



MULTIMEDIA RESEARCH

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Evaluation of *Cyberchase Do the Math* Online Videos

Report for Thirteen/WNET
by Barbara N. Flagg, Ed.D., Director



Drawn after viewing Buzz & Deleete *Do the Math* Video: *Can't Wait to Tessellate*

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EXECUTIVE SUMMARY
EVALUATION OF *CYBERCHASE DO THE MATH* ONLINE VIDEOS
MULTIMEDIA RESEARCH • MAY 4 2009

Cyberchase is a public television series of half-hour animated math shows for 8-11 year olds produced by Thirteen/WNET New York. As part of a National Science Foundation grant, *Cyberchase* has produced and posted on the *Cyberchase* website ten short-form animated *Do the Math* videos to motivate viewers to do math-related activities both online and offline, to increase confidence and interest in mathematics and to improve math knowledge. Four videos presented *The Misadventures of Buzz & Delete* covering the topics of fractions, tessellation, linear measurement and inverse operations. Three *Lucky Star* videos showed Jackie hosting a math game show with *Cyberchase* characters as contestants. In three live-action *Math Magic* videos, the character Harry demonstrated math tricks with a child helper. Employing online tracking and pre and post surveys and interviews, Multimedia Research implemented a pre-post same-sample evaluation of the impact of the *Do the Math* videos on third graders who viewed at home one video daily for ten days. Because participating children were assigned to watch a daily video, the study results are limited in generalization to similarly motivated users.

Children increased their engagement with mathematics by taking advantage of the online and offline opportunities.

- Eight out of ten children were motivated to replay one or more of the assigned ten *Do the Math* videos. Three-quarters of the viewers reported talking to others about the videos.
- Watching the videos motivated almost all viewers to click on a *Do the Math* video-related game, particularly the *Lucky Star* game. One-fifth of the group reported playing *Cyberchase* math games not related to the videos.
- One child submitted a story to *Cyberchase* via the Sent It feature, but one-third of viewers said they were motivated to send something and 15% clicked on the Send It button. The other children said they were simply not interested in sending something or that they had no time or did not know how to send something.
- *Do the Math* videos motivated almost three-quarters of the children to do at least one offline math activity not related to school or homework. A majority of children reported doing at least one non-school math activity related to the *Buzz & Delete* videos and/or a *Math Magic* video trick.

Children were motivated to continue interactions with *Cyberchase*.

- After the ten days of assigned viewing, online activity continued to be tracked. A few children viewed a video short again or started a video-related game online, and a few children asked about future access to the *Math Magic* videos to practice the tricks.
- Of those children who had not watched the television series in the months prior to the study, 13% were motivated by the short-form videos to watch the long-form show during the study.

Children demonstrated greater confidence but no greater interest in solving math problems related to the *Do the Math* videos.

- Viewing the ten short form videos significantly increased children's confidence in solving math problems. Almost three-quarters of the children were more confident about their ability to figure out *Do the Math* type problems after viewing the ten videos.
- Video exposure did not significantly influence children's interest in solving a set of six *Do the Math* problems.

Children showed increased understanding of math content specific to three of the four *Buzz & Delete* videos.

- Viewing three of the four *Buzz & Delete* videos significantly improved specific math knowledge related to fractions, tessellation, and measurement. Children learned that $1/3$ is larger than $1/8$, that hexagons can "tessellate," and that a measuring instrument will help split a room equally. Exposure to the *B&D: Together Again* video did not change viewers' ability to reverse directions.

Children found the *Do the Math* genres and videos fun and appealing.

- The three *Do the Math* video genres did not differ significantly in appeal ratings, with 84% to 88% of viewers liking the three genres "a lot" or "sort of." When asked to choose one favorite and one least favorite video, the children split their votes fairly equally among the ten videos, with no genre being preferred.
- Viewers liked the ten videos because they were fun and funny, because the characters and their interactions were appealing, and because they learned from them.
- Lower appeal of videos resulted when the viewers were already familiar with the math or when they found the math confusing; on average, however, the math hit the third-graders' sweet spot.

In conclusion, the ten *Do the Math* videos were successful in motivating both online and offline math-related activities during the study period, successful in increasing viewer confidence in their ability to do math problem-solving, and successful in improving specific math knowledge. The videos were less successful in encouraging math-related activities after the assigned viewing period, possibly because the sample of children were already saturated with the available *Do the Math* experiences. With the addition of more well-produced *Do the Math* videos and games, it is likely that future video viewers will be motivated in a manner similar to the study sample.

INTRODUCTION

Produced by Thirteen/WNET New York, *Cyberchase* is a public television series of half-hour animated math shows for 8-11 year olds, accompanied by Web games, print activities and outreach kits.¹ The goal of the multimedia project is to improve problem-solving and math skills and inspire children with confidence and enthusiasm toward mathematics.

As part of a National Science Foundation grant, Thirteen/WNET has produced and posted online ten short-form motivational animated videos. To evaluate the impact of *Cyberchase Do the Math* videos, Multimedia Research implemented a pre-post same-sample evaluation with the following goals:

- (1) to determine the extent to which viewing ten short math videos online motivates further online and offline math-related activities;
- (2) to evaluate whether viewing ten videos changes interest and confidence in figuring out math-related problem activities;
- (3) to assess change in math knowledge related to viewing of four of the ten math videos; and
- (4) to explore appeal of the ten videos and their three different genres.

METHOD

Sample

Sixty-two third graders participated in the study, equally distributed across six national sites (North Miami, FL; Providence, RI; Harvard, MA; Milwaukee, WI; Austin, TX; Sacramento, CA). The sample included equal gender groups and 15% minority representation. The children were eight (66%) and nine (34%) years old.

All children were familiar with *Cyberchase* characters through watching the television series or using the website. Their favorite characters were Digit (29%), Matt (16%), Jackie (13%), and Hacker (6%), and 27% did not have a favorite. Half (50%) of the sample had recent TV viewing experience within a month previous to joining the study; 31% viewed *Cyberchase* “last year,” and 19% viewed “long ago.”

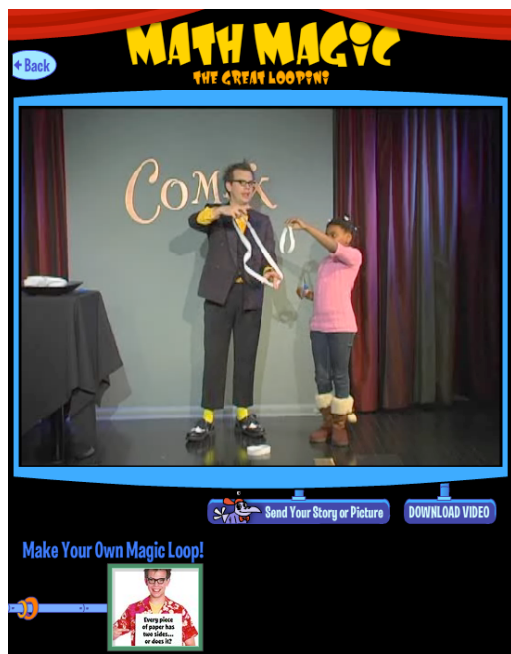
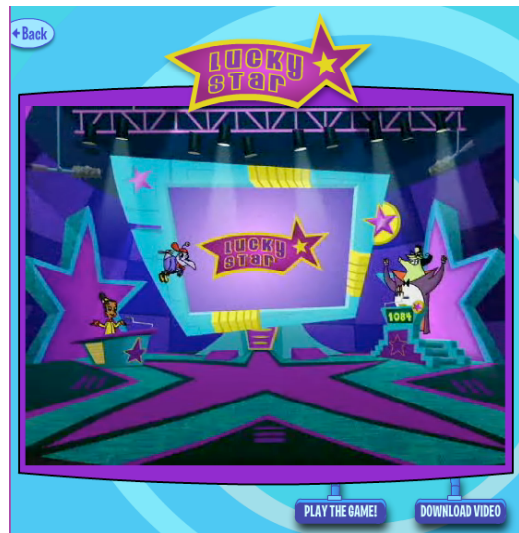
All participants had broadband Internet access at home to view the online videos. Two-fifths (40%) of the sample had visited the *Cyberchase* website prior to joining the study. They had played games and/or a Quest adventure.

