

The Crucial Role of Animated Children's Educational Games

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The role of animated children's educational games can not be understated. With the abundance of television programming that is purely entertainment, children are idling away alarming amounts of time watching television programs that have no educational substance. Their formative years are hampered by the lack of cognitive stimuli that educational programming can provide. Because it has been historically difficult to attract sponsors, and therefore funding, to educational programming, another avenue must be sought.

Based on research of the current television watching habits, programming trends, successful educational television shows, and sound educational principles, I maintain that educational games will be a strong component in alleviating the excessive amount of time that children spend with pure entertainment television. Research of current popular educational games has led me to develop a basic set of criteria that would provide the most effective educational games. Companies can capitalize on the proliferation of computers in homes and schools, and elevate engaging educational games to a level of prominence among current media outlets, such that children will turn to the educational games for entertainment and still receive an education at the same time.

Part I: A Study of Educational Television

Question:

Is there a need for educational television? Study 5 current animated programs and discuss the educational content they contain.

It is no longer a revelation to state that children watch a great deal of television. Since such a large proportion of their day is spent in front of the television, we naturally ask, "What are they watching and does it have any educational value—and, indeed, does it need to have educational content?" For the purposes of this study, I will define "educational" in terms of traditional academic education for children from three to seven years of age (e.g. simple arithmetic, phonics, colors, shapes, etc.). This age range is roughly from preschool to 2nd grade.

In order to properly address the educational value of current children's programming, I will begin by determining the quantity of television that children watch, while considering the proportion of educational versus entertainment shows. Then, I will

review the attempt by the government to impose educational television on stations with the "Children's Television Act" of 1990. To help ascertain the effectiveness of the Act, I will explore the content of 5 popular shows that are representative of current children's programming.

1. Quantity of Television

How much television do children watch? How available is it? According to the Department of Commerce, "more homes have television than have indoor plumbing" [FEDERAL COMMUNICATIONS COMMISSION, RESEARCH AND ORDER: Policies & Rules Concerning Children 96-335, 1996]. Children are sitting in front of those TV's to the tune of 3.5 hours per day and "almost one in five watch more than 35 hours of TV each week [GENTILE, D.A. and WALSH, D. A. 2002]. What does this add up to? "By the time most American children begin the first grade, they will have spent the equivalent of three school years in front of the television set" [BENTON FOUNDATION . 1996]. This is some serious time watching television.

2. Quality of Television

Equally as important to the quantity of television watched, is the quality of the programming. According to the National Institute on Media and the Family, "Children between the ages of 3 and 5 are at a critical stage in brain development for the development of language and other cognitive skills. The extent to which heavy television viewing can influence the development of brain neural networks, and displaces time the child would spend in other activities and verbal interactions, influences early cognitive development" [NATIONAL INSTITUTE ON MEDIA AND THE FAMILY, TELEVISION'S EFFECT ON READING AND ACADEMIC ACHIEVEMENT. 2002]. In other words, if television is taking away from cognitive processes that would normally be engaged, then it can be counter-productive. In fact, studies have shown that " children who watch cartoons or other purely entertainment television shows during their pre-school years, do poorer on pre-reading skills at age five [MACBETH, T. 1996]. Conversely, children who view educational programs geared toward their age group fair better on pre-reading skills than those who watched less educational television [WRIGHT, J. *et al* 2001].

How much television is educational and how much is entertainment? Unfortunately, there are very few educational programs. There are "Sesame Street" and "Mr. Rodgers" (now only re-runs), but most shows hover at the entertainment level. Sachiko

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Kodaira of the NHK Broadcasting Culture Research Institute states that

"Children aged 2- 4 prefer to watch cartoons instead of educational programmes [sic]. In some cases kids over the age of 4 turn to mainstream commercial programmes and prefer films and series made for adults." [3RD WORLD SUMMIT ON MEDIA FOR CHILDREN, THESSALONIKI-GREECE 23-26 MARCH 2001].

Because of this trend of turning to entertaining cartoons, the market for educational programming is smaller. Add to that the fact that educational shows are targeted at specific age groups, whereas a show that is purely entertaining will more likely draw viewers far outside its initial intended audience age. For example, an eight year old may tire of hearing about the sounds certain letters make and feel too mature for that show, whereas a fun adventure show may be appealing to both the younger audience and to the eight year old. When the viewership is more limited, sponsors are slow to pay for commercials. So, economically, stations are more likely to run the entertaining shows that draw higher sponsorship and therefore more money. This study of the educational content of current children's programming will be explored in greater detail later in this paper as I cite specific examples of current popular shows.

