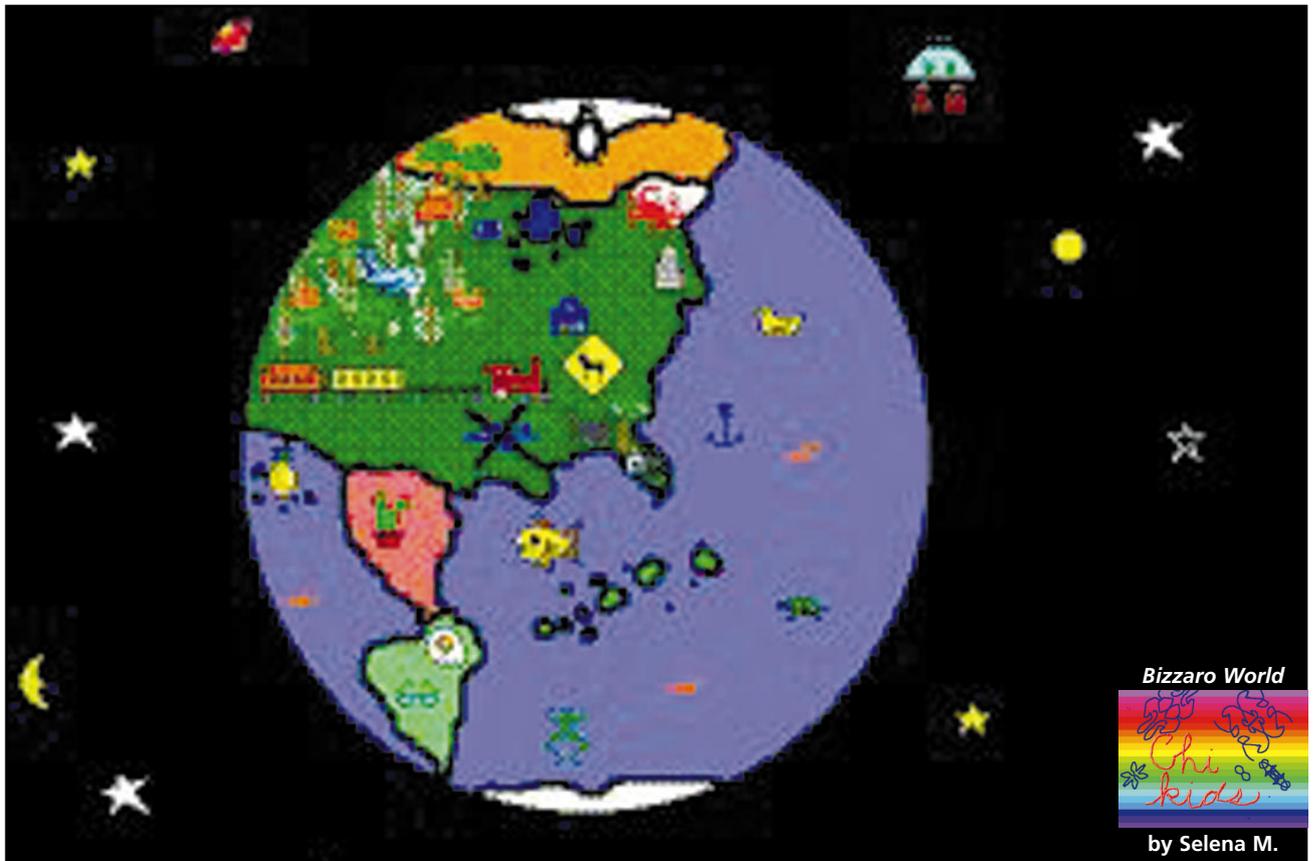


Guidelines for Usability Testing with Children



Although user-centered design is a well-supported concept in the literature on adult computer products, not until recently have publications begun to appear addressing the need to include the user in the design process of children's computer products. Good examples are a recent panel discussion in *interactions* on the importance of understanding the perspectives and needs of children, and the energizing work of Allison Druin and Cynthia Solomon [1, 2]. Growth has also occurred in evaluation research in both the industrial and academic communities, assessing the effectiveness or appeal of various types of

children's software and hardware products [5, 8]. As the body of literature on children's use of computer products grows, a necessary step is to flesh out the details of exactly how to include children in computer product design. The goal of this column is to provide examples and guidelines from one research group working to incorporate user data from children in the design process.