¹ For a more complete description, see <http://pbskids.org/cyberchase/parentsteachers/show/index.html>

Do the Math Short-form Videos

Participants viewed ten short-form videos online in three different genres:

- Each of four *The Misadventures of Buzz & Delete* videos cover a single math topic: tessellation, linear measurement, inverse operations and fractions (see example screen to the right). At the end of the 2-minute videos, the character Digit asks viewers to share with *Cyberchase* a story about their math experiences. The *Send It* button is positioned below the video player, along with a *Download Video* button. By clicking *Back*, games are available for three of the four online videos. (Mission Magnetite, Make a Match, 13 Ways to a Half; Wacky Ruler; Cybersquad and the Eye of Rom).
- Three *Lucky Star* short videos present Jackie as host and *Cyberchase* characters as contestants in the *Lucky Star* game show (see Jackie and Hacker in screen to the right). Each 4-minute video ends with direct prompts from Jackie to viewers to play the online version of the *Lucky Star* game. The *Play the Game!* button is positioned below the video player, along with a *Download Video* button. By clicking *Back*, users access other *Lucky Star* videos.



- In three live-action *Math Magic* short videos, the character Harry (Matt Wilson) demonstrates math tricks with child helpers (see screen to the left). At the end of the 4-6 minute videos, Harry asks viewers to send a story to *Cyberchase* about what happens when they try the magic trick themselves. The *Send It* button is positioned below the video player. Users can download the video and/or pdf instructions for the math magic trick. By clicking *Back*, users access other *Math Magic* videos.

Procedure

Pre-viewing procedure. Upon signing informed consent, parents received via email a welcome message from *Cyberchase* providing the participating child with a log on name and password and confirming an accurate live email address:

Dear Parent:

Thank you for agreeing to permit your third grader to take part in this important evaluation project commissioned by PBS KIDS GO! Cyberchase. As previously discussed, your child will watch a 2-5 minute video online each day for ten days, make a decision about what else, if anything, he/she would like to do related to the video, then talk to your local evaluator about his/her experience at an agreed upon time.

Your child will use the log on name and password provided here:

logon name:

logon password:

Your local evaluator will meet with your child soon at a mutually convenient time to explain how to log on to the Cyberchase website. If you have questions at this time, contact your local evaluator.

Please confirm that you have received this message by hitting 'Reply.' By replying, we know that we have the correct email address to reach you with the daily messages that will start Monday, March 9, 2009.

Thank you in advance for your help.

Sincerely,

Cyberchase Producers

During a pre-viewing visit to each child's home, local evaluators confirmed that the home computer could successfully access the online videos, confirmed that the log on name and password functioned, and posted a sticky note on the computer with the log on name and password as a reminder. Also during this visit, the children themselves completed an online survey to assess their interest and confidence in figuring out math-related problem activities and their math knowledge related to the specific content of the four *Buzz & Delete* videos.

Viewing procedure. One week to a few days after the pre-viewing visit, participating children's parents began receiving from *Cyberchase* a short daily request for their child to view a *Cyberchase* video online. Each of the ten emails, sent each weekday over a two week period, provided a unique URL for that day's viewing and suggested the non-specific option of "doing something" related to the video:

Dear Parent:

Today, please help your child to log on at

<http://pbskids.org/cyberchase/day1/>

After your child views the short video, please allow time for your child to do something on-line or off-line related to the video, if s/he wishes.

Should you experience any difficulty logging on, please contact your local researcher.

Thank you in advance for your cooperation.

Sincerely,

Cyberchase Producers

The videos were viewed in the order presented in Table 1.

Table 1. *Cyberchase Do the Math* Video Viewing Schedule

Day	Week 1	Week 2
Monday	Math Magic: The Great Loopini	Lucky Star: Behind the Scenes
Tuesday	Buzz & Delete: Any Way You Slice It	Buzz & Delete: Can't Wait to Tessellate
Wednesday	Lucky Star: With TW	Math Magic: I've Got Your Number
Thursday	Buzz & Delete: Together Again	Lucky Star: With Hacker
Friday	Math Magic: The Fractionator	Buzz & Delete: Measuring Up

Each Sunday, local evaluators contacted parents to remind them to open *Cyberchase* emails daily during the subsequent week. Via log on information, the children's online activity related to the video shorts was tracked in a limited way. The tracking recorded the start and completion of each of the ten videos; the start of six video-related games; and the start of the *Send It* function. Completion of games and sending activity were not available in the tracking data. The children could access any part of the *Cyberchase* website via a comprehensive menu present at all times on the screen, but other *Cyberchase* web activity was not tracked.

If a child was not recorded as having viewed a daily video, the local evaluator contacted the parent to remind them. Illness, funerals, busy schedules, connection failures and simple forgetfulness sometimes interfered with the daily routine, but all children made up a missed viewing on the subsequent day. During the first week, 72% of 61² tracked children viewed every day's video on the assigned day. During the second week, 64% viewed every day on the assigned day.

Post-viewing procedure

After the last viewing day, local evaluators sent parents emails confirming post-viewing interview dates beginning at least ten days later. The ten-day delay, during which online tracking continued, permitted the children an opportunity to view videos again, play related games, or carry out offline related activities. At the post-viewing hour-long session, local evaluators interviewed individual children about video appeal and their motivation to do online or offline math-related activities. Also, the children answered again the pre-survey math knowledge, interest and confidence questions, presented in reverse order. Upon completion of the procedure, each family received an honorarium of \$120.

² One child's computer cookie functioned inconsistently; the parent confirmed via email that the child had viewed each day's video. Tracking data for 61 of 62 participants were analyzed.

Table 2 summarizes overall evaluation goals, desired user outcomes and the data collection methods.

Table 2. Goals, Outcomes and Methods

Evaluation Goals	User Outcomes	Data Collection Methods
Determine extent to which viewing online videos motivates further online and offline math related activities	Children will increase their engagement with mathematics by taking advantage of some or all of the online and offline opportunities.	During the ten-day viewing period, online tracking records children's accessing of ten videos, related game pages, and Send It page. Post-interview asks children if they wanted to do video-related online and offline activities and if not, why not.
	Children will be motivated to continue interactions with <i>Cyberchase</i> .	After the ten-day viewing period, online tracking records if and how children's online activity continues for the subsequent ten days. Pre and post interviews assess self-reported change in children's viewing of the televised <i>Cyberchase</i> series.
Measure extent to which viewing online videos changes interest and confidence in figuring out math-related problem activities	Children will demonstrate more positive interest and greater confidence in doing math problem-solving.	Rating scales in pre and post surveys assess interest and confidence in math problem-solving.
Assess change in math knowledge related to four videos	Children will show increased understanding of math content specific to the four <i>Buzz</i> & <i>Delete</i> videos.	Pre and post tests assess knowledge of four concepts specific to four videos: fractions, tessellations, linear measurement, and inverse operations.
Evaluate appeal of the ten videos and their different genres.	Children will find the <i>Do the Math</i> videos fun and appealing.	Post-interview assesses appeal of the three video genres and comparative appeal of the individual videos.

RESULTS: MOTIVATION TO DO MATH-RELATED ACTIVITIES

One of the major goals of the short-form videos is to motivate viewers to do other math-related activities both online and offline. Online tracking and post-interviews collected data to evaluate how well this goal was achieved.

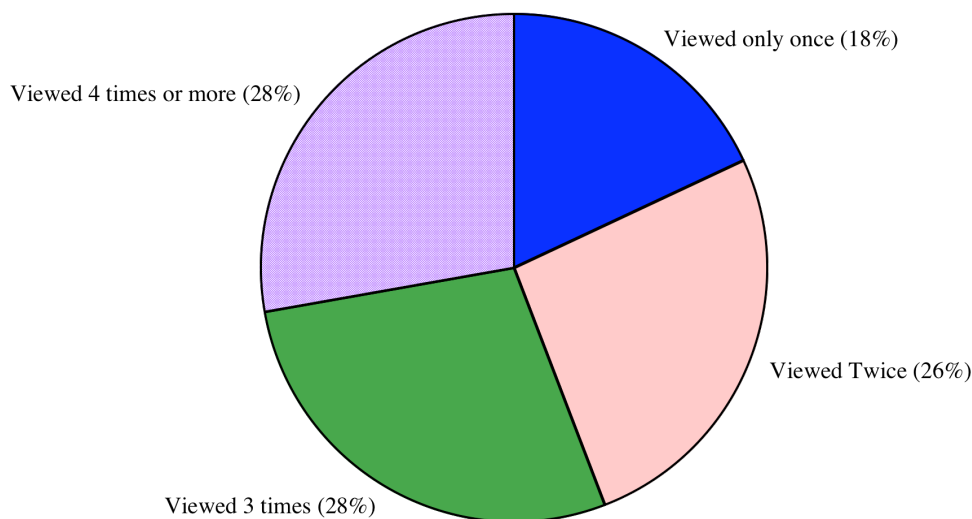
Online Activities

Most of the children replayed one or more of the assigned online videos. Watching the videos motivated almost all viewers to click on a related game, particularly the Lucky Star game. Many more children would have started games associated with the *B&D* videos had it been more obvious that the games were available. One-fifth of the group was motivated by the viewing to play non-video-related games on the website. During the ten days after the assigned videos were completed, a couple of children viewed a video short or started a related game online. Watching the videos motivated one-third of the viewers to send something to *Cyberchase*; however, of the 15% of children who actually clicked on the Send It button, only one child followed through with a story submission. Barriers to sending something to *Cyberchase* included mainly lack of interest as well as lack of time and lack of knowledge of how to send.