3. "Children's Television Act" of 1990

Due to the lack of educational television shows for children, Congress passed the "Children's Television Act" of 1990 that was supposed to increase the amount of educational programming among broadcast networks. Although hailed as a sign of good things to come, not much changed due to vague guidelines and requirements. Dr. Dale Kunkel of the University of California Santa Barbara conducted research in 1994 and found that most stations reported running less than two hours of educational programs per week. Some even stretched the definition of educational to include shows like "America's Funniest Home Videos," "Bugs and Friends," "Mighty Morphin Power Rangers," "Woody Woodpecker," "X-Men," and "Yogi Bear" [BENTON FOUNDATION. 1996.] Therefore, in 1996, the Federal Communications Commission (FCC) issued a Report and Order [FEDERAL COMMUNICATIONS COMMISSION, RESEARCH AND ORDER: POLICIES & RULES CONCERNING CHILDREN 96-335. 1996]. with more specific regulations. Programs now have to be at least 30 minutes in length and broadcast on a weekly basis. Each station must provide at least three hours total of children's television programming per week. Stations must have a public file with the above and other information, and community members can register complaints if the requirements are not met.

In 2001, the FCC released a follow-up study conducted over three years to determine the

effectiveness of the 1996 issue. The report found that, for the most part, stations were complying and that "the average amount of core children's TV programming (defined as specifically designed with a significant purpose to meet the educational and informational needs of children's ages 16 and under) aired by commercial broadcasters is approximately four hours per week" [THREE YEAR REVIEW OF THE IMPLEMENTATION OF THE CHILDREN'S TELEVISION RULES AND GUIDELINES 1997-1999. MCI v. FCC. 515 F 2d 385] More than half of the commercial stations were doing the same. Unfortunately, it's still difficult to determine what is meant by "educational" in the study. Of the shows cited in the 3-7 age range, only "The Magic School Bus" stands out as truly educational in the academic sense. "Anatole" (CBS affiliate) dealt with interpersonal relations. "The Magic School Bus" (Fox affiliate) explores science issues. "Pet Playhouse" (Independent station) introduced different animals [THREE YEAR REVIEW OF THE IMPLEMENTATION OF THE CHILDREN'S TELEVISION RULES AND GUIDELINES 1997-1999. MCI v. FCC. 515 F 2d 385] Most of the examples cited related to interpersonal or self-esteem issues. While important topics in themselves, they are routinely covered in most entertainment shows.

4. Analysis of Representative Programs

While "Mr. Rogers" and "Sesame Street" are excellent shows, "Mr. Rogers" now contains only re-runs and "Sesame Street," for the most part is not animated. In keeping with the research cited earlier that showed children are more likely to turn to animated cartoon programming, I reviewed current children's animated television programs that were representative of available programs. I have viewed most of the available shows on broadcast and cable television for the age range of three to seven. Most shows fall within the realms of PBS (PBS Kids), Disney (Playhouse Disney), and Nickelodeon (Nick Jr.). The following shows I have seen 3 or more episodes each: "Stanley," "PB&J Otter," "Little Bill," "Little Bear," "Max and Ruby," "Marvin the Tap Dancing Horse," "George Shrinks," "JoJo's Circus," and "Sagwa." The following shows I have seen 10 or more episodes each: "Dora the Explorer," "Blue's Clues," "Oswald," "Bob the Builder," "Clifford the Big Red Dog," "Caillou," "Rolie Polie Olie" and "Dragon Tales." Of the above shows, I chose five to study in-depth. I randomly selected one episode of each of the following shows to determine the educational content: "JoJo's Circus," "Rolie Polie Olie," "Dora the Explorer," "Clifford the Big Red Dog," and "Jay Jay the Jet Plane."

