Production Features for Intrinsically Interesting Learning Environments

Sandra L. Calvert

Director, Children's Digital Media Center
Department of Psychology, Georgetown University
37th & O Streets, NW, Washington, DC 20057 USA

calverts@georgetown.edu

Abstract

Production features that attract children's interest and that foster their learning are examined. Action, involving movement, is put forth as a feature that is developmentally appropriate for young children, for boys, and for developmentally delayed children, in part because these groups may well be visual processors. Music is a motivating feature for girls though its effects on learning are less clear. Knowledge about how children learn from new media is linked to the creation of intrinsically interesting environments that can engage children to think and learn as they are being entertained.

Keywords: early childhood education, elementary education, learning processes, research.

1 Introduction

With the advent of computers, new interactive avenues of learning became available for teaching young children. In our research program, we expanded on earlier research about television features to create engaging learning situations that would be comprehensible and memorable to young children. In particular, we built on the use of action (i.e. movement) as a way to enhance young children's learning of verbal content.

2 Children's Processing of Media Content

Children's skills at processing media content depend on the content presented and the forms used to present that content. More specifically, media present content in both verbal and visual ways that parallel the symbolic and iconic modes, respectively, that children can use to represent content (Calvert 1999).

The developmental progression from iconic (e.g. visual) to symbolic (e.g verbal) modes of thought is important to the creation of computer applications as content can be presented with production features that children can understand (Greenfield 1993). At young ages, for instance, children rely more on visual forms like action for remembering content, whereas at older age, children increasingly can use verbal, symbolic forms such as language and dialogue to remember content (Calvert 1999). In addition, children who are developmentally delayed or who have learning problems may also rely on action as a form to supplement the more abstract messages that are often delivered in words.

2.1 Action for Children's Memory of Computer-Presented Content

In an early effort to utilize interesting production features such as action to enhance learning, we designed a computer program in sprite Logo called *Parkworld* that simulated a park scene (Watson, Calvert and Popkin 1987). The scene included a road, pond, grassy area, train track, and sky. Objects such as a dog, cat, fish, tree, train, and car could appear in our park by keying in the name of the word. We presented these words in the context of a story. In our initial version, sound effects were presented with the objects.

Preschoolers visited our park simulation for four days. Motivation (i.e. interest) and memory of the object names were our key outcome variables. Therefore, each day each child selected objects to put in their park as an indicator of their interest. On the fifth day, we asked each child to tell us all the objects that he or she could remember. We found that preschoolers preferentially selected and remembered moving over non-moving objects (Calvert, Watkins, Brinkley and Bordeaux 1989). The implication is that action was both more attention getting, as indicated by preferential selection choices, as well as more memorable, presumably because action provides a developmentally appropriate visual mode for children to encode and think about information.

In our next study (Calvert, Watson, Brinkley and Penny 1990), we replaced the sound effects with spoken language, made possible by the use of a voice synthesizer. Our program was now called *Talkworld*. This time we compared kindergarteners' and second graders' memory of verbal content when it had been presented with or without action and with or without verbal labels. Some of our children were good readers while others were poor readers. We found that second graders who were poor readers remembered just as many objects as the good readers when objects were presented with action.

The final noteworthy study (Calvert 1991) with *Talkworld* involved reading a story where we varied whether or not we said the target words. When objects were not spoken, the experimenter paused just before the

word would be said while typing the target word into the computer. Once again, objects moved or did not move. Preschoolers were compared to kindergartners. As before, young children remembered objects that moved better than objects that did not move. We also found evidence of an early rehearsal strategy: our kindergartners were more likely to name objects when we did not do so for them. Put another way, the creation of an intrinsically interesting computer application fostered children's interest in playing the game, which in turn, fostered activities that improve memory.

Taken together, this line of studies supports an action superiority hypothesis: children are more likely to remember objects that move than those that are stationary. In addition, verbal information that is integrated with action is well remembered, assisting the youngest children as well as those who had reading problems. Thus, action appears to be a developmentally appropriate way for presenting content to young children. The results suggest that the judicious use of production features can elicit children's interest, active engagement, and strategy production, thereby facilitating their memory of verbal content (Calvert 1999).

2.2 Computer Designs for Children with Autism

Building on these same design principles, Moore and Calvert (2000) created a CD-ROM to teach nouns to preschool-aged children who had autism. Children were all taught the Lovaas (1981) method, a behavioural intervention approach in which children learn to pay attention and focus on what an adult is teaching them. In addition, some children were taught nouns on a computer while others were taught strictly by the Lovaas method. The program used engaging production features such as action and sound effects.

The computer group increased over the control group in motivation, attention to, and learning of verbal material. The computer was an ideal way to deliver content to children with autism because these children are often uncomfortable with human interaction, enjoy repetition, and like constancy in their experiences (Moore 2002).

