



MULTIMEDIA RESEARCH

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Formative Evaluation of Season VII *Cyberchase* Materials



Report for
WNET
by

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INTRODUCTION

Cyberchase is a public television series of half-hour animated math shows for 8-11 year olds. To help guide the development of Season 7 (Do The Math!), this formative evaluation gathered feedback from third graders in response to three different materials: (1) a web-based game concept; (2) a web-based storymaker concept; and (3) “The Misadventures of Buzz & Delete” short videos.

METHOD

Sample

Equally distributed across three sites (North Miami, FL; Austin, TX; Providence, RI), 32 third graders participated in the evaluation, including equal gender groups and 25% minority representation. All but two participants had viewed *Cyberchase* previously. One-third of the sample had recent viewing experience in the previous few months; one-third viewed “last year,” and one-third viewed “long ago.” Two-fifths (41%) of the sample had visited the *Cyberchase* website previously.

Procedure

At the start of their 40-minute session, the third graders were told:

The people who make the Cyberchase television show are developing some new ideas for kids your age. Today I’m going to show you some of these new ideas and ask your opinion.

Participants were interviewed about their reactions in response to a variety of media materials: (1) a web-based game concept; (2) a web-based storymaker concept; and (3) “The Misadventures of Buzz & Delete” short videos. Specific procedures for each set of materials are reviewed in the results sections.

RESULTS: WEB-BASED GAME CONCEPT

Cyberchase is developing a web-based game, which includes two parts. In the first un-timed part, users choose a math problem and pick an answer choice from four possibilities, earning 100 points for a correct answer. In the second timed part, the Lightning Round, users have 60 seconds to answer as many problems as they can, earning a to-be-decided number of points per correct answer. The evaluation looked at the type of problems to include in the game and respondents' preference for part one or part two of the game.

Of our 32 third graders, 69% watch TV game shows, and 59% had seen the game show “Are you smarter than a fifth grader?,” so most students were familiar with the game show concept.

Interviewers introduced the game concept to participants, as follows:

Cyberchase is developing a game show on their website. The game has a host and a contestant. You are the contestant. Your goal is to solve as many math problems as you can. You get points for each math problem you solve. When you score enough points to beat other kids playing on that day, your user name gets posted on the web site. There are two parts to the game. The first part of the game involves problems like these. [Participants were shown word problems as presented in Appendix A.] I don't want you to solve these problems, but I would like you to read the problems aloud to me and think about which one is easiest and which one is hardest for you to answer.

Types of Problems

Table 1 presents the sample's choice of easiest and hardest problems in part one of the game. Respondents felt that the easiest problem for them was #5, counting squares in the rectangle, and the next easiest was the multiplication problem, #2. The hardest problem related to knowledge of the series itself (#3. Who is the leader of Radopolis?), but recency of viewing the series did not influence the choice of this problem as “hardest.” The area (#1) and division (#4) problems were rated as next hardest.

Table 1. Easiest and Hardest Part One Problems to Answer

Problem	Easiest	Hardest
1. What is the area of this strange fish from Aquari-Yum?	0%	25%
2. You're making four stools like this one. How many legs do you need to make?	22%	0%
3. Who is the leader of Radopolis?	3%	53%
4. One penguin weighs 25 pounds. A wagon can carry 125 pounds. How many penguins can you carry in one wagon?	6%	22%
5. How many squares are in this figure?	69%	0%

Although respondents were not asked to explain their choice, several commented aloud as they read the problems. One third grader liked area problems but said #1 was harder than what he is used to because the squares are not whole; another child noted that the “squares are cut off,”

making it harder to solve. One student felt that the size of the numbers in #4 make it a hard problem, but another child noted that #4 “is easy if you count by 25.”

Participants were asked if their choice of ‘hardest’ problem was too hard to include in the game. Table 2 shows that about one-half (48%) of the students who said a problem was ‘hardest’ felt that the problem was not too hard to include in the game. They were willing to be challenged; for example, one child suggested of problem #1: “put it in the challenging category.” One-quarter of the sample said that #3 (program knowledge) should not be included in the game.

Table 2. Part One Problems Too Hard to Put in Game

Is problem too hard to include in game?	Hardest	No	Maybe	Yes
1. What is the area of this strange fish from Aquari-Yum?	25%	13%	9%	3%
3. Who is the leader of Radopolis?	53%	22%	6%	25%
4. One penguin weighs 25 pounds. A wagon can carry 125 pounds. How many penguins can you carry in one wagon?	22%	13%	3%	6%
5. How many squares are in this figure?	0%	-	-	-
		48%	18%	34%

Interviewers introduced the Lightning Round concept to participants, as follows:

The second part of the game is the Lightning Round. The Lightning Round presents problems like these. [Participants were shown word problems as presented in Appendix B.] Again, I don’t want you to solve these problems, but I would like you to read the problems aloud to me and think about which one is easiest and which one is hardest for you to answer.

Table 3 presents the sample’s choice of easiest and hardest problems. Unlike the problems in part one, part two choices of “easiest” problem showed more variability. One-quarter of the sample felt that the easiest problem for them was A, addition, or F, comparison. One-fifth of the sample chose C, multiplication, or D, division, as easiest. Subtraction, B, was the least frequent choice for both the easiest or hardest category. The hardest problem related to measurement knowledge, E.