1. "JoJo's Circus"

"JoJo's Circus," from Playhouse Disney, is a stop motion show about a young clown named JoJo and her adventures with her pet lion Goliath. I chose this show because it is an excellent example of high quality animation with interesting action and dynamic staging. It's also relatively new on the

scene, so it's a sign of what is being currently produced. The episode I researched is "First Day of Clown School." JoJo begins by addressing the viewer with a question, "Do you know where Goliath is?" Then we see the lion in the background. JoJo pauses long enough for a response and then says, "Oh, behind the bush?" And there she finds him. This question/answer theme is played out a couple more times in different scenarios. The story unfolds in the following manner: JoJo meets the teacher on the first day; the teacher steps out of the classroom; JoJo disobeys directions and ends up creating a mess; JoJo cleans up the mess before the teacher returns; upon the teacher's return, JoJo decides to tell her the truth about what happened in her absence even though it is difficult. It's a good lesson on telling the truth, even when you can get away without saying anything—a very admirable lesson. Other than that, though, there is no educational content. There is the introduction on how to duck—as in, when a pie is thrown at you and you duck to avoid it, but no language arts or arithmetic in any fashion. Other JoJo episodes are similar in scope. Is this a good show? Is this worth having? Yes, yes. It's entertaining and has a good message, but it can not be mistaken for being educational.

2. "Rolie Polie Olie"

"Rolie Polie Olie" is another popular Playhouse Disney show. This one is computer-generated 3D. It has fun camera shots and a lot of action with cute stories that revolve around solving problems. It's based on a family of robots who live in a house full of "live" appliances, furniture, and doors. I chose this show because it is one of the few 3D children's shows, and it has enjoyed a good deal of popularity. The show I reviewed is "Universal Spot," in which the inventor father creates a universal remote that operates everything in the house—cupboards, toaster, chairs, etc. Unwittingly, the hungry dog Spot swallows the remote and manages to set off everything in the house in a whirl of activity. The hapless family is chased by everything from the kitchen chairs to the vacuum cleaner. This continues until the animated pepper shaker devises a way to make the dog sneeze and eject the remote at the same time. Okay, so the show was fun. That's worth something. Any moral to the story? Maybe it is: "Don't leave your remote within reach of your hungry canine." Then there's the issue of the presence of an educational value. I'm still searching for that. This is standard for this show. Very entertaining, but no educational value whatsoever.

3. "Dora the Explorer"

"Dora the Explorer" is a 2D animated adventure daily shown on Nick Jr. I chose this show because it is wildly popular and it has an interactive nature that is very appealing. The show centers on Dora, a young girl, who embarks on an adventure each episode with her trusty sidekick Boots the monkey

(who wears, of course, boots). In the episode "El Coqui," Dora sets out to find the island of Coqui the frog. She consults the map and troubleshoots two impediments along the way. She frequently asks for viewer participation to answer a question or imitate motions she is making (e.g. repeating after her and then jumping through the "echo bush"). This is important as it allows the child to feel as though he or she is part of the adventure and solving some of the problems along the way. Dora even had three animal sounds that the viewer is to guess the animal who makes the sound. Simple color and numbers were explored in choosing the correct coin for the ferry passage. There is a run-in with Swiper the crafty fox and the audience successfully ward him off by saying, "Swiper, no swiping!" Fun. Dora consistently introduces Spanish words and phrases—in this episode, it was the Spanish for: frog, let's go, hi, one, two, and some brief sentences with another character.

"Dora" is definitely one of the best in the educational arena of the animated children's programs. Unfortunately, it remains at a 3-4 year old level. Counting rarely reaches above the number eight, and sounding out words is never explored. There are some simplistic logic problems to solve that five-year olds would find very easy. The Spanish is a bonus, however, and very necessary in this nation that is gathering increasing numbers of Spanish-speaking immigrants. Also, the virtues of helping a friend and not stealing are routinely investigated. While this show is somewhat helpful for the preschooler, most kindergarteners are expected to recognize many of the letters and numbers upon entering.

4. "Clifford the Big Red Dog"

"Clifford the Big Red Dog" is a popular 2D animation aired by Nick Jr. and features dogs that talk to each other (but not to their owners) and get involved in problem solving situations. The solution usually involves the giant Clifford who towers over most homes. I chose this show since it is so popular and children respond so positively to the loveable Clifford. Clifford is bigger than the Hulk, but as gentle as Cinderella. These two features are rarely found in the same creature in animation. In the "Limelight Fright" episode, Cleo the poodle is scheduled to perform her dance routine at the local talent show. She gets stage fright and her canine friends try in different ways to encourage her to perform. Spurred on by the camaraderie, she dances much to everyone's delight. The moral lesson of encouragement is important and necessary but the show doesn't reach any further academically. Entertaining and worthwhile, yet not educational. Incidentally, the Clifford show will only air reruns due to the recent death of Clifford voice-actor, John Ritter. However, new shows of Clifford's Puppy Days with a different voice actor is still creating new episodes.

