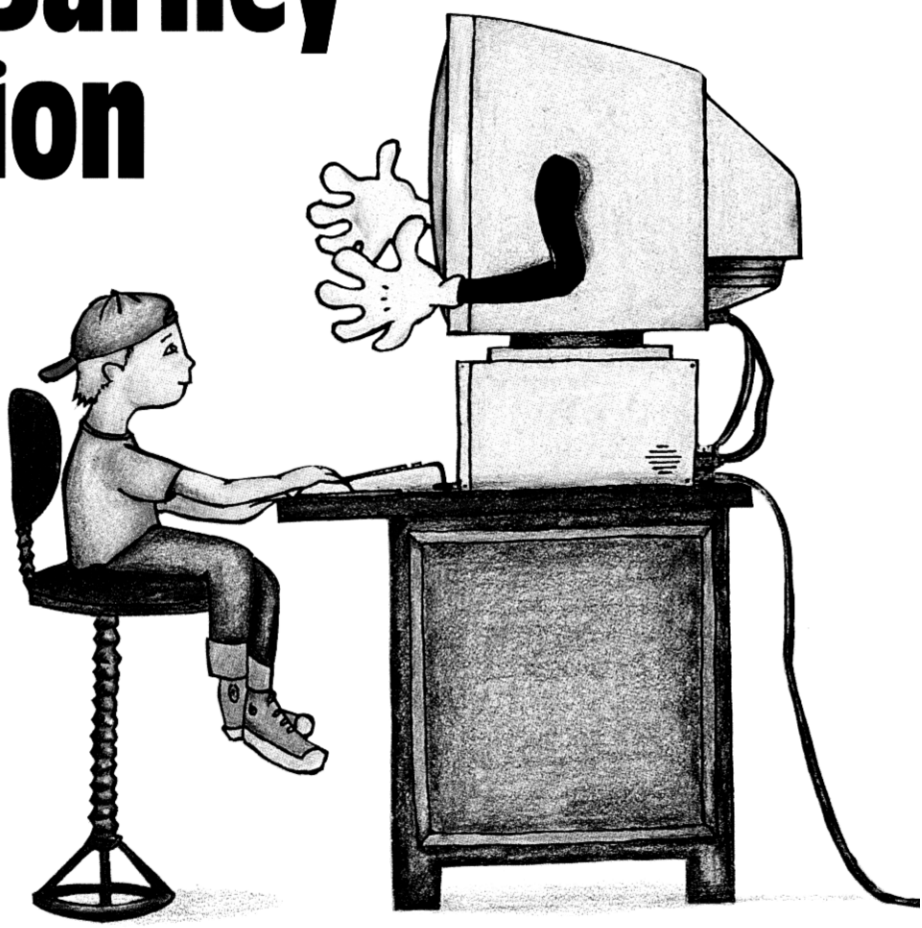
Computational Gifts for the Barney Generation



One hundred fifty years ago, Friedrich Fröbel, the father of the kindergarten, gave young children a toolbox of 20 objects and various activities to play with them. These activities involved throwing and catching woolen balls accompanied by songs, arranging wooden sticks in patterns, and folding paper in intricate ways. Fröbel designed a complete educational program, probably the first of its kind, with the materials of his time.

Just five generations later, the materials of the time have significantly changed. Interactive technologies have penetrated our homes. Sega and Nintendo spew out interactive game after interactive game. Edutainment has become a commonplace word. What toolkit would Fröbel put together today?

Five-year-old Emma has had, from day one of her life, a computer in her house. For all Emma knows, a house comes with a refrigerator, bathtub, TV and computer. Emma's generation is the first truly digital generation. Computers will accompany Emma and her generation at every step in their maturation process. What "computational" gifts are we giving to the Barney Generation?[1] This is a most serious question. What these children experience today will drive their expectations and dreams for tomorrow.

In what follows, we examine a collection of computer-based products targeted for home use by the Barney Generation. What messages about the potential and possibilities of technology are we sending children in these first exposures? Should we be proud of these "computational" gifts?