Table 3. Easiest and Hardest Part Two Problems to Answer

Problem	Easiest	Hardest
A. $6 + 6 + 6 = ?$	25%	6%
B. $25 - 6 =$	3%	3%
C. $4 \times 5 =$	19%	3%
D. $25 \div 5 =$	19%	9%
E. How many cups in a quart?	0%	59%
F. Which is bigger, an inch or a yard?	25%	0%
G. How many sides does a pentagon have?	9%	20%

Although respondents were not asked to explain their choice, several commented as they read the problems. One third grader chose C as “easiest” because “multiplication is easy for me.” Related to E, one child noted that “some kids don’t know how much a quart is” and chose this as the “hardest” problem.

Participants were asked if their choice of ‘hardest’ problem was too hard to include in the game. Table 4 shows that half (50%) of the students who said a problem was ‘hardest’ felt that the problem was not too hard to include in the game.

Table 4. Part Two Problems Too Hard to Put in Game

Is problem too hard to put in game?	Hardest	No	Maybe	Yes
A. $6 + 6 + 6 = ?$	6%			6% ¹
B. $25 - 6 =$	3%	3%		
C. $4 \times 5 =$	3%	3%		
D. $25 \div 5 =$	9%	3%		6%
E. How many cups in a quart?	59%	31%	6%	22%
F. Which is bigger, an inch or a yard?	0%			
G. How many sides does a pentagon have?	20%	10%		10%
		50%	6%	44%

The interviewer reminded respondents that players will have as much time as needed to figure out answers to part one problems but only 60 seconds to answer as many part two problems as possible. Students were then asked if they could do each type of part two problem “fast” and asked if the Lightning Round should include each type of problem (see Table 5).

Some children added qualifications as to whether or not they could do a problem type fast; for example, “yes and no, depending on what numbers”, “yes, if they don’t go past the 6’s,” “no, if you are over 7.” Answers with qualifications or answers of “sort of” were put in the “no” category for “can you do [blank] problem fast.”

The third graders appear to be most comfortable with their skills in answering problems of addition, subtraction, multiplication, and comparison. Although the students were uncertain about answering fast the problems of “shapes, figures,” most of the group felt such problems should be included in the Lightning Round. More uncertainty surrounds the inclusion of division and measurement problems.

Table 5. Problems for the Lightning Round

Type of problem	Can you do [blank] problem fast?	Should we include [blank] problem in Lightning Round?
Addition	94%	100%
Subtraction	91%	100%
Multiplication	94%	91%
Division	59%	50%
Measurement	31%	53%
Comparison	94%	100%
Shapes, Figures	66%	91%

¹ Perhaps these two kids think the addition problem is hardest because it presents THREE numbers whereas the others present only TWO numbers?

Preferences for Part One or Part Two

Finally, interviewers asked participants which part of the game they would like to play the most: *the first part where you solve these type of problems with as much time as you need and you earn 100 points for each correct answer, or the Lightning Round where you solve as many of these type of problems as fast as you can in 60 seconds and earn fewer point for each correct answer.*

Responses as to which part was preferred were independent of demographics, background, and answers on all previous questions except children's assessment of their ability to answer division problems fast. One's ability to answer division problems fast was significantly related to one's preference to play the first part or the second part.² Of the 13 (41%) children who felt they could not answer division problems "fast," 1 (8%) chose the Lightning Round as that which they would like to play the most. Of the 19 (59%) children who felt they could answer division problems "fast," 10 (53%) chose the Lightning Round.

Of the total sample, two-thirds (66%) wanted to play the first part the most. Respondents choosing the first part noted that they would have more time to do problems, that they would get more points, that the problems gave multiple-choice answers and were illustrated.

Because like if you get stuck on a problem or something and you forget how to do it, you can do something to help. Like you can count on your fingers or something, but with the lightning round, you wouldn't have 10 more seconds to do that.

Easier to do them when you are not timed

Have as much time as you need and choices for your answers and you can check them

So then you can have more time to figure it out and not be in a rush.

Because this one [part two], if you run out of time, you can get only up to here or here and then you have to and you can't do it that fast. With this one [part one] you can take as long as you want.

Cause you have lots of time to solve the problems.

You don't have to do it in a limit of time.

I take a lot of time for these kinds of things

You have more time to figure it out

You get more points for them, and there is more time.

Have as much time and earn more points

Because you have more time and get more points

More time, and that's a lot of points.

I like the fact that you are put under pressure on this one [part two], but I prefer the first part, because you earn more points and I just like earning more points, and the other is faster and you don't earn as much points. I actually think this one [(first part)] will be a little easier.

I would really like to do a bit of each, but I might want to warm my brain up with something where I have all the time in the world then go to the timed one

Because it gives you A, B & C - multiple choice

Seems funnest out of the two - multiple answers, and don't solve in your head

I think these are more fun

I think that these are more interesting. They have more pictures and it helps you when you need help. Like it shows the figures and gives you something to look at.

Cause it looks fun...the pictures.

Like word problems better

² 2 x 2 chi-square Fisher Exact Test significant at $p = 0.01$.

One-third (34%) wanted to play the second part the most. Respondents liked the challenge posed by the timed Lightning Round.

