

Cyberchase

Season 5 Pilot Summative Research: How Are Outreach Materials Used?



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Executive Summary: Overview of Results and Implications

To prepare for future summative research on the synergy among multiple educational media, the present pilot research explored real-life use of *Cyberchase* outreach materials. The present pilot study included: a Web survey of 48 outreach providers (representing over 3000 children in 19 states), follow-up phone interviews with 26 of these providers, and in-person observations at two outreach sites, one in New York and one in Massachusetts. With an eye toward future summative research, the resulting data yield conclusions and implications in two broadly defined areas: providers' use of *Cyberchase* outreach materials and possible directions for measuring the outcomes of such use.

Use of Outreach Materials

Taken together, the data from the Web survey, phone survey, and in-person observations encompass a wide variety of providers in a wide variety of outreach settings (schools, after-school programs, museums, libraries, educational sessions led by engineers, etc.). Some general trends emerged that held true across all of these settings – for example, most providers used more than one type of *Cyberchase* outreach materials, most sessions were conducted with groups of between 1 and 30 children, and most sessions ran between 16 and 30 minutes.

However, as expected, the data also make it abundantly clear that there is no such thing as one “typical” pattern of use. We observed great diversity in virtually every aspect of use: the providers' purposes in using the materials, the audiences they served, the ways in which they selected the hands-on activity for a given session, the ways in which they presented the activities, the amount of guidance and instruction they provided during a session, and how (and whether) they integrated the hands-on activities with other *Cyberchase* media or non-*Cyberchase* materials/activities. Indeed, these did not only differ between different types of providers (e.g., after-school leaders vs. engineers), but within each type of provider too.

Certainly, some of this diversity might be attributed to the inclinations of individual providers. Yet, several factors emerged that appeared to contribute to some of the diversity of use. If so, these factors might also be used to help predict some of the variation that might be observed in future summative research (or in the real world):

- As might be expected, school and after-school staff more often worked with children on an ongoing basis, allowing them greater opportunities for knowing the children's levels of ability and using *Cyberchase* in more than one session with the same children.
- To some degree, the nature of the provider and the audience influenced the purposes for which the outreach materials were used – that is, whether they were used to educate children about a particular mathematical topic, stimulate children's interest in mathematics or engineering in general, introduce parents to

ways to use *Cyberchase* at home with their children, and so on. Depending on the purpose of the session, providers might then employ the activities or other *Cyberchase* media differently.

- Providers often modified both the activities they presented and the amount of guidance they provided, as a function of the age of the children they served.
- Providers who were more experienced with *Cyberchase* used a greater variety of *Cyberchase* outreach materials and were more likely to use multiple media. This might be due to their becoming more facile with *Cyberchase* materials over time, and/or to receiving other outreach materials that had been produced in past seasons.
- Providers' decisions as to whether to divide children into small groups for outreach activities appeared to be influenced by: the size of the overall group, the type of media being used (e.g., computers were often used by children individually or in pairs), children's level of math performance (with small groups more likely to be used for at-risk children), and perhaps the type of provider and setting (e.g., museum educators may have been less likely to divide children into groups).
- Some providers appeared to apply the *Cyberchase* TV series and Web site somewhat differently. The TV series was often closely integrated with a hands-on activity, as a means of motivating children and/or introducing the topic. By contrast, the fit was not always as tight between hands-on activities and online games. Although some providers spoke about selecting specific *Cyberchase* online games because they dealt with similar mathematical content, others seemed to treat the games more as "free play" to be done at the end of the session.

In addition, most providers also spoke about educational benefits of *Cyberchase* that they had observed among the children they serve. These observations not only serve as informal indications of impact, but also suggest possible directions for attitudinal and academic outcomes that might be measured more systematically in future summative research:

- Indicators of attitudinal outcomes included: enthusiasm and excitement during *Cyberchase* activities, spontaneous references to *Cyberchase* during non-*Cyberchase* math activities, retelling the plot of *Cyberchase* episodes seen at home, less complaining about math, parent reports of children's spontaneous positive comments at home, choosing to play *Cyberchase* games during free computer time, and increased requests for math-related books.
- Indicators of academic outcomes included: increases in mathematics test scores, the sophistication of children's performance while working on *Cyberchase* activities, their use of mathematical vocabulary (e.g., words such as "inverse"),

and the degree to which children tended to speak spontaneously about mathematics.

In sum, the present study fills a necessary prerequisite for future summative research on children's learning from multiple media. The study contributes to our understanding in several respects: (1) by lending insight into the broad range of ways in which outreach materials are used in the real world, (2) by opening a window into some of the ways in which outreach materials are integrated with other media, and (3) by suggesting some possible areas of impact and observable means of gauging these outcomes. All of these new understandings will be crucial in approaching the design of future summative research. Perhaps most important, though, a richer understanding of real-world use can also help to inform the creation of future outreach materials, so that they can be as useful and effective as possible.

Purpose

Future summative research on *Cyberchase* is intended to explore the synergy among multiple media (television, online, hands-on outreach materials) in informal mathematics education. A necessary prerequisite to such research is understanding the ways in which each individual medium is used in the real world. Thus, the present pilot study documents some of the range of ways in which *Cyberchase* outreach materials are currently being used in varied real-world settings.

Three complementary pieces of research comprise the present pilot study:

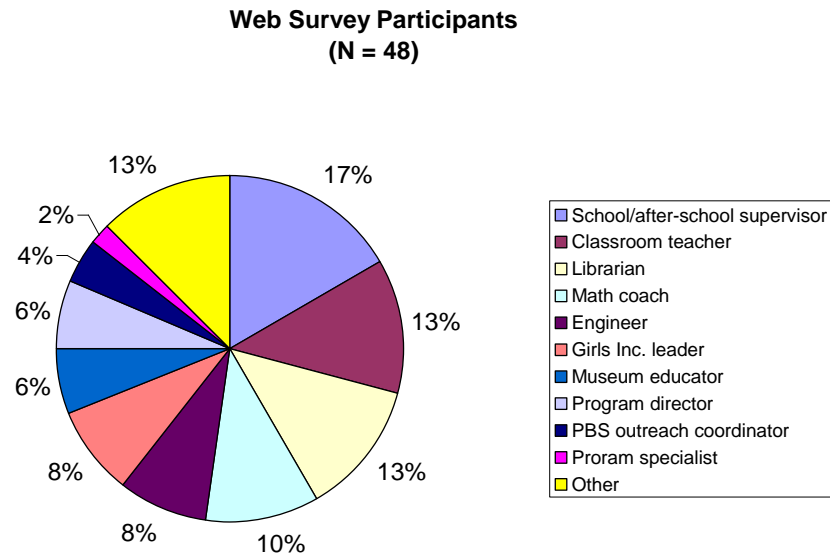
- A Web survey was conducted with 48 providers (representing more than 3000 children who'd used *Cyberchase* materials), from 19 states around the country.
- Follow-up phone interviews were conducted with a subset of 26 participants from the Web survey, to gain richer insight into their use of the materials.
- In-person observations of naturalistic use were conducted at two sites, a school in New York and a Girls Inc. after-school site in Massachusetts. Observations at the Massachusetts site were conducted with a mixed-age group of girls. In New York, three *Cyberchase* sessions were observed: one with first graders, one with third graders, and a workshop for parents. This allowed us to compare examples of use between school and out-of-school settings, between use with parents and children, and between use with children at the heart of *Cyberchase*'s target age group and younger children.