In a later computer application for children with autism, Moore (2002) served as a consultant for a program called *Let's Face It* that was designed to desensitise children to human facial features. More specifically, because children with autism often dislike human faces and human interaction, and therefore learn less from adults, the computer program displays visual depictions of human faces displaying various human emotions. This computer application may be less threatening, providing a way for children to become increasingly accustomed to the human face. By contrast, in the Lovaas method an experimenter pulls a child's face toward theirs and says "Look at me," an approach that could initially be uncomfortable to a child who avoids human contact. This promising computer application is now being evaluated for its efficacy.

2.3 Action and Music as Intrinsically Interesting Features

Content presented with production features such as action may be memorable to children, in part, because moving forms are intrinsically interesting to them. Malone (1981), for instance, created a fraction game and added features to determine what made it interesting and enjoyable for grade-school aged children. Boys preferred action while girls preferred the musical rewards. Similarly, girls prefer to listen to music while boys prefer action-oriented television and video games (Roberts, Foehr, Rideout and Brodie 1999). Less is known about how music or singing influences learning though it appears that superficial rote repetition of lyrics is fostered more than deeper knowledge of important lessons when young children view educational television content or learn informative content via singing (Calvert 1999).

Instead of having children respond to a program created by adults, Kafai (1996) had grade-school children create their own fraction games to teach math. Once again, boys relied heavily on action, and classic content themes of good versus evil were prevalent. By contrast, girls created video games with diverse themes and messages, relying less on competition and action-oriented features than the boys. Overall, the results suggest that boys prefer action more than girls, who in turn, prefer musical features more than boys.

3 Online Games

Faster computers and interfaces brought with them the introduction of flash applications that allowed visual, moving animated sequences to be added to content applications, not unlike the animated television programs that children can view. Many edutainment programs for children, which combine educational content with a game format, can engage and interest children, sometimes providing their earliest online experiences.

The focus of these online games is the character, who typically comes from a television program and is then transported to online activities. Quality preschool children's television programs, ranging from *Dora the Explorer* to *Oswald* to *Blue's Clues* to *Sesame Street* to *Clifford the Big Red Dog*, build on character popularity to bring young children online to interact with games. Some of these online games are created to foster pre-academic skills, such as early literacy skills and spatial skills, in a way that children enjoy and can understand. During grade school, popular television programs like *The Wild Thornberries* are adapted for online games to promote reasoning skills, such as how to take care of animals in a wildlife refuge.

Although most of these games are comparatively short when compared to a television program, they do provide children with the opportunity to interact with the content. While these online games are certainly popular, little is known about how much children actually learn from them. In one study conducted in our laboratory, our preliminary results suggested that children did not learn targeted vocabulary embedded in an online story book, instead focusing on the visual content. As the verbal

content was placed in a different position on the page from the visually interactive content, we believe that this spatial disconnection between action and language can actually depress language development by pulling children away from the implicit lesson of the task, that of learning to read words. The implication is that interesting on-screen actions have to be closely linked to associated verbal content for language skills to be facilitated.

4 Multi-user Domains

New online applications allow dynamic social interactions for children who are in different places. Some of these involve entry into mutual fantasy worlds, known as Multi-user domains or Muds.

Early Muds were text based with children creating online fantasy scenarios that built upon popular role playing games such as dungeons and dragons (Turkle 1997). Players who enter these Muds created a handle, or name, that is used in the game context.

As computers have become faster and now link to faster online interfaces through DSL and cable modems, Muds have become visual as well as textual. Players create visual characters known as avatars. These visually rich interactions allow different experiences from the earlier verbal interfaces. For example, an aggressive verbal exchange now becomes an aggressive visual interaction between two avatars, and a verbal sexual exchange now becomes a much more explicit visual sexual interaction between two avatars (Schroeder 1997).

In our research, we are examining 11–12 year-old children's online social interactions in a Mud that we created. Our Mud is built in Flash, a programming language that allows animated moving scenarios. Children initially enter the Mud and create an avatar by selecting a name, a boy or girl avatar, and a costume for their avatar to wear. Children then enter a stage scene where they meet a partner. Children can then choose to interact through writing or visually playing with one another. Verbal text appears over the avatar's head in a cartoon-like bubble. Visual options include dragging the avatar within a scene, changing emotions through a click menu of options ranging from happy to angry to silly, and changing scenes through a click menu of options ranging from a park to a castle to outer space. So far, we have found that boys are more movement oriented than girls, and girls write more than boys (Calvert 2003). These social interactions dovetail nicely with what children do offline. That is, girls are often better writers than boys, and boys like action-oriented media experiences more than girls (Ruble and Martin 1998, Calvert 1999).

5 Conclusion

The creation of attractive and interesting online content for young children depends on our knowledge of what features children like, and what features they readily understand. Results suggest the value of attractive production features, particularly action, in making effective software applications for young children. Boys and children with developmental issues also benefit from action, perhaps because they tend to be visual processors. Music is an important feature in sustaining attention and interest, particularly for girls, though its value for memory is less clear. The creation of intrinsically interesting computer learning environments, built in part through the use of attention-getting production features, can foster situations where children are actively engaged in learning experiences that entertain them as they educate them.

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