More of a challenge just more fun - don't get it right then oh oh

Cause it's challenging, like you have time and you have to figure it out quickly and you don't have anything to help you.

I like math problems, and I like a challenge

More challenging

More challenging

Like having some pressure, boring to have forever to answer questions

I like when you have the time limit

If I was older, then I could do them faster. It would be easy for kids under 7, but what about the kids who want a challenge? I prefer the speed round.

The time limit lets you see how good you are

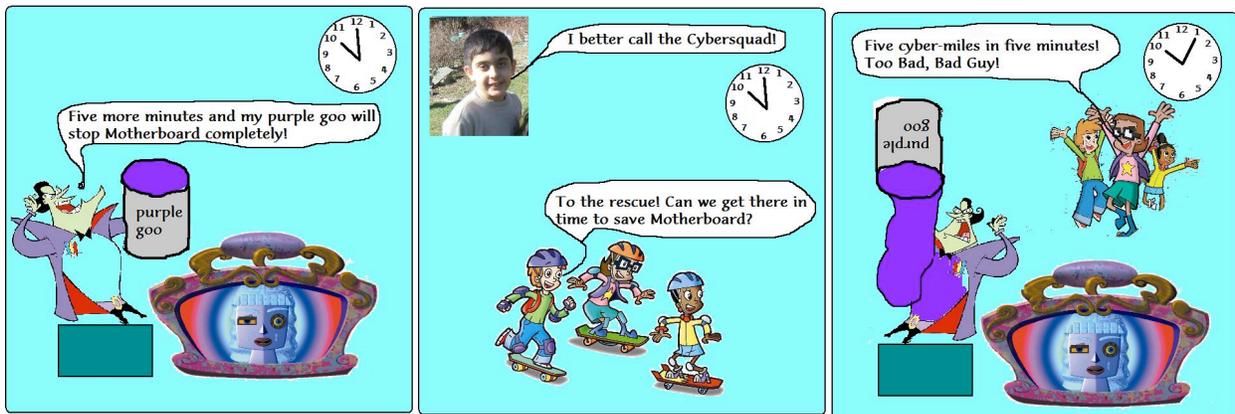
Because this one [part one] takes too much time, and if one person's done, then you'll have to wait until the other person's done, and it won't be fair to the one who gets done first

Because if anybody ever has a test, or they need help with something, that will help them get fast at it.

RESULTS: WEB-BASED STORYMAKER CONCEPT

Cyberchase is developing a web-based storymaker. The evaluation looked at preference for story creation functions and sharing mechanisms. The evaluation participants were shown the story cartoon below and walked through the functions of the storymaker, as follows:

Another activity on the Cyberchase web site will let you create a story with words and pictures and drawing tools. Here's an example of what one person made with the Cyberchase storymaker. I'm going to read the story to you. [reads story] With the storymaker, you can choose to click and drag Cyberchase characters into your story space. The characters will be in different poses and different expressions on their faces. Here the person who created this story used the characters Hacker, and Motherboard and the three kids. With the storymaker, you can also insert other Cyberchase artwork. Here the creator added a clock. You can use photos from your own computer. Here the creator used a photo of himself. With the storymaker, you can draw with a computer pencil using your mouse. Here you can see the creator drew a can of purple goo and a blue box. Finally, you can type whatever text you want to tell your story.



Of our 32 third graders, 56% said that they had previously used a computer to create a story, as follows:

Yeah I was making a comic. It was called "Comic Life" on a Mac. You don't have to pay for it. Me and my sister, we took photos of ourself on the computer, and we put them on the squares, and we added the like speech bubbles and the exclamation points and fonts and the boxes that you put on the bottom that tells you what is exactly happening.

I've started a lot of stories. I found out how to make talk bubbles in MSWord. Then I use a paint program to draw pictures.

I did biographies, I did one about the Dali Lama, I did one about I think John F. Kennedy. I used pictures, clip art and used Microsoft word.

With Microsoft word. I did it for fun. [did not finish or use pictures]

I do Powerpoint presentations, and I use Nicktoons creator- you can mix and record music, add voices with a computer microphone

Did it on Powerpoint at school

Used Powerpoint to make slides and stories

Used Powerpoint

Cause I have this game, and it was on Princesses, and you can make a story about if you were a Princess. I don't remember exactly.

I play a game- on a disk. I can't remember the name, because it got broken. You use different nouns and fill in the blanks.

Used bag to pick out plots, solutions and main characters and typed it and put it on a CD

Made a story about ghosts - drawing and words

It was called "The night before the moon started"- about the person who tried to develop the moon. Everyone was blocking him from trying, like Martin Luther King, he was trying to make it fair for everyone.

I am still working on it- I am writing a Dragon story- I found a picture and I am working on names for the characters and the story.

Drew a picture and wrote sentences and put them together on a website

There was this thing, there were no pictures. It would just let you type whatever you wanted and then it would go on to the next page, until you finished and on the bottom it said 'the end' and then the computer, there was a button, and it would read it for you. You did the pictures after, so you could see what you did. And you could print it.

Making different pictures and creating story and putting it on the computer

Like put stuff on and I tried to write, but it didn't work. I was putting on pictures, I forgot what the software is. I put all the stuff, but when I tried to write it, it didn't work out, I never really got to write it.

