

**Back to Sesame Street: Reviving developmentally-focused formative  
research**

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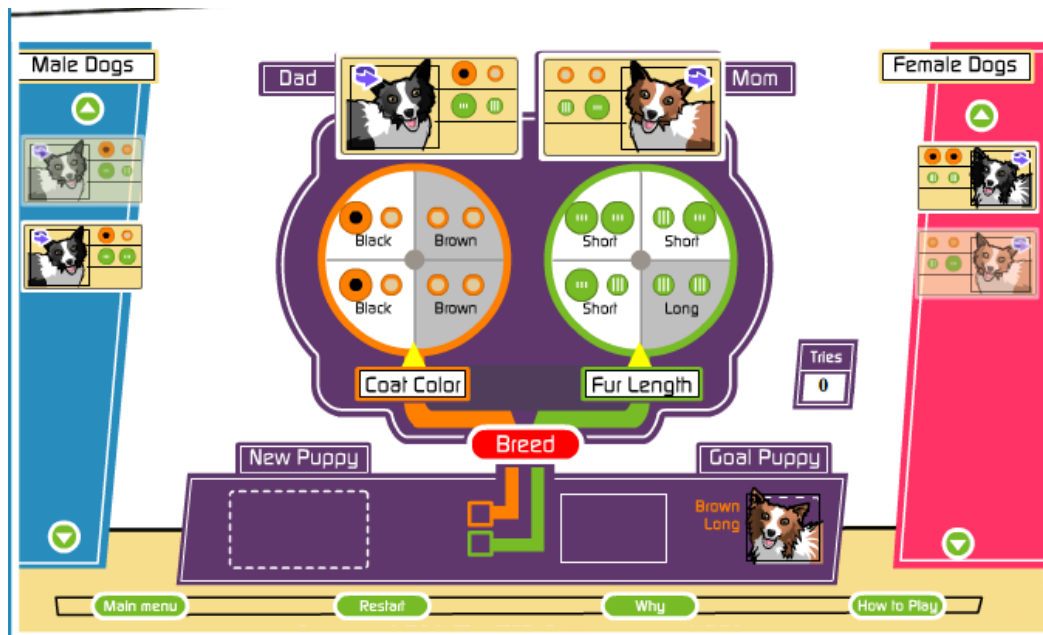
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**Genetics game**

This is a screen shot from a web-based mini-game about genetics. It's intended for middle grades students, and it appears to be intended to help them learn how genetics traits from parents combine to produce offspring with a particular appearance.



So, I'm a developmental psychologist and I'm going to tell you something – this is not going to work. This isn't surprising – it happens all the time. In this particular case, there are a number of challenges. For one, that the game requires students to track, in their heads, a series of multivariate interactions, then use inductive reasoning to draw a set of conclusions, use those conclusions to predict future outcomes and then act in accordance with those predictions. Each of those steps is something that, say, a twelve year old is *capable* of doing, but is highly unlikely to be able to manage to tackle on his or her own.

But more importantly, you can win this game by guessing. And that Achilles' heel, which many educational games have, unfortunately aligns perfectly with what Deanna Kuhn calls the "most fundamental" cognitive challenge for middle grades students – the importance of developing the ability to recognize exactly what it is that needs to be found out – to distinguish theory from evidence, and prior belief from new knowledge. The idea that the

information available to them can be understood as evidence that can be actively reasoned about and used to guide conclusions – that the interactions of these little dots here to produce other dots down below can be tracked and considered and gradually understood – is something they are only just beginning to be able to do on their own.

I could say a lot more here, but the point is that this game was, most likely, designed without ever talking to children about how they interpreted the purpose and function of the game elements. This is the special challenge facing educational media – it is not enough for it to contain or embody new information or ideas. Instead, it has to speak clearly and accessibly to its target audience in ways its audience is already prepared to make sense of. This is easier to remember this when designing for young children, but in fact it is equally important for adolescents and for adults as well.

### **Formative research**

The specific methodology used to gather this kind of insight for the purpose of informing the development of educational media is called *formative research*. It's a rather old-school kind of research that is not frequently used right now, but it is critical to bettering our chances of creating games that will succeed in meeting the educational goals we may set for them. In the world of children's media, it was pioneered at Children's Television Workshop and was heavily used during the development of shows including *Sesame Street*, *The Electric Company*, *3-2-1 Contact*, and *Square One*. Developmental psychologists worked intensively with children of the target ages for these shows, testing out concepts prior to production and then also testing early versions of programs. They brought their findings back to producers and writers in a tight, iterative feedback process, creating an integrated team that used insight into children's thinking to inform the structure, tone, and content of these shows, both in their broad outlines and in the particular features of individual skits, scenes, songs or characters.