Please note that the purpose of this study was not to identify “the way” (or even all of the ways) in which providers use *Cyberchase* outreach materials. We entered the study with the expectation that such materials would be used in many different ways, as a function of both the nature of the setting and the inclinations of each individual provider. In fact, this expectation was confirmed; we found that providers do indeed use the materials in a wide variety of ways. Thus, this study lends insight into some of the breadth that exists in providers' use of the outreach materials, and some of the factors that lead providers to use the materials in one way or another.

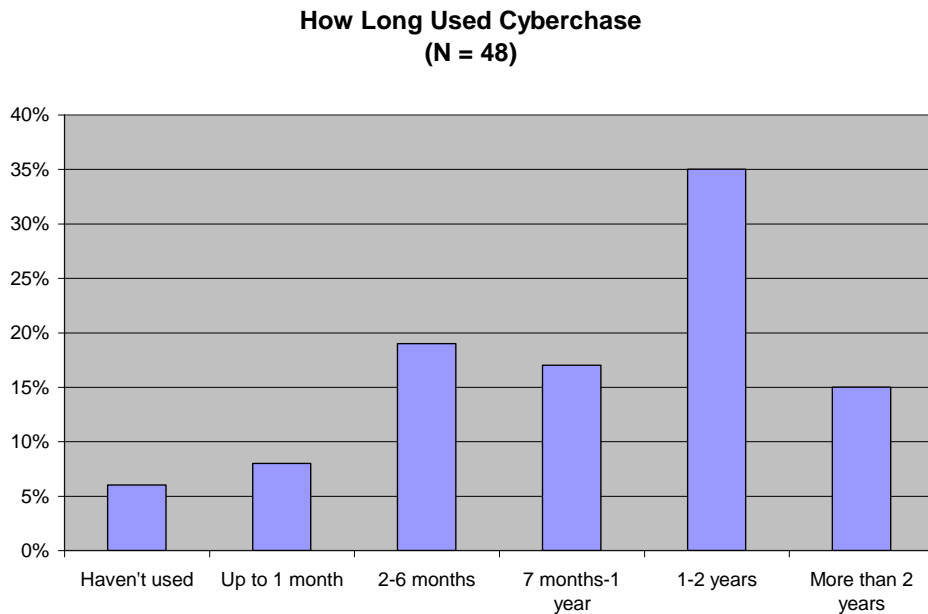
A list of the Web and phone survey questions can be found in the Appendix.

Participants

The 48 Web survey participants represented a fairly diverse range of outreach settings and occupations, as seen in the following chart:



The participants also varied in their amount of experience with the *Cyberchase* materials, ranging from a few providers who had not yet used the materials with children to several who had been using them for more than two years. The greatest numbers of participants had used the materials for 1 to 2 years (35%). Another 35% had used them between 2 months and 1 year, as seen in the following chart:



The participants were fairly evenly divided between those who had participated in a *Cyberchase* training session (54%) to learn how to use the materials, and those who had not (46%). The providers with training typically received in-person training from a trainer affiliated with *Cyberchase*, although a few were trained via teleconference or by someone within their own organization.

RESULTS

Demographic and Baseline Information

Overall Number and Geographic Distribution

Together, the 48 participants in the Web survey had already used *Cyberchase* outreach materials with more than 3000 children in 19 different states around the country. Understandably, the cumulative total was greatest among those providers who had been using *Cyberchase* for the longest period of time (more than one year).

The greatest number of providers was based in New York (27%), followed by Massachusetts (8%), California (6%), Nebraska (4%), Maine (4%), North Carolina (4%), Texas (4%), and Oregon (4%). Individual providers were based in Alabama, Connecticut, Florida, Illinois, Kansas, Louisiana, Mississippi, Pennsylvania, South Carolina, Tennessee, and Wyoming.

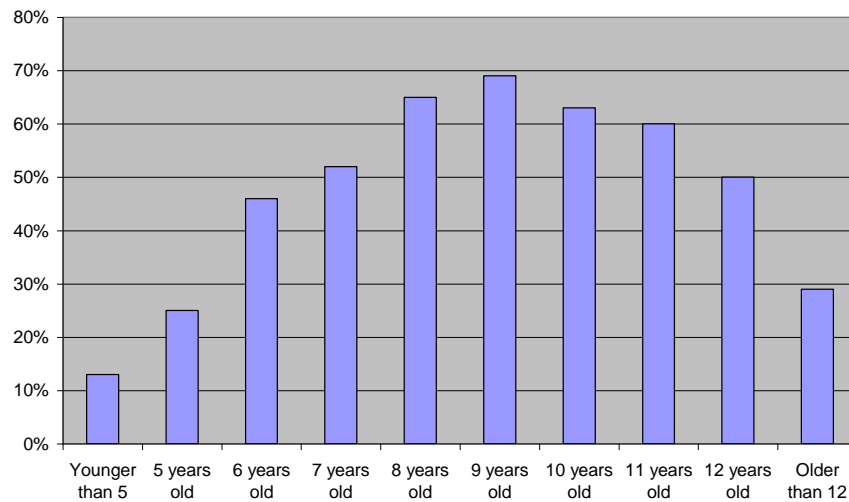
Gender

The vast majority of providers (81%) said they work with both boys and girls. Approximately 19% (particularly those at Girls Inc. sites) said they work only with girls. None of the providers said they work exclusively with boys.

Age

The ages of the children ran the gamut of the options that were offered in the Web survey, from “younger than 5 years old” to “older than 12 years old.” However, most children clustered around *Cyberchase*’s target age group of 8 to 11, as illustrated by the following table:

Ages of Children



Note: Providers could choose more than one age group, so percentages sum to more than 100%.