As usability engineers at Microsoft, we apply various research methods to improve the design of children's computer products, both software and hardware. We review design specifications for common usability issues and age-appropriateness for the target population. We also visit homes and schools to gather observational, interview, and questionnaire data on children's use and liking of computer products. We conduct longitudinal studies in homes or in the lab to assess ease of use, learning, and appeal over time. However, the majority of our research consists of usability lab tests, which offer the advantages of iterative testing of design changes, team involvement in observing children, and rapid discovery of usability issues. Applying our developmental psychology backgrounds and professional experience, we have developed the following guidelines for how to tailor traditional software usability testing to allow children to participate.

This column is geared towards the computer professional who is suddenly presented with the need to assess the usability of a computer product with children. We will assume that you have access to basic usability lab equipment (e.g., a quiet room for testing that is set up with computer equipment as well as a camera to record the interaction, and a one-way mirror into an observation room next door) and a general knowledge of usability testing. A few resources for usability methods that we have found helpful can be found in the reference list [3, 4, 6, 7]. In the rest of this column, we will focus our information on how to adapt testing to maximize the benefit of using children.

Descriptions of Common Target Age Ranges

Following are general descriptions of three common target age ranges: preschool-aged children (2 to 5 years), elementary-school-aged children

(6 to 10 years), and middle-school-aged children (11 to 14 years). These age divisions are arbitrary, and many behaviors will overlap. In our experience, most children younger than 2 1/2 years of age are not proficient enough with standard input devices (e.g., mouse, trackball, or keyboard) to interact with the technology and provide useful data. Children older than 14 years of age will likely behave as adults in a testing situation and should be treated accordingly.

Preschool (ages 2 to 5 years)

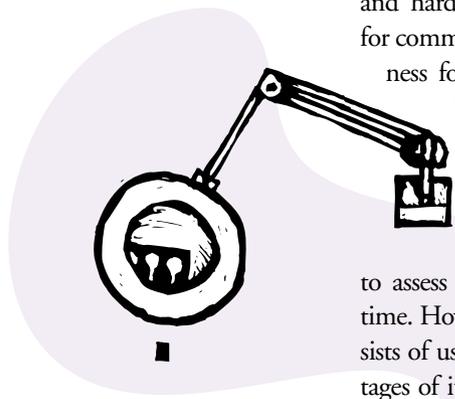
Preschoolers require the most extensive adaptations of usability testing because their attention span, their motivation to please adults, and their ability to adjust to strange surroundings and new people may change from one moment to the next. In general, children in this age range should be allowed to explore the computer according to their own interests and pacing instead of performing a series of directed tasks. They will often be happy to show you what they know, and what they can do on the computer independently. When assessing appeal or engagement, testers will need to closely observe children's behavior such as sighing, smiling, or sliding under the table. Children this age often have difficulty expressing their likes and dislikes in words.

Elementary School (ages 6 to 10 years)

Children in this age range are relatively easy to include in software usability testing. Their experience in school makes them ready to sit at a task and follow directions from an adult, and they are generally not self-conscious about being observed as they play on the computer. They will answer questions and try new things with ease. In this age range, children will develop more sophistication about how they can describe the things they see and do. Six- and seven-year-old children will be more hands-on—ready to work on the computer but a little shy or inarticulate when talking about the computer. Ten-year-old children may have extensive computer experience and be ready to critique your software.

Middle School (ages 11 to 14 years)

Children in this age range are very easy to include in usability testing. Most will be com-



comfortable with computers and with unfamiliar adults. Children this age can be asked to perform, and actually enjoy, specific tasks after a period of free exploration. Some older children in this age range may be able to “think aloud” during the session, while others may be self-conscious about having people watch them and listen to what they say. These children may bring a very high level of computer expertise, or distinct expectations for what they will be doing, to a usability session.

