

A Real Virtual Playroom: Designing Media to Foster Creative Engagement

by Seth Hunter

Last week, I spent a few hours with Luca, a five-year-old boy, on our porch with his mother's iPad and a LEGO set. He showed me his favorite games and activities on the iPad. We played Cut the Rope and Angry Birds, both strategy games in a simulated physics world. We took turns using our fingers to do things like feeding a frog by slicing a series of ropes.

While we were playing Luca commented that the iPad was his favorite thing in the world because it's like a TV that you can take anywhere and play games on. His mother came in after an hour and took away the iPad, and we transitioned to playing with Lego bricks. We set up a battle between characters, and started making up rules about how they interacted and who was going to live or die. We constructed a maze on the floor and guided little men through it, acting out a scenario in which the characters were racing through the maze, as it grew increasingly hard to navigate.

Although I enjoyed playing the games on the iPad with Luca, I learned more about his personality from the LEGOs because we were communicating with each other and enacting our own scenario. I don't think there is anything inherently bad about computer games, but I usually don't incorporate game mechanics like the ones in Angry Birds in my own designs because I believe they support actions without fostering creative inquiry or deep understanding. Trends like gamification [27] and edutainment [39] are often used by developers to try to make media and education more engaging by taking advantage of our psychological predisposition to repeat something over and over when the game rewards us in small ways as we go. This might be one reason why Luca would have kept playing with the iPad during our entire session if his mother had not taken it away.

Part of my criticism of game mechanics is also derived from my recent work as a media researcher. I am working on a series of physical shadow puppets - dragons, birds, and mice that are mapped to digital characters in an open ended virtual environment. So far, pilot tests of the system with nine children have revealed two general categories of responses: How do I win? and Can I make my own? The two responses indicate an underlying set of assumptions the children brought to the interface which raise critical questions to me as a designer. Is the How do I win? approach an inherent or a learned response to screen based systems? What motivated the children who wanted to make their own?

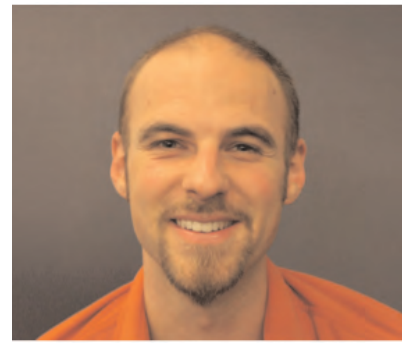
Lifetimes of research by developmental psychologists such as Jean Piaget [1], Erik Erikson [2], and computer pioneers like Seymour Papert [3] and Mitch Resnick [4] have demonstrated a correlation between early imagination, play, and creativity with the capacity for empathy, critical thought, and inventiveness. My views follow educational researchers and designers that advocate for more constructive Can I make my own? approach to media design. I think it will help children grow into creative careers, understand the perspectives of others, and author their own possible futures.

The immediate challenge for designers (as I see it) is to invent tools and scenarios that make creating things as easy and compelling as playing games. I believe one way of doing this is to leverage the affordances of both the digital and physical domains with a critical eye on what will have lasting benefits for the child.

What principles should inform the design of software for children as access and exposure to different forms of media increases?

What do children expect from digital media and what is the role of the designer in shaping these expectations?

How should new media be integrated with the traditional play patterns and experiences of the child?



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Why did I write this?

This essay presents observations of children from my perspective of an interactive media designer. It examines the limitation of game dynamics and presents a proposal for more creative mixed reality applications. It outlines six principle opportunities afforded by digital media and argues that incorporating them into play experiences will empower children to invent their own possible futures.

Statement of Bias:

Seth is a graduate student at the MIT Media Lab and a Fellow of Hasbro. Some of the references in this article include colleagues and alumni of the Media Lab, including Mitch Resnick, Hayes Raffle, Sherry Turkle, Natalie Freed and Eric Rosenbaum. He is also an active member of the Interaction Design for Children community and referenced papers of colleagues at that conference. Most of the references in the article are not personally associated with the author.

A Real Virtual Playroom

Children are increasingly exposed to a diverse media ecology of devices in their play spaces. Recent studies by the Sesame Workshop [5] indicate that the average child over 8 years of age spends more than 10 hours a day interacting with media devices like phones, televisions, video games, and computers. Being an active citizen in society increasingly requires being able to navigate and participate in the activities facilitated by these devices.