Data from both the phone survey and in-person observations indicated that some providers typically use the materials with mixed-age groups, while others conduct sessions with a single grade or age group at a time. In some cases, the *Cyberchase* materials have also proven to be highly popular with children outside the target age range; for example, one math coach told us that the materials had “really taken off” with the first grade teachers in her school.

Ethnicity

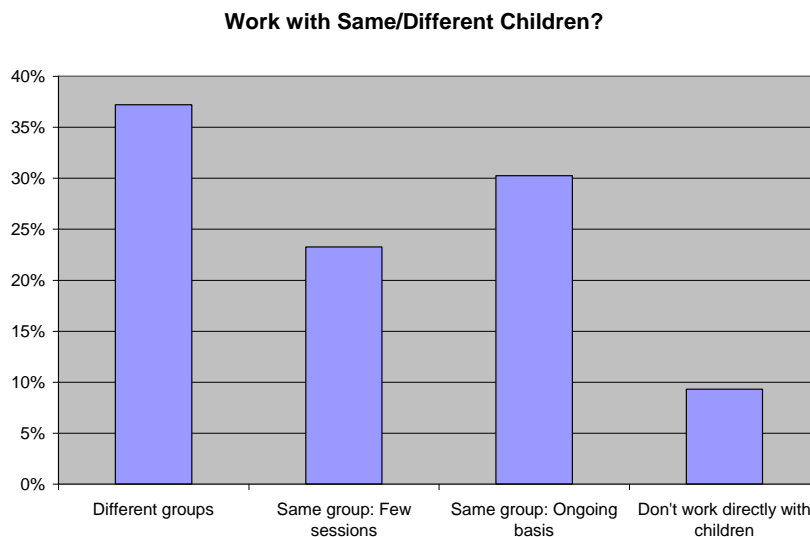
Most of the participants reported working with children of multiple ethnicities. Providers most often said that they work with children who are white (79%), African-American (75%), and/or Latino (71%). Smaller, but still substantial, numbers work with Asian-American (54%) and/or Native American children (35%).

Math Performance

Most providers said that they work with children who are average (69%) and/or at risk (52%) in mathematics performance. Approximately 25% also work with children who are advanced in mathematics performance.

How Often Work with Same Children

To provide a baseline for understanding use of *Cyberchase* materials, we also asked the providers several questions about their work with children in general (i.e., outside the context of *Cyberchase*). In general, the providers were fairly evenly divided as to whether they work with the same children over time, as seen in the following chart:



Among those who work with the same children over time, most said they meet with the children either once per week (40%) or every day (32%). The remainder said they meet

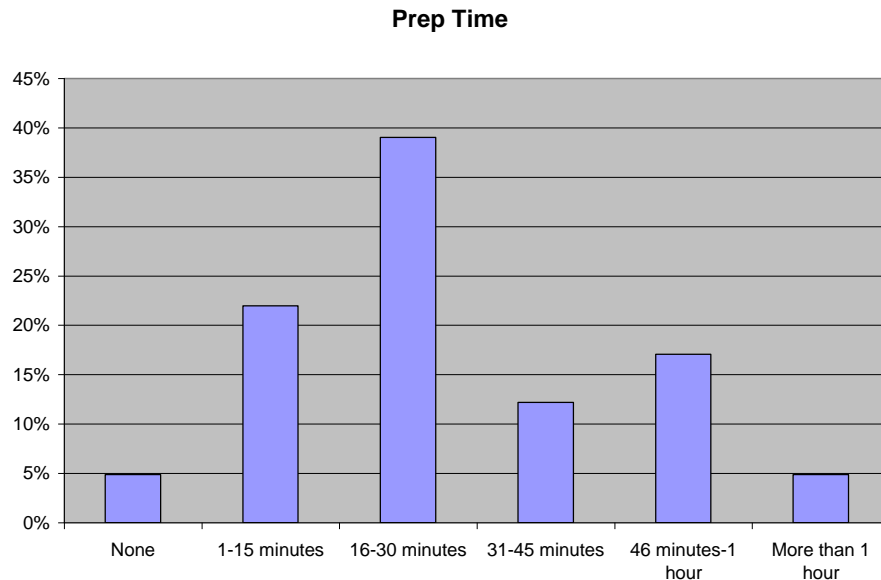
with the children either a few times per week (12%), once per month (12%), or a few times per month (4%).

Nearly 2/3 of the providers (62%) said that, when they do meet with children, they typically spend about 1 hour per session. Approximately 19% spend 2 hours per session, and 12% spend less than 1 hour. A few spend about 4 hours (2%) or more than 4 hours (4%).

How Do They Prepare for *Cyberchase* Sessions?

Prep time

Before doing *Cyberchase* activities with children, virtually all of the providers (95%) said they spend time preparing for the session. The vast majority of providers (90%) spend somewhere between 1 minute and 1 hour preparing, with 39% spending 16 to 30 minutes of prep time. The following chart summarizes their answers:



In the phone survey, providers described various ways in which they spend their prep time. The most common ways included:

- Assembling materials (e.g., creating or gathering manipulatives, downloading or photocopying printables),
- Reviewing the lesson plan for a given hands-on activity, and
- Previewing the video of the relevant TV episode.

Others described a wide range of other preparatory tasks, such as trying hands-on activities themselves, looking for appropriate *Cyberchase* online games, translating materials into Spanish for use with Latino children, or (as a librarian explained) finding related books to be shared with the children. For example:

“I watch the video once or twice. I pick points where I’m going to stop [the video] and ask questions. I play games online myself first, so I know how they work. I create activities for younger kids... first graders.”

-- Math coach

“I watch the video. I read the workshop in a box. I write notes of what I want to do, and look at my notes from last time to see what worked.”

-- Librarian

“I translate things into Spanish for the kids because many don’t speak English. The translation takes the most time.”