Story Creation Functions

After hearing the explanation of how the storymaker might work, participants were asked to point to a face on a 5-face scale to rate their interest in the various functions of the concept. Table 6 presents the functions and percent of responses.

Almost all students were interested in all the functions described, but more hesitation appeared for adding photos or drawing free-hand. Those children who had previously used a computer to create a story rated the idea of using their own photos significantly higher in appeal than those who had not previously created a computer-based story.³ All but one respondent had previously taken pictures with a digital camera, and 69% had taken pictures with a cell phone. One child explained his neutral interest in photos: "Cause it could be a little dangerous because there are people that are going to see this. They could put in their address, phone number, parents' email address and stuff like that."

Table 6. Appeal of Storymaker Functions

How much do you like the idea of ...					
...clicking and dragging <i>Cyberchase</i> characters into your story space?	34%	63%	3%		
...putting in other <i>Cyberchase</i> artwork for background or props?	53%	34%	9%		3%
...using photos from your own computer or camera or cell phone?	56%	22%	19%	3%	
...drawing whatever you want with a computer pencil using your mouse?	50%	34%	16%		

³ Scoring the responses from 5 to 1, with 5 being the happiest face, yields a mean rating for using photos of 4.7 for the 18 children who had created a computer-based story vs. 3.9 for the 14 children who had not. A *t*-test indicates significant difference at $p = 0.01$.

Students were asked what else they would like to do in the storymaker to create their own story:

- 31% suggested the ability to choose backgrounds, beyond *Cyberchase*.
- 22% recommended movement or animation of characters.
- 22% did not have ideas to add.
- 13% desired more characters and more poses.
- 9% wished to add music or sound effects.
- 6% wanted the typed words to be read aloud or have the characters say the words.

Here are the respondents' verbatim suggestions:

Choose background. Things from the show to give you ideas for stories

Put the backgrounds that I want, and is that the only time that you can show on the clock?

Like it to be more background of different things

Put backgrounds instead of just all blue

Choosing a background, think bubbles plus talk bubbles

Choose a picture to make a background, and then drag it into the picture

Add backgrounds with different patterns

I like the idea. You could pick like how many pages you'd want and also like what kind of background for each frame, like you could pick like mountains if you want or forests or like you could make a road and like put stuff on it.

Add backdrops and scenes, music and sound.

They should make the laboratory for a background - where Motherboard works. Have a little video of Hacker talking, have them talking the words that are typed. Well music I think you can have one of the pictures and click on it and it has sound or something like that - and it can move - movement.

You could put more than how many pictures are there - Maybe you should have sound, so you can have it read what you wrote and see if you made any mistakes.

Add sound effects

Be able to move the characters around a little

Motion...like adding lines [behind the people indicating they are moving]

Be able to make motions and it starts moving and talking

Maybe make the purple goo glow a little bit or maybe make it like Zap him, make him like stop. Maybe make Hacker try to stop them when they come in and take out something and try to zap them and dodge and they can push it out of his hands and he drops it. Maybe make like they are in a spaceship.

I'd like to make the pictures move

Animation, lots of different poses

Have more characters to choose from

Maybe characters can take it from real art work i.e. Mona Lisa

Add more words, more characters - like that bird (Digit)

Making it a book. A Chapter Book. Put pictures and take them and put them in the book.

Quote from show and drag it to the story

Put more props in there

If you read a comic, you usually see these boxes right there (pointing to bottom of frame) and it goes from one thing to another thing and it tells you what is happening in this. A box to describe the action. And I think if you highlight something, they should have a font button, and you should be able to see what font it is right now, you can type in which one you want or scroll down to choose a cool one and click on it and it will turn the regular font into that font.

Story Sharing Mechanisms

Interviewers asked the children to imagine that they could do all the things talked about and make their own short story. Participants then used the face scale to rate their interest in saving, printing, emailing, and posting their story. Table 7 presents the percent of responses for each of these activities. Third graders were most interested in saving, posting, and printing. There was less interest in emailing the story. Note that a few children assumed that once the story was saved that they could not edit or add more to it; they wanted to be able to continue modifying their story.

Table 7. Appeal of Sharing Story

How much would you like to...					
...save your story in your computer so you can look at it later?	66%	28%	3%		3%
...print out your story, like I have printed out this one?	53%	28%	6%	9%	3%
...email the story to other people?	44%	31%	9%	13%	3%
...post your story on the <i>Cyberchase</i> web site so lots of other kids can see it?	56%	25%	13%	3%	3%

When asked to identify their preferred way of sharing their story, 47% chose posting it, 38% chose printing it out, and 16% chose emailing the story. Children who had ideas of what else they would like to do with their story said the following:

- You could put your name spot, like where you could like write your name - they would like put a little slip right here where you can put your name and then you can put it up on your wall and pretend it is a really big thing you just made. Or sort of like depending on how big the things are when you print it you could, you could push it out and you could like fold it and put it/make into a book.
- Be able to get a cover and back to print out and make it into a book - cover and title
- Bring it to my class and show them
- Put it on a sign, so people can read it. Like a poster sign. Or put it on the playground so people can read it there.
- Like to show it to people on the computer and lots of people to see it
- Put it on the show
- Look at other people's stories
- Destroy it
- Fax it to other people
- Make a lot of copies
- Insert it into a piece of writing, paste it into other things

Interviewers asked the children to imagine that stories that other kids have created using the storymaker can be seen on the *Cyberchase* web site. Participants then used the face scale to rate their interest in looking at others' stories and voting on a favorite. Table 8 presents the percent of responses for each of these activities. Third graders were very positive about the possibilities of looking at and voting on other kids' stories.