Story Telling Goes Digital

The first wave of electronic books is crashing over us now. CD-ROM publishers are doing the obvious: putting stories onto CD-ROMs. To the text and pictures, they add animation, sounds, and a narrator with a saccharine voice. Take the classic fable, "The Tortoise and The Hare," a Living Book by Broderbund. The child advances through the story by clicking on forward and backward arrows. Objects on the screen (Figure 1) can be animated: click on the tortoise and it will run around, click on the birds and they will start singing, click on the water and it will jump up and down. As the text is read aloud, the corresponding text segments are highlighted.

Translating printed books into other media *can* be value-adding. Oftentimes the narrator of a book-on-tape is the author himself/herself; books-on-tape have found a fine niche market with the vision-

ILLUSTRATION: ANA CICA

Yasmin Kafai
Elliot Soloway

[1]TV has long provided preschool children with friendly "characters"—Captain Kangaroo, Mr. Rogers, and now, Barney. Barney is a well-mannered, good-humored, pillow-stuffed and purple-ish dinosaur who is as close a daily buddy to millions of preschool children as any TV character can be or has been.

impaired and with commuters. In the hands of a skilled group of screenwriters, directors, actors, filmmakers, and so forth, the movie version of a book can be quite compelling. On occasion, the movie can actually stand on its own as a work of art.

However, it is our opinion that the current genre of electronic books hasn't figured out how to exploit the computational medium yet. The animations are gratuitous; water jumping up and down doesn't add anything to the story line. The narration

Figure 1. Scene from the Living Book, The Tortoise and the Hare

really isn't in synch with the text highlighting, so it's not clear that children see a connection between the written words and the spoken words. "Paging" through a book on CD-ROM is painfully slow; Emma literally said "Pop, I hate this."

The most telling observation is this: whereas Emma reads her printed books over and over again, she has read each electronic book only once.

Patience. We must remember that movies started out filming theater productions; new technology mimics old . . . for a while.

More Than Just Digital Crayons and Digital Keyboards

For the longest time, young Picassos have used paper and pencil to draw pictures, and early Beethovens have used pots and sticks to make music. What are the digital counterparts of these materials and tools?

KidPix is an electronic paintbox and canvas. For starters, it provides much of the functionality found in adult-oriented graphics programs: pencils, spray paints or brushes can be used to create objects and distortions, to reverse colors, flip images, and repeat patterns. But KidPix makes use of the computational medium to tap into young children's sense of play. Letters talk, curious shapes are available as stamps, tessellation tools transform images in funky, unexpected ways.

In KidPix (Figure 2) there are a number of different delete tools, each of which goes through a different visually and auditorially interesting process. Watching children use KidPix reveals that these are the features they enjoy best. Professional graphics packages allow the creation of neat-looking graphics; in KidPix a goal is to mess around until the trajectory of transformations is not visible anymore!

One of the benefits of KidPix is that it allows children to save their artwork and even to import pictures from other sources. These features might not be worthwhile mentioning, yet in the area of children's software it is a unique occurrence. Amazingly enough, most software discussed in this review does not allow children to save their work in progress or to use imported work for future transformations.

Thinking Things (Figure 3) goes one step further in its use of the computational medium: children can animate different shapes and create worlds of flying objects through variously structured spaces. The size and direction of shapes can be changed. In addition, children can record their own sounds and attach them to the animated objects. Adults prefer this corner of Thinking Things, too.

Oranga Banga and Toony Loon (Figure 4), also part of Thinking Things, play challenging and memorable drum rhythms and melodies for children to repeat. Mark, a five-year-old, played intensely for one hour by himself trying to imitate given percussion patterns. As he progressed through different examples, the patterns became more difficult. Every time he missed a beat, one of the screen figures shook its head and played it again for him. Children can also create their own rhythms and have Oranga Banga replay them. It's not just the functionality that draws children in; Oranga Banga and Toony Loon are fun characters with which to interact.

One of the best features of Thinking Things activities is that they can be adapted to the player's level, ranging from beginning to advanced. Levels are an integral part of video games; levels need to be incorporated into more children's software.