-- Program Director

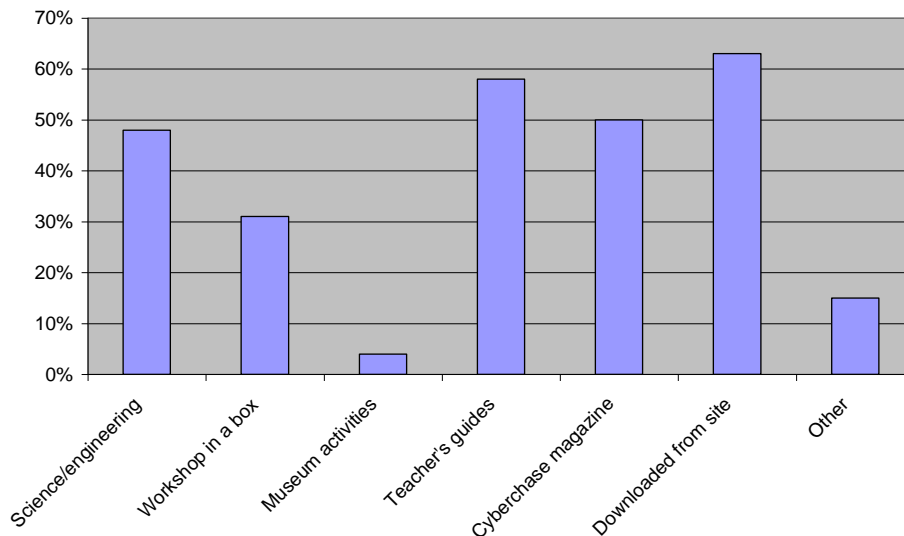
As one might expect, those providers who spend more time preparing were more likely to include time-consuming tasks (e.g., previewing a video) as part of their preparation.

Choosing Hands-On Activities

The *Cyberchase* materials used by providers run the gamut of the materials that have been produced over the life of the series (e.g., teacher’s guides, science/engineering materials, workshops in a box). On average, providers reported using between two and three types of materials. Those providers who had been using *Cyberchase* longer also reported using a greater variety of materials -- perhaps because of their greater familiarity with *Cyberchase*, or because they had received different materials over the course of several seasons.

As the following chart illustrates, providers most often reported using hands-on activities download from the Web site (63%), followed by the teacher’s guides (58%), *Cyberchase* magazines (50%), science/engineering materials (48%), and workshops in a box (31%).

Outreach Materials Used



Note: Providers could choose more than one type of materials, so percentages sum to more than 100%.

In the phone survey, providers most often explained that they choose activities based on their mathematical content. (This was echoed by the math coach in our in-person observations, who explained that she chose to do an activity about area and perimeter because, on a recent state exam, it was the topic with which the students had the most difficulty.) The next most common consideration was finding activities that their

children would enjoy. And a few providers apiece explained that they chose activities based on either practical considerations (e.g., what supplies or *Cyberchase* activities they had on hand), age-appropriateness, or by letting the children choose activities themselves.

Among those who based their decisions on mathematical content, the key consideration was often finding a match to the math that children were doing in school, regardless of whether the providers were school-based math coaches, Girls Inc. leaders, or librarians. Others described finding matches to the curriculum of a special event; for example, two museum educators talked about finding matches to their theme weeks. And a few said they simply follow the curriculum provided in the *Cyberchase* materials.

Some examples of the providers' responses include:

"We see what their math homework is about, so we pick activities that help reinforce what they need to learn for school."

-- Girls Inc. leader

"We have 'wonder weeks' with themes such as 'matter' or 'math'... We pick a Cyberchase show that matches our wonder week theme."

-- Museum educator

"We use it for outreach events, so pick something that's really engaging and easy to teach and simple to learn."

-- Engineer

"We choose materials appropriate for sixth through eighth graders."

-- Math coach

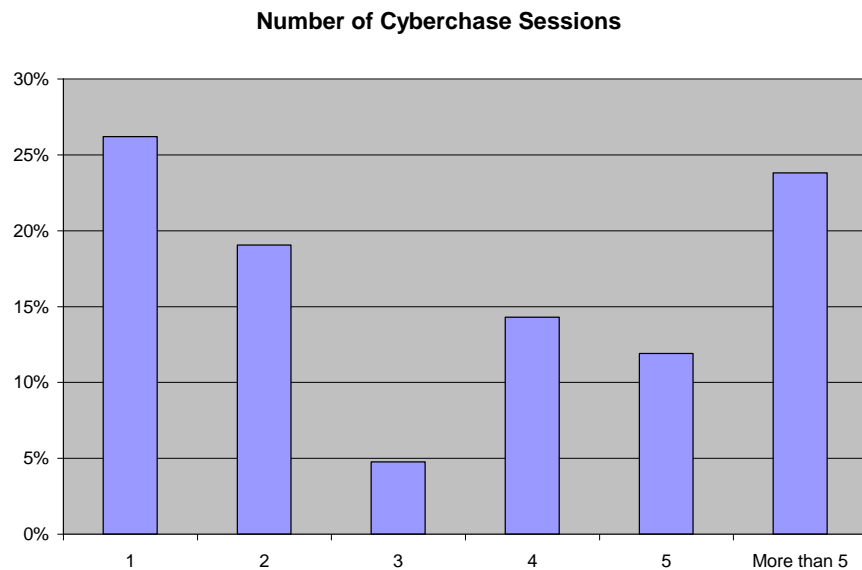
"Sometimes it's based on the supplies we have. But when we did the math/science/engineering program, we did it straight through."

-- Program specialist

What Do *Cyberchase* Sessions Look Like?

Frequency and Length

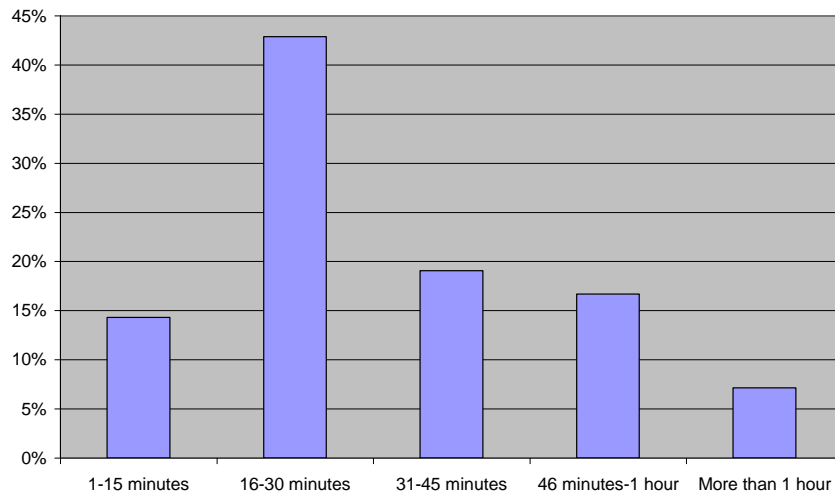
Given that not all of the providers work with the same children on an ongoing basis (see pg. 9), it is not surprising that a parallel trend was found in the fairly even split among providers who spend one, two, or more than five sessions doing *Cyberchase* activities with the same children:



As one might expect, school and after-school providers said they conduct the greatest number of *Cyberchase* sessions with the same children. Engineers and museum educators were most likely to say they conduct only a single session with the same children.