The effects of these devices generate mixed reports by researchers like Howard Chudacoff [6], who outlines trends that suggest that play is shifting from a world invented by children to a world prescribed by parents and other adults. He states, The resourcefulness of children's culture has eroded, as children have become less skilled at transforming everyday objects into play-things. The critical question for educators, parents, and designers is not how to protect our children from exposure to media but how to design tools that creatively empower them within a changing media landscape.

This is a fascinating area for designers to explore because increasingly portable devices are putting computers in our pockets and our children's bedrooms. The dynamics between gaming and creative play, the digital and the physical, the fantastic and the real are converging. Children often fluidly transition between media devices and physical toys, imaginary play and real communication, inventing their own rules and playing games on personal devices.

Imagine for a moment that Luca and I could construct a world of characters on the iPad by holding Lego men up to the screen. Then we would invent our own maze for them to wander through by drawing the borders with our fingers and put the men in a medieval landscape by holding up a picture book from Luca's bookshelf. Luca could add his own dramatic voice effects as the characters ran into each other. Later, Luca could share the game he invented with his mother and change the background to a moonscape. As an interactive designer my mind often quickly sketches out applications like this that re-contextualize scenarios we enact in the physical world. I contrast these to existing software applications and there is a huge gap in expressive capability. I want to combine the ease and immediacy of the physical with the plasticity and imaginative possibilities of the digital.

It's easier to build things with Lego bricks than do so in software environments. This is one of the primary arguments behind tangible learning systems in the Interaction Design for Children Community [7,8]. But the two domains inform each other. The iPad games Luca and I played were simulating aspects of reality in carefully designed scenarios that encouraged problem solving. When we were playing with Lego bricks we added our own rule set and constructed an evolving landscape. But on the iPad our choices were limited. We were not able to invent and adapt the scenario.

Six Creative Affordances of Digital Media

Luca likes the activities he plays on the iPad. He asks his mother if he can play when the adults are talking about things he is not interested in. Initially the applications seem like harmless puzzles, but when he keeps repeating the same actions over and over, I start asking myself questions. Are there unique affordances of digital media that could benefit him in the long run? What are the properties that distinguish digital media from traditional media like books, television, and learning toys?

Lev Manovitch outlines unique principles that underlie new media in his book *The Language of New Media* [9]: automation (new media objects can be created and modified automatically), variability (they exist in multiple versions), transcoding (it influences how we understand and represent ourselves), and modularity (elements exist independently). These are insightful on a conceptual level because they help define the medium, but the principles don't translate into tools we can use to create meaningful experiences for the child. The screen can be a magical canvas for the human imagination. It can be a portal that connects us with others, helps transform our identities, responds to our actions, and records our ideas.

In place of a conceptual framework, I propose a set of six principal questions as guidelines for deepening the value of creative software applications. They are derived from exploring what human experiences are made possible through interaction with digital media.



What distinguishes digital media from traditional media like books, television, and learning toys? Here are six questions you can ask.

- 1) *Create and Program: Can I make my own and bring it to life?*
- 2) *Pretending and Fantasy: Can I do impossible things?*
- 3) *Transformation: Can I become something new?*
- 4) *Interactivity: Can I make it respond to me?*
- 5) *Time-Based Storytelling and Playback: Can I tell a story?*
- 6) *Social Play at a Distance: Can I play with my friends?*

These areas are by no means exhaustive; they are intended to frame a critical conversation around creative potential from the perspective of the child. After each question, I discuss examples of existing software and research that provide insight into ways of supporting the child in that area. At the end, I discuss strategies for software developers and companies that are following this approach today.

1) Create and Program: Can I make my own and bring it to life?

Online massive multiplayer environments for children like Disney's Pixie Hollow [10], and Club Penguin [11] understand that every child wants to make something that is uniquely theirs. Children go through an extensive process of choosing the attributes of their character - its skin, hair, eyes, wings, costume and accessories - before entering the world. This is in part to motivate the child to feel some ownership of the avatar, and in part to motivate them to spend time in the world playing games to earn tokens for more merchandise. The economy of these worlds has been criticized by reviewers like Mireya Navarro in an article entitled Pay up kid, or your igloo melts [12] as encouraging consumerism.

In my opinion, Disney took the easy way out. They added game dynamics to something that could be a highly creative environment. If Pixie Hollow let you design your character and then act out stories with other children, imagine the possibilities! The goals would shift to how to bring your character to life, give it expression, and define its relationship with the virtual world. Should designers do this work, or can designers learn to scaffold this process for the child?

Environments like Scratch [13], Alice [38], and Stencyl [39] provide more open-ended environments that allow the child to learn basic programming concepts. Programming is a gateway to expression. They enable the child to tell the computer what to do instead of following instructions. They allow the child to exhibit control and feel empowered. Through these environments children convey a set of instructions for how to bring the things on the screen to life. What follows is making it interesting and immersive through fantasy and imagination.

