MIXED AGES · AN EVIDENCE-BASED ESSAY FOR PARENTS

Will Younger Classmates Hold My Eight-Year-Old Back?

In grade school, barely. Planned tutoring, not the mix, helped tutor and tutored.

15-minute read Every figure sourced below By George Weber Nothing here is for sale

You may know this table, or one close to it.

It is 7:15 on a Wednesday. The dishes are in the sink. Your six-year-old has a homework page of tens and ones, and for the third time he has written 34 where the answer is 43. His forehead is on the table now. You are at the counter with a dish towel over your shoulder, saying “look at the tens” in a voice you are working hard to keep kind.

Your eight-year-old is supposed to be doing her own page. Instead she slides off her chair, takes the change jar down from the shelf by the door, and tips out a pile of coins.

“Okay. These are dimes. Each one is ten.” She counts out four. “These are pennies.” She counts out three. “So how much?”

He counts the dimes by tens, out loud, touching each one. Forty. Then the pennies. Forty-three.

Then he asks her a question. If it’s the same two numbers, why is 34 different?

She opens her mouth, and nothing comes out. “Wait,” she says. She pushes the coins around for a while. Then, slowly: “Because the dimes are worth more. Where the number sits tells you if it’s dimes or pennies.” You can see her working it out as she says it. She had never needed to know that before.

Earlier that day, a friend told you about the small school her children go to, where six- to eleven-year-olds share one room. You heard yourself answer the way most of us would. “I don’t know. Kids should be with kids their own age. That’s how school works.”

You meant it. You still mean it.

You put the coins back in the jar, and you are not quite sure what you just watched.

Every room had a birth year on the door

Count the rooms your children have been in since they turned five. Nearly every one was sorted by birth year.

There was a kindergarten room, then a first-grade room. There was a date on the enrollment form, and a child born a week on one side of it landed a whole year apart from a child born a week on the other. The workbooks say “Grade 2” on the cover. The library shelves say it too. Almost every grown-up your child meets asks the same first question: “What grade are you in?”

So it is not strange that you said what you said. You were sorted the same way, for thirteen years. Nearly everyone reading this was.

Then school ends, and much of the sorting stops.

Some things are still keyed to age: the driver’s license, the vote, the retirement age. But look at the rooms where adults spend their days. At work, a 24-year-old sits beside a 58-year-old, and nobody thinks it is odd. The newest person picks things up from the one who has been there longest. At a family dinner, three generations pass the same dish. In a neighborhood, the teenager next door teaches your son to ride without training wheels.

A classic 1990 case for mixed-age early education, published by the National Association for the Education of Young Children, put the point plainly: “Mixed-age grouping resembles family and neighborhood groupings, which throughout human history have informally provided much of children’s socialization and education.” That is an argument, not a finding, and the same authors admitted there was as yet no evidence for what mix of older and younger children works best. But you know what it describes. You have seen it at your own table.

Why, then, were the school rooms sorted? A fair answer: grouping children by birth year made it easier to run schools for many children at once. One room, one age, one set of books, one teacher who knows what comes next. On that argument, it solved a real problem for the people running schools. Another essay in this series looks at that history.

But a design brings its assumptions along, and they come home with you.

Here is the main one. Each age needs its own lesson. When the older one helps, she loses time on her own work. And a younger child in a mixed room gets lost. You may have felt it on Wednesday, in the second before the coins came out, when part of you wanted to send your daughter back to her own page. It is there again in the hesitation when a program you are curious about puts a seven-year-old and an eleven-year-old at one table. If you teach your children at home, it can look like a planner with a column for each child, and no column for the time between them, when one might help the other.

It comes with a worry. What if I get this wrong in a way I can’t see until later? What if my eight-year-old is held back by the six-year-old? What if the six-year-old feels small next to her? What if they turn out a little odd?

Follow the assumption and the worry down together, and you reach what sat under that second on Wednesday: a sense that the sorting itself is part of how children learn. That each child learns best among children the same age, and if you take the birth year off the door, something important leaks out.

That makes sense. It is what a careful person thinks after thirteen years of rooms with a birth year on the door. The assumption came with the design. It is not a flaw in you.

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What the belief gets right

Say the belief the way you said it to your friend.

Kids should be with kids their own age. That's how school works.

There is real truth in it. Three parts of it hold up.

