they take their early steps in number.

We will help you see clearly the development that is taking place, where that development fits into a larger scheme of things, and what you can do to help your child develop strong and useful numerical abilities.

Counting is an excellent example of the use of cultural tools to help children develop higher levels of awareness.

The number words “one”, “two”, “three”, “four” ... (in English) are more or less arbitrary cultural signs that a child learns to use as they carry out counting actions. These number-words come to have deeper meaning for children as they use them to count things more efficiently and productively.

Your role as parent is critical in their development as capable, mathematically proficient, young people.