Table 8. Appeal of Others' Stories

How much would you like to...					
...look at the stories that other kids have created?	63%	31%	6%		
...vote for your favorite story?	56%	28%	16%		

Students were asked what else they would like to do with other kids' stories:

- 31% recommended sharing the stories with others via email or printing.
- 25% did not have ideas to add.
- 16% suggested being able to edit the others' stories.
- 16% thought about adding comments to the stories.

Here are the respondents' verbatim suggestions:

If I know the person, show my class and compliment them
 Show to other people they don't know and read and see how good they are and give me an idea of what I can do
 Yeah, send it to other people. Email it.
 Email it to friends who would like it
 Email
 Maybe if you could click a button on something, I'd post it on the website (her friends) or I'd email it to all her friends and my friends.
 Send them to other people
 Print and send to a friend
 Print it
 Print it out
 Take own version and change it a little - how you want - post your version of their story
 Make weird people in it (add to it) Make him have black eyes...(edit other peoples) I'd add a monster in it.
 Be able to change them on your computer
 Change and improve it
 Adding to it like pictures or drawing
 Make a comment...or like...maybe give a story back to her, if she sends one to you
 Send comments - use other's stories to get your ideas
 Add comments, maybe you can put a comment bar and you can type in what comment you want...but if you type in a bad word, they would probably scratch it out - so...I think that all comments should be approved first.
 Be able to on the bottom of the screen say what you like and don't like and the person can see that
 Send him a certificate saying that this was really good!
 Save it
 Like if you like it a lot, maybe you can copy it and so you can see it again, if you want to see it. Or make it a screen saver.
 You should get a reward if you get the most votes
 Add them to your pictures and then paste it places

RESULTS: “THE MISADVENTURES OF BUZZ & DELETE” SHORT VIDEOS

Cyberchase is developing short videos starring Buzz and Delete to motivate viewers to do math activities at home. Two show videos (Tessellations and Measurement) were shown, with the order of viewing alternated. The evaluation looked at appeal, clarity of story, and motivation to model the math.

Prior to viewing, the interviewer explained the rough nature of the videos, as follows:

Now we're going to watch some video on the computer. But these are special videos. This is Buzz and this is Delete as they look in the finished television show [interviewer points to characters in picture to the right]



But before the TV show is finished, Buzz and Delete are drawn in black and white sketches, like this:



The videos you are going to see are black and white drawings of Buzz and Delete. Eventually these drawings will be made into the color animation that you see on the TV. But right now all I have are black and white video drawings. Are you ready to watch the first video?

Appeal

Viewers used the face scale to rate appeal of the stories about Buzz & Delete. Table 9 presents the percent of responses for Tessellations and Measurement. Almost all the viewers liked the two stories.

Table 9. Ratings of Story Appeal

How much did you like seeing this story about Buzz & Delete?					
Tessellations	50%	41%	6%	3%	
Measurement	66%	25%	9%		

Clarity of Story

For each story, viewers were asked to explain what kind of problem Buzz or Delete has and how they solved the problem.

Viewers pointed out four instigating problems in the Measurement video. Half of the sample described the problem as relating to an inequality of space.

- 31% suggested “they were fighting because each of their stuff was on the other persons’ part of the room.”
- 28% described the problem as “trying to get their room equal so they can each have a side.”
- 22% noted that “Buzz thought that Delete’s side of the room was bigger.”
- 9% said the problem was “not sharing.”
- 9% could not define the problem; e.g., “Delete is being mean and worried.”

Viewers gave varying detail of how the problem was solved. In describing the solution to the problem, more than half of the respondents focused on ripping of a comic book to make the spaces equal, and 38% of the children noted the making of a ruler with comic books. Responses were sorted into the following categories:

- 22% said they ripped a comic book so each would have 7.5 comics; for example, “ripped a comic. Each had 7.5 comics, the same amount of comics so both were happy.”
- 22% said they ripped a comic book to make things equal; for example, “they ripped the comic so they could have equal groups.”
- 19% described making a ruler of comic books and ripping a comic to make things equal/7.5 comics each; for example, “make a ruler out of comics, split the last comic in half, each side is 7.5 comics wide.”
- 19% noted they solved the problem by using comic books as a ruler; for example, “with comic books to make a ruler.”
- 9% suggested they solved the problem by using comic books to make equal sides; for example, “took comic books and made the sides even across the room.”
- 9% pointed out that they ripped a comic book; for example, “comic ripped in two, Delete said it was fair.”

For the Tessellation video, viewers presented several problem descriptions.

- 31% noted the initial problem that Delete had spaces or gaps in his picture; for example, “there were spaces in his art work.”
- 28% ignored the initial problem and jumped to the second problem of making a picture with no gaps that wasn’t dull; for example, “He couldn’t make an interesting picture with no gaps.”
- 25% suggested that Delete had trouble using shapes; for example, “He couldn’t make a picture with shapes.”
- 6% simply said “he couldn’t tessellate.”