Children need friends near their own age. An eight-year-old wants someone who laughs at the same jokes and is reading the same books. Nothing here argues against that. Friendship and social life have their own essay in the main series, and this one leaves them there.

Age changes how you teach. Your six-year-old needed the dimes. Your eight-year-old could take the rule, once she had worked out how to say it. Explaining place value to both of them in the same words, at the same speed, would not work for either one. Age is a fair first guess about what a child is ready for.

It is right to doubt that mixing ages, by itself, makes children learn more. A room of mixed ages can go badly. The older child can get bored, or quietly turned into the unpaid helper. The younger one can get lost, or bossed around. If someone tells you that simply putting ages together is the answer, you are right to ask for evidence.

Hold on to all three. Nothing below asks you to let go of them.

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Where your worry is right

Start with the worry itself. If mixing ages has costs, who pays them?

The clearest answer comes from preschool, and it lands on the older children. In a national study of Head Start preschools, researchers followed 1,644 three-year-olds and 1,185 four-year-olds through a school year. The four-

year-olds in rooms with more three-year-olds made smaller academic gains that year. The authors put the gap at about 4 to 5 months of academic development. The three-year-olds were not clearly helped or hurt. As reported by Education Week, an earlier preschool study pointed the same way: wider age spreads went with weaker development, though its authors suggested a curriculum built for mixed rooms could make them as good or better.

That is close to your worry, seen in preschool rooms: more younger children in the room went with smaller gains for the older ones.

But a follow-up study of the same kind of classroom found a pattern worth knowing. When the teacher had more education, the older children's lag in literacy did not show up. The authors put it this way: "mixed-age classrooms taught by a teacher with higher education were not associated with decreased literacy gains among older children." The measure was preschool teachers' own schooling, and nobody should read it as a test a parent has to pass. What it hints at is narrower: something about the adult in a mixed room seemed to matter. It is not a simple recipe, either. The same study found that its measure of classroom quality told less about children's skills in mixed rooms than in sorted ones.

Combined classes show up in ordinary schools too, often formed because the numbers did not divide evenly. A RAND study of Los Angeles students in grades 3 to 5 found that children in combined-grade classes, in both grades of the pair, scored slightly lower, more so in math. The largest gap was about a tenth of a standard deviation. (A standard deviation is a yardstick for how spread out children's scores are.) In the authors' words, "the effect sizes, while statistically significant, are not of substantive significance."

None of these studies assigned children to rooms by chance. Still, the pattern is worth taking seriously.

So your worry about the eight-year-old was not foolish. In preschool rooms, it has evidence behind it. In ordinary elementary classes the evidence is fainter: the costs found were small, and they did not fall especially on the older grade.

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No worse, and no better

Go back to the sentence you said to your friend. *Kids should be with kids their own age.* If the sorting itself were doing much of the work, you might expect sorted classes to come out ahead.

In 1995, the researcher Simon Veenman gathered studies that compared elementary classes mixing grades or ages with single-grade classes. On achievement, he found no consistent difference either way. The typical difference was about zero.

Read that both ways. Mixed rooms did not go with more learning. Sorted rooms did not go with much more either. Across many classes, the two came out about the same. Two researchers answered a year later that the even result may hide a small cost in mixed-grade classes as schools usually form them, and that argument is still open.

So the sorting, on its own, seems to add little to how much children learn, on average. What happens inside the room may matter more. Your Wednesday is a picture of that, not proof: your son got from 34 to 43 when his sister picked up the coins and showed him, then had to find the words for why. The studies that test that kind of teaching come next.

The mix of ages doesn’t do the teaching. The teaching does.

Here is what that sounds like in your own words:

Same-age friends, yes. But when my two sit down together, their ages aren’t the question. The question is what one is explaining to the other, and how I set it up.

The parts of the old belief that were true are still true. Your six-year-old needs friends who are six. He needs things explained in six-year-old ways. What has moved is the idea that the sorting does much to keep his learning on track, or that a room with older children in it is a risk by its nature. The gain, like the risk, seems to live in what happens when the ages meet.

So what does happen when they meet, and to whom?

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When tutoring is planned

One thing to say once, before the studies. Every study from here on ran in a school, a lab, or a community that researchers watched. None ran at a family table. What may carry over to yours is the shape of what happened, and the shape is worth knowing.

First, a distinction that matters for everything after it. Two different things get called “mixing ages.”