5. "Jay Jay the Jet Plane"

"Jay Jay the Jet Plane" is another of the hard to find computer generated 3D animations. PBS Kids airs Jay Jay, who with his airplane friends engage in mini adventures and encounter situations similar to what young children do. Topics of trust, friendship, and asking for help are routinely explored. In the episode, "Snuffy's First Day of School," Snuffy the young airplane is afraid to go to school despite encouragement from his older friends. On the opening day of school, he flies away and hides. Only Oscar the biplane knows where to find him and convinces him that everything will be fine. Later we find that Oscar is, in fact, Snuffy's teacher (much to Snuffy's relief). The show teaches virtues and explores interpersonal relationships in a meaningful way. However, there is virtually no academic matter addressed.

The five sample shows I have discussed above are indicative to the majority of animated programming available today to children ages 3 to 7. While shows like these are of some value, especially in the realm of interpersonal relations, they are not in themselves adequate. Given the volume of cartoon television viewing that is occurring among children of these ages, it is imperative that some substantive animation is offered to help stimulate children's developing cognitive processes and prepare them for the linguistic and logic challenges that will inevitably be waiting for them in school (and in life). Also, for children already in school, the shows that delve into language arts, mathematics, science, social studies, and other educational areas will help reinforce the relevance of what they are doing in school. They will see the characters in the animations, whom they have learned to trust, express interest and concern for matters that are raised in school. In addition to adding further study to those subjects, the animations will also validate those studies and make the time spent in the classroom more meaningful. There is a great need today for educational animation programming.

Part II: Solutions to a Lack of Children's Educational Programming

Question:

Regarding the lack of Educational programming for children aged three to seven on television:

- a) How are educational animation shorts (2-3 minutes) beneficial for both television and computers?
- b) What are solid educational principles that can be effectively employed in animated shorts, especially with regard to computer educational games?
- c) How effective are current computer educational games? Choose nine popular games aimed at the educational market and set up the parameters on which to evaluate them in future research.

1. The Current Predicament of Entertainment-Oriented Television

Today's children are inundated with television. There are varieties of shows on numerous channels to choose from. Many children spend three and a half hours per day watching television. Unfortunately, the bulk of programming is merely entertaining, and it does not stimulate cognitive processes within the viewers' minds that are so important at this developmental age. What can we do about it? Create more educational television? A solution not so easily realized. The problem lies within the commercial nature of American television. Stations need the money from sponsors to operate and sponsors need lots of viewers to see their products. Historically, educational television has not garnered the broad viewer base that entertainment television has, since educational television has to focus on a more specific age group for its content to the unintended exclusion of other age groups. Therefore, stations showcase entertaining programs to the extent that true educational television can only be found on Public Broadcasting Service (PBS), which is funded by grants and individuals, that is, not commercials. Even the "Children's Television Act" of 1990, enacted to force broadcast stations to create more educational programming, saw little fruit. The media theorist George Gerbner has noted that " 'Jetsons,' 'Power Rangers,' 'Yogi Bear,' 'NBA Inside Stuff,' 'Sports Illustrated for Kids,' and the 'Weird Al Show' " were comfortably listed as educational, but it would be difficult for someone to defend that responsibly. In essence, he says that the lack of specific guidelines "renders it meaningless" such that, the Television Act becomes a "provision you can manage and manipulate easily" while attempting to appear responsible [GERBNER, G. 1997].