Viewers gave varying detail of how the problem was solved. A high percentage (72%) used some variation of the term “tessellate” in their answer. Responses were sorted into the following categories:

- 19% described the solution as tessellation, putting together shapes without gaps; for example, “he tessellated, made shape without overlaps or gaps.”
- 19% said Delete tessellated using different shapes; for example, “He tessellated, used different shapes and made a big picture with all of it.”
- 16% simple said that “he tessellated.”
- 16% said Delete used different shapes/different colors to make it look interesting; for example, “he used the other shapes and it looked good, and he won.”
- 13% noted that he put hexagons together, for example, “he used hexagons and different colors to make a donut picture.”
- 9% described tessellating using a repeated pattern without gaps or spaces; for example, “He tessellated, made a repeated pattern without gaps or spaces.”
- 9% noted the Delete tessellated with hexagons; “By tessellating with a hexagon.”

Motivation to Model Math

Viewers used the face scale to rate how much the videos motivate them to do something like Buzz & Delete did. Table 10 presents the percent of responses for Tessellations and Measurement. About two-thirds of the sample agreed that watching the videos made them want to do something like what Buzz and Delete did.

Table 10. Ratings of Motivation

How much does watching this story make you want to do something like what Buzz and Delete did?					
Tessellations	28%	34%	25%	6%	6%
Measurement	16%	50%	22%	3%	9%

For each video, the children were asked what they could do at home that is something like what Buzz and Delete did.

For the Measurement video, one-third of the sample suggested using a ruler to measure and divide a space, typically a room, into equal parts, and one-quarter of the sample suggested measuring and dividing but did not suggest a tool for measurement.

- 31% suggested using a ruler to measure and divide a space into equal parts; for example, “you could like get rulers, instead of books and go ruler, ruler, ruler, all the way across the room, and then see which one is longer, so that you would know which half is your room space, and you would have to do something to make it the same.”
- 25% proposed measuring and dividing a space into equal parts; for example, “we could make a fort and share it with friends and each have a side and measure our sides to make sure they are the same;” “Playing with my friends or my sister, we could divide the room in half and figure out what was equal.”
- 22% suggested using an object other than a ruler (e.g., books, pencils, paper) to measure and divide a space in equal parts; for example, “use pencils across the room to divide sides in half.”
- 16% were unable to come up with any ideas.
- 6% suggested sharing things; for example, “could share baseball cards with my brother and father.”

For the Tessellations video, half of the sample suggested making an artwork or an artwork with shapes, whereas 44% described an activity that seemed somewhat to recognize the concept of tessellation:

- 28% simply suggested making an unspecified artwork or drawing; for example, “paint different shapes;” “draw something good.”
- 25% described making a drawing, picture, or artwork with shapes; for example, “I could probably draw a drawing with chalk creating shapes and putting them all together;” “Create shape figures- making things using shapes. I would make a bee hive out of different shapes;”
- 22% said they could “tessellate” but only one child defined the term; for example, “I could get pattern blocks, and I could find different ways to tessellate, just like Buzz & Delete did;” “I could enter an art contest and tessellate my art;” “I could take pieces of scraps and tessellate and put them together with no gaps.”
- 13% described an activity of making something of hexagons or something without gaps; for example, “cut out hexagons and put them all together;” “enter a contest and build a raft without gaps on it.”
- 9% described using squares to make a picture; for example, “Color different squares and put them in a certain order to make it look like a picture.”
- 3% were not able to suggest an idea.

The children were shown a picture of Digit and asked what Digit could say that would make them want to do something at home like Buzz and Delete did. Listed below are the proposals for Digit's speech from those children who understood the task and who made an attempt to interest home viewers in the activity.

Some commonalities appear in the proposals for Measurement. One-third of the responses use the verb "try." About 28% bring the story of sharing a room into Digit's speech. The suggestion to "divide" or "split" is in 22% of the responses, and "fun" is used in 13%.

It's good to share a room, because then you can have fun together. Get stuff to make a line down the middle of the room, like a ruler or stuff that is straight like a person lying down.

If you have a brother or sister, try to be even with your stuff and the stuff that you want on your side and all the stuff that the other kid wants on their side and then the stuff that you both want to share in the middle. You can use your feet, you can use stuffed animals, you can probably ask your parents to help you out with splitting it up.

Go to your room and try to do what Buzz and Delete did with your sister, brother or sibling. You can use a book, stuffed animals, blocks.

Sharing a room is not easy, and you need to make it easy. You should make it always equal so it can be fair.

Make a room in half, cutting with a saw would be dangerous. You could use bags - shopping bags or a plant, like pots, or feet.

If your room is all messy, you can divide it in two to make it not as messy, so you can keep track of things. If you are sharing your room with your brother or sister and you fight a lot, you can divide your rooms. Use what Buzz & Delete used, paper!

If you and someone else are sharing a room, you can divide it in half so you each could have an equal size to play in.

If you have a room with a brother or sister, you could do this yourself!

Maybe when you have a sibling, you need their toys out of your space, you could make a ruler and split the room.

Try to divide your space up. If you share a room, you could divide the space in half like Buzz and Delete.

The thing that Buzz and Delete just did is a great way to learn your mathematical facts and measuring. Maybe you can try an experiment like that at home with your parent's permission.