When they work with the children, almost all of the providers (93%) spend somewhere between 1 minute and 1 hour on the activity, with 43% spending 16 to 30 minutes. The following chart summarizes the length of their sessions with children:

Length of Session



Size of the Group

All of the providers said that they typically do *Cyberchase* activities with groups of between 1 and 30 children at a time. The greatest number (38%) said they do the activities with 11 to 20 children at a time, and most of the remaining providers were fairly evenly divided between doing the activities with 6 to 10 children (24%) and 21 to 30 children (29%). Only a few do the activities with fewer than 6 children or more than 30 at a time.

However, whereas the above figures represent the number of children in the room, nearly two-thirds of the providers (62%) said that they typically divide the children into smaller groups while working on a given hands-on activity. Almost all of the remaining providers (33%) said they keep all of the children in one group, and a few have the children work individually.

Several factors seemed to contribute to the decision to divide children into smaller groups. Not surprisingly, one factor was the *number of children* in the room; providers who serve larger numbers of children were significantly more likely to say that they divide children into smaller groups. Another factor was the *type of media* involved; several providers noted that, although they keep the large group intact for most activities, they have children visit the Web site individually or in pairs (e.g., a librarian explained that they keep children in “*a group for the video and game... [but have them work] individually for the Web. But we only have 12 computers, so if there are more than 12 kids, they work in pairs*”). A third factor was the level of the children’s performance in mathematics; providers serving at-risk children were more likely to report dividing children into small groups (perhaps to make it easier to provide children with individualized support). Finally, the *type of setting/provider* may have played a role (although the present sample size makes it difficult to draw a definitive conclusion); almost all of the teachers, after-school staff, librarians, and Girls Inc. leaders said they

divide the children into groups, whereas the two museum educators either keep the large group intact or have children work individually.

Virtually all of the phone survey participants said that, when children work in small groups, all of the groups work on the same activity at the same time. However, two providers said that they have the small groups work on different activities, either to provide children in mixed-age groups with age-appropriate activities or to allow the groups to take turns doing a hands-on activity and visiting the Web site.

Combining Media

How many use multiple media?: With an eye toward future research on multiple media, it is interesting to note that most providers (83%) said they don't just use hands-on materials with children. Rather, the greatest number (50%) said they combine hands-on activities with both watching the *Cyberchase* TV series and visiting the Web site. Another 26% have children watch the TV series and do hands-on activities (i.e., without using the Web site), while fewer (7%) said they just use hands-on activities and the Web site.

Providers were more likely to use the TV series and/or Web site if they had been using *Cyberchase* for more than 1 or 2 years (perhaps because of their greater familiarity with the series and materials). Across the various types of providers, engineers were least likely to combine hands-on activities with the TV series or Web site.

The providers in the phone survey saw the value of multiple media primarily in two respects: stimulating appeal and engagement, and aiding comprehension among children of diverse ages and learning styles. For example:

"The episode gets their attention really well, and the activity helps expand their learning."

-- Girls Inc. leader

"It's good to start with the TV show because it makes the whole activity seem less math-y."

-- Librarian

"It's great to tie manipulatives to TV and the Web. It gets kids moving and thinking in many different ways."

-- Girls Inc. leader

"It's good because it addresses all the different learning styles. Also, the various platforms appeal to different age groups. The younger kids get more excited about the TV show, and the older ones like the hands-on activity. All kids are fascinated by the computer."

-- Program specialist

Where do they use multiple media?: Among those who also use the TV series and/or Web site, most said they have the children use them on-site (66%). Fewer have the children use them at home (12%) or both at home and on-site (23%). Participants in the phone survey explained that they generally use these media on-site either because (in the words of one after-school administrator) “*I tell them to watch it at home but I can’t monitor them so we watch it at school*” or because of access issues (e.g., one program director explained, “*Our kids are low income and ESL, so they don’t have computers or watch PBS at home*”).

How do they choose TV episodes or Web activities?: As in their choice of hands-on activities (see pg. 12), Web survey participants typically said they choose TV episodes or Web activities that relate to the same math topic as their hands-on activity (46%). Far fewer choose TV episodes or Web activities simply because they think the children will enjoy them (15%), because the TV episode is on the air that day (8%) or simply supplied with the outreach materials (6%), because the Web activity is featured on the home page (10%), or by letting the children choose an episode or activity for themselves (4%).

Integrating with Other Lessons or Materials

Integrating with other lessons: In the phone survey, providers were evenly divided between those who integrate *Cyberchase* activities into their ongoing lessons and those who treat *Cyberchase* as a self-contained unit. Some integrate *Cyberchase* activities into classroom curricula, special events such as engineering weeks or wonder weeks, or programs such as Math Counts. For example:

“I talk to their teachers to find out what they’re doing in class. For example, if they’re doing measurement, we’ll do the Cyberchase measurement show.”

-- Program Director

“We did it as part of National Engineers’ Week.”

-- Engineer

“We tie in library books that we pull in when the kids are doing activities. We talk about math in history or in other countries. We also show them books of math jokes and riddles.”

-- Librarian

Those who keep *Cyberchase* separate generally explained either that they don’t carry on any mathematics instruction other than *Cyberchase* or that they are unable to integrate it because of practical constraints (e.g., “*I only have these kids for this one session a week, so this is the only thing I do with them,*” “*It’s a 50-minute class, so there isn’t enough time to do Cyberchase and any other lessons*”).

Integrating with other materials: Relatively few providers said that they combine the hands-on activities with non-*Cyberchase* materials; rather, 63% said that they usually use *Cyberchase* by itself. However, 19% said that they combine *Cyberchase* activities with

materials in other subject areas (e.g., science, language arts), and a few combine them with either existing math materials (4%; e.g., from Math Counts or Everyday Math) or math activities or materials that they have created themselves (13%). For example, in our in-person observations, the New York-based math coach created handouts of focus questions for children to answer while watching the video (e.g., “*How do you find the perimeter?*,” “*Why are they running out of space?*”), to make the relevant mathematics more salient for the children.

What Happens?

As expected, the Web survey, phone survey, and in-person observations all showed that providers use the *Cyberchase* outreach materials in a myriad of ways, depending on the nature of the setting, the practical constraints inherent in the setting, and the goals and inclinations of the provider. For example, contrast the following two providers’ descriptions of their use:

“1) Discuss theme. 2) Students ask questions, and we have a discussion to make sure they understand. 3) [Screen the] TV show and stop the tape at spots to ask questions. 4) Do [a hands-on] activity to find the answer. 5) Watch the rest of the video to see if their answer was right. 6) Class discussion to go over the solution. 7) If there is time, they play on the computer.”