One is a **mixed-age class**: several ages share a room, with one teacher. The other is **cross-age tutoring**: a planned program in which an older tutor works with a younger child, on set material, at set times. A result from one does not stand in for the other. This section is about the second.

In 2025, a team of researchers pooled about 30 studies of planned cross-age tutoring programs in reading and math. Most of the children being tutored were in the first three grades of school. The review asked how much each side gained, compared with similar students outside the programs.

Both sides gained.

The children being tutored gained a small-to-moderate amount: about a third of a standard deviation. Put another way, the average tutored child scored about where the 63rd child of 100 in the comparison group did. That is our arithmetic, not the authors'.

The tutors gained about as much as the children they helped. Fewer studies measured the tutors, 14 of them, so that side is less certain.

Who were the tutors? In about half the programs, students in grades 5 through 12. In the rest, adults: university students and community volunteers.

That tutors gain too is an old finding. A 1982 review of 65 school tutoring programs found that the tutors, like the children they helped, understood the subject better and liked it more, though neither group's self-esteem changed much.

A smaller review, of 16 articles that measured only tutors, found they did best when tutoring classmates their own age, without trading roles. That is a pattern across a few studies, not a rule, but it hints that what helps the tutor is the teaching, not just being the older one. The same review also found that tutors in secondary school did better than younger tutors, so it says little about an eight-year-old.

The UK's Education Endowment Foundation, which sums up school research for teachers, counts peer tutoring among its better-evidenced approaches, and it attaches conditions. Tutoring seems to work best when the tutors are trained, which the foundation calls essential; when sessions go over what a child has already been taught, not brand-new material; and when they are regular and frequent, in blocks of weeks rather than long programs. In cross-age tutoring, some studies found an age gap of under three years worked best. These are the foundation's guidance, and the reviews above do not all agree: the 2025 review found no clear difference by number of sessions, and the review of tutors did not find that more training went with bigger gains for them.

Hold those conditions up to your own table. Your two are two years apart, and his homework page was on something he had already been taught. But nobody had shown your daughter how to help him, and training is the condition the foundation calls essential. It was one Wednesday, not a regular session. And the tutors in that 2025 review were older than she is, or adults.

Which leaves the question your Wednesday raised. When your daughter put down her own page and picked up the coins, what was she getting out of it?

Why explaining sticks to the explainer

Go back to your daughter’s “wait.”

She had used place value for years without having to say why it worked. Then someone asked her. That pause, where she had to find the answer and put it in order for someone else, is one place researchers think the tutor’s gain may come from.

The cleanest experiments here are with adults, not children. In two lab experiments, Logan Fiorella and Richard Mayer had adult students learn a short science lesson. Some only studied it. Some prepared to teach it. Some prepared and then actually taught it, by recording a brief video lecture. In the experiment that tested students a week after the lesson, only the ones who had actually taught came out clearly ahead of those who only studied, and by a large margin. Getting ready to teach, without teaching, had not kept a clear edge.

A review that pooled 28 studies of this kind, mostly with university students, fills in more of the picture. Students who got ready to teach learned somewhat more than students who simply studied, without expecting to teach. The studies of actually teaching showed a larger average gain, a moderate amount. And the studies where the teaching was live and two-way, with questions going back and forth, tended to show larger gains.

It does not always work, and the researchers who know this work best say so. Left alone, people who teach tend to recite the material back rather than explain it. Fiorella calls this a “knowledge-telling bias.” Picture a child who reads the page aloud to her brother: that is the reciting kind. To gain, the one teaching has to know the thing well enough to explain it, and needs support turning “because” into a real reason. Nerves about teaching wear the benefit down too.

Why does explaining help at all? Researchers still debate it. One leading idea is that explaining makes you pull what you know out of memory and put it in order. Pulling things out of memory has an essay of its own in the main series (“But She Understood It Yesterday”).

No study we found tested an eight-year-old with a jar of coins. What may carry over is the shape. In these studies, the gain tended to be larger for actually explaining than for just getting ready to, and larger again when someone could ask back. On Wednesday, someone did.

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When the ages meet

So far, this has been about the one doing the teaching. When the ages meet, the younger child gets something too: help with what he can’t yet do alone. The evidence for it comes from watching, not testing.