Guidelines for Testing Children

Set-up and planning

- Make the lab a little more child-friendly by placing a couple of colorful posters on the walls, but avoid going overboard. Strike a balance between an adult-oriented lab environment and an inviting play space that may distract children from the computer. For example, one of us added giant floor pillows to the lab until one child decided to spend her time there having a pillow fight.

- Preschool-aged children may have difficulty switching from the input device they use at home (trackball versus mouse, one-button versus two-button mouse) to a different one in the lab. If possible, find out what they regularly use and set it up for them before the test. Also, set the cursor or pointer speed to its slowest setting for children in this age range.

- Use laboratory equipment as effectively yet as unobtrusively as possible. Make sure to place microphones close to children to pick up their soft voices but opt for smaller ones such as pressure zone microphones (PZM) over large ones. Avoid furniture arrangements that face children directly toward the video camera or a one-way mirror. In one poorly designed arrangement, two 11-year-olds faced the one-way mirror as they interacted with a paper prototype. This resulted in a lot of off-task grooming behavior.

- Schedule children for an hour of lab time. Preschoolers will last on average about 30 minutes, but will need extra time for play and exploration. Even older children will become fatigued after an hour of concentrated computer use. Give yourself plenty of time in between children, and don't over-schedule the day. You

will find yourself more tired than usual after testing children, especially when you are in the room with them observing and providing encouragement and feedback.

- When planning a series of tasks, switch the order around for different children so that the same tasks do not always come at the end of the test when children are tired. We have had the experience of children's beginning to chafe at being told what to do towards the end of the test and inventing novel ways of responding, such as picking all the left-hand items when asked to show preferences in a paired comparison task.

- Screen children for testing that have at least some experience with the computer. You don't want to have to spend your testing time teaching a child how to use a mouse. We usually require that children have 6 months' experience with mouse-driven software at home before they can participate in usability testing.

- Do not include children in testing who have too much computer expertise (unless they are your target audience). Children with advanced computer skills (programming their own games, scripting Web pages for their school, and so on) will not provide the kind of data necessary to build products that are usable for children at large.

- In general it is not a good idea to use your own or colleagues' children as usability participants. Even if children whose parents work for software companies do not have the aforementioned advanced skills, mentioned above, they probably have above-average exposure to the products their parents develop and to terms used in the industry. This knowledge may bias the study. It also puts children in an awkward position if they truly do not like your product.



Introductions

- Establish a relationship with children when you first meet them by engaging in some small talk to find out more about one another. Children are often happy to talk about their birthdays, their favorite computer games, or their favorite subjects or sports at school.



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• Explain confidentiality agreements by telling children that designs are “top-secret.” Parents should sign the agreements because they are the legal guardians and because they will also see or hear about the design. Older children may be dropped off by parents or come by bus. In that case, confidentiality agreements can be sent home with the child and to be returned by mail.

• Have a script for introducing children to the testing situation. A possible script might be (after introducing yourself):

“I call this a test, but I’m not testing you at all. I’m asking you to help us test our software design. I need to see what’s too easy or what’s too hard for children your age so we can fix it and make it better. I’ll ask you to figure out things on your own most of the time, but I’m here if you get stuck.”

For preschool-aged children, this dialogue is also directed to parents, and could be altered as follows:

“I want to make it clear that I’m testing the software, not your child. We want the software to be fun and easy for your child to use on her own, so I will be asking you to sit back and allow your child to try things out. I’m right here if she gets stuck, and I will help her out by giving some hints and asking her to make some guesses.”

• Motivate older children by emphasizing the importance of their role. For example, tell them that you have forgotten what it is like to be a child, and that you need their help to make a good product for children all around the world. We have seen this kind of statement make the difference between rowdy, uncooperative and willing, helpful junior high school classrooms.

• Set children’s expectations appropriately for what they will be doing during the usability session. Many children will expect to see a finished piece of software when they enter the lab and may be disappointed when they are presented with a paper prototype. Explain to them why it is important to get their feedback at the current stage in development. One of us had a disastrous session in which a child who expected to

be play-testing games refused to participate when he was presented with a paper prototype for an educational title.

