Watch and Learn

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Children's educational television has had a successful beginning and middle, but as it extends its lessons through the Internet and classroom activities, will it help kids live happily ever after?

In the early 1970s, graduate student Barbara Flagg, who studied children's attention patterns and beginning reading, made the realization that outgoing graduate students make every year, right around May: she was broke. But like most in the field she had heard about a new educational television show teaching kids all kinds of basic skills. The show was *Sesame Street*, and it was doing something completely new to children's educational television. It was paying behavioral researchers like her to make it better.

A few years earlier, the Department of Education had granted Children's Television Workshop $8 million to create educational television programs that would prepare young kids for school. The workshop was given a two-year lead time to develop a show curriculum and test the show's effectiveness before it was broadcast. The opportunity for trial, error, and retrial was an industry rarity. Traditionally, producers had created shows based on sellable ideas that could be ready to air quickly. Consultation with educators, if it happened at all, occurred after much of the groundwork had already been done. The workshop, however, had gathered a mixture of scientists and television people. Working in close collaboration on all aspects of production — from story ideas to scripts to the color of Big Bird's plumage — the team figured out how to get kids to *Sesame Street*, and how to keep them there.

"In the early days of *Sesame Street*, in 1969, no one was thinking this way — that you could try out material with kids before you developed curriculum," said Flagg, who got a job with the workshop's math show, *The Electric Company*, during this era. "It seems so logical now. When you think about it — why not?"

This preliminary testing, called formative research, helped *Sesame Street* balance entertainment and teaching. Often, formative researchers simply watched kids watch television. They set two screens side by side — one with *Sesame Street* or *The Electric Company*, the other with colorful slides — and noted when kids looked away from the show. Sometimes they hooked up kids to eye movement recorders. "In the '70s, this meant kids sitting with their heads in a harness," said Shalom Fisch, who left the workshop a few years ago as vice president (by that time it was called Sesame Workshop). The equipment couldn't be transported, so parents brought their kids to the laboratory. The children sat in barbershop-style chairs and only watched short spurts of video, because movement disrupted the recorders. Without the head fixtures, said Flagg, the 4- and 5-year-olds would look around for their mothers.

Discomfort aside, the research made a difference. By knowing what part of the screen kids watched, producers could make their educational messages more effective. For example, *The Electric Company*, a show that taught basic grammar and reading skills, often ran a skit about forming words. During the skit,

two faces looked at one another. Letters came out of the mouths and met up in the middle to make a word. This seemed like a logical presentation until the researchers looked at the eye movement results and found that children weren't looking at the words at all — they were looking at the faces. In the new version, producers changed the faces to silhouettes, directing the focus back onto the letters, and children made the connection.

"As we developed new methodologies for testing the appeal, comprehensibility, and attention-attracting potential of *Sesame Street* and *The Electric Company*, research staffs were pilot testing these methods and procedures, and providing almost instant feedback as to what worked and what did not," said Jennings Bryant, University of Alabama, who helped develop some of the workshop's early research.

Thirty-six years later, *Sesame Street* has been shown empirically to benefit children's learning up to 10 years after they watch the program, said Fisch, who specializes in both formative research and evaluating shows after they air, a process called summative research. Another crucial development was the realization that licensed children's products could lead to big business, as typified by the *Sesame*-based toy Tickle Me Elmo sending parents into a Christmas craze in 1996. Thanks to licensing revenue, the workshop no longer relies primarily on government funding. This confluence of research value, potential marketing capital, and more television channels set the stage for other children's shows to build on *Sesame*'s success, said APS Charter Member Daniel Anderson, University of Massachusetts. It also set the stage for what Anderson calls the "golden age of television for young children."

Blue's Clues
Also in the 1970s, not far from where Flagg ran tests for *The Electric Company*, Anderson was lecturing to an undergraduate child development class. The lesson focused on the development of attention in children. After class, one student approached Anderson with a question. If younger children are more distractible than older children and have a hard time maintaining attention, the student asked, why can my 4-year-old brother sit and stare at *Sesame Street*? The question, Anderson concluded, was a good one.

At the time, said Anderson, the dominant theory was set by Jean Piaget. According to Piaget followers, children couldn't comprehend a video montage. For example, they argued, shown a building's exterior followed by a character sitting in a room, adults assume the room is in the building, but children don't make that connection. If Piaget's theory was accurate, thought Anderson, children might have a difficult time following *Sesame Street*, which uses a similar sequencing technique, known as a magazine format.

To test his theory, Anderson rearranged segments of *Sesame Street* and had children watch the altered show. Before long, he found that changing the events did affect children's comprehension. Some kids, in fact, were so upset at the muddled sequence that they approached the screen and tried to make the change themselves. "We found that kids don't just sit and stare," Anderson said. "For kids as young as 24-months, it was important to the kids that the show makes sense." It turned out kids could make the connection — they just had to work harder than adults to do it.