Viewing *Do the Math* Videos Online

Every child viewed each of the ten videos at least once, as requested by the daily emails from *Cyberchase* to the parents. Children were free to view a video more often but not directly encouraged to do so. Figure 1 indicates that 82% of the sample viewed at least one video more than once, and 56% viewed one or more videos at least three times.

Figure 1. Distribution of Users Replaying Videos



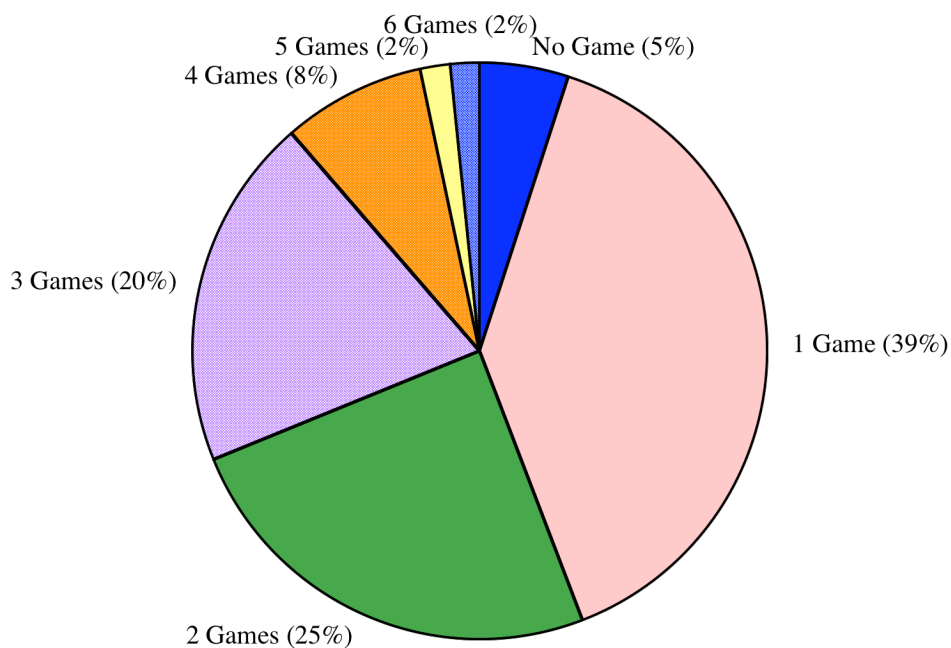
- 39% of tracked users viewed a *Lucky Star* video more than once, possibly as a mechanism to get to the Lucky Star game.
- 25% of users viewed a *Math Magic* video more than once, possibly to review the specifics of a trick in order to try it at home. Tracking for downloading the instruction pdfs was not available, but no child mentioned looking at printed instructions in the post-interviews, so repeated viewing of the video appears to be the likely way to learn the technique of the math tricks; for example: *I kind of had to go back a couple of times to watch the video again to see how to do them because I forgot.*
- 21% of users viewed a *BCD* video more than once.
- Two (3%) children viewed videos during the ten day period after the last assigned video was viewed: One viewed *Math Magic: I've Got Your Number*, and one viewed *Lucky Star: With TW*.

Game Playing Online

The tracking program recorded when users clicked to begin playing one of the six math-related games associated with the *Do the Math* videos. The program did not record game completion. Figure 2 displays the frequency of games on which users clicked.

- 95% of the children clicked on at least one of the six games during the study period.
- 32% of users clicked on three or more of the six games.

Figure 2. Distribution of Users Clicking on Number of Games



Lucky Star Game. A character in the *Lucky Star* videos directly encouraged playing the game, and the game button was accessible on the page where the study users saw the videos. In the post-interview, the children were shown photos of three *Lucky Star* videos and asked if they wanted to play the Lucky Star game online after seeing the videos.

- 94% of the children said that after viewing a *Lucky Star* video that they wanted to play the game online, and all of these children were recorded as actually starting a Lucky Star game. Of those who started a game,
 - 54% clicked to start the game on three or more different days, indicating its popularity;
 - 5% played the game during the ten day period after the last assigned video was viewed.
- The 6% of children who did not want to play the Lucky Star game online could not give a reason for their lack of interest.

B&D Games. No character in the *B&D* videos directly encouraged playing video-related games, and the game buttons were not accessible on the pages where the study users saw the videos. In the post-interview, the children were shown photos of three *B&D* videos that had related games and asked if they wanted to play the games online after seeing each video.

The games associated with *B&D: Any Way You Slice It* video include Mission Magnetite, Make a Match, and 13 Ways to a Half.

- 50% of the children said that after viewing *B&D: Any Way You Slice It* that they wanted to play the fraction games online. Online tracking revealed that 47% of the sample actually started a fraction game. Of those who started a game,
 - 38% started one of the three fraction games;
 - 7% started two of the three fraction games; and
 - 2% started all three of the fraction games.
 - No one started a fraction game during the ten days after the video viewing period.
- Of the 50% of children who did not want to play the fraction game online,
 - 71% explained that they did not know there was a fraction game available; e.g., *I didn't know how to get to them or what they were called. If I had, I would have done it.*
 - 19% were not interested in fractions; e.g., *I'm not really into fractions that much. The video was interesting, but I don't like fractions that much.*
 - 10% felt fractions were easy; e.g., *because it would be too easy for me.*

The Eye of Rom game is related to the video *B&D: Together Again*.

- 34% of the children said that after viewing *B&D: Together Again* that they wanted to play the Eye of Rom game online. Online tracking revealed that 26% actually clicked on the Eye of Rom play button. No one clicked on Eye of Rom during the ten days after the video viewing period.
- Of the 66% of children who did not want to play the Eye of Rom game online,
 - 88% explained that they did not know there was a game available; e.g., *I didn't see it.*
 - 10% felt the game was too hard to do; e.g., *Because I tried it out before, and it was really hard.*
 - 2% felt the game would be easy; e.g., *Because I already knew that stuff, so I decided not to it.*

The *B&D: Measuring Up* video is associated with the Wacky Ruler game.

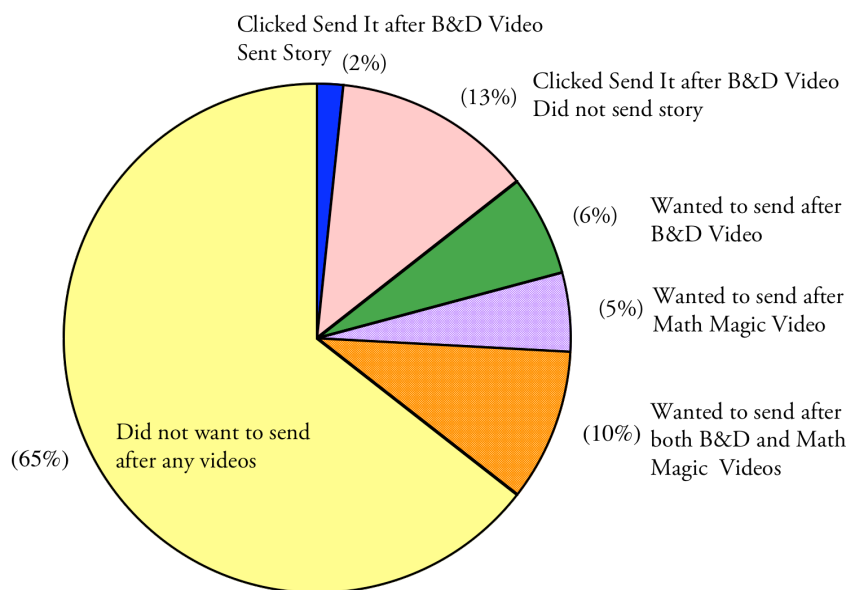
- 29% of the children said that after viewing *Measuring Up* that they wanted to play the Wacky Ruler game online. Online tracking revealed that 23% actually clicked on the Wacky Ruler button. No one clicked on Wacky Ruler during the ten days after the video viewing period.
- Of the 71% of children who did not want to play the Wacky Ruler game online,
 - 77% explained that they did not know there was a game available; e.g., *I didn't know it was there. If you want the kids to play the game, you have the characters on the screen at the end of the show point to the link on the website.*
 - 11% felt the game was too hard to do; e.g., *I tried it but I didn't like it because I had no idea of what to do. I even looked at the directions.*
 - 11% felt the game might be boring; e.g., *because I thought it might be a little bit boring.*

The children were also asked at the end of the post-interview if they did anything else because they watched the ten videos. One-fifth (21%) of the sample reported that they were motivated to play other *Cyberchase* games online including Quest.

