

Counting by tens shows a sophistication of young children's understanding of number concepts, study finds

September 27 2023, by Patrick Lejtenyi

I have **3** dollars. I make **5** more dollars. How many dollars do I have now?

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80

Questions

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16

I have **3** dollars. I make **5** more dollars. How many dollars do I have now?

92	93	94	95	96	97	98	99	100
82	83	84	85	86	87	88	89	90
72	73	74	75	76	77	78	79	80
62	63	64	65	66	67	68	69	70
52	53	54	55	56	57	58	59	60
42	43	44	45	46	47	48	49	50
32	33	34	35	36	37	38	39	40
22	23	24	25	26	27	28	29	30
12	13	14	15	16	17	18	19	20
2	3	4	5	6	7	8	9	10

[Back to main page](#)

Questions

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16

I have **3** dollars. I make **5** more dollars. How many dollars do I have now?

2	93	94	95	96	97	98	99	100
2	83	84	85	86	87	88	89	90
2	73	74	75	76	77	78	79	80
2	63	64	65	66	67	68	69	70
2	53	54	55	56	57	58	59	60
2	43	44	45	46	47	48	49	50
2	33	34	35	36	37	38	39	40
2	23	24	25	26	27	28	29	30
2	13	14	15	16	17	18	19	20
2	3	4	5	6	7	8	9	10

[Back to main page](#)

From bottom left clockwise: bottom-up table, top-down table, bottom-up with visual cue. Credit: Table programming by André Loiselle.

Understanding how children learn to count can have profound impacts on the kinds of instructional materials used in the classroom. And the way those materials are designed can shape the strategies children use to learn, according to a new paper led by Concordia researchers.

Writing in the journal [*School Science and Mathematics*](#), the authors study how young children, mostly in the first grade, used a hundreds table to perform age-appropriate counting tasks. Hundreds tables, as the name suggests, are [charts](#) divided into rows and columns of 10, with each square containing a number from one to 100. The researchers discovered that the children who counted left-to-right, top-to-bottom outperformed children who counted left-to-right, bottom-to-top.

In this study, children used the tables on a screen to solve addition problems. One group of children used a top-down table, where the top left corner was marked 1 and bottom left corner was marked 100. Another group of children used a bottom-up, where one occupied the bottom left and 100 the top right. A third group of children used a bottom-up table with a visual cue of a cylinder next to it. The cylinder was designed to show the "up-is-more" relation as it filled with water when the numbers increased when moving up in the table.

"We found that children using the top-down chart used a more sophisticated strategy of counting by 10 and moving vertically, rather than using the more simplistic strategy of counting by one and moving horizontally," says Vera Wagner. She co-authored the paper with Helena

Osana, a professor in the Department of Education in the Faculty of Arts and Science and Jairo Navarrete-Ulloa of O'Higgins University in Chile.

The authors believe the benefits of the top-down table could be related to the way children learn to read and that they are applying the same approach to base-ten concepts.

"We were working with [young children](#), so reading instruction is likely at the forefront of their attention," says Wagner, who now teaches [elementary students](#) at a Montreal-area school. "The structure of moving in that particular way might be more ingrained."

The power of spatial configuration

Osana notes that the practice of counting by 10s rather than by ones—which is a more efficient method of arriving at the same answer—is an example of unitizing, in which multiples of one unit form a new unit representing a larger number.

"From a theoretical perspective, the study shows that the spatial configuration of instructional materials can actually support this more sophisticated understanding of numbers and the unitizing aspect that goes along with it," she says.

While the researchers are not suggesting children will automatically gravitate toward the top-down chart under every circumstance, they do think the study's results provide educators with a sense of the ways their students process numbers and addition.

"It is important for teachers to be aware of how children are thinking about the tools we are giving them," says Osana, principal investigator of the Mathematics Teaching and Learning Lab. "We are not saying that teachers have to use the top-down hundreds chart every time, but they

should think about the strategies their students are using and why they use them with one particular instructional tool and not another."

More information: Helena P. Osana et al, Spatial configuration of hundreds charts influences children's knowledge of base-ten concepts, *School Science and Mathematics* (2023). [DOI: 10.1111/ssm.12593](https://doi.org/10.1111/ssm.12593)

Provided by Concordia University

Citation: Counting by tens shows a sophistication of young children's understanding of number concepts, study finds (2023, September 27) retrieved 28 April 2024 from <https://phys.org/news/2023-09-tens-sophistication-young-children-concepts.html>

This document is subject to copyright. Apart from any fair dealing for the purpose of private study or research, no part may be reproduced without the written permission. The content is provided for information purposes only.