2. Magazine Format Animations as a Solution

Perhaps there is a solution to the overexposure of children to entertainment television. One that involves educational television that would reach a broad viewer base, which is enticing for sponsors. Since research has shown that children generally opt for animated programs over live action, it is possible that a cartoon based educational program will reach a broader audience than the live action (or, at least, predominantly live action) current versions, like "Sesame Street" and "Mr. Rodgers." Then, to further broaden the age group, a magazine style show can be produced that contains educational shorts (2-5 minutes) for different learning levels. For example, there can be a short aimed at counting to the number 10, followed by a short that deals with reading an animated storybook. Three to four year olds can learn with the counting, while seven to eight year olds can follow the story. Five and six year olds will fall somewhere in between, depending on their learning level. Each group will be "entertained" by both shorts since

they will be a fun style of animation and will enjoy sitting through them. A broader age group will be inclined to watch the show and benefit from the educational content involved within.

3. Transferring Animation Shorts To Educational Computer Games

Using the magazine format with numerous shorts has an added benefit, which is key to making it work. These same shorts that are created with the television budget can be imported into an interactive learning experience for children using the computer, saving money on creating the computer programs. Each animation short can be followed with questions or an activity dealing with the lesson. Moreover, these educational computer games can be used at home or in the school. The child watches the show on television, and since the television has the aura of importance and relevance in a child's life, he or she will be more apt to engage in the computer game with the same characters from television. Suddenly, the child sees the learning experience as more engaging and relevant to his or her life. This possibility will expand even more as computers continue to drop in price, and more and more people buy them. Just as almost every home now has a television, soon every home will have a computer. The television and computer game can even make reference to each other: the game can promote the television program and the television program can advertise the game. This, in turn, can increase interest in the television show, driving up the viewer base, which would attract more sponsors.

Not only the television producers, but also the children will profit. Learning will, in essence, occur twice. Researcher David Whitebread maintains that "activities intended to help young children learn must first and foremost interest them, intrigue them and be personally relevant to them" [WHITEBREAD, D. 2000]. Only then, can their attention be maintained to effectively learn. Being on television will make it seem that much more important and significant to children. They will go to school and see the animated characters performing on their computers and feel that they are dealing with the "real world." The child may even choose the computer game at home over the entertainment television and use their time stimulating neural processes instead of passively watching a screen.

4. Solid Educational Principles

In order to effectively create the educational animation shorts, solid educational principles must be employed, especially with regard to television viewership and computer interaction.

1. Jean Piaget

Child researcher Jean Piaget defined stages of cognitive development, including the preoperational

stage that lasts from about two to about seven years of age. One of the characteristics of this group is "creative play, wherein checkers are cookies, papers are dishes, a box is a table, and so on. By manipulating symbols, we are essentially thinking...in the absence of the actual objects involved" [BEOREE, C. 1999]. Creative play is essentially what animation is—using the symbols on the screen to represent something else. Piaget also asserted that another trait of the preoperational stage is animism, or "ascribing lifelike qualities to inanimate objects. Children will usually ascribe life to objects that represent figures that are alive in real life: stuffed animals, toy people, and so on" [HUMAN DEVELOPMENT LAB SCHOOL. 2003]. This is also an essential component of animation, that of causing the inanimate (paper, ink, pixels, etc.) to appear alive. Animation is a perfect medium for this age group in that it is the ultimate in play, turning the inanimate into seemingly live creatures. This may be the reason animation holds the attention of young children so well.

2. Howard Gardner

Another pioneer in researching child development is Howard Gardner. He pioneered the eight multiple intelligences (he began with seven, another was added and still others are considered by many). Gardner believed that people learn best in different ways. The eight intelligences are as follows [ARMSTRONG, T. 2000]:

1. Linguistic: think in words
2. Logical/Mathematical: think by reasoning
3. Spatial: think in images and pictures
4. Bodily/Kinesthetic: think through somatic sensations
5. Musical: think via rhythms and melodies
6. Interpersonal: think by bouncing ideas off other people
7. Intrapersonal: think in relation to their needs, feelings, and goals
8. Naturalist: think through nature and natural forms

This theory holds that individuals will naturally learn best under one or more of the intelligences and an instructional institution will be most effective if they incorporate different intelligences into their lesson plans. Usually, most schools focus on the linguistic and logical/mathematical intelligences, utilizing verbal instruction and worksheets/textbook problems to the exclusion of the other intelligences.