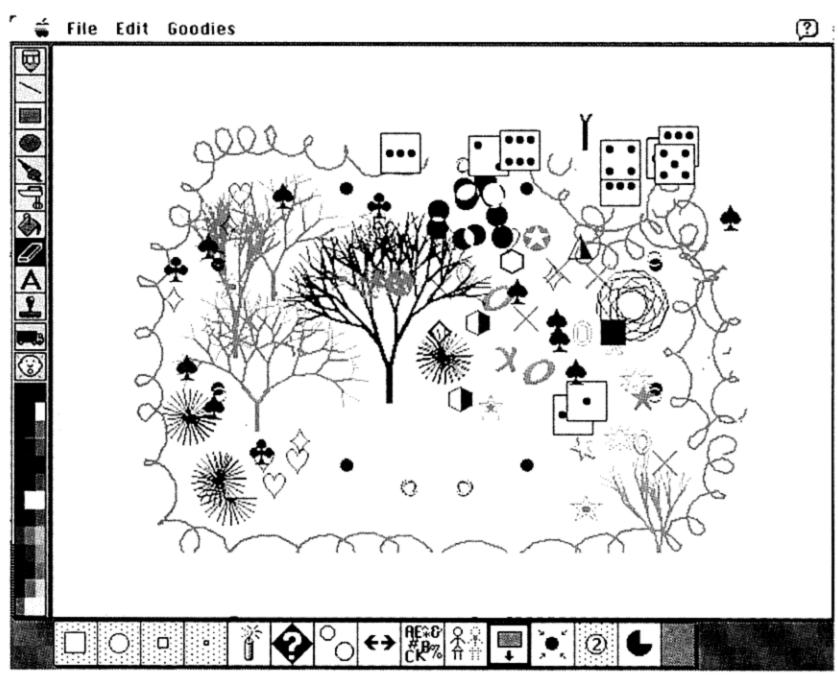


Figure 2. Emma's KidPix picture

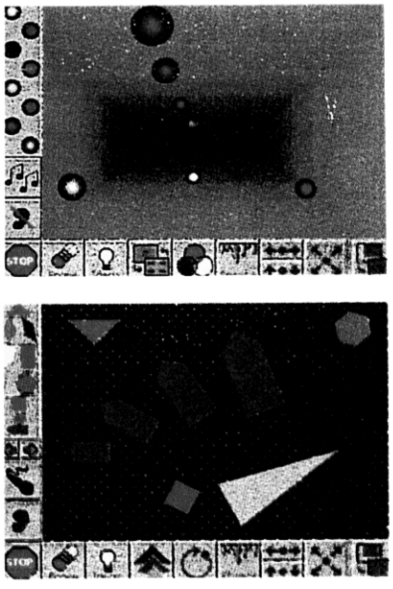


Figure 3. Thinking Things—Blox

Finally, *please* don't think that we are advocating that children not use pencils and crayons, pots and sticks; it's just that the Barney Generation is fortunate to have a rich set of options available to them.

Jeopardy on the Computer: Getting the Right Answer

Drill and practice software is relatively easy to write: have the user choose from among a set of answers. Now add in some color, sound, animation and bingo, drill and practice for the Barney Generation. Millie's Mathhouse, Stickybear's Early Learning Center and Busytown are just a few examples where many of the provided activities for learning arithmetic, writing, and reading utilize this instructional method.

Millie's Mathhouse (Figure 5) teaches children to count, recognize patterns and sizes. Want your big character to wear shoes? Only the big ones will fit. Working with the Number Machine? Only one number counts the number of cookies correctly. While children are meant to "play" in Millie's Mathhouse, after the tenth time or so, getting the one right answer is no longer particularly challenging, engaging, or even fun.

The Carmen SanDiego series of software has definitely been very popular. Much the same as the board game Clue, the goal is to move around gathering information about a crook. Similar to the TV show Jeopardy, one must answer questions in order to progress. Watch children play Carmen. Are they interested in the answers to the questions? The chase is what is exciting; showing that *x* was born in country *y* in year *z* is not. Learning just the dates and names of historical personalities does not enhance a child's deeper understanding of social and political forces. Do the children even remember these decontextualized, random facts?

So, why is Carmen so popular? Children and adults can play it together; the adults answer the questions and the children manipulate the program. Digital parlor games. There is definitely value in adults playing with children. Maybe it *is* so much fun precisely because the content material is so innocuous and inconsequential.

There are zillions of programs for teaching kids letters, numbers, shapes, colors. Frankly, these sorts of programs make the least use of the computational medium. While they *may* be more engaging than conventional drill and practice technology—flash cards—it just feels like a big waste of time and resources.