-- Program Director

“Ours is a drop-in program for kids from the neighborhood, so we leave it flexible as the kids come and go. [As a result,] we only use the Cyberchase Web site. The children choose which games they want to play. Then, they team up and we have a competition to see which team can finish the game first.”

-- Librarian

Given this diversity of use, the focus of our analysis is twofold: (1) to identify some of the commonalities that arose across users, and (2) to document some of the differences, along with some of the factors that may have contributed toward them.

Number of activities per session: When they do *Cyberchase* activities, approximately three-quarters of the providers (76%) said that they do one activity per session. Fewer providers do more than one activity in the same session (7%) or divide a single activity over multiple sessions (17%).

Getting started: In describing how they typically run a *Cyberchase* session, approximately one-half of the providers said that they begin by giving the children some sort of introduction. Often, the introduction introduces the math topic that will be used in the activity. For example, in our in-person observations, a math coach introduced a session to her third-grade students in this way:

“Today, we will explore perimeter and area. Who can tell me what ‘perimeter’ is? [Girl: The squares... on the edges.] ...So if I were to count the squares on the

edges...all the way around [draws rectangle on blackboard and highlights the sides], that is perimeter, right? So it's the outside edge. Now, someone mentioned the word 'area.' What's 'area?' If I draw this [draws second rectangle on board], where is the area?... Come put an X on the area. [Boy draws X inside rectangle.] Excellent! So the area is all the space inside..."

However, not all of the providers said their introductions center on the specific mathematics content of the activity. Rather, their introductions take different foci, consistent with the providers' goals in doing the activity – to instruct children in a specific math topic, to spark children's interest in mathematics and/or science, or to introduce them to *Cyberchase*. For example, a math coach and an engineer said they begin by discussing math or engineering in general, to stimulate children's interest in these fields. On the other hand, a librarian and a PBS outreach coordinator both begin by talking about *Cyberchase* and its characters.

Indeed, even the same provider may introduce the material differently for different audiences. For example, the math coach quoted above began by introducing area and perimeter to her students. But when we observed her leading a workshop for parents (in which her primary goal was to introduce the parents to *Cyberchase* and the sorts of activities they can do with their children), she began by telling them about the TV series instead.

Using multiple media: Consistent with the providers' earlier accounts of integrating media (see pg. 16), nearly all of the phone survey participants spoke about both video and hands-on activities when describing a typical session. A little more than one-half included the *Cyberchase* Web site.

When these providers do show a *Cyberchase* video, most show a complete episode, although a few show shorter clips instead (perhaps due to time constraints). Almost all of the providers show the video before having the children work on hands-on activities, as a means of engaging the children and setting up the activity. However, a few (like the program director quoted on pg. 18) show part of the video, then stop the tape before the solution is revealed so that the children can try to solve the problem themselves via the hands-on activity. Once the children complete the activity, the providers show the rest of the video, so that children can see the characters' solution and the conclusion of the story.

We found a variation on this approach in our in-person observations at the Girls Inc. site in Massachusetts. In keeping with the recommendations made in the "Pattern Play" workshop in a box, the provider stopped the video several times to do several different activities related to patterns. She began by showing a video of the animated episode "The Poddleville Caper," about visual patterns, then stopped the video in the middle to lead the children in a discussion about visual patterns and ask them to name everyday places where visual patterns appear (e.g., bricks in a wall). Next, she showed the rest of the animated episode, and then stopped the video a second time to conduct two activities: In one, she asked children to identify the visual patterns on a handout. In the other, she led the children in an activity about auditory patterns that began with rhythmic hand-clapping

and then proceeded to using simple musical instruments. Finally, she re-started the video to show the accompanying live-action “*Cyberchase For Real*” segment, in which the stage group Stomp demonstrated similar, rhythmic auditory patterns. Thus, the video and hands-on activity were woven together in ways that allowed the video to feed into the hands-on activity and vice versa.

TV vs. Web: Interestingly, although the vast majority of providers said they show videos near the beginning of the session, most of the providers who use the *Cyberchase* Web site said that they have children visit the Web site near the end of the session. In part, this may stem from the fact that providers reported sending the children online individually or in pairs, whereas the hands-on activities are more typically group activities. In addition, two providers explained that they use the Web site last because “*it’s more likely they’ll go back to it at home*” or “*that’s what they’re looking forward to.*”

However, providers also may use the Web site last because of the way they think of the online games: Although a few providers use specific Web activities to reinforce their lessons (e.g., one program specialist follows the video and hands-on activities by sending children “*to the Web site to do related games*”), several providers said explicitly that they use the Web site as a “free play” activity. For example:

“[At the end of the session, children visit the] Cyberchase Web site, where kids can do whatever games they want.”

-- After-school supervisor

“Kids also go to the computer lab, where they have to spend time on the Cyberchase site. It’s free time, but we make them go to Cyberchase for part of it.”

-- School supervisor

Thus, within the context of outreach settings (as opposed to at-home use), some providers appear to employ the *Cyberchase* television series and online activities somewhat differently. To this subset of the providers, the television series is a means of motivating children and introducing their hands-on lesson. By contrast, the Web site is less closely tied to the content of the lesson – a fun and educational opportunity for free play.

How much guidance?: Providers varied widely in their reports of the amount of guidance they give children during the sessions (and were fairly evenly distributed across the range). Some described giving children a great deal of instruction, others said they give very little, and still others fell somewhere in between. For example:

“We give a lot of guidance.”

-- Engineer

“We do a lot of modeling. I show them how to do it, and then they go and try to do it themselves.”

-- Math coach

“I explain it to them and answer questions, but I try to let them work it out on their own. We do have a group discussion between the video and the activity, which helps a lot.”

-- Girls Inc. leader

“I let them do it all on their own. But the room is small, so they’re always talking with each other and helping each other.”

-- Girls Inc. leader

“We didn’t really do any instruction. We just talked to get them excited about math.”

-- Math coach

Influence of age: In the phone survey, several providers mentioned using different activities or different media with different age groups (e.g., *“I go through the curriculum, and I choose the activities that would be best for each grade level”*). We saw a concrete example of how the activities might be modified for different age groups in our in-person observations, where an area/perimeter activity (based on the *Cyberchase* episode “Totally Rad”) was used in both first grade and third grade classrooms. In both grades, the activity centered around comparing skating parks with different shapes but the same perimeter, to see which shapes yielded the largest area. However, teachers provided much more support to first graders, leading the class through the construction of each park. By contrast, once the math coach working with the third graders introduced the activity and presented an example, she divided the children into two groups and had them generate examples of their own – as many as they could.