At one ungraded school in Massachusetts that families chose for their children, two researchers recorded 196 everyday encounters between adolescents (12 to 19) and children at least four years younger (4 to 11). Nobody arranged these meetings. The researchers watched the older ones help the younger ones do things just beyond their reach: things a child can do with a little help but not yet alone. And, the researchers concluded, the children pushed the adolescents “to make implicit knowledge explicit, be creative, and practice nurturance and leadership.”

To make implicit knowledge explicit. That sounds a lot like the “wait” at your table.

Far from Massachusetts, a researcher watched and filmed children in Maya families in southern Mexico, where caring for younger brothers and sisters is expected. Children as young as four began teaching their toddler siblings everyday tasks. By about eight, they were skilled teachers. They talked, showed with their hands, gave feedback and explained.

The developmental psychologist Barbara Rogoff has a name for the wider pattern: “Learning by Observing and Pitching In.” Children watch closely and gradually join the real work going on around them, in their families and communities.

On Wednesday, your six-year-old was the one reaching up. He reached for forty-three with his sister’s coins. Then he asked why 34 was different, and his question is what made her find the words.

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The same table, a year on

It is 7:15 on a Wednesday, a year from now. The dishes are still in the sink. That part did not change.

The change jar lives on the table now.

A few nights a week, for fifteen minutes, your daughter, nine now, goes over a page your son has already been taught. Back at the start, you showed her how: let him try first, then ask him to say why. Tonight you are at the counter, close enough to hear. She has a small card, and on it she writes one thing he got stuck on. You read it at bedtime. One card says, *Forgets the zero in 40.* A later one says, *Got it. Asked why 100 has two zeros.* The cards tell you more than his worksheets do.

When he asks her a “why” she can’t answer, she says, “Wait.” Sometimes she works it out. Sometimes she says, “Let’s go ask,” and they both come to the counter. Both are allowed.

Then the fifteen minutes are over, and she goes back to her own page, which is hard for her. That part is hers. Nobody is spending it on anyone else.

Your friend asks again about the room where six- to eleven-year-olds share a table. You still say children need friends their own age. Then you ask a better question: “What happens when the big ones and the little ones meet? Who plans it, and who’s watching?”

At the table, your son pushes four dimes across to his sister and asks why the tens get written first.

She says, “Wait.”

You don’t step in. You have learned to wait too.

ABOUT THE WRITER

Who wrote this, and why

My name is George Weber. My wife, Jaclyn, and I have five children, all under eleven.

My second son is Jordy. When he was seven, we sat at the kitchen table after dinner, and I asked him to explain why reading and discussion were so hard. This is a boy who will stand at a workbench for hours without looking up. He taught his little brother and sister to ride a bike, and then to use a screw gun. He builds things I could not build. That night he kept his head down. Twice, all he gave me was “I don’t know.” Then he said it:

> “I’m just not good at school.”

He was not describing a difficulty. He was describing himself.

Here is the part I would rather not say. I had seen it coming for a while. That night I was interrogating a seven-year-old for a reason he did not have, when what he was really carrying was shame. And I kept sending him, because I could not see what else to do.

For years, Jaclyn had told me the truth about the other option. She would not become the entire staff of a school with five children in it, and if we did this, I would have to free at least fifteen hours a week. She was right on both counts, and I could not find the hours. So I know the arithmetic in these essays from the inside.

Before this work, I made more than $4 million building six personal-training studios. I have stepped away from them. I have given the next twenty years to two things: helping parents make the right choice for their own children, whatever that choice turns out to be, and helping lead what I believe is a coming change in how families educate their children.

I am not an academic. The research in these essays belongs to the people named in the sources. My job was to read it carefully and tell you what it says, and what it does not. That is why every essay ends with what it does not claim.

I wrote them for the parent I was that night at the kitchen table.