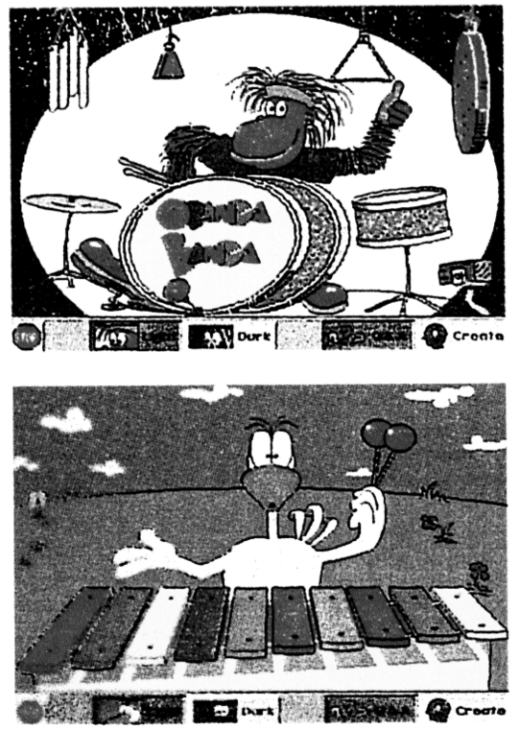
Anchoring Children in the Familiar: Is That Important?

Millie's Mathhouse and Thinking Things provide a main navigation screen; a child chooses one of the activities from an icon of that activity. Moreover, each of the activities are independent of each other. In contrast, Playroom and Backyard (Figure 6) attempt to anchor the child in a familiar context and include activities that are appropriate (more or less) for that context. For example, in Backyard, children can write a song by painting the fence in different colors, they can learn about animal anatomy by mixing and matching body parts of broken animal cookies, and they can develop spatial skills by following a simple map to locate a treasure and dig it up in the sand box. In Playroom, children can play a board game by adding and subtracting numbers, learn about telling time by having time represented in words, numbers, or on a clock face, and learn about letters by selecting and arranging objects to tell imaginative stories.

Guestimation, one of the games on the CD-ROM Countdown, anchors students in a different way. Rather than using graphical images of objects, Guestimation employs video clips of real objects (e.g., marbles, noodles, crumbled paper). In addition to providing an anchoring, the use of real paper added some of the ambiguity and complexity found in the everyday world, which isn't necessarily true for the drawn graphic images.

Is context valuable for learning? Is video? Why aren't more academics studying young children's software? A few years ago there were studies that argued that media does not make a difference in learning, that media are simply means of conveyance. Afterall, does it matter if a head of lettuce is delivered to you via car, truck or train? This is a classic case of where psychological findings are dia-

Figure 4. Thinking Things—Oranga Banga and Toony Loon



metrically opposed to common sense and all of one's experience. How can it be that media does not matter, for heaven's sake! We do *not* need more of those kinds of studies!

Design Suggestions for Computational Gifts

Based on our experiences with young children and their software, here are a few suggestions for improving software for this age group:

1. Think about the computer as a place for social activities. Placing a computer game on software can also be a social activity shared by several children. Provide options for multiplayer interactions such as taking turns.

2. Allow settings for players of different abilities. The assumption that all users and players are the same has dominated human-computer interaction research and literature for the last 10 years. Although children's software is often targeted at different age groups, it still tends to assume that children of the same age are of the same abilities and learning styles.

3. Provide room for reuse, change, and growth. Allow children to save their work and games in progress. Allow for the reuse or otherwise created pieces of work. Most importantly, allow children to experience or make something three months down the road that they couldn't do in the beginning. Provide several layers of complexity in the software.

4. Eschew the minimalist design mentality for children's software. Fewer features is not necessarily the right design strategy. Kids love to explore nooks and crannies.

5. Do not assume that learning is easy. Reading the instruction and promotional materials of software packages could lead one to the conclusion that edutainment has found the magic formula for scholastic success: learning combined with entertainment features will draw children into getting all the knowledge needed to succeed in school and later life. This magic tool has yet to be developed and it is questionable whether there is one.

