

Cyberchase
Formative Evaluation of Proposed Season 3 Show Topics
March 2003

It is imperative that our writers, producers, director of animation and others involved in creating the Cyberchase series have a keen understanding of children in our target population and how they think, talk and act. The goal of this formative evaluation for Season 3 evaluation was two-fold:

- To observe and assess the performance of third-graders on tasks related to two math topics in development for Season 3 (Angle & Distance and Logic & Reasoning)
- To observe and assess the behavior, language and thought processes at work as third-graders talk through their problem-solving

The evaluation would reveal the children's level of engagement, the range and quality of their thought-processing, the informal words and language they use, the mistakes they make and the extent to which they can overcome cognitive obstacles to problem-solving. This would allow us to refine our approach to the math content for the two topics under evaluation as well as to authenticate the actions and dialogue of the show's characters for future episodes in development. Barbara Flagg of Multimedia Research conducted the study.

Sample

The study included small groups of third graders at a K-3 school in a suburban/rural area of Long Island, New York. The school has about 100 students, 30 percent of whom are eligible for free lunch. About 55 percent of the students are white, 35 percent are African American and 10 percent are Hispanic.

Procedure

Small groups of two to four children were given tasks related to Angle & Distance and Logic & Reasoning. The tasks were designed by the Cyberchase math team and Frances Curcio, Professor of Mathematics Education at Queens College, City University of New York. The children were told that the people who make Cyberchase were interested in watching how they solved problems. Children were videotaped in a cooperative problem-solving setting. Three to four groups were videotaped for each topic and each group worked on the tasks for 20-30 minutes. The researcher collected eight hours of footage which was eventually edited down to about one hour per topic.

During each problem-solving session, the researcher used standard, non-suggestive probes to encourage discussion (e.g., "What are you thinking about when you're doing that?" "Why do you want to do that?" "What do you expect to happen?" "Is there another way to think about it?"). As much as possible, the researcher refrained from instructing the children or interfering with their activity.

Logic & Reasoning

Task: Children were given pictures of the three Cyberchase characters and clues about each character's likes and dislikes. They were asked to match a character with his or her favorite subject, color, sport or musical instrument. They were also given a blank table on a worksheet.

Example: Jackie, Matt and Inez each have a favorite color: red, green or purple.
Matt likes a color that reminds him of the outdoors.
Matt and Inez don't like primary colors.
Who likes which color?

Analysis: The children used all sorts of information to draw conclusions. One boy immediately concluded that Matt's favorite color is green "because the outdoors is green." A girl concluded that Jackie must like red because the clue says Matt and Inez don't like primary colors and red is primary color. Guessing was just as good as logic for some children. Some had trouble with the idea that their conclusion needed to logically fit with the given information. Children did not naturally use the table as a tool to help them figure out the problem, though most seemed to understand how to use it once the researcher introduced it as an option. (The researcher had to show several students where to enter information onto the table.)

All but one of the problems had enough information for children to correctly match characters to their favorites. The childrens' initial reaction to this 'missing information' problem was, "No fair," and the video conveys their frustration as they grapple with the clues. The researcher suggested that the table might help them organize their information. Unlike with the previous problems where the table was useful, but not always necessary, the students really seemed to use the table as a tool for this problem. When they were told they could ask for another clue, their tables helped them deduce that they needed to request more information about one particular character. Their triumph at solving the 'hard' problem contrasted with their initial frustration.

Angle & Distance

Task: Children were given a piece of paper marked with locations (A, B, C, D, etc.), a toy car, equal-sized angle wedges and a ruler. They were asked to place a toy car at a defined starting point and then turn in the direction of different locations by using the angle wedges provided to determine the amount of the turn. Then they were asked to use a ruler to measure the distance to that location. They were encouraged to talk about how much turn their car made and how far the car went.

Analysis: This type of two-step measurement activity (how much turn, how much distance) was not familiar to the students and their initial unease is apparent on the videotape. Children were asked to find places by turning and then asked to combine that idea with measuring. The children didn't connect the concept of 'angle' with 'turn.' The researcher had to give the children more instruction on this task than on the Logic & Reasoning exercises, but students eventually demonstrated they were able to complete this unfamiliar task. The degree of their understanding, however, was harder to assess.

At this age, children's experience with angles is most likely limited to knowing about right angles in squares. They don't have the language to talk about an angle in terms of 'amount of turn.'

Impact of Research on Cyberchase Development

The videotaped footage allowed us to watch children solve problems, hear their thoughts, listen to their vocabulary and observe group dynamics. This study provided us with an analysis that gave us more insight than we would have gleaned from a written report. Collectively viewing the tapes and discussing our observations was a valuable tool in helping the Cyberchase team incorporate authentic child behavior in its plans for these and future shows. Some observations from the Cyberchase team:

Logic & Reasoning

- Logic & Reasoning is age-appropriate and kids truly enjoyed the challenge. We plan to produce a Deductive Reasoning show for Season 3 that will employ similar problems and that will feature some of the behaviors and attitudes observed here.
- None of the kids initially saw the value of the table as a tool. However, they do end up using the table easily after being introduced to it and it proved helpful with the harder problems.
- By using 'elimination' type clues (i.e., all other choices are accounted for), kids generally are able to leap to the correct conclusion.