George Weber

FATHER OF FIVE

READ NEXT

Age Sets the Floor. Readiness Sets the Pace

If the birthday has been deciding more than it should in your house, the next essay asks what it should decide about freedom

WHAT THIS ARTICLE DOES NOT CLAIM

- **It does not show what happens at a family table.** Every study here ran in schools, preschools or labs, or watched communities. No study we found tested this at home, or showed that unplanned help between siblings brings the gains of planned tutoring. What we suggest for a family is reasoning from those studies, not a result.
- **It does not show that mixing ages raises achievement.** Mixed and single-grade classes came out about even, and the critique that this hides a small cost is still open.
- **It does not show how young a tutor can be.** The tutoring review's tutors were fifth graders and up, or adults. A review we read describes one learning-by-teaching study in which 4- and 5-year-olds explained solutions to their mothers, but none we found tested a child teaching a sibling at home.
- **It does not show that learning by teaching works the same way for children.** That research is mostly adults in labs, teaching one short lesson, and the researchers describe the benefit as conditional.
- **It does not show how much a younger child gains from an older child, rather than from an adult.** Planned tutoring did measure gains for the children being tutored, but about half the programs used adult tutors, and the pages we read give no separate figure for child tutors. Unplanned meetings between older and younger children rest on observation only: one ungraded school that families chose, where more than half of students' social interactions spanned gaps of over two years, and one culture where sibling care is expected. No comparison group, no measured gain.
- **It does not show that mixed rooms hold older children back everywhere.** The cost evidence is observational and mostly from low-income preschool rooms (one study known to us only through an Education Week report). The one elementary study, a working paper, found only small gaps.
- **Montessori** classrooms keep three ages together. Montessori is the most-tested alternative, with modest positive effects on average that are clearest in the early years. No one can say how much comes from any single feature, such as mixed ages.
- **Nothing here is a claim about social skills or friendship.**
- Percentiles are our arithmetic. The table, the change jar and the year-on routine are illustrative composites; the routine is reasoning, not a tested method.