2) Pretending and Fantasy: Can I do impossible things?

One of the most compelling things about playing with children is that their imaginations are not yet limited by empirical knowledge. They love to make pigs fly, let farm animals talk, and give superpowers to their creations. Fantasy is about enacting the impossible because it is exciting! But it's also a critical part of the child's development.

Piaget [1], Erikson [2], Freud [16], and Vygotsky [17] outline stages of childhood development that transition from egocentric to socially aware. The process begins by acting on the world and discovering object permanence, and continues as the child learns to represent things symbolically through pretend play. She will assign agency to her dolls, and then fantasize about what they do. Hartup [18] and others theorize that fantasy leads to rule based play, the ability to imagine possibilities, and eventually the perspective of others. This type of socio-dramatic play is more accentuated in girls than boys. Boys tend to focus on amplifying aspects of themselves, often in impossible heroic ways.

Often the stories and metaphors are embedded in media entertainment and appropriated in various ways by children across different forms of media. Henry Jenkins [19] describes in *Convergence Culture* how many children respond to the Harry Potter fantasy world, joining fan clubs and reinventing aspects of the story to fulfill their desires as they shape their identities. Part of the mass appeal of this epic series is that it satisfies fantasies we have about ourselves by casting them in a world fictional characters with magical powers that can do impossible things.

3) Transformation: Can I become something new?

David Rokeby describes media interfaces as Transforming Mirrors in his essays about the metaphors that underlie digital experiences [20]. He writes that they operate like a wayward loop of consciousness through which one's image of one's self and one's relationship to the world can be examined, questioned and transformed.

We reinvent ourselves throughout our lives, particularly during transitional stages in our development. We also enact aspects of ourselves in virtual activities where the story is embedded in a safe world that cannot hurt us. Sherry Turkle in *Life on the Screen* [21] says the imperative to self-knowledge has always been at the heart of interaction. She portrays online environments as liminal spaces that are between real and fictional, not quite a mirror of the child but reflecting aspects of themselves that they project and transform.

Transformation is imbued with surprise and delight because it allows us to experiment with our identities. One safe way for children to do this is in their homes with their toys. Another is in applications that capture and transform their movements and expressions. Hayes Raffle and Kimiko Ryokai illustrate this idea in an application called StoryFaces [22]. Children explore emotional expressions in storytelling with video by placing their faces in various parts of a story like a balloon or a dragon costume. The authors conclude: Our preliminary results suggest that digital authoring can give young children an opportunity to play and reflect on their pretend emotions, and that when these emotions are cast into the context of a traditional narrative, children can engage with and meaningfully manipulate elements of those stories.

A key question for future developers is who determines how things get transformed. For example, if Hasbro Inc. is developing an application, does the child become a My Little Pony or a Transformer? Or, can they bring any object from their environment into the virtual world? Can they then decide what it will become? How much will the brand concerns of companies influence the scope of possible transformations?

4) Interactivity: Can I make it respond to me?

The speed and automated behavior of a computer give the impression of something that is alive and capable of responding to our actions. This magic can be used as a learning tool if we allow children to define the relationship between inputs in the world and outputs on the screen.

A child might inquire about what is possible. Can I make it do something when I speak? Can I control it with my body? Can I enact a story with my dolls? Interactive designers ask themselves similar questions when they are trying to envision how people are going to

use their software. Why not let users make choices that inform designers about possible uses?

Devices like the Cricket [23] from Mitch Resnick's Lifelong Kindergarten group at the MIT Media Lab are designed specifically with this purpose in mind. Crickets are programmable devices that connect input sensors like light, sound, and touch sensors and output devices like motors and speakers. Computers have the capability of associating any set of mappings - space to time (see SoundForms [24]), voice to action (see Jabberstamp [25]), sound and color (see Singing Fingers [26]) in unexpected and surprising ways. Designing a rich and expressive set of possible mappings will allow children to exhibit control of when and how things respond in virtual environments.

5) Time-Based Storytelling and Playback: Can I tell a story?

Returning to storytelling for a moment, many children who have used the digital puppetry system I am working on have asked me if they can make a movie. I'd love to incorporate this capability into the work. Programs like Toontastic [15], iStopMotion [28], Animationish [29], Reel Director [30], Voice Band [31], and Shidonni [32] are applications designed to help children author time based media. The empowering aspect of their approach is that they scaffold the process of self-expression, and encourage reflection by allowing the child to replay and modify portions of the timeline.