In 1993, Nickelodeon asked Anderson to design a block of preschool programs based on what his years of child research had taught him: When children watch television, they are active, intellectually and behaviorally. One of these shows was called *Blue's Clues*. Each episode of *Blue's Clues* presents a puzzle that viewers solve by answering clues peppered throughout. To keep kids focused on the content,

Anderson minimized editing and video montage. As a result, the show is lively but not rapidly paced. Repetition is a crucial element. "Kids have to work to understand transition, even though they can," Anderson said. "You want them to spend the work on the content."

In an episode called "Blue's Predictions," the show's human host, Joe, says some variation of the word "predict" around 15 times. At one point, Joe and an animated bookmark (named Bookmark) read a story. "Once upon a time, there was a penguin," says Bookmark. "His name was Penguin Pierre." Bookmark stops and points to the penguin. "That's Penguin Pierre," it says. Another pause. "I think that's Penguin Pierre," Joe says. The children watching probably don't realize that the voice of Bookmark is none other than The Fonz, Henry Winkler, but they are able to focus on the penguin's story, which helps them solve the episode's puzzle.

Simple as it seems, *Blue's Clues* became a smash hit, thanks largely to Anderson's research, as well as the producers' practice of testing each episode three times before it airs. "What was different about *Blue's Clues* was that it took the philosophical position that the audience wanted to play a role in the show, that the audience is not passive," Anderson said. "It took a position that kids watch television to learn. If you challenge them, they'll rise to the challenge."

ADHDTV
Elizabeth Lorch remembers the first time she saw *Blue's Clues*

. About eight years ago, she and her 4-year-old daughter were lying on the couch at home, ill with a stomach bug. Lorch turned on the television and flipped the channels in search of something to pass the time. When she got to Nickelodeon, which was running a *Blue's Clues* marathon, her daughter perked up immediately. "Wow," Lorch remembers thinking. "This is how you get a preschooler to pay attention."

Lorch studied under Anderson as a graduate student, has co-authored chapters with him, and still keeps a close eye on his research. From what she sees, children's research in this area is focusing more on younger and younger viewers. The popularity of *Barney*, said Lorch, showed researchers that very young children — under four years old — could be pulled into television. Its success brought on *Teletubbies*, *Baby Einstein*, and other toddler shows. It also aroused controversy over whether children this young should be spending so much time in front of the screen. "Kids have become more sophisticated. They're watching TV much earlier," Flagg said. "The things we learned in the '70s about television apply at an earlier age than they used to, because there's so much exposure."

In 1999, the American Academy of Pediatrics decided that "so much exposure" had become too much exposure. The Academy released a statement that children ages 2 to 16 should spend no more than two hours a day in front of *any* screen — television, computer, or video game — and that kids under age 2 should watch no television at all. "Our concern is, we know in the first couple years of life that children's brains are physically developing, and that development is dependent on interaction with people," said Daniel Broughton, a pediatrician at the Mayo Clinic in Minnesota, and a member of the Academy's Committee on Communication that prepared the statement. "There's no value in watching TV at this age, and it's potentially harmful."

As an example of this potential harm, Broughton points to a 2004 study published in the academy's

journal *Pediatrics*. In the study, researchers found a correlation between television viewing in children ages 1 and 3 and decreased attention spans in these same children around age 7. "Limiting young children's exposure to television as a medium during formative years of brain development – consistent with the American Academy of Pediatrics' recommendations – may reduce children's subsequent risk of developing ADHD," the authors write.

The authors acknowledge that their results, while highly suggestive, call for scrutiny and replication. But the implications are explosive. According to the Centers for Disease Control and Prevention, four million children aged 3 to 17 had been diagnosed with attention deficit hyperactivity disorder, or ADHD, as of 2003. Lorch has taken many of these kids, from age 4 to 12, and placed them back in front of the television to see just what their attention difficulties mean for learning. Instead of using children to inform what works in television, Lorch is using television to inform what works — or doesn't work — in children. What she found harkens back to the Piaget period: they have difficulty making connections.

Lorch studied how kids with ADHD watch television by placing them in a room with toys. In the early days of *Sesame Street*, such "distracters" were used to see which parts of a show children liked, and which parts they didn't. Lorch told children they would be tested on what happened during the show after the experiment. To no surprise, the attention of children with ADHD dropped when toys were present. But Lorch found that these same children did not score lower on remembering the show's discrete, individual events. Where they scored lower was connecting the events into a flowing narrative. "There's something about understanding a structure of a story that kids with ADHD are missing," Lorch said. "Stories are seen as individual events."

Lorch is running some pilot experiments on how to help kids acquire the needed links. She's showing students the episodes and having them map out the story on paper before they talk about it. "It's a way of getting them to zero in on what's this character trying to accomplish," she said. It's exactly this integration of different formats — television, as well as the Internet and after-school teaching guides — that has Fisch, Flagg, and the producers of a show called *Cyberchase* excited for the future of children's educational media.