Conducting this kind of research, to ensure that designers and producers have what they need in order to create media that is *comprehensible* to children who do not yet know what you want them to come to understand – requires listening very carefully to how someone very different from yourself experiences the world – or more particularly, how they make sense of the materials you are creating to support their learning. It requires spending considerable time and effort *early* in the development process listening to your target audience and probing how they think about the ideas that you want them to learn more about. Note that I did not say, “probing *what* they think, or what they know.” The critical issue here is the *developmental* issue, which briefly put, concerns the organizational structures children use spontaneously as they go about making sense of the world around them.

### **Our current work**

So this is an approach that we are currently using in our own work at the Center for Children and Technology. We are working on two research and development projects that involve creating games for the Nintendo DS to support seventh grade literacy and science

learning in ways that are fully integrated with day to day instruction in regular classrooms. One is funded by IES, the other by the Gates Foundation. For both projects, we are working with seventh grade students to test out both their current understanding of topics we want to tackle through our games, and to test the comprehensibility of particular approaches to the core activities that the games might involve.

For example, this image is one of a series that we've been using to explore how seventh graders articulate their thinking about heredity – specifically their theories about whether and how traits and features are passed on to children. On the right side of the slide are a couple of things the kids we worked with had to say on the topic.

Show picture of Woman 3



Height: 5'1"  
Weight: 110 lbs  
Profession: Dancer  
Handedness: Left handed  
Eyesight: poor, wears contacts  
Personality: Outgoing  
Medical conditions: Frequent back pain

“The first child looks like the father because I look mostly like my father and my younger sister looks mostly like my mom.”

“If it’s a boy then the first kid will look like the father. With the second kid, she would look like half the mother and half the father.”

What we heard largely reinforced what the literature already says about kids’ understanding of the topic, but what was most useful was that we also heard that how deeply their theories were based in their personal narratives about their own families and their investments in their own ideas about how they are like and unlike their family members. This suggests that in any game we create, we will need to leave space for kids to tease apart the target ideas – that specific biological traits are passed on in particular, predictable ways – and other, social dimensions of inheritance, the ways that we make ourselves like and unlike our relatives as our relationships with them develop over time.

### **An American Childhood**

I’d like to end with reference to Annie Dillard’s memoir, *An American Childhood*, which is probably one of the best books ever written about what it feels like to experience that thing that developmental psychologists are talking about when they talk about “development.”

Near the beginning of this memoir, Dillard recalls encountering a field guide for children in her local library in suburban Pittsburgh (this is in the 1940s). She, as a ten year old, is amazed that anyone has written a book about the possibility of exploring in nature –

something she is hungry to do but which has not been recognized or supported by anyone around her. But the book, rather than leading her into the field, stymies her:

*...my ignorance...was just beginning to attract my own notice. What, for example, was this noisome-sounding substance called cheesecloth, and what do scientists do with it? ...Where – short of robbing a museum – might a fifth-grade student at the Ellis School on Fifth Avenue obtain such a legendary item as a wooden bucket?*

*The Field Book of Ponds and Streams was a shocker from beginning to end. (p. 355)*

In one sense, it is easy to read this quote and think “thank goodness we have so many forms of rich media now – we’re beyond dusty books and wooden buckets.” And that’s true in many ways. One message of this passage is how information-poor her world was, compared to that of many American ten year olds today. But what Dillard is also illustrating here is the enormous gap she perceives, as a ten year old, between the autonomy and world-view of an adult scientist and the specificity of her own life as a child – between understanding the world as an object of study and understanding it as being largely co-extensive with one’s own experience and beliefs. Dillard has a wonderful image she uses throughout the book of “waking up to herself” – of becoming conscious of the separation between her experience of the world and its persistent existence entirely apart from her wishes, hopes or beliefs about it.

Games can help us to spark this awareness in young adolescents – they can help kids begin to see the world as a complex system, and themselves as having the agency and the authority to explore, explain, and analyze it – but only if we make sure to find out where they are starting from, and meet them there, on their own terms.