You could try to split a room. Use anything.

If you can figure out how to do it evenly, you could get the side with the door!

You should measure your room. It's really fun. Fill it up with things you like.

Try making a ruler at your house, like Buzz and Delete did!

If you make a ruler, you could send it in and we can show it to the website.

You can fix your problems by making a ruler and finding a way.

If you call now, we can give you a ruler to measure. Kids, get a prize from Cyberchase.

We need you to help divide the bench in half so I can eat here with a friend.

Hey kids! Have you considered trying these projects at home! It's fun!

Try what they did! Share things equally by counting, like they did.

Try to figure out a way to share things.

Hey kids! You could learn from an accident! [the ripping of the comic book]

Hi. I bet you don't want to rip your comic in 2, instead read it together.

That's really neat!

That was good and it looks like fun!

Don't give up and keep trying!

Some commonalities appear in the proposals for Tessellation. One-third of the responses use the verb “try.” One-quarter use the term “tessellate” in relation to making an artwork, but most respondents simply suggest making some artwork. One-quarter of the responses refer to the story of a contest. “Fun” is used in 16% of the speech suggestions.

Digit could say that tessellating is a great way to learn your geometry and learn which shapes fit together and which shapes do not fit together. For example, get pattern blocks at home and just find a bunch of shapes that you think are cool and try to make them into a pattern without any gaps or spaces.

I'm the owner of an art gallery and want you to make a picture using only shapes of different colors with no gaps or overlaps.

Hello, do you know about tessellations, and do you want to make a picture? Try making a tessellation with little blocks of shapes or paper and cut the paper and glue it.

Try to tessellate with other things like paper, beads and skinny, not heavy stuff...sea glass...shells...

If you tessellate, you can make amazing shapes - including people. Make sure all the shapes are together and start from the corner of a page, if you are doing triangles. He should tell people if you want to make it look more interesting, you can make them different colors.

If you have a shape problem, you could tessellate to solve shape problems.

You could tessellate too and enter your picture in the contest!

Wow, you won the contest - good tessellating!

Draw something with hexagons and squares.

First I would have digit demonstrate making cool shapes. Then he would say " If you put all these together, you can make something that no one has ever seen. Now, that's something that would be on the front page!

Hi kids, I'm Digit, and you can do this at home, using interesting shapes and sizes too, kids no lawsuits or suing on this program, thank you for playing this program - bye kids!

Try this at home and see what shapes that you can find. Underneath him, there could be like shapes going down and like he could say look at these shapes and see what shape you want to try out.

Take a little picture of something that you like and you can put it up on the wall. Use pieces of something that you have and can put together and make something out of it, like paper, books, shoes.

Make your own picture at home, like Buzz and Delete did!

Practice makes perfect - Turn mistakes into art.

Say to try painting and making art - really fun you should try it

Maybe we could make a huge portrait and have everyone in town join us and we could make a big picture

If you see a contest, you should try, and we'll help you on our website.

If you send it to the website- you could win a prize (but really say the name of the prize, like a t-shirt)

If you do this project, you could win a prize!

Nice job - you won first place - that was some cool tessellating!

I bet you are going to win first prize!

He should say how fun the project is.

Hey kids, you can do this at home.

HikKids! Did you like our show? Well, if you did, then why not try these projects at home? They're fun, educational and interactive!

Hi kids, welcome to Cyberchase - try this at home. And then they show them like a project, like "with parents permission!"

Hey kids, if you do that you can start your very own donut story at your own house.

Don't try this at home. It's really fun, showing that people did it. Cyberchase in real life.

It's a lot of fun...or...maybe instead of saying something - he could show an example of it, the writer could put a picture of what it would looked like and he could say "It's a lot of fun, you should try it at home, get a couple of friends and you can do it."

SUMMARY & DISCUSSION

Web-based Game Concept

More than two-thirds of our 32 third graders were familiar with televised game shows. The formative evaluation of the web-based game concept looked at the type of problems to include in the game and respondents' preferences for part one or part two of the game.

- √ For part one of the game, the children rated problem types, from easiest to hardest, as counting shapes; multiplication; division; area; and *Cyberchase* program knowledge. One-quarter of the sample felt that program knowledge was “too hard” to include in the game.

- √ For part two, one-quarter of the sample felt that the easiest problem for them was addition or comparison. One-fifth of the sample chose multiplication or division. Subtraction was considered neither easiest nor hardest. The hardest problem related to measurement knowledge (i.e., “how many cups in a quart”), chosen as hardest by 59% of the sample. Almost one-quarter of the sample felt that measurement knowledge was “too hard” to include in the game.
 - When considering that part two is a timed Lightning Round, more than 90% of the third graders felt that they could do “fast” the problems of addition, subtraction, multiplication, and comparison. They were less certain about quickly answering the problems of “shapes, figures,” but most of the group felt such problems should be included in the Lightning Round. More uncertainty surrounds the inclusion of division and measurement problems: six of ten respondents thought they could do division quickly, but only three of ten felt they could do measurement problems fast. Half of the respondents supported the inclusion of division and measurement in the timed part two. Measurement, as represented by the cups to quart problem, was challenging to the children.