Sending To *Cyberchase* Online

At the end of each of the four *B&D* videos and three *Math Magic* videos, characters in the videos directly encouraged viewers to send a story to *Cyberchase*, and a Send It button was available below the video player to follow up on the video's request. Figure 3 displays the distribution of users' sending actions.

Figure 3. Distribution of Users' Sending Actions



- 35% of children reported that they wanted to send something to *Cyberchase* after viewing a video. Children were more motivated by the *B&D* videos than by the *Math Magic* videos. For the *Math Magic* videos, there was an expectation of doing the trick before sending to *Cyberchase*; whereas *B&D* viewers could write a story immediately after seeing the video.

- 15% of the children clicked on the Send It button after viewing a *B&D* video, and one (2%) child reported sending something to *Cyberchase: A story about fractions based on the Buzz and Delete one with the cakes. My story was about pizza.* See the child's submission below:³

Storytitle: Pizza

Submission: I like pizza and so does Jesse, my brother. So we need to split it evenly. Jesse says "I want more," but it won't be fair. So we both get 4, and that's half of the pizza for each of us.

Name: Child's first name

Age: 8

Those who clicked on the Send It button but did not send something were asked why not. Most said they did not know how to do the task or did not have time; for example:

Because I didn't know how to do it.

I didn't know how to do it.

I wanted to see what the other people sent. And I thought I was going to do it, but then I decided not to.

I was looking at writing a report but I didn't know what to write. I had no ideas.

I didn't have enough time to do it that day.

I didn't really want to send something because I just didn't think it was that important, and I didn't think that I needed to, and I had a lot of homework and didn't have a lot of time and stuff.

Those who did not want to send something to *Cyberchase* gave a variety of reasons as why not:

- 51% simply said that they did not want to; e.g., *Because I didn't really want to. I liked it, but I didn't want to.*
- 11% did not have time; e.g., *Cause I didn't have any time. I was busy with basketball, and I had a lot of homework.*
- 11% noted that they did not know how to send something; e.g., *I didn't really know how to do it, and my mum was not here, and I really didn't know how to do it.*
- 11% observed that they did not know that they could send something; e.g., *I did not see that, so then maybe it needs to be more visible or bigger or something.*
- 8% felt shy; e.g., *Because I'm shy.*
- 8% did not think the videos were interesting enough; e.g., *Because they weren't that interesting.*

³ Submissions were not tracked, however, we could locate this story using the date and timestamp of the user's Send It button choice, and confirming with user's first name and age.

Offline Activities

The children participated in a variety of offline activities related to math. Three-quarters of the sample reported talking to others, mainly about the magic tricks and videos. Of those children who had not watched the television series in the months prior to the study, 13% were motivated by the short-form videos to watch the long-form show during the study. The videos motivated 71% of the children to do at home at least one math activity not related to school or homework. The *B&D* videos motivated 58% to do at least one math activity not related to school or homework. *Math Magic* videos motivated 60% of the children to do at least one magic trick. Most of those who did not want to do a trick simply “didn’t think of doing” a trick.

Discussing Math Offline

Three-quarters (76%) of the children reported that they talked to somebody about the videos or games or magic tricks. The children talked to their parents (47%), friends (40%), siblings (23%) and teachers (4%). They talked about the magic tricks (53%), the videos in general (47%), games (9%), and doing the study itself (6%).

Viewing *Cyberchase* Television Series Offline

In the post-interview, 81% of the children agreed that watching the short videos on the *Cyberchase* website made them want to watch the show on television; however, only 36% of the children reported actually watching during the ten-day assigned viewing period and the subsequent ten days. Of those children who had not watched *Cyberchase* in the months prior to the study, 13% were motivated by the video shorts to watch the television series during the study period.

When asked why viewing the shorts made them want to watch the show on television, the majority of kids related that the videos were “cool,” “fun” or “entertaining;” for example:

Because it looked cool on the website. I thought it would be cool on TV.

Because it was fun to watch on the computer, and I wanted to see longer episodes.

Because it showed all the exciting things, all cool. The magic math guy, he was always so funny. I wanted to see him on TV. He has funny things on TV too.

It looked cool, how the videos looked cool. I don’t know, it just kind of made me want to watch it.

The characters and the show itself were interesting.

Six children were motivated to watch *Cyberchase* on TV because they might learn something; e.g.,

Because it looks cool, and I like to learn new things.

Because it entertained me, and it kind of helped me learn.

*I want to watch *Cyberchase* so I can learn, and on the other shows, I can’t learn.*

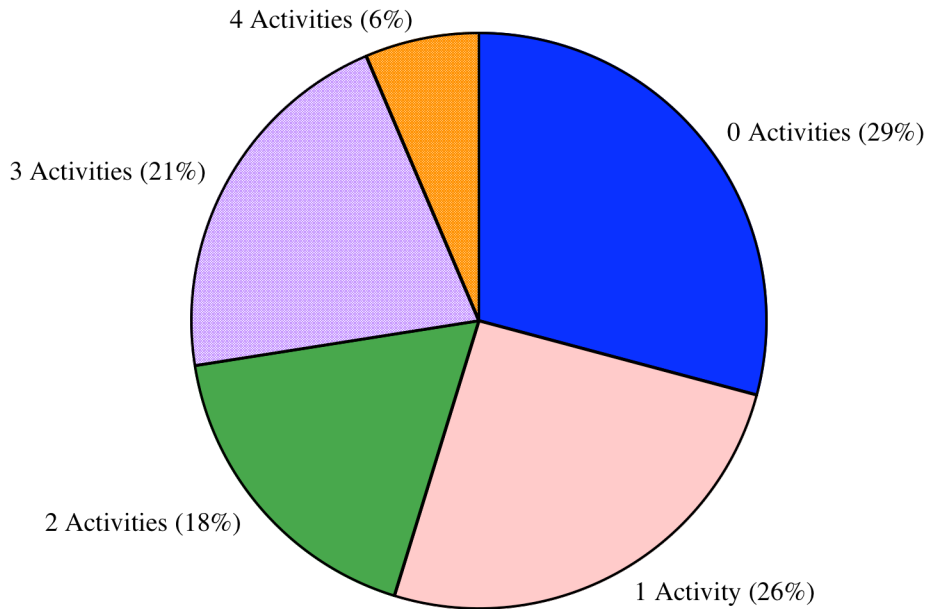
Because I could understand about fractions in order.

Reasons given by the 19% who said they were not motivated by the shorts to watch the full-length show included that they do not like the series, the series is meant for younger children, and the full-length show is not like the shorts.

Doing Video-Related Math Activities Offline

Four *B&D* videos and three *Math Magic* videos modeled activities that might motivate doing math-related activities offline, at home. In response to the seven videos as a whole, 71% of the children were motivated to do at least one non-school-related math activity,⁴ and 45% reported doing more than one activity offline. See Figure 4.