SOURCES

- Chang, A., Mauer, E., Wanzek, J., Kim, S., Scammacca, N., & Swanson, E. (2025). Examining the academic effects of cross-age tutoring: A meta-analysis. *Educational Psychology Review*, 37, Article 19. Meta-analysis of planned cross-age tutoring programs, K–12 reading and math (32 studies in the abstract, 31 in the limitations; tutees mostly grades 1–3; tutor outcomes from 14 studies; about 47% of studies used students in grades 5–12 as tutors, the rest adult university students or community volunteers). Tutees about 0.33, tutors about 0.39 of a standard deviation versus comparison students; intervals overlap; difference not tested, so the review does not show tutors gain more. Whether the 14 tutor-outcome studies used child or adult tutors is not stated in the pages read; the grade-5 floor is inferred from the reported percentages. Tutee results varied a good deal from study to study. Its moderator tests found no significant differences in impact by number of sessions, tutor type, tutee risk status or subject area. Mostly US studies. READ LEVEL: publisher article page (abstract plus body excerpts). Accessed 2026-10-04. https://doi.org/10.1007/s10648-025-09997-z
- Cohen, P. A., Kulik, J. A., & Kulik, C.-L. C. (1982). Educational outcomes of tutoring: A meta-analysis of findings. *American Educational Research Journal*, 19(2), 237–248. Meta-analysis, 65 evaluations of school tutoring programs. Paraphrased from the abstract (tutors "gained a better understanding of and developed more positive attitudes toward the subject matter"). READ LEVEL: abstract only. Accessed 2026-10-04. https://doi.org/10.3102/00028312019002237
- Leung, K. C. (2019). An updated meta-analysis on the effect of peer tutoring on tutors' achievement. *School Psychology International*, 40(2), 200–214. Meta-analysis, 16 articles; weighted mean effect for tutors 0.43; same-age, non-reciprocal tutoring the best arrangement for tutors (moderator result); the same moderator results also favored tutors from secondary school, and went with fewer and shorter training sessions, which pulls against EEF's view that training is essential. Comparison groups are not described in the abstract. READ LEVEL: abstract and publisher page. Accessed 2026-10-04. https://doi.org/10.1177/0143034318808832
- Education Endowment Foundation (updated May 2025). Peer tutoring. *Teaching and Learning Toolkit*. Evidence synthesis of school studies, mostly UK and US; conditions paraphrased (training for tutors essential; review rather than new material; regular sessions, 4 to 5 times a week for up to 10 weeks, over less intensive or longer programs; in cross-age tutoring, some studies found a gap under three years best). These are EEF guidance, not findings of the reviews above; Chang 2025 found no significant difference by number of sessions. EEF also cautions that evaluations run by organizations connected with a program tend to show larger impacts. Months figure not used (a conversion for comparing approaches, not growth measured in any child). READ LEVEL: publisher page. Accessed 2026-10-04. https://educationendowmentfoundation.org.uk/education-evidence/teaching-learning-toolkit/peer-tutoring
- Fiorella, L., & Mayer, R. E. (2013). The relative benefits of learning by teaching and teaching expectancy. *Contemporary Educational Psychology*, 38(4), 281–288. Two lab experiments with adult learners; "teaching" was a brief video-recorded lecture, with no one in the room. Experiment 1 tested immediately, and both the preparing and the teaching groups outperformed study-only; Experiment 2 was a separate group tested after one week. One-week delayed test: teaching vs study-only d = 0.79; preparing vs study-only d = 0.24 (not significant). READ LEVEL: abstract (publisher page). Accessed 2026-10-04. https://doi.org/10.1016/j.cedpsych.2013.06.001
- Kobayashi, K. (2019). Learning by preparing-to-teach and teaching: A meta-analysis. *Japanese Psychological Research*. Meta-analysis, 28 studies, mostly university students: preparing to teach g = 0.35; teaching with preparing to teach g = 0.56; larger with interactive teaching (a pattern across pooled studies; the abstract does not report a test of the difference between the two pooled estimates). READ LEVEL: abstract excerpt on an indexing page (publisher page refused). Accessed 2026-10-04. https://doi.org/10.1111/jpr.12221
- Kobayashi, K. (2019). Interactivity: A potential determinant of learning by preparing to teach and teaching. *Frontiers in Psychology*, 9, 2755. Review and reanalysis of prior studies, mostly university students; source of "conditionally effective" and of the point that, "at least under certain conditions, students scarcely, if at all, benefitted from studying with the expectation of teaching others." It also describes a few studies with young children, including Rittle-Johnson et al. (2008), in which 4- and 5-year-olds explained solutions to their mothers; that study was not read here. READ LEVEL: full text. Accessed 2026-10-04. https://doi.org/10.3389/fpsyg.2018.02755
- Kobayashi, K. (2022). The retrieval practice hypothesis in research on learning by teaching: Current status and challenges. *Frontiers in Psychology*, 13, 842668. Theoretical review; the retrieval account is one leading explanation, still debated. READ LEVEL: full text. Accessed 2026-10-04. https://doi.org/10.3389/fpsyg.2022.842668
- Fiorella, L. (2023). Learning by teaching. In *In Their Own Words: What Scholars and Teachers Want You to Know About Why and How to Apply the Science of Learning in Your Academic Setting* (Society for the Teaching of Psychology). Practitioner review by the lead researcher: the "knowledge-telling bias"; the need for "sufficient domain and strategic knowledge to make sense of the learning material"; anxiety about teaching as a limit. READ LEVEL: full text. Accessed 2026-10-04. https://www.unh.edu/teaching-learning-resource-hub/sites/default/files/media/2023-06/itow-learning-by-teaching-fiorella.pdf
- Gray, P., & Feldman, J. (2004). Playing in the zone of proximal development: Qualities of self-directed age mixing between adolescents and young children at a democratic school. *American Journal of Education*, 110(2). Observational; 196 naturally occurring interactions between adolescents

(12–19) and children (4–11) at least four years younger, at one ungraded, self-selected school (Sudbury Valley, Massachusetts); no comparison group. Quoted from the abstract. READ LEVEL: abstract (publisher page). Accessed 2026-10-04. https://doi.org/10.1086/380572