• Show children and parents around the lab, including behind one-way mirrors. Letting children see the workings of the lab gives them a better sense of control and trust in you. Explain that team members like to watch children use their designs, and when in another room, they can talk to one another about how to fix things without bothering you. Explain cameras and microphones, saying that you use them so you don’t have to remember everything children tell you—you can look at the tape later.

• Younger children (up to 7- or 8-year-olds) will need to have the tester in the room with them—they will need reassurance and encouragement and may be agitated by being alone or following directions from a loudspeaker. Because these children will probably have their parents in the room as well, your presence is essential to diminish parents’ interference. Older children can try being by themselves, which will enable you to take notes in the observation room. When necessary to give help or instructions through an intercom, speak softly and give children some kind of warning before launching into what you need to communicate.

• Younger or shyer children may be uncomfortable alone with the tester. In our labs, all children under 5 have their parents remain with them throughout testing. If needed, make provisions for the parent to stay in the testing room with his or her child (ideally out of the child’s line of sight), and explain to the parent that he or she they may observe but should interact with their child as little as possible during the test. Especially shy children may need additional support from their parents, and can sit on their parents’ laps if they would like to do so. If there is a separate observation area, the parents of older children should be allowed to watch the test from there.

• If siblings accompany children to a test, make sure they stay in the observation area or another separate room for the duration. We each have had the experience of the older siblings in the corner of the room who finally can’t contain themselves and start to shout out directions.

During the Test

- Preschool-aged children may need a little warm-up with the computer at the beginning of the test. One way to help children warm up is to play a game of placing your finger somewhere on the computer screen and asking the child, “Can you make the pointer touch my finger?” Move to a few other locations on screen and ask, “How about over here?” “What about in this corner?” This game also gives you a good indication of their competence with the mouse.

- Older children can be expected to perform specific tasks in addition to free exploration of the product. However, it will be necessary to break down the tasks into smaller segments than for adults, particularly for complex activities. Check to make sure children understand what is being asked of them and restate the task if you see signs that a child has forgotten it. It is also a good idea to prepare a script of hints that offer varying levels of support for performing the task. Tracking which hints are needed and when can give you a better understanding of the help a child will need to progress in the program.

- Children in general are often used to working or playing with new computer programs with others—their parents, siblings, friends, or classmates. They are used to asking for help if they aren’t sure what to do. You’ll need to redirect their questions by questions of your own. A sample exchange might run:

Child: *What do I click on to start?*

Tester: *What does it look like you click on?*

Child: *I don’t know.*

Tester: *Look around the screen. Do you see anything that looks like it might start the game?*

Child: *Is this it?*

Tester: *What do you think?*

- Do not ask children if they want to play the game or do a task—that gives them the option to say no. Instead use phrases such as “Now I need you to...” or “Let’s do this...” or “It’s time to...”

- If children begin to stray from the computer, swinging around to look at the mirror or pictures on the wall or trying to engage you in

random conversation, they should be gently reminded to pay attention to the computer. They can be encouraged to keep working with comments like “We need to keep trying this for 5 more minutes—then we can try something different.” “I want to see just how much you can do—let’s try some more.”

- Another way to encourage young children to try an activity they aren’t immediately attracted to is to pretend that you need help doing it. One girl was immediately drawn in after the tester gave several incorrect answers in a row and then offered her a turn to get it right.

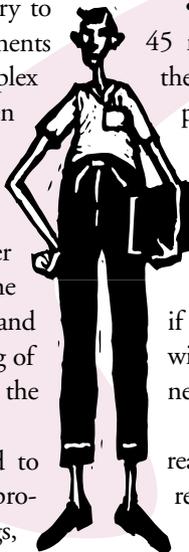
- If your test will run longer than about 45 minutes, children should be asked if they want to take a short break at some point. This should be something brief, like using the restroom if needed or getting a drink of water. It’s definitely time to take a break when a preschool-aged child begins to bounce or wriggle uncontrollably, even if he states he doesn’t want to stop (check with the parents for their child’s cues for needing to use the restroom).

- For children who are struggling to read words or numbers, you may have to read items for them (if that’s an expected part of the interaction), for example, e.g., “That says 3 plus 2 equals what? What’s 3 plus 2?” If a child says, “I don’t know—tell me” you can say, “Try to figure it out” or “Make a guess—what do you think?”