- √ In considering which part of the game they liked the most, two-thirds chose the first part, because they would have more time to do problems, they would get more points, and the problems gave multiple-choice answers and were illustrated. Those who reported that they could not answer division problems quickly were significantly more likely to prefer part one over part two. The third of the sample who wanted most to play the Lightning Round enjoyed the challenge presented by the pressure of time.

Web-based Storymaker Concept

More than half of our 32 third graders had previously used a computer to create a story. The formative evaluation of the storymaker concept explored preferences for story creation functions and sharing mechanisms.

- √ Almost all students rated a positive interest in all the functions described, but the functions of adding photos or drawing free-hand elicited more neutral ratings than putting in *Cyberchase* backgrounds, props, and characters. Those children who had previously used a computer to create a story rated the idea of using their own photos significantly higher in appeal than those who had not previously created a computer-based story. All but one respondent had previously taken pictures with a digital camera, and 69% had taken pictures with a cell phone, so access to digital photos is not an issue, but technical ability and personal exposure may be of concern.
 - Children suggested the additional ability to move or animate characters, add more characters and poses, and add music or sound effects.
- √ Nine out of ten children wanted to save their story to look at later; eight of ten wanted to print it out or post it on the *Cyberchase* web site; and three-quarters of the group were interested in emailing the story to other people. When asked their preference among the three sharing mechanisms, 47% chose to post, 38% chose to print, and 16% chose to email.
- √ With respect to stories that other kids have created, 94% of our students were interested in looking at them and 84% interested in voting for their favorite story. Additionally, one-third thought they might share others' stories via email or printing, and 16% suggested being able to edit others' stories or commenting on them.

“The Misadventures of Buzz & Delete” Short Videos

The formative evaluation of the short video concept assessed appeal, clarity of story, and motivation to model the math.

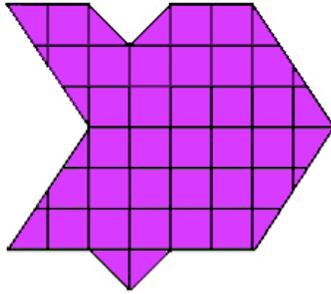
- √ Nine out of ten viewers liked both the Tessellations and Measurement videos.
- √ Half of the sample defined the problem in Measurement as relating to division and equality of space, and one-third suggested the problem related to keeping control over one's stuff. In describing the solution to the problem, 38% of the children noted the making of a ruler with comic books, and more than half of the respondents focused on ripping of a comic book to make the spaces equal.
- √ In the Tessellation video, one-third of the sample noted the initial problem that Delete had spaces in his picture that he did not want, and 28% remarked on the second problem of making an interesting picture with no spaces. In describing the solution to the problem, almost three-quarters of the sample mentioned some variation of “tessellate” with varying levels of accuracy of description.
- √ About two-thirds of the third graders felt that the videos made them want to do something like what Buzz and Delete did; another quarter of the sample were neutral about being motivated to do something.
 - The Measurement video motivated one-third of the sample to suggest using a

ruler to measure and divide a space, typically a room, into equal parts; one-fifth to suggest using an object other than a ruler; and one-quarter to suggest measuring and dividing without a measurement tool specified.

- The Tessellations video motivated half of the sample to suggest making an artwork or an artwork with shapes; and two-fifths to suggest an activity that seemed to recognize the concept of tessellation.
- To encourage viewers at home to model Buzz & Delete's activities, the third graders suggested that Digit's speech emphasize the story, "trying" things, and "fun."

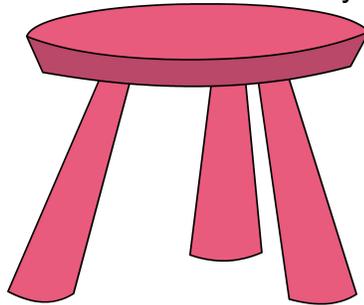
APPENDIX A: PART ONE GAME PROBLEMS

1. What is the area of this strange fish from Aquari-Yum?



- (a) 43 squares
- (b) 24 squares
- (c) 36 squares
- (d) 38 squares

2. You're making four stools like this one. How many legs do you need to make?



- (a) 8 legs
- (b) 10 legs
- (c) 12 legs
- (d) 16 legs

3. Who is the leader of Radopolis?



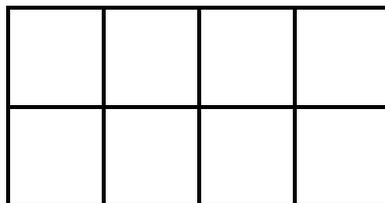
- (a) Dr. Marbles
- (b) Slider
- (c) The Groovester
- (d) Dudicus

4. One penguin weighs 25 pounds. A wagon can carry 125 pounds. How many penguins can you carry in one wagon?



- (a) 100 penguins
- (b) 25 penguins
- (c) 5 penguins
- (d) 12 penguins

5. How many squares are in this figure? Are there...



- (a) 8 squares
- (b) 2 squares
- (c) 16 squares
- (d) 11 squares

APPENDIX B: PART TWO GAME PROBLEMS

A. $6 + 6 + 6 =$

B. $25 - 6 =$

C. $4 \times 5 =$

D. $25 \div 5 =$

E. How many cups in a quart?

F. Which is bigger, an inch or a yard?

G. How many sides does a pentagon have?