- Maynard, A. E. (2002). Cultural teaching: The development of teaching skills in Maya sibling interactions. *Child Development*, 73(3), 969–982. Observational (filmed sibling interactions), Zinacantec Maya families, Chiapas, Mexico; children teaching toddler siblings from about age four, skilled by about eight. Paraphrased; no figures used. READ LEVEL: abstract (publisher page). Accessed 2026-10-04. https://doi.org/10.1111/1467-8624.00450
- Gray, P. (2011). The special value of children's age-mixed play. *American Journal of Play*, 3(4), 500–522 (ERIC EJ985544). Narrative review plus the author's observations at the same school; "more than half of the social interactions among students spanned age gaps greater than twenty-four months." One self-selected school; the article does not discuss risks. READ LEVEL: full text. Accessed 2026-10-04. https://files.eric.ed.gov/fulltext/EJ985544.pdf
- Rogoff, B. (2014). Learning by observing and pitching in to family and community endeavors: An orientation. *Human Development*, 57(2–3), 69–81. Conceptual review of observational research. Used for the named term only. READ LEVEL: abstract (publisher page). Accessed 2026-10-04. https://doi.org/10.1159/000356757
- Katz, L. G., Evangelou, D., & Hartman, J. A. (1990). *The Case for Mixed-Age Grouping in Early Education*. National Association for the Education of Young Children (ERIC ED326302). Narrative review and argument, early childhood; quotation from p. v. The authors also write (p. 42) that "there is at present no empirical basis on which to predict what proportions of older to younger children within a class are optimal." READ LEVEL: full text. Accessed 2026-10-04. https://files.eric.ed.gov/fulltext/ED326302.pdf
- Randolph, J. J., et al. (2023). Montessori education's impact on academic and nonacademic outcomes: A systematic review. *Campbell Systematic Reviews*, 19(3), e1330. Systematic review and meta-analysis, 32 studies; effects belong to the whole method (Lillard is a co-author). No figures used here. READ LEVEL: abstract and plain-language summary. Accessed 2026-10-04. https://doi.org/10.1002/cl2.1330
- Ansari, A., Purtell, K. M., & Gershoff, E. T. (2016). Classroom age composition and the school readiness of 3- and 4-year-olds in the Head Start program. *Psychological Science*, 27(1), 53–63. Observational, nationally representative Head Start cohort (FACES 2009); 1,644 three-year-olds, 1,185 four-year-olds; gap for four-year-olds put by the authors at "4 to 5 months of academic development." READ LEVEL: abstract (publisher page). Accessed 2026-10-04. https://doi.org/10.1177/0956797615610882
- Purtell, K. M., & Ansari, A. (2018). Classroom age composition and preschoolers' school readiness: The implications of classroom quality and teacher qualifications. *AERA Open*, 4(1). Observational, Head Start, 2,829 children in 486 classrooms. Quoted from the abstract. Also found classroom quality less predictive of children's skills in mixed-age rooms, so "quality" is not a simple lever. READ LEVEL: abstract (publisher page). Accessed 2026-10-04. https://doi.org/10.1177/2332858418758300
- Moller, A. C., Forbes-Jones, E., & Hightower, A. D. (2008). *Journal of Educational Psychology*, 100(4). Observational, preschool classrooms; wider age spreads went with weaker development, though the authors still suggested mixed-age rooms with fitting curricula could be as good or better. No figures used. READ LEVEL: secondary report only: Education Week, "Mixed-Age Classes" (December 2008); paraphrased, not quoted. Accessed 2026-10-04. https://www.edweek.org/policy-politics/mixed-age-classes/2008/12
- Mariano, L. T., & Kirby, S. N. (2009). *Achievement of Students in Multigrade Classrooms: Evidence from the Los Angeles Unified School District* (RAND Working Paper WR-685). Observational administrative panel, 2003–2007, just over 380,000 students in grades 3–5; effects from about −0.01 to −0.04 SD in reading and −0.03 to −0.09 SD in math; "not of substantive significance." Working paper, not peer reviewed. READ LEVEL: full text. Accessed 2026-10-04. https://www.rand.org/content/dam/rand/pubs/working_papers/2009/RAND_WR685.pdf
- Veenman, S. (1995). Cognitive and noncognitive effects of multigrade and multi-age classes: A best-evidence synthesis. *Review of Educational Research*, 65(4), 319–381. Best-evidence synthesis, elementary classes; median achievement difference .00 (multigrade vs single-grade) and −.03 (multi-age vs single-age); noncognitive effects small, with the multi-age ones called "inconsistent." Multi-age classes formed on purpose also came out about even. The abstract does not describe the designs of the included studies. Quoted from the abstract. READ LEVEL: abstract (publisher page). Accessed 2026-10-04. https://doi.org/10.3102/00346543065004319
- Mason, D. A., & Burns, R. B. (1996). "Simply no worse and simply no better" may simply be wrong: A critique of Veenman's conclusion about multigrade classes. *Review of Educational Research*, 66(3), 307–322. Critique naming "(a) selection bias and (b) lower-quality instruction"; concludes "at least a small negative effect on achievement" for multigrade classes. READ LEVEL: abstract (publisher page). Accessed 2026-10-04. https://doi.org/10.3102/00346543066003307
- Illustrative composites: the Wednesday homework table and change jar, the friend's description of a mixed-age room, and the same table a year on. No real family is described.