While not a replacement for an integrated curriculum, computer games can provide the multi-intelligence approach to learning. Intelligences one through five can easily be incorporated into animation and educational computer games. Songs or rhymes can help those who are musical. Interesting images and animations will help those who are spatial learners. Similarly, David Whitebread argues that images for children are key

to their learning processes and “when they are introduced to something new, they need to see and hear, touch and physically experience in as great a variety of ways possible” [WHITEBREAD, D. 2000]. Although he was not specifically referring to animation, the case can easily be made that animation and interactive educational games can provide an experience comparable to the physical manipulation and interaction that he documented. The bodily/kinesthetic learner can also be satisfied as he or she is asked to participate in a motion activity on television or is able to interact with the computer via the keyboard or mouse. Glove and boot controls can also be incorporated, as they are in many children’s recreational games and would truly create a kinesthetic learning experience. Even the interpersonal and intrapersonal intelligences can be addressed depending on the activity and focus of the game. While not a substitute for interacting with people, the computer programmers can anticipate many of the responses and effectively simulate interactive interpersonal or introspective activity. The many levels of interactivity is key here. With an interactive game, the player can choose a portion or section to play, rather than being funneled in only one direction. In some instances the player will be able to choose the next step or change the course of play, so that it is a new experience every time. And at its basic level, there should be the opportunity for the player to input responses to questions or situations and receive immediate feedback regarding those inputs. In this way, a very dynamic neural interaction is created that is very engaging. Almost all the intelligences can be integrated into each computer game, so that each child will be likely to find one or more of his or her optimal types of learning.

How useful is the multiple intelligences approach to learning? There are a number of schools that claim success with curriculums centered around multiple intelligences. Howard Gardner writes:

There is much evidence that schools influenced by MI theory are effective. The testimonials from satisfied administrators, parents, students, and teachers are legion. And many of the classes and schools claim that students are more likely to come to school, to like school, to complete school, and to do well in assessments [GARDNER, H. 1999].

One in-depth study, involving six MI schools found that they all embraced the axiom that “all students require choice and opportunities to personalize some of their educational experiences [so that] extensive curricular time is dedicated to student-selected interests” [CAMPBELL, L and CAMPBELL, B. 1999]. The need for personalized curricular choices is met with computer technology as children choose the topic or type of educational game that they would like to master. This can be part of a center or rotation within the instructional setting, in which students

can use the available computers to augment the lessons presented by the teacher. Students who are able to move ahead more quickly or would like to explore a particular field can find the computer an exceptional ally in his quest.

3. B.F. Skinner and Sidney L. Pressey

While B.F. Skinner was not a child psychologist nor was his focus on the learning process, his contributions to the field of Behavioral Psychology are useful with respect to education with the use of a computer. As a behaviorist, he was primarily concerned with why people do what they do and how to get people to perform certain activities. Much of his research centered on what he called Operant Behavior. He writes:

The behavior is said to be strengthened by its consequences, and for that reason the consequences themselves are called “reinforcers.” Thus when a hungry organism exhibits behavior that produces food, the behavior is reinforced by that consequence and is therefore more likely to recur [SKINNER, B.F. 1976].

Much of his research used rats or pigeons performing behaviors to receive food or water. He found that when a desired behavior was performed and a reward was given, the creature learned to repeat that desired behavior in order to receive multiple rewards. “Skinner compared this learning with the way children learn to talk—they are rewarded for making a sound that is sort of like a word until in fact they can say the word” [A SCIENCE ODYSSEY: PEOPLE AND DISCOVERY, B.F. SKINNER 1904 – 1990. 1998]. He later included teaching machines into his research. These teaching machines were the equivalent in his day to the computer, although on a much simpler level. The machines would have sliders and a small window in which questions and answers would be revealed. Manual counters kept track of the number of points for correct answers. He found that the “important features of the device are these: reinforcement for the right answer is immediate” [SKINNER, B.F. 1968]. The students actually enjoyed using the machine with its interactive knobs that revealed immediately whether they were correct or not. When they found out their progress as they went along, they actually learned as they were tested. Even as far back as the 1920’s, Sidney L. Pressey did research on this phenomenon. Pressey noted that:

When an examination is corrected and returned after a delay of many hours or days, the student’s behavior is not appreciably modified. The immediate report supplied by a self-scoring device, however, can have an important instructional effect [SKINNER, B.F. 1968].