Figure 4. Distribution of Children Reporting Doing Video-Inspired Math-Related Non-School-Related Activities Offline

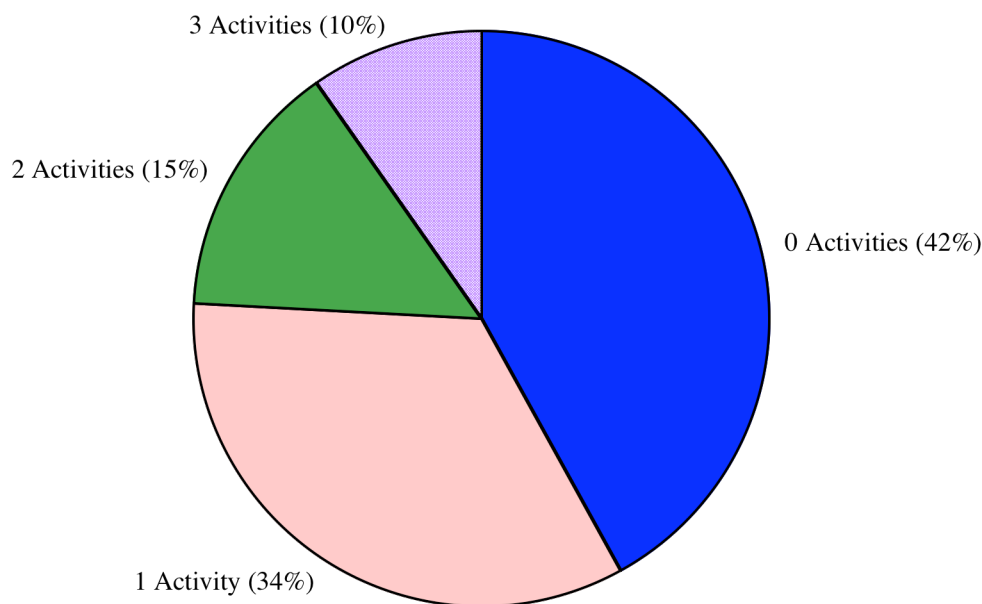


A majority of viewers described doing at least one math magic trick (60%) and at least one non-school-related *B&D* math activity (58%). Specific offline activity findings for these two genres follow.

⁴ “Non-school related” means not in school and not as part of homework.

Doing B&D Video-Related Activities Offline. The children were asked if they did anything at home, outside of the *Cyberchase* website, with fractions, measurement, art or tessellation, and reversing steps. Figure 5 shows the frequency distribution of B&D video-inspired non-school-related math activities: 58% of the children described doing math activities related to one or more of the B&D videos, and 25% did activities related to two or more videos.

Figure 5. Distribution of Children Reporting Doing B&D Inspired Math-Related Non-School-Related Activities Offline



- Of the 31% of children who indicated that they had done something outside of school with art or tessellation,
 - 58% described using shapes; e.g.,
*I did a cat with squares.*⁵
I did some art – like with hexagons and mixed them together with other shapes to see what happened.
This was my favorite one. I was just watching it again twice when you came in. I tried making what Buzz did, but it was really hard. Having to write a lot of octagons or pentagons. I don't remember, but I think they were pentagons.
 - 42% described generally drawing a picture; e.g.
I drew a picture, but that wasn't tessellation though.
- Of the 21% of viewers who reported that they had done something with measurement, outside of school and homework,
 - 77% described measuring miscellaneous items at home; e.g.,
I measured the length of the map in my house from California to Peru. I wanted to see how long it was because my cousins go to Peru.
I measured with my friend. We had to attack somebody's side with a cone and throw it past the

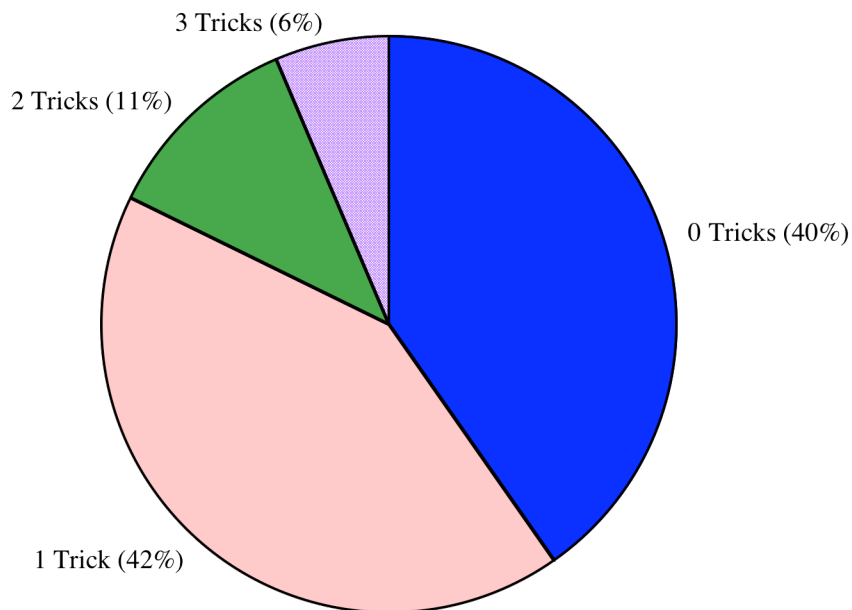
⁵ The tessellation drawing on the cover page of this report is the only art product that was physically available at the time of the post-interview.

*line, so we had to measure past the bricks.
I did. I got my tape measurer, and I started measuring my family room and how wide it was. It was fun.*

- 23% noted measuring during cooking; e.g.,
I helped my mom and dad make supper and measured ingredients.
- Of the 18% who said they had done something with reversing steps at home,
 - 73% referenced a toy at home; e.g.,
*With my own transformer. It changes into a car.
On my DS, my diving game, I flew to a place that I had been, then I flew to another place, then I flew back to that place.*
 - 27% noted reversing steps to locate a lost item; e.g.,
To find my sneakers, I reversed my steps.
- Of the 16% of children who noted doing something with fractions at home, not at school or as part of homework,
 - 60% referred to food sharing; e.g.,
*That night I had pizza. I was just thinking about how that night I had the fractions and the pizza.
I split cookies with my friends.*
 - 40% referred to cooking; e.g.,
*We were cooking, and my mom showed me how to use fractions in cooking.
Well we were eating melon, and we wanted to put the pieces in equal slices, so we cut the cantaloupe, and we measured and did the slices equally. I did this with my aunt. My aunt saw the video with me, so we decided to do this.*

Doing Math Magic Video-Related Activities Offline. The three *Math Magic* videos presented math activities that viewers could replicate offline. The children were asked if wanted to try the magic tricks and if they actually did any magic tricks at home. Almost three-quarters (71%) of the children wanted to try the magic tricks at home after they saw the videos. Of those who did not want to try the tricks, 50% said they “didn’t think of” doing a trick at home, 17% were too busy, 17% thought the tricks were too hard to do, and 17% said they already knew the answers. Figure 6 shows that 60% of the viewers actually did one or more of the magic tricks.

Figure 6. Distribution of Children Reporting Doing *Math Magic* Tricks Offline



- 46% of the children tried the Loopini Mobius strip; e.g.,
I did it with three pieces of notebook paper. I taped two of them together, and then I cut them into a band, then because some of the class was watching me, I pulled an assistant, and I gave him the longest band, and then I tried to do exactly what the trick said, but it didn't work the first time. I'm not sure exactly why. But I did do it another time, and it worked except not a lot of people believed me. They thought I switched it out with [a classmate's] because he had the longer piece of paper.
We got a strip of paper. My mom got the little one. I twisted mine so it could be longer. It worked and after I cut it, mine was longer. Then we switched, and my mom's was longer.
- 32% tried the Number trick; e.g.,
I did the one where you pick a number, and you always end up with 6. It always worked. I did it four or five times to my friends at school. And my sister did it also a few times to my neighbors, her friends at school, her assistant teacher.
I wrote the steps down so I wouldn't forget them, and I tried them on my friend, my mom and dad and another person. That went pretty good.

- 27% tried the Banana trick; e.g.,
I did the Banana Fractionator while at Disney World on my older brother. We bought a pin with us. I was in one room, and he was in the other room. I did the pin pricks, then I brought the banana into the other room, and since my older brother doesn't like bananas, Sarah his girlfriend was the volunteer. I had her hold the laser pointer and then she cut it with the laser pointer. Then I opened the banana, and they saw the slices.
With the banana one, I follow the instructions like he said, and I did it on my friend, and one time it worked and one time it didn't work. He said that to poke the holes in the brown spot, but the first time I didn't.

RESULTS: INTEREST AND CONFIDENCE IN FIGURING OUT MATH-RELATED PROBLEM ACTIVITIES

Another goal of the short-form videos is to increase viewers' interest and confidence in figuring out math-related problem activities. Rating scales⁶ in pre and post surveys collected data to evaluate how well this goal was achieved. The children answered on five-point scales how interested they were in a problem and how confident they were in figuring out the problem, as shown in the example below. The post-survey items were presented in the reverse order from the pre-survey items. Each child read the questions aloud and typed their own choices.