Reactions and Outcomes

Providers' Opinions

When asked to compare the *Cyberchase* materials to other educational materials they have used, most believed that the *Cyberchase* materials are either “much better” (38%) or “a little better” (36%) than other materials. The remaining providers felt that the quality of the *Cyberchase* materials is “about the same” as the other materials (26%). No one considered the *Cyberchase* materials to be worse than other materials.

These ratings were particularly strong among classroom teachers.

Educational Outcomes

In the Web and phone surveys, we asked providers to tell us about any benefits of *Cyberchase* that they had observed among the children with whom they work. Their responses served as an informal indication of impact, and also suggested possible directions for assessments of outcomes in the future summative study.

Most providers spoke of *Cyberchase*'s impact on children's attitudes toward mathematics, as reflected in enhanced motivation, interest, confidence, and enjoyment, reduced math anxiety, and seeing mathematics as applicable beyond the classroom. Indicators of positive attitudes included children's enthusiasm and excitement while doing the *Cyberchase* activities, their spontaneous references to *Cyberchase* while doing non-*Cyberchase* math activities, retelling the plot of *Cyberchase* episodes seen at home, fewer complaints about math, parent reports of children's spontaneous positive comments at home, choosing to play *Cyberchase* games during free computer time, and increased requests for math-related books.

Many also reported benefits in children's performance in mathematics, such as aspects of problem solving, geometry, spatial reasoning, and measurement. Indicators of these sorts of outcomes included increases in test scores, the sophistication of children's in-person performance while doing the activities, their use of mathematical vocabulary (e.g., words such as “inverse”), and the degree to which children spoke spontaneously about mathematics.

Examples of these comments include:

“Attitude has improved, they get more excited about math, they talk about the characters a lot even when we aren't doing anything related to Cyberchase, it allowed girls to get over their fear of math”

-- Program director

“Attitudes change over the course of the program. At the first session, kids said “no, you can't make us do math” but now, they like it and they don't complain.”

-- Girls Inc. leader

“One little girl was forced to join by her mother and said “I hate math” but then she kept coming back and now she says she likes it. Even the 12 and 13 year olds say they like math more now. Many of the kids talk about watching Cyberchase at home, they really like it. We are getting a lot of requests for math activity books in the library.”

-- Librarian

“Many of the puzzles and brain teasers help children with problem solving skills. It is so much fun when you see a child struggling w/ a tangram model and all of a sudden s/he shouts- hey I did it! When children are playing on the website it is fun to watch them help one another out.”

-- Librarian

“When I was asking the girls what direction a ball would go if it was hit off the ball at an angle, almost all of them guessed it would come right back to me. They learned through that time that the ball will take a different path if it’s not rolled into the wall exactly perpendicular. They learned the concept of angle in equals angle out on the other side.”

-- Girls Inc. leader

“Unit test scores improved after we did the related Cyberchase unit. Math vocabulary, kids are using math terms such as “inverse” in their everyday life, when that happens, they’ve achieved ownership. Also, when I go into the classrooms and they are learning a math concept and it was on an episode they bring the episode into the classroom. So now the teachers are watching Cyberchase at night so they can interact with their students!”

-- Math coach

Conclusions

Taken together, the data from this research portray the use of outreach materials as both rich and highly diverse. Whereas the presentation of a television episode may be essentially the same to children throughout the country, their experience of outreach materials is likely to vary greatly depending upon the setting and the nature of the provider.

Still, as noted in the Overview of Results at the beginning of this report (see pgs. 2-4), several factors did appear to contribute to some of this diversity of use. Thus, these factors can be used to help anticipate some of the variation of use that is likely to appear in future summative research – or, indeed, in real-world use.

In this way, the present study contributes to our understanding of the use of hands-on materials in several respects: (1) by lending insight into the broad range of ways in which outreach materials are used in the real world, (2) by opening a window into some of the ways in which outreach materials are integrated with other media, and (3) by suggesting some possible areas of impact and observable means of gauging these outcomes.

All of these new understandings will be crucial in approaching the design of future summative research. Yet, perhaps even more important, a richer understanding of real-world use can also help to inform the creation of future outreach materials, so that they can be as useful and effective as possible.

Appendix: Questions Used in Web and Phone Surveys

Web Survey

- 1) Are you a:
 - School or after-school administrator/supervisor
 - Program director
 - Classroom teacher
 - Librarian
 - Museum educator
 - Girls Inc. leader
 - Other after-school provider
 - Other: (please specify)

- 2) How long have you (or your colleagues) been using Cyberchase materials?
 - 1 month or less
 - 2 to 6 months
 - 7 months to 1 year
 - 1-2 years
 - More than 2 years
 - I have not used Cyberchase materials [terminate]

- 3) Did you participate in any Cyberchase training sessions, to learn how to use the materials?
 - No, I figured out the Cyberchase materials by myself
 - Yes, someone from my organization trained me to use the Cyberchase materials
 - Yes, I was trained in-person by someone from Cyberchase
 - Yes, I was trained in a Cyberchase teleconference

- 4) In all the time that you've used Cyberchase materials, what's the total number of kids with whom you've used these materials?
 - None
 - 1-25
 - 26-50
 - 51-75
 - 76-100
 - 101-125
 - 126-150
 - 151-175
 - 175-200
 - More than 200

- 5) Do you typically work with:

- The same group of children on an ongoing basis
- The same group of children for a few sessions
- Different groups of children for one session each
- I don't work with children

[If answer to 5 is A or B, ask 6]

- 6) How often do you meet with the same children?
- Every day (or every weekday)
 - A few times per week
 - Once per week
 - A few times per month
 - Once per month
 - Less than once per month
- 7) When you work with children, how much time do you usually spend with them?
- Less than 1 hour
 - About 1 hour
 - About 2 hours
 - About 3 hours
 - About 4 hours
 - More than 4 hours
- 8) Which Cyberchase outreach materials have you used? (please check all that apply)
- Math in Science and Engineering Activity Guide
 - Workshop in a Box
 - Museum activities
 - Cyberchase Teacher's Guide
 - Cyberchase Magazine
 - Activity ideas that I downloaded from the Cyberchase Web site
 - Other: (please specify)
- 9) How many sessions do you typically devote to doing Cyberchase activities with the same children:
- 1
 - 2
 - 3
 - 4
 - 5
 - More than 5
- 10) When you do Cyberchase activities with children, do you typically:
- Do one Cyberchase activity per session
 - Do several Cyberchase activities in the same session

Spend more than one session (with the same children) doing the same activity

11) How much time do your children typically spend on a single Cyberchase activity?