- Keep children feeling encouraged by offering generic positive feedback, in case they may feel they are failing at figuring out the software. Statements like, “You really worked at that!” or “You did that all on your own!” can help keep children motivated without giving them information about success or failure.

Finishing Up

- Gauge how much children like a program by observing signs of engagement such as smiles and laughs or leaning forward to try things, and signs of disengagement such as frowns, sighs, yawns, or turning away from the computer. These behavioral signs are much more reliable than children’s responses to questions about whether or not they like something, particular-



METHODS & TOOLS

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ly for younger children. Children are eager to please adults, and may tell you they like your program just to make you happy.

- Older children may be able to give reliable ratings about aspects of the software. We have found it helpful to use a vertical scale with a smile face on the top end and a frown face on the bottom end to make the end markers clear. These children also enjoy being asked to give ideas about how to make things better.

- After testing, reward children by commenting on how helpful they were. Explain to them that all of their hard work helped you to see exactly which things need to be fixed.

- For a gratuity, children and parents often appreciate a choice of a gift certificate to a local toy store or movie theater in addition to standard software or payment options.



Conclusions

In general, the same rules about planning, lab arrangement, and interactions with participants, etc. that are used in usability testing with adults also apply to usability testing with children. Adapting the testing situation for children essentially means taking a few steps to tailor the environment to their developmental level. Simplifying instructions so that they are clear to those with more limited vocabularies, providing additional comfort levels for those who are less able to regulate their emotional arousal, pacing the test to accommodate differing attention spans and energy reserves—these are all part of respectfully testing children.

The benefits to be gained from gathering data from children as users are unquestionable. Usability testing with children gives insight into the different perspectives children bring to computer products and such basic elements as navigation and productivity. Some teams assume that because they were once children, or because they have children at home, they can evaluate the usability of a product for children. This rarely results in a good outcome. No amount of adult evaluation will find all the issues that children will stumble into as a matter of course. For example, a drag-and-drop interactivity of placing food items in a mixing bowl got through several reviews until it was tested with children and

found that they placed items over the top of the bowl in order to drop them in. Another example was the use of a funny noise as an error message that children enjoyed so much that they stopped progressing and simply made the error again and again.

Like other products, computer products for children should be iteratively tested by children. Many teams do play-testing with children at the end of a product cycle, assessing general appeal and playability when the product can be seen in all its glory. However, the cost of making changes at such a late stage severely curtails the amount of fixing that can be done. Adding usability testing to interim stages of design allows for child input at crucial stages. Children's usability testing can resolve design debates, give quantitative information about effectiveness of educational approaches, refine user interface design so it's accessible for all ages—all before the design is too difficult and costly to change. A complete program of children's usability testing is the essential component to creating products that are child-friendly and child-approved. @

References

- [1] Brouwer-Janse, M. D., Suri, J. F., Yawitz, M., de Vries, G., Fozard, J. L., and Coleman, R. User interfaces for young and old. *interactions* (March–April 1997), 34–46.
- [2] Druin, A., and Solomon, C. *Designing Multimedia Environments for Children*. John Wiley, New York, 1996.
- [3] Dumas, J. S., and Redish, J. C. *A Practical Guide to Usability Testing*. Ablex, Norwood, NJ, 1993.
- [4] Hix, D., and Hartson, H. R. *Developing User Interfaces: Ensuring Usability through Product and Process*. John Wiley, New York, 1993.
- [5] Lieberman, D. A. Learning to learn revisited: Computers and the development of self-directed learning skills. *Journal of Research on Computing in Education*, 23,3 (1991), 373–395.
- [6] Nielsen, J. *Usability Engineering*. Academic Press Professional, Chestnut Hill, MA, 1993.
- [7] Rubin, J. *Handbook of Usability Testing: How to Plan, Design, and Conduct Effective Tests*. John Wiley, New York, 1994.
- [8] Strommen, E. F., and Revelle, G. L. Research in interactive technologies at the Children's Television Workshop. *Educational Technology Research & Development*, 38,4, 65–80.

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