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Most Americans born since the mid-1960s have a favorite "Sesame Street" skit. Jennifer Kotler Clarke watched hers on a black-and-white television set in her family's Bronx apartment. There were two aliens: One of them had long arms that didn't move, while the other had short, moving arms. The aliens wished to eat apples from a tree, and they succeeded, after a couple of minutes, by working together. "Let's call this cooperation," one of them says. "No," the other replies, "let's call it Shirley."

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grade level for their age, an effect that is particularly pronounced among boys, African Americans and children who grow up in disadvantaged areas.

Clarke grew up to be the show's vice president for research and evaluation, and she has long believed that the program's laughs and lessons stick with children. Now, landmark academic research appears to back her up.

The most authoritative study ever done on the impact of "Sesame Street," to be released on Monday, finds that the famous show on public TV has delivered lasting educational benefits to millions of American children – benefits as powerful as the ones children get from going to preschool.

The paper from the University of Maryland's Melissa Kearney and Wellesley College's Phillip Levine finds that the show has left children more likely to stay at the appropriate

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After “Sesame Street” was introduced, children living in places where its broadcast could be more readily received saw a 14 percent drop in their likelihood of being behind in school. Levine and Kearney note in their paper that a wide body of previous research has found that Head Start, the pre-kindergarten program for low-income Americans, delivers a similar benefit.

The researchers also say those effects probably come from “Sesame Street’s” focus on presenting viewers with an academic curriculum, heavy on reading and math, that would appear to have helped prepare children for school.

While it might seem implausible that a TV show could have such effects, the results build on Nixon-era government studies that found big short-term benefits in watching the show, along with years of focus-group studies by the team of academic researchers who help write “Sesame Street” scripts. Several outside researchers have reviewed the study, and none are known to have questioned its results.

The new findings offer comforting news for parents who plopped their children in front of public TV every day and/or memorized entire Elmo DVDs, unwittingly.

They also raise a provocative question, at a time when many lawmakers are pushing to expand spending on early-childhood education: Do kids need preschool if a TV show works just as well?

Yes, say the economists – and the “Sesame Street” educational team. Head Start, Kearney and Levine write, was designed to provide more than an academic boost: It delivers family support, medical and dental services, and development of emotional skills that help kids in social settings.

Levine and Kearney see the study as a clear lesson in the value of a (very cheap) mass-media complement to preschool. The potentially controversial implication they embrace from the study isn’t about early-childhood education. It’s about college, and the trend toward low-cost massive open online courses, or MOOCs.

“Sesame Street,” Levine and Kearney write, was the original MOOC. “If we can do this with ‘Sesame Street’ on television, we can potentially do this with all sorts of electronic communications,” Kearney said in an interview. “It’s encouraging because it means we might be able to make real progress in ways that are affordable and scalable.”

The research can’t say whether the show continues to deliver such high benefits to children, said Diane Whitmore Schanzenbach, an economist at Northwestern University’s School of Education and Social Policy, who has read drafts of the paper and given feedback to the authors.

But, she said, it clearly shows “the importance of childhood education, which is really having its moment right now.”

The economists’ study was brought to you, so to speak, by the letters U, H and F.

“Sesame Street” debuted in 1969 with a diverse cast of humans and brightly colored fuzzy Muppets, including Oscar the Grouch, Bert and Ernie, and, of course, Big Bird. It was the country’s first explicitly educational children’s program, and it was an immediate hit: In the early 1970s, one-third of all American toddlers watched it.

That’s a Super Bowl-level audience share. But it’s even more striking because another third of the nation’s toddlers couldn’t have watched the show if they wanted

to – they didn't have the right kind of antenna to tune in to their local public television station.

This was well before the popularization of cable. TV broadcasts arrived over the air, on two different kinds of signals. The higher-quality signal was known as VHF, or Channels 1 to 13 on a standard TV set. The lower-quality signal was called UHF, and many households at that time were unable to tune it in. By a quirk of federal licensing, the public broadcasting channels in many major cities, including New York and Boston, aired on VHF channels, while others, including Los Angeles and Washington, aired on UHF.

As a result, about two-thirds of the nation's households were able to watch "Sesame Street." The other third weren't.

Levine read about that divide in early 2014. He realized it was the sort of rare natural experiment that economists live for – two groups of people, divvied up by fate and the Federal Communications Commission, who could be compared over time to see whether there was a difference in their educational outcomes.

"It's econometrically phenomenal," he said, "because it's essentially random, who had UHF and who had VHF."

Levine and Kearney pinpointed which cities had high or low levels of access to the show. Then they used census data to track children from those cities throughout school, to see whether they were staying at grade level. They couldn't study individual people, or even determine whether people in particular areas watched the show. But they found a large and statistically meaningful effect on the educational progress of children who, because of where they lived, were much more likely to be able to watch. (The effect appears to fade out before high school graduation, they also found.)

"Sesame Street" writers design their shows to have those effects.

From the start, the program rooted its scripts in an academic curriculum designed to help children – particularly low-income urban kids – prepare for school.

At first the writers focused on basics: letters, numbers, cooperation. Over the decades they expanded to incorporate research on what children needed to succeed in the classroom and in life. "We're constantly changing the show, for good reasons," said Rosemarie Truglio, the senior vice president of global educational content at Sesame Workshop.

When writers wanted to emphasize science learning, Truglio said in an interview in "Sesame Street" offices just off Central Park in Manhattan, they turned the inquisitive monster Super Grover into a one-Muppet embodiment of the scientific method.

When they realized that media-soaked children needed more help paying attention and controlling impulses, they decided to make an example out of Cookie Monster – the googly-eyed character who famously cannot resist sweets.

"As an educator, I was a little worried about that," Truglio said. "Because he was going to fail, a lot." Then she realized that was the point: Children needed to see someone struggle with the attention issues they struggle with, and try multiple techniques to overcome them. In one recent skit, modeled on the "Karate Kid" movies, Cookie Monster needs three tries to learn a special move from his sensei, but he finally masters listening with his whole body and, as a reward, he earns a

cookie belt.

Which he eats.

“Sesame Street” researchers aggressively test their shows via focus groups to see what works. Their success, they said, rests on a simple formula that wraps education in entertainment, harnessing the power of human narrative. They said the approach could easily extend to college students – to MOOCs – as well as preschoolers.

“Storytelling is critical,” Clarke said. “If you organize information in storytelling, children are more likely to learn it. And adults are, too.”

Like Clarke, Kearney grew up loving “Sesame Street.” (Levine, her co-author, was of school age when the show hit the air.) Kearney remembers running through her house with her sisters, singing a Big Bird song about the alphabet. Her favorite character was the Count – the one who most resembled an economist. –

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