Angle & Distance

- Angle & Distance needs to be simplified because the notion of angle appeared too hard when combined with distance. The experience of watching the kids on the videotape led us to change the topic to Direction & Distance and limit the scope of the content we will address in the show.
- We need to take more realistic math bites. We were trying to do too much with Angle & Distance. Less is better so we can make sure kids understand it well.
- The angle wedges in the Angle & Distance problem got in the way. The kids physically had a difficult time at first moving the manipulatives. This shows that manipulatives — when they aren't easily understood — can impede understanding.

Behavior, Language & Thought Processes

- The video illustrated the range of abilities and depth of understanding of kids in the same grade.

- The kids were quite animated as they tackled the problems. Our director of animation made sketches of some of the ‘thinking’ poses as he watched the videotape (see attached).
- Some kids seemed to fade out of the group problem-solving and then would jump back into it. Their comments revealed that although they appeared to have tuned out, they were actually thinking all along.
- Kids aren’t always able to verbalize their logic and reasoning.
- One boy realized the group had gone down the wrong path with their logic and they needed to start over. We need to illustrate this kind of thinking in the show.
- Many different learning styles were represented but there was one clear similarity – they all showed frustration with the problem when it appeared really hard. Frustration is not necessarily a bad thing, however. We should make frustration more natural to all our characters, and not limit it to just one personality. And there is tremendous satisfaction in solving a hard problem that at first proved frustrating.
- It was valuable to see how kids interacted with each other — clapping when they triumphed, complimenting each other for correct answers. Our Cyberchase characters work together, but we could use some more payoff moments of this type.
- The more verbal students will often speak and summarize for the group. The kids who lack confidence and verbal ability will defer to more verbal peers. If the quiet student feels that the group is going down the wrong path, he/she will quietly (and persistently) voice their opinion until someone in the group takes note.

Conclusion

We gained considerable insight into what kids are thinking, how groups interact with individuals in the group, and kids’ verbal and non-verbal reactions — powerful information for the production of new shows.

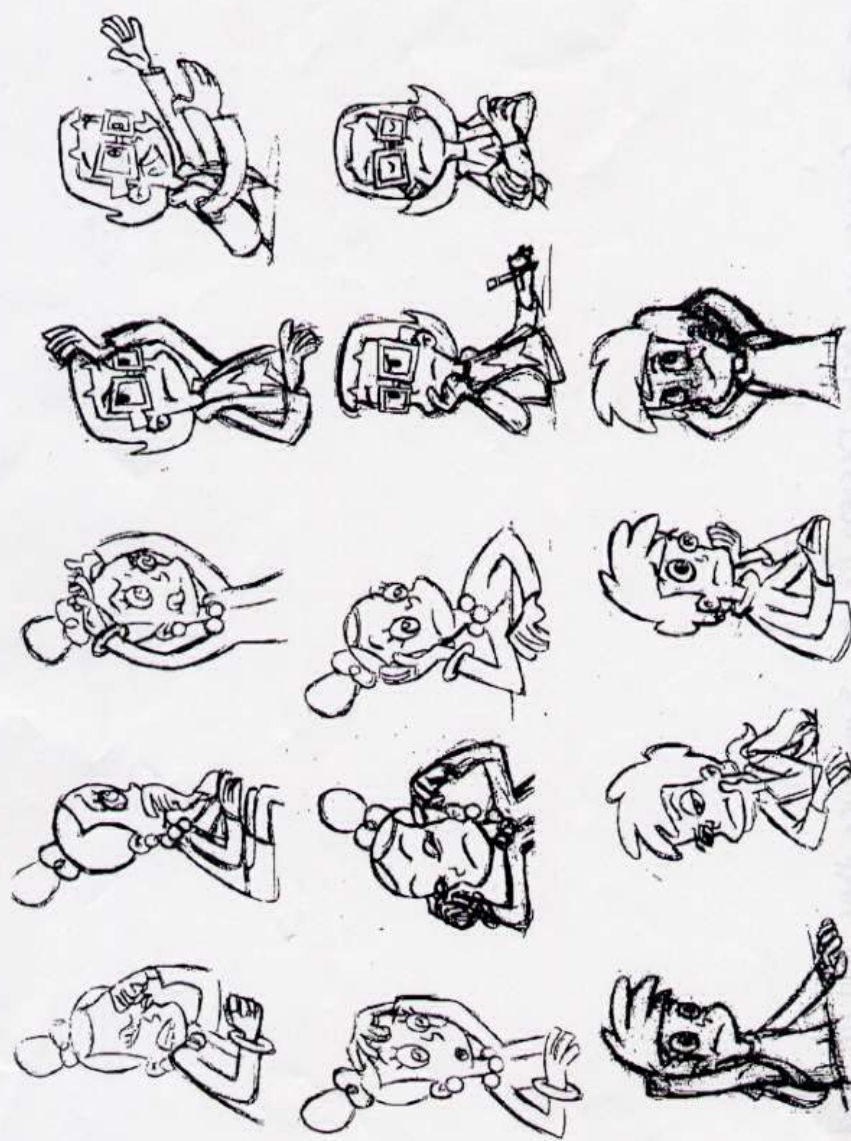
It was decided that, in the future, we should deliberately pick a simple problem for kids to do alone so we can watch how individuals respond. We agreed that, budget permitting, we should do this again, but our process needs to be fine-tuned so the production team can get the most benefit from the study.

Sketches of 'Thinking Poses' Observed in Videotapes of Students

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Inez, Jackie And Matt - Thinking Poses - Rough

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