The capability to record and combine multiple states make graphic user interfaces ideal for the creation of time based stories. The linear nature of time can be circumvented and manipulated by creating tool sets that are flexible and provide graphic representations of editing capabilities. Efforts have been made at Tufts University to make a Tangible Video Editor [9] by embedding clips in tangible pieces that can be rearranged but because of the precise nature of video editing they have very limited capabilities.

6) Social Play at a Distance: Can I play with my friends?

Digital representation allows information to pass so quickly over networks that interaction at a distance feels simultaneous. The richness of these experiences is increasingly compelling in applications like Skype, Google+, and iChat. Researchers at Nokia [33] and Georgia Tech [34] are doing extensive investigations on how to design software that can help families connect at a distance, particularly for children ages 3-5.

Simultaneously under development are networked environments like Club Penguin. They have been very successful at garnering the interest of children to interact together in virtual environments. Researchers such as Ito et al [35] report that children are partially motivated to play games online because they share secrets with each other in their real life social networks. Further research at Arizona State University [36] has found that children understand the idea of remote connection and can relate through the perspective of dolls. The dolls act as bodily extensions of the child through which they can enact their own concerns. The dolls can also scaffold interactions between children and provide a context for an ongoing dialogue between the characters.

Software like Club Penguin presents privacy concerns for parents regarding the safety of the children. As a result, the communication enabled in the environments is very restricted. I can imagine an application more like Skype for Toys in which the parents control who is in the child's network. The application would allow children to invite approved friends to play in environments they create instead of those designed by Disney. In such a world, children would share assets they have created: character costumes, effects, and even behavior scripts. They might even collaborate to record stories of their characters and share them with each other.

Conclusion

My experiences with Luca and the children who have used my software have been encouraging. Regardless of whether they think it is a game or a creative platform, they enjoy exhibiting control over the characters, and experience delight as they discover the affordances between the physical and digital versions. But extending the interaction beyond this initial novelty will require me to make some critical design choices about the principles behind the application.

Earlier I presented the argument that applications that empower children to build and model their own worlds will have a more lasting positive impact than game-based approaches. The physical and digital worlds both have affordances that can enrich the lives of a child. We already have an intuitive understanding of physics, the properties of real objects, and the ability to manipulate things in the physical world. Can people have the same intuitive understanding of the dynamics of digital spaces?

Digital representation has the potential to allow children to create their own worlds and tell the things in their world how to behave. Fantasy and Storytelling are critical aspects of the child's development and the screen can provide a safe place to enact and explore their assumptions about the world. As children interact with media they project and transform representations of themselves - enacting possible futures and shaping their identities. In this way the computer becomes a transforming mirror of the self. It has the potential to empower the child when they control the mappings between the world and the media. Results from the interaction may take the form of movies, animations, interactive stories, and even games that they can share with other people; and in an ideal future this will happen in a networked environment where children can simultaneously create things together.

Practical Guidelines: Make Software Simple, Open Ended, Flexible, and Modifiable

Supporting children as designers and not just players is not a new idea; it's an ongoing effort by many researchers in the children's design community. So what are some practical guidelines to help developers follow the principles outlined above? They are doing so by using simple metaphors, creating open environments, designing flexible tools, and embedding modifiable rules [37]. Very good examples of physical systems that embody these concepts are the Adventure Playgrounds [40] in Europe and the New Imagination Playgrounds [41] in the US. These playground systems are designed to encourage open ended, unstructured play, allowing children to configure their own landscapes and invent games with giant foam blocks.

There are also many examples of software environments on the horizon that follow some of these guidelines. As Laura Richardson [37] highlights: Games like Ridemakerz and Xtractaurs are trying to bridge the physical-digital divide, while also enabling creators to design some aspects of their play. Shidonni, Spore, and Scribblenauts are truly embracing the open and digital potential. With them, the play is so unlimited no one cares that someone else wrote the rules. Kids get to design their own games in real time with Scratch, Kodu, Kerpoof, and Alice. LEGO Mindstorms, Pleo, and the Spy Tracker System from Wild Planet enable authors to write their own software applications for physical products.



There are many critical choices to make moving forward as we adapt software applications to new media platforms. Portable video players, smart phones, tablets, and learning devices are already in the homes of many children today. But television remains the medium children spend the most time with [5]. A shift is occurring away from television to more interactive media, but will this interaction be a game or a canvas with infinite possibilities? In this essay I propose a Can I make my own? approach that utilizes the tools and toys in our everyday physical world. By making creation as easy as gaming we can help the child grow into creative careers, understand the perspectives of others, and author their own possible futures.

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