- 1 to 15 minutes
- 16 to 30 minutes
- 31 to 45 minutes
- 46 minutes to 1 hour
- More than 1 hour

12) How much prep time (if any) do you spend before doing a Cyberchase activity with children?

- None
- 1 to 15 minutes
- 16 to 30 minutes
- 31 to 45 minutes
- 46 minutes to 1 hour
- More than 1 hour

13) When you do a Cyberchase activity with children, how many children usually participate in the session?

- 1 to 5 children
- 6 to 10 children
- 11 to 20 children
- 21 to 30 children
- 31 to 40 children
- 41 to 50 children
- More than 50 children

14) When you do Cyberchase activities with children, do you usually:

- Keep all of the children in one group
- Split the children into smaller groups
- Have children work on the activities individually

15) Please give an example of how you've run a Cyberchase activity:
[open-ended]

16) In your opinion, how do the Cyberchase material compare to other educational materials that you've used? Are the Cyberchase materials:

- Much better
- A little better
- About the same
- A little worse
- Much worse
- I've never used other materials

17) When you do Cyberchase activities with children, do you have them watch the TV show or visit the Cyberchase Web site too?

- No, I just use the hands-on activities
- Yes, I have them watch the TV show
- Yes, I have them visit the Web site
- Yes, I have them watch the TV show and visit the Web site

[If no, skip to Q27]

18) Where do they watch the TV show or use the Web site?

- At home
- In our group setting
- At home and in our group setting

19) How do you decide which TV episodes or Web activities to use? (please check all that apply)

- I let the children choose
- I choose the TV episode that is on TV that day
- I choose a Web activity that's featured on the Cyberchase home page
- I choose a TV episode or Web activity that I think the children will enjoy
- I choose a TV episode or Web activity that covers the same math as our hands-on activity
- Other: (please specify)

20) Do you usually use Cyberchase activities by themselves or combine them with other math activities? (please check all that apply)

- I use Cyberchase activities by themselves
- I combine Cyberchase activities with other existing math materials/activities (such as Math Rabbit computer software)*
- I combine Cyberchase activities with math activities that I have created myself
- I combine Cyberchase activities with materials in other subjects, such as science or language arts

[If C, ask Q28]

21) Please give an example of an activity that you created and combined with Cyberchase:

[open-ended]

22) Do you think the children have benefited from doing Cyberchase activities? If so, please give an example that illustrates how children have learned or benefited:

[open-ended]

23) Do you work with:

- Girls
- Boys

Both girls and boys

24) How old are the children with whom you work? (please check all that apply)

- Younger than 5 years old
- 5 years old
- 6 years old
- 7 years old
- 8 years old
- 9 years old
- 10 years old
- 11 years old
- 12 years old
- Older than 12 years old

25) Do you work with children who are: (please check all that apply)

[fill in numbers or pull-down menu]

- African-American/Black
- Asian
- Latino/Hispanic
- Native American/Indian
- White
- Other

26) To the best of your knowledge, are the children: (please check all that apply)

- Average in math performance
- Advanced in math performance
- At risk in math performance

27) What state do you work in?

[pull-down menu of U.S. states]

28) May we contact you for a follow-up phone call, to find out more about your experiences with Cyberchase?

- Yes
- No

[IF NO, SKIP TO END]

29) If so, please give us a phone number where we can contact you:

[open-ended]

30) When are the best times to try to reach you?

[open-ended]

Name: [open-ended]

E-mail address: [open-ended]

Phone Survey

- 1) When you do a Cyberchase activity with your kids, how do you decide which activity to do? Anything else?
- 2) (REFER TO ANSWER TO WEB Q12 – IF ANSWER IS MORE THAN ZERO)
In the Web survey, you said that you typically spend about [TIME] in prep time before you conduct an activity. How do you prepare? What do you usually do to get ready?
- 2a) (IF ANSWER TO WEB Q12 IS ZERO) In the Web survey, you said that you typically don't spend any prep time before you conduct an activity. Is that because you don't need it, or because you don't have any time available? If you're not able to spend prep time beforehand, how do you get yourself up to speed on the activity while doing it with your kids?
- 3) How do you typically use the Cyberchase materials -- can you describe a typical session for me? Can you give me an example?

(USE THESE FOLLOW-UP QUESTIONS IF NEEDED)

- 3a) Do you usually keep the kids in one big group, or split them up?
- 3b) (IF KIDS ARE SPLIT) Do all of your kids/groups work on the activity at the same time, or do you have one group do the Cyberchase activity while everyone else is doing something else?
- 3c) How much guidance do you give the kids while they're doing the activity, and how much do you let them figure out on their own?
- 4) Do you usually tie the Cyberchase activity to the rest of your regularly-scheduled [lessons/activities], or do you handle the Cyberchase activity separately? Why? (IF INTEGRATE) How does that work? Can you give me an example?
- 5) (REFER TO ANSWER TO WEB Q17 – IF ANSWER IS YES) In the Web survey, you said that you typically combine the hands-on activities with using the Cyberchase [TV show and/or Web site]. Why? What do you think is the added value of using these pieces together?
- 6) When you combine the hands-on activities with the Cyberchase [TV show and/or Web site], how do you usually combine them? Can you give me an example?

(USE THESE FOLLOW-UP QUESTIONS IF NEEDED)

- 6a) (REFER TO ANSWER TO WEB Q18) In the Web survey, you said that you usually have kids watch the Cyberchase TV show or Web site [at home/in outreach setting/both]. Why have you chosen to have them watch it there?

6b) (IF ANSWER TO WEB Q17 IS B OR C) When kids visit the Cyberchase Web site in your [outreach setting], do they use the computer individually or in a group? (IF GROUP) How does that work? Since only one kid can click a mouse at a time, how does the group work together to use the Web site?

6c) When you combine Cyberchase hands-on activities with the [TV show and/or Web site], how do you decide which [TV episodes/Web activities] to use? Anything else?

7) (REFER TO WEB Q20 – IF ANSWER IS B OR C) In the Web survey, you said that you usually combine Cyberchase activities with other activities that you have [bought or received/created yourself]. How does that work? Can you give me an example?

8) (REFER TO WEB Q22) Finally, you said that you thought your kids have benefited from Cyberchase. In what ways do you think they have benefited? What sorts of changes have you seen in their attitudes toward math, or knowledge of math, or problem solving?

9) Before we wrap up, is there anything else that you'd like to say?