11. How interesting would it be to figure out how to do a magic trick?

It would be very interesting.

It would be a little interesting.

It would be so-so.

It would be a little boring.

It would be very boring.

12. How well do you think you could figure out how to do a magic trick?

I definitely could do it.

I maybe could do it.

I'm not sure that I could do it.

Maybe I could not do it.

I definitely could not do it.

⁶ The interest and confidence rating scales were based on rating scales in *Cyberchase* research implemented by Shalom Fisch of MediaKidz Research & Consulting for Thirteen/WNET.

Each of the interest and confidence rating scales included a *Cyberchase Do the Math* set of six items that referenced activities in the short form videos:

- ...to figure out how to do a magic trick?
- ...to figure out how to divide a room into equal parts?
- ...to go on a math quiz game show?
- ...to figure out how to use a single type of shape to cover an area without gaps?
- ...to figure out which of two fractions is biggest?
- ...to figure out how to reverse a set of directions to get back to your starting point?

A set of six items not related to the *Do the Math* videos was also integrated into the rating questions:

- two math-based items that are like *Cyberchase* problems:
 - ...to figure out how the sizes of different parts of your body compare to each other?
 - ...to figure out how to make a secret code that you and a friend could share?
- two items that are school type math activities:
 - ...to figure out the right answer to a math problem on the blackboard?
 - ...to figure out the best way to study for a math test?
- two items that are not math activities:
 - ...to figure out the history of your home town?
 - ...to figure out how to take care of a pet?

Changes in Interest and Confidence

Watching the short form videos did not influence interest but did significantly increase confidence. The mean confidence ratings after viewing were significantly higher than the ratings before viewing for the set of six *Do the Math* problems. Almost three-quarters of the sample were more confident about their ability to figure out the *Do the Math* type problems after viewing the ten videos. There were no differences pre to post in the set of six non-*Do the Math* problems for either interest or confidence.

Changes in Interest in Figuring Out Math-Related Problem Activities

There were no significant changes in interest from the pre-survey to the post-survey in the combined set of six *Do the Math* problem activities, nor were there changes in interest in the set of six non-*Do the Math* items.

Changes in Confidence in Figuring Out Math-Related Problem Activities

There were significant changes in confidence from the pre-survey to the post-survey in the combined set of six *Do the Math* problem activities.⁷ Table 3 presents the pre-post mean confidence ratings for the *Do the Math* problem set. Post-viewing confidence of *Do the Math* math problem activities was greater than pre-viewing confidence for 71% of the sample. Viewing the *Do the Math* videos significantly increased children's confidence in their ability to figure out the *Do the Math* type problems. There was no difference in confidence pre to post for the set of six items not related to the *Do the Math* videos, thus supporting the conclusion that viewing the videos yielded a real effect rather than a testing effect.

⁷ One-tailed paired *t*-test of means, $t(61) = -4.746, p \leq 0.0001$.

Table 3. Pre and Post Mean Confidence Ratings for Set of Six *Do the Math* Problem Activities

	I definitely could do it 1	I maybe could do it 2	I'm not sure that I could do it 3	Maybe I could not do it 4	I definitely could not do it 5
Pre	$M = 2.33$ ($SD = 0.66$)				
Post	$M = 1.95$ ($SD = 0.66$)				

RESULTS: CHANGE IN MATH KNOWLEDGE

The short-form videos were also intended to increase viewers' knowledge about a limited set of math problems related to four *B&D Do the Math* videos about fractions, tessellation, inverse operations and measurement. Four questions were asked in the pre survey and again in reverse order in the post survey. Each child read the questions aloud and typed their own answers.

Change in Math Knowledge

Viewing the short form *B&D* videos significantly increased children's comparative knowledge of the two video fractions, significantly increased children's recognition that hexagons can "tessellate," and significantly increased children's likelihood of suggesting the use of a measuring instrument to "split a room equally." Exposure to the *B&D: Together Again* video did not change viewers' ability to reverse directions, as measured by the survey question. Thus, three of the four videos improved viewers' specific math knowledge.

B&D: Any Way You Slice It. The children were asked to compare in the question below the specific fractions that were used in the *B&D* video. Two-thirds (65%) of the group gave the correct answer prior to seeing the videos and 98% gave the correct answer after - a statistically significant change.⁸

33. Imagine that you have a choice of 1/3 of a pizza or 1/8 of a pizza. Which is the larger slice of pizza?

- 1/3
- 1/8
- I don't know

⁸ McNemar Two-Tailed Test of Paired Proportions, $p \leq 0.0001$.

B&D: Can't Wait to Tessellate. In conjunction with reading the question shown below, the local evaluator showed the child a white piece of paper and yellow cut-out shapes of one circle, one hexagon and one square.

34. Imagine that you have a lots of yellow circles, lots of yellow hexagons, and lots of yellow squares and a piece of white paper. Your goal is to choose one kind of shape and place lots of that kind of shape side-by-side on the paper, so that no white of the paper shows through and everything is yellow. Which kind of shape would you choose to cover the paper with no gaps or overlaps, so that the white paper is all yellow?

	No	Yes
Would yellow circles side-by-side cover the paper so that no white shows through?	<input type="radio"/>	<input type="radio"/>
Would yellow hexagons side-by-side cover the paper so that no white shows through?	<input type="radio"/>	<input type="radio"/>
Would yellow squares side-by-side cover the paper so that no white shows through?	<input type="radio"/>	<input type="radio"/>

The circles were not chosen by almost all children in both the pre (97%) and post (98%) surveys. The squares were chosen by almost all children in both the pre (97%) and post (100%) surveys. The hexagons yielded a significant difference between pre (8%) and post (26%) responses.⁹ The video helped children to recognize that hexagons can “tessellate.”

B&D: Measuring Up. Related to this video, the children were asked an open-ended question:

35. Imagine that you have to share your room with someone else. You want to be fair and split the room equally. How would you split the room equally?

The open-ended responses were sorted into categories by key word or key phrases. Below are the categories and example answers of how to split the room equally:

- Declare “this is my side, that’s yours”
*I would probably just say this is your side and that one’s mine.
 One part is their part and the other side is the other person’s part.*
- Use tape, string, wall, line to mark the division
*I’d put a rope in the middle of the room, or a string or whatever.
 Put a tape, like a blue tape in the middle of the room.
 I would guess about what’s equal, and then put a rope in the middle of the room, and I would put it into the wall and tie it. I would put all my stuff on my side and that would do it.*
- Split the room in half; e.g.,
*Split it in half
 I would divide it into two equal groups
 Half and half*

⁹ McNemar Two-Tailed Test of Paired Proportions, $p = 0.013$

- Measure the room with ruler or other object

I would use a ruler to measure the length of the room and the width and then the room would be divided equally.

I would probably take some rulers and measure it out equally and then once we get to the middle of the room, we would split it evenly, and it would be fair.

You could get some Xerox paper, and put it all on the room. Some could be red, and some could be purple, and you could get it to be equal by having the same number of each color.

I would take an even block or cube and then count how many of them it would be from one side of the room to the other, and if it was an odd number, I would just split it in half.

Pre and post frequencies for each category are displayed in Table 4. A child’s response could include more than one category; for example, *I would draw a line across the room in the middle [use line to divide room] by measuring it first. I would use a ruler [measure with ruler].* In the post-survey, significantly fewer children simply declared “this is my side, that’s yours;”¹⁰ and significantly more children said they would measure the room with a ruler or other object.¹¹ There were no differences in the proportions of children using tape or string to divide a room or those saying they would split the room in half.

Table 4. How to Split a Room Equally

Response Category	% Pre	% Post
Declare “this is my side, that’s yours”	19%	0%
Use tape, string, wall, line to mark the division	19%	30%
Split room in half	63%	66%
Measure room with ruler or other object	27%	65%

Additionally, like Buzz and Delete in the video, 16% of the children raised the issue of the door in their post-survey answers; e.g., *I’d measure the room in inches, and if it was an even number, then we would split the room in two, and if the door was on the other side, the person would get free access to the door. And if it was an odd number of inches, then that space would be for both of the people in the room.*

¹⁰ McNemar Two-Tailed Test of Paired Proportions, $p = 0.0005$.

¹¹ McNemar Two-Tailed Test of Paired Proportions, $p \leq 0.0001$.