Interactive Media
Cyberchase is a PBS show in which three curious kids solve math-related problems to save the universe. In formative research sessions, Flagg, the show's director of multimedia research, wanted to see how kids understand problem solving — for example, getting from Point A to Point B. Flagg gave third graders a game board and a Monopoly piece, and provided them the same directions the *Cyberchase* characters would have. As the kids worked their way through the directions, Flagg videotaped their misconceptions, their "aha!" moments, and the language they used to describe their thoughts, which then helped writers improve the script.

"If you want to communicate education, you need to know who your audience is and how you can communicate with them," Flagg said. "We focus on letting our audience have a voice in all areas of what we do." With *Cyberchase*, this means taking its role as an educational tool beyond the screen. The very title indicates a new direction in children's attention — from the living room to the Web. The villain's name is Hacker. A quick glance at the show's Web site shows not a few but dozens of educational, interactive games that Flagg says are closely tied to the show's content.

Two years ago, in his role as summative evaluator, Fisch began to document the significant educational impact of the *Cyberchase* television series. Since then, he has turned his eye toward multiple media. "The trend now is not to produce a TV show, and then follow it with other materials. Instead producers approach each project through multiple media, like a TV show, Web site, and after school outreach materials'," said Fisch, who has become president of MediaKidz Research & Consulting since leaving Sesame Workshop. "Nobody has looked at the cumulative impact when you put all these pieces together." Since the research is so novel, Fisch had to reassess its value at many points along the way. The National Science Foundation gave money to Fisch and the producers of *Cyberchase* to examine the literature in several disciplines — developmental psychology, education, communication, and media effects — and figure out the directions that such research might take. Now, they plan to to pursue the next step: pilot testing methods and measure to assess impact.

Indeed, formative research suggests that interactive media may go a long way in reinforcing the educational tools television has honed over the past decades. "I've been very struck by the high degree of consistency that I've seen in kids' responses over time and across different media," Fisch said. "Each medium presents its own unique issues, but in many ways, the things that make content work in one medium overlap greatly with the things that make it work in another."

Among these findings is the effectiveness of after-school educational materials. The show provides many schools with hands-on *Cyberchase*-related activities for children to work on while waiting for parents to pick them up. "As opposed to TV or the Web, where every kid is seeing the same stuff, [after-school materials] will have a different style based on the teacher," Fisch said. "The experiences will vary a lot, because teachers can tailor their approaches to the needs and abilities of individual kids."

APS Fellow Ed Palmer, Davidson College, believes interactive media will provide the next wave of children's educational material. "We can educate kids about TV viewing through computer software," said Palmer (no relation to the psychologist Ed Palmer who played a major role in *Sesame Street*'s early days). But with the potential benefits of interactive media, said Palmer, come the caveats. As children's programs move from cable television to digital television and the Internet, the already-limited commercial aspect will disappear entirely, forcing advertisers to invade children's media in other, subtler ways. "When a kid buys a game now, the advertising company outfits it with their ads, and kids don't have a clue this is happening," Palmer said. "Kids give the same credibility to commercials as programming. We need education to get on top of sophistication in the Internet — what the advertising industry is already on top of. If we get there with educational messages, I think we'd have a major stride forward."

It Isn't Easy Eating Green
Recently, Sesame Workshop launched a program intended to do exactly what Palmer believes it should: use educational message to make a positive social impact. The program, called Healthy Habits for Life, addresses the growing problem of child obesity. The problem is so bad that Cookie Monster now calls cookies a "sometimes food," said Jennifer Kotler, the workshop's director of research. "We're trying to promote nutrition and healthy segments of shows," Kotler said. "We realized there's not much research out there on how to get preschool kids to like healthier foods."

To tackle the problem, the workshop called in one of the experts: Elmo. The ticklish red Muppet with the high-pitched voice is the face of the Elmo-Broccoli study, which has helped researchers find out

what 3-, 4-, and 5-year-olds think of when they hear the word "healthy." It doesn't take a trained researcher to know that given the option of broccoli or chocolate, children will choose chocolate. But what researchers did find interesting was that as children get older they seem to have a better sense of what's healthy, even though their preference for the unhealthier option stays the same. "A 3-year-old thinks what he likes is healthy, but a 5-year-old knows it's not," Kotler said. "That's a two-year window where we might be able to intervene with education."

Taking advantage of that window meant finding out exactly why children choose one food over another. So researchers went into schools and showed children two cards: one with a picture of broccoli, the other with a snapshot of chocolate. At this stage, 78 percent of the kids preferred the chocolate card. When researchers put Elmo in the chocolate card and a generic red puppet in the broccoli card, the preference for chocolate shot up to 89 percent. But when Elmo was placed next to the broccoli and the generic character next to the chocolate, children's preferences split right down the middle. It wasn't just a need for green; the same thing happened with grapes and bananas.

The workshop recently received funding from the Atkins company to move forward with the study, which means giving children the actual food instead of a picture. "Maybe something as small as a sticker on healthy foods can influence what a child wants to eat," Kotler said. But more importantly for the future of children's education, the results indicate to Kotler just how influential children's programming has become. "We're here to educate," Kotler said. "Children spend more time with TV than anything besides sleeping, so we should focus on it like we focus on helping them in the classroom."