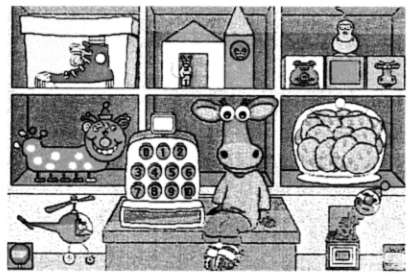


Figure 5. Millie's Math House

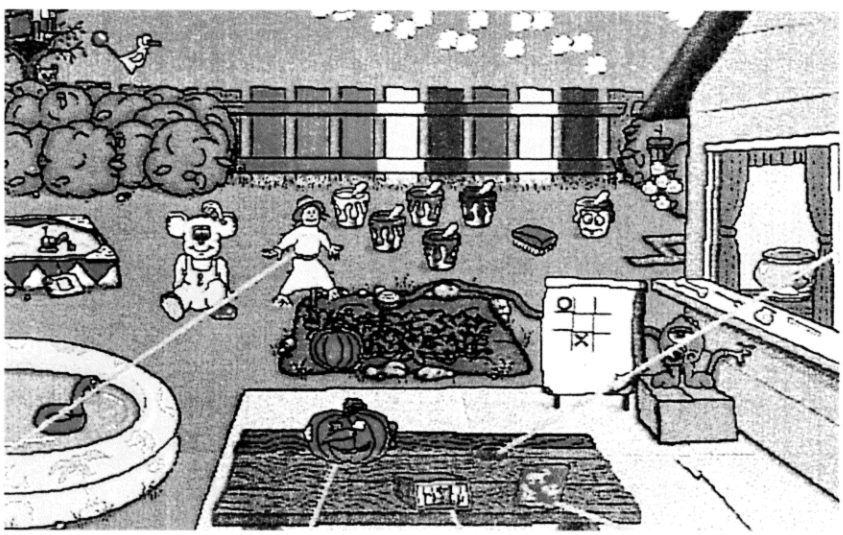
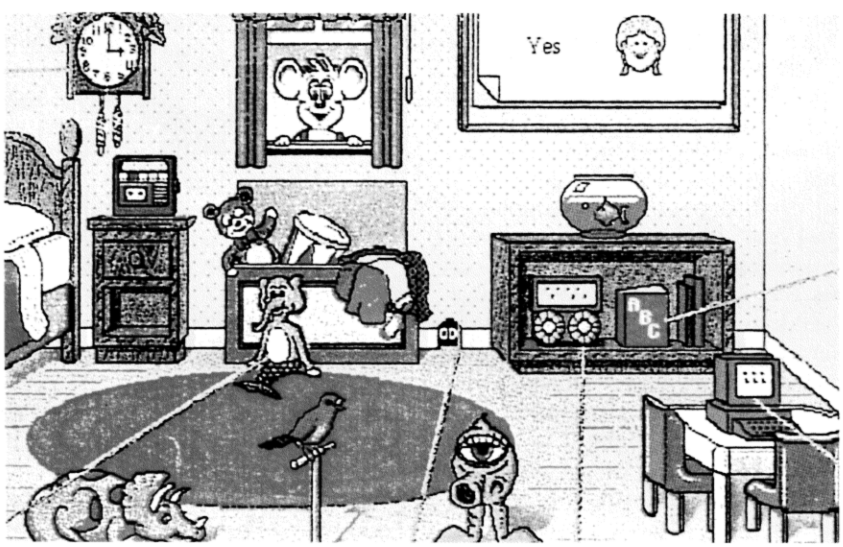


Figure 6. Backyard, Playroom



Programmers And Young Children

One hundred fifty years ago, Fröbel gave young children gifts constructed from materials of his time. Children are still the same, but the world in which they grow up has changed. How do we exploit the materials of this age to make gifts for our children? Interestingly, software professionals may well be uniquely positioned to contribute those gifts. Young children display a wonderment and excitement about computers that is reminiscent of that exhibited by programmers. Thus, the last design prescription for computational gifts should be: play to a child's imagination and engage the child's sense of wonder. ◘

Elliot Soloway *is an associate professor in the Department of Electrical Engineering and Computer Science at the University of Michigan.*

Yasmin Kafai *is an assistant professor in the School of Education at the University of California, Los Angeles.*