B&D: Together Again. The children answered the following question related to this *B&D* video about inverse operations:

36. Here is a set of directions that some friends followed to get from a store to your house.

Walk out the store door.

Turn right and walk two blocks.

Turn left and walk four blocks.

Turn left to your front door.

Now the friends want to go back to the store. Give them specific directions of how to get back to the store.

The original directions in the question are Right, 2 blocks, Left, 4 blocks, Left. Table 5 presents the frequency of reverse directional sequences given by the children. Both before and after the videos, the children understood the concept of reversing the directions, but very few could provide the correct reverse directions. The children did not reverse directions by reading bottom up and right to left; that is, “Go out the front door. Turn right. Walk 4 blocks,” etc. Most children reversed directions by reading bottom up and left to right; that is, “Turn right out your front door. Turn right and walk four blocks,” etc.

Table 5. Directional Sequences to Get Back to the Store

Reverse Directions	Example	% Pre	% Post
Right, 4 blocks, Right, 2 blocks, Left [correct response]	<i>Turn right and walk 4 blocks. Turn right and walk 2 blocks. Turn left and walk into the store.</i>	2%	3%
Right, Right, 4 blocks, Left, 2 blocks	<i>Turn right from your front door. Turn right and walk 4 blocks. Turn left and walk 2 blocks. Walk in the store door.</i>	24%	52%
Right, 4 blocks, Left, 2 blocks	<i>Walk out my door. Turn right and walk 4 blocks. Turn left and walk 2 blocks. Walk into the store door.</i>	16%	13%
Left, Left, 4 blocks, Right, 2 blocks	<i>Go out of your front door and turn left, turn left and walk 4 blocks, turn right and walk two blocks, walk into the store</i>	15%	8%
Left, 4 blocks, Right, 2 blocks	<i>Walk out my door, turn left and walk four blocks, turn right and walk two blocks, go inside the store</i>	13%	3%
Left, 2 blocks, Right, 4 blocks, Right	<i>First, walk out our front door. Then turn left and walk two blocks. Then turn right and walk four blocks. Then turn right to the store door.</i>	2%	5%
Miscellaneous other orders		15%	10%
Unable to answer		13%	6%

RESULTS: GENRE AND VIDEO APPEAL

The evaluation included questions that related to the appeal of the three different genres and comparative appeal of the individual videos.

Genre and Video Appeal

The three genres did not differ significantly in appeal ratings, with 84% to 88% of viewers liking the three genres “a lot” or “sort of.” When asked to choose one favorite and one least favorite video, the children split their votes fairly equally among the ten videos, with no genre being preferred.






Children liked the *Math Magic* videos because they were fun, cool or made math fun. They thought Harry was funny and enjoyed the audience involvement. They liked math tricks that they could understand and do themselves. They did not like math tricks that were confusing or with which they were already familiar.

Children liked the characters in the *Lucky Star* videos and enjoyed learning from the shorts. They thought it was funny that Hacker lost his game but felt that the Behind the Scenes video was least interesting because it did not show a game played.

Children liked the *Buzz & Delete* videos mainly because they were funny. They liked that the characters would argue about a problem and then solve it together. Those who did not like some of the *B&D* videos complained that the characters were mean to each other, that the videos were boring or the math too easy.

For each of the three video genres, the children were shown photos of the videos and asked to pick a face that shows how much they liked the videos as a group. The set of faces was defined, left to right, as meaning “you liked something a lot, you sort of like it, it was okay, you sort of didn’t like it and you didn’t like it at all.” Table 6 presents the distribution of appeal of the three video genres. Appeal did not differ significantly among the three genres.

Table 6. Appeal of Video Genres

Point to the face that shows how much you liked...					
...the <i>Math Magic</i> videos as a group.	56%	31%	8%	5%	0%
...the <i>Lucky Star</i> videos as a group.	53%	31%	16%	0%	0%
...the <i>Buzz & Delete</i> videos as a group.	44%	42%	14%	0%	0%

Math Magic Videos

When asked what they liked about the *Math Magic* videos, most of the children said they were fun, cool or made math fun:

- 45% liked the videos because they were fun, cool, or made math fun; e.g.,
That they were really fun to watch.
They were kind of like math and magic combined. That made it really fun to watch.
Like he did cool stuff that was tricky. I liked this the best. I just think it was really neat.
It was cool. It made math more fun. I only think math is so so.
They were cool experiments.
They were very interesting and cool.
Have fun learning math.
I liked how we were learning but he was making it fun. Teaching and yet it was fun.
 - 31% felt the videos were funny.
I like how funny the banana one was, and I knew what he did with the ring, because I have done that before. The other one was funny too. They were all funny.
He is always so funny and does funny things like the laser and the sucking up.
I liked them because the guy was sometimes funny, because he would say like 'da da dunh' and stuff like that. That's pretty much it.
It tricks you. It was really funny.
 - 24% liked that they learned tricks.
Well, I liked that if you did it, it actually worked. So those videos actually taught you something.
I like how I learned the tricks.
I like that if they teach you magic tricks, you can share them during math to your class, and they can learn cool things that have to do with math but are magic tricks.
I liked that they actually worked. I got to show the class the Mobius band one – at first it didn't work, and then I did it again and it worked.
 - 18% liked that Harry told them how to do the tricks.
That he tells us how to do it at the end. Can I watch these again on the Cyberchase website? Because I want to teach my Mom how to do this trick.
It actually seemed like magic, and then afterwards, he showed us how to do it.
I liked how they had tricks and at the end, he would tell you the answer.
 - 15% liked the audience involvement.
I liked that it was real, and that there were kids that came up, and they used their imaginations.
That the Math Magic guy took kids from the crowd to help
I liked when the person picked people from the audience and helped him.
How he made the crowd do all these things that I laughed at.
- A minority of children could identify something that they did not like about the *Math Magic* videos:
- 10% focused on Harry's looks or actions; e.g.,
I think he's a little bit weird, like his hair is funny and he talks funny, for me.
He was being kind of bossy.

How he laughed.

I thought the guy was annoying by trying to trick the audience.

- 6% felt that the tricks were hard; e.g.,
The only thing is that I couldn't do one of the magic tricks.
On the Loopini one, I didn't like that it was kind of hard to do, so they could have made it easier.
Some of them, I didn't really get the tricks.

The children chose from among photos of the ten videos the one that they liked the best and the one they liked the least. As a group, the three *Math Magic* videos were chosen as the favorite by 36% of the viewers and as least favorite by 40%, as distributed in Table 7.

Table 7. Favorite and Least Favorite Videos for *Math Magic* Genre

<i>Math Magic</i> Video	Favorite of 10 videos	Least Favorite of 10 videos
I've Got Your Number	13%	8%
The Fractionator	13%	16%
The Great Loopini	10%	16%
	36%	40%

Children liked the *Number* video because they thought it was *cool* that you would always get *the same number* and because they could *share it* anywhere without preparation or props. Those who chose this video as their least favorite either thought it was *confusing* or *already knew the trick*.

Children liked *Fractionator* because they liked the fun by-play of the laser finger and goggles and because they liked the *neat trick*. Those who chose this video as their least favorite did not like the *magic finger*, felt the trick was either *too easy to do* or *wasn't really interesting*.

Children liked *Loopini* because it was *fun to watch*, *cool how it worked*, and the *easiest trick to do*. Children who chose this video as least favorite felt it was *not as interesting* as the others and *didn't make sense*.

Lucky Star Videos

When asked what they liked about the Lucky Star videos, most of the children said they liked the characters:

- 40% liked the videos because they liked the characters; e.g.,
I liked the people that were in it.
I loved seeing the characters and the contestants that won.
It was cool to see the characters for Cyberchase in the videos.
I liked the Hacker one the best – the other, they were all funny and they made me want to play the game. Their voices were funny.
When Hacker got really mad and what he was doing. I liked how the square moved himself and jumped around.
I like those because they were showing all the characters, and they were funny how they got mad, and how they would react to things happening. I liked those videos.

- 31% liked the videos because they learned from them; e.g.,
Actually showed me how to think about doing the game right to get the points.
They helped me learn about math.
Cause it made me smarter.
I really liked them. It's math and I like math. I liked how they thought of it and figured it out.
I liked to see them playing the games and thinking the questions.
The Lucky Star videos teach you how to do things, but they were really fun, and it's like watching a game show, and you learn something too.
- 23% liked the videos because they were associated with the Lucky Star game; e.g.,
It made me play the game.
It had me try the Lucky Star game.
I liked how with one star you get a ton of points, and the game was really fun at the end.
I liked how there was a competition. I liked how it was a game, and it was fun.
- 16% liked the video because they like game shows; e.g.,
I like game shows and the questions they asked.
They were really fun, funny. And I just really like game shows.
I liked that it had questions in it, like a game show, it kept me more interested.

A minority of children could identify something that they did not like about the *Lucky Star* videos. A few (6%) picked on Hacker as the *bad guy*; 5% felt the questions were *kind of hard*, and 3% complained that the questions were *sort of obvious*.

The children chose from among photos of the ten videos the one that they liked the best and the one they liked the least. As a group, the three *Lucky Star* videos were chosen as the favorite by 27% of the viewers and as least favorite by 26%, as presented in Table 8.

Table 8. Favorite and Least Favorite Videos for *Lucky Star* Genre

<i>Lucky Star</i> Video	Favorite of 10 videos	Least Favorite of 10 videos
With Hacker	15%	2%
With TW	10%	6%
Behind the Scenes	2%	18%
	27%	26%

Children liked the *Lucky Star* Hacker video because it was *funny* and *Hacker lost*. The one person who chose this video as their least favorite does not like Hacker.

Children liked *Lucky Star* TW because they liked the character and her come-from-behind victory. The few who chose this video as their least favorite described it as *boring*.

The one child who liked *Lucky Star* Behind the Scenes liked Jackie and *how she took control of things*. This video was the least favorite of the ten videos. Children who chose this video as least favorite said it was *just background, not interesting* and *didn't have much of the game*

Buzz & Delete Videos

When asked what they liked about the *Buzz & Delete* videos, most of the children said they were funny:

- 48% liked the videos because they were funny; e.g.,
I liked that it was really cool and funny. At first, it was cool because on some of the videos, it started like they wouldn't make it or they got what they wanted, but sometimes they didn't, that is what was funny about them.
For the cake one, the one guy picked a higher fraction because he thought he was going to get a bigger cake by picking the bigger fraction, and that was funny.
They were funny. The guys were funny to watch as they made mistakes.
They were funny because in one of the videos they were fighting over the room.
They were funny also like when Buzz tessellated and he made a big donut.
I liked Delete. He is a robot, and he and Buzz are funny.
Buzz and Delete were interesting characters to watch. They were silly and funny.
- 26% liked the videos because the characters would argue about a problem and then solve it together; e.g.,
I liked them because one time they were angry, because they had two sides, and they tried to figure out something together. It was neat.
I liked the Buzz and Delete videos because they always have some sort of big problem, then they fix it. There was always a problem and always a solution.
That at the beginning they are fighting, and at the end they solved the problem.
That it was only Buzz and Delete. In some they were fighting, and some they were happy. I liked how they worked together. It was funny how they fight, that they could agree and then they got mad because the door was on Buzz's side.
Buzz always had the problem, and Delete had in some, and Delete would help. Shows team work and lots of math and things.
- 19% liked the videos because they learned something; e.g.,
I liked this one, because we were learning about fractions in school. I didn't know about tessellations, so that one was cool. This one, it was really cool, I didn't know that you could reverse directions. They taught you how to fix things, how to do shapes, how to split the room, and how to get a bigger piece of cake.
I learned how to make a picture out of all different kinds of shapes.
I learned stuff from them.
Because they taught you a lot of things – like how to divide into equal groups, and how to do things in order.
They kind of taught you fractions and stuff and geometry and halves. I liked learning that.

A minority of children could identify something that they did not like about the *B&D* videos:

- 15% felt the characters were mean and cranky.
- 10% thought some of the *B&D* videos were boring.
- 8% said that they already knew the math.

The children chose from among photos of the ten videos the one that they liked the best and the one they liked the least. As a group, the four *Buzz & Delete* videos were chosen as the favorite by 37% of the viewers and as least favorite by 28%, as presented in Table 9.

Table 9. Favorite and Least Favorite Videos for *Buzz & Delete* Genre

<i>Buzz & Delete</i> Video	Favorite of 10 videos	Least Favorite of 10 videos
Anyway You Slice It	18%	11%
Measuring Up	8%	3%
Together Again	6%	8%
Can't Wait to Tessellate	5%	6%
	37%	28%

The *Anyway You Slice It* video was the favorite among the ten videos, possibly because it was the first viewed of the ten. Children liked this video because it was *funny* and they *learned the most*. Those for whom this video was their least favorite did not like the fighting or reported already knowing the math content.

Measuring Up was a favorite because it was *funny* and *interesting*. Children who chose this video as least favorite said it was *not fun*.

The video *Together Again* was chosen as a favorite because *they take something apart and put it back together*. Those who liked this video the least said it was *too obvious* and *kind of boring*. A few children chose *Can't Wait to Tessellate* as their favorite, because they liked the concept of tessellation: *It was cool how you can tessellate. It's not like just putting different shapes together. You can actually do something with one shape*. The few who chose this video as their least favorite did not think putting shapes together was interesting.

SUMMARY & DISCUSSION

The pre-post same-sample study measured the extent to which viewing ten short-form online *Cyberchase Do the Math* videos motivated viewers to do math-related activities both online and offline; changed interest and confidence in figuring out math-related problem activities; and changed video-related math knowledge.

Children increased their engagement with mathematics by taking advantage of some of the online and offline opportunities.

All of the participating children viewed all of the ten assigned online videos, and most of the children were motivated to replay one or more of the assigned videos. Three-quarters of the viewers reported talking to others about the videos.

Watching the videos motivated almost all viewers to click on a video-related game, and one-fifth of the group reported playing *Cyberchase* math games not related to the videos. Many more children would have started games associated with the *Buzz & Delete* videos if the games had been made available on the video-player pages.

After viewing videos, one-third of the children said they were motivated to send something to *Cyberchase*, but only 15% actually clicked on the Send It button and one child submitted a story. Most children said they were simply not interested in sending something or that they had no time or did not know how to send something.

The children participated in a variety of offline activities related to math. The videos motivated almost three-quarters of the children to do at least one math activity not related to school or homework. The *Buzz & Delete* videos motivated 58% to do at least one math activity not related to school or homework. *Math Magic* videos motivated 60% of the children to do at least one magic trick. Most of those who did not want to do a trick said that they did not think about doing one.

Few children were motivated to continue interactions with *Cyberchase*.

Of those children who had not watched the television series in the months prior to the study, 13% were motivated by the short-form videos to watch the long-form show during the 20 days of the study. During the ten days after the assigned videos were completed, a couple of children were tracked viewing a video short again or starting a video-related game online. The lack of continued interaction with the *Do the Math* videos and games could be a result of saturation with the *Do the Math* experience. During the initial ten days, the children had seen all the videos, replayed some, and played many of the games, and thus were familiar with the *Do the Math* products. However, a few children asked about future access to the *Math Magic* videos to practice the tricks.

Children demonstrated greater confidence but no greater interest in solving math problems related to the *Do the Math* videos.

Watching the short form videos did not influence children's interest in solving a set of six *Do the Math* problems but did significantly increase confidence. Almost three-quarters of the children were more confident about their ability to figure out the *Do the Math* type problems after viewing the ten videos. There were no differences pre to post in the set of six non-*Do the Math* problems for either interest or confidence.

Children showed increased understanding of math content specific to three of the four *Buzz & Delete* videos.

Viewing three of the four *Buzz & Delete* videos significantly improved children's specific math knowledge related to fractions, tessellation, and measurement. Children learned that $1/3$ is larger than $1/8$, that hexagons can "tessellate," and that a measuring instrument will help split a room equally. Exposure to the *B&D: Together Again* video did not change viewers' ability to reverse directions, as measured by the survey question.

Children found the *Do the Math* genres and videos fun and appealing.

The three *Do the Math* video genres did not differ significantly in appeal ratings, with 84% to 88% of viewers liking the three genres "a lot" or "sort of." When asked to choose one favorite and one least favorite video, the children split their votes fairly equally among the ten videos, with no genre being preferred. Viewers liked the ten videos because they were fun and funny, because the characters and their interactions were appealing, and because they learned from them. Lower appeal resulted when the viewers were already familiar with the math or when they found the math confusing; on average, however, the math hit the third-graders' sweet spot.

Because participating children were assigned to watch a daily video, the study results are limited in generalization to similarly motivated users. Nonetheless, the high appeal and educational quality of the videos support the notion that other website visitors who view these videos will be motivated in a manner similar to the study sample.