As a teacher, I have experienced this first-hand numerous times. After giving a lesson and assigning homework, sometimes a couple of students will have completed their homework entirely incorrectly and thereby engraining the wrong process into their minds. They would not find out they did all the problems wrong until the following day. This is also true with tests. When students don't find out their scores until the next day, interest has waned and they may not even recall what their incorrect thought process was at the time they took the test. However, if they find out if they answered correctly right away, they more fully understand their thought process and how to effectively answer the question in the future.

Pressey set forth his research nearly one hundred years ago, yet how many schools have adopted this approach? Almost none. There is no excuse for this to continue. Previously teaching machines could be awkward and limited in scope, but today with computer technology becoming more widely available, we should be employing much more of this type of teaching. The teacher, of course, can never be replaced. However, after the teacher has given her instruction, the students can break into different activities, one of which can include the educational computer game. This game can reinforce the instruction and allow students to discover what they truly know. Rewards given for correct answers include fun animations, points, and moving on to the next level or adventure. If incorrect answers are repeatedly given, the lesson can be re-presented. Thus each student can progress at his own level as he is reinforced for answering correctly.

5. Effectiveness of Current Educational Computer Games

Given the importance of educational games in the learning process, we need to evaluate what, specifically, would make a suitable game that enhances learning rather than inhibit it or merely entertain. Information must be presented appropriately. Navigation should be intuitive and allow the user to make choices that best follow an interesting educational path. Evaluation of knowledge learned should be clear and suitable. True interactivity would allow the user to make real choices as he or she progresses through the adventure, rather than merely guessing or blindly following along a planned route of information dissemination [KHAN, B. 1997].

How do the current games stand up? Unfortunately, the relative newness of educational computer games and the veritable dearth of research on their effectiveness leave me with the task of evaluating a random selection of games myself. While the number of options to choose from is rather impressive ("Reader Rabbit," "Math Blaster," "Reading Blaster," "School House Rock," "Blue's Clues," "Disney," "M&M's," "Curious George," "Let's Play," "Dr. Seuss Preschool," "Leap Frog,"

and others), I limited my case study to nine educational games. I chose three titles that I know are popular in many school settings: "Math Blaster (Ages 4-6)," "Reading Blaster (Ages 5-7)" and "Reader Rabbit (Thinking Adventures Ages 4-6)." I chose four games that were based on television and feature animation shows: "Winnie the Pooh and the Honey Tree" (Animated Storybook), "Disney's 101 Dalmatians" (Animated Storybook), "Blue's Clues" ("Blue's ABC Time Activities"), and "Arthur" ("Arthur's Reading Games Ages 5 to 7"). I choose one animated storybook after a popular children's book: "The Polar Express." I also randomly chose one low-budget game: "Phonics 4 Kids" (For Ages 3-10).

In order to better evaluate the above games, I addressed twelve points that would assess the effectiveness of the games as interesting and educational. Many of my questions came directly from or were inspired by Margaret Gredler's *Designing and Evaluating Games and Simulations* [GREDLER, M. 1994]. I will score each of the following items on a scale from one to five, with five being the best score. The four categories to be assessed are: ease of use, graphics, treatment of correct answers, and treatment of incorrect answers.

By studying the above points, I hoped to determine the needs in the educational game industry for the three to seven age group. My hypothesis was that the above games will either be very boring or overly entertaining to a detriment of education. Thus, my suggested solution of the animation short followed by activities would fill the gap of solid educational gaming. Moreover, by researching existing educational games, I was able to better understand the important aspects of making a game educational and fun at the same time.

Part III: Evaluation of Current Children's Educational Games

Question: How effective are current children's educational games? Are they educational and fun? Does the interactivity enhance the experience?

1. The Criteria Used to Determine Effectiveness of the Games

When I set out to evaluate the games, my main areas of interest in comparing them lay in the following categories: ease of use and navigation, relevance of graphics and animation, treatment of correct answers, and treatment of incorrect answers. My goal was to assess the interactivity of each game. However, as I began to review the games, I quickly realized that I had failed to include a criteria for the educational quality as well as the ability for the game to reach its target audience. These two areas may be equally if not more important than interactivity. So, I added notes to my evaluation sheet to give a more complete assessment.

All the games included the age groups from five years old to six years old, with some including ages slightly above or below that. This is the age of the emerging reader. A child is learning the names of letters, their sounds, and how they fit together to form words. Also, the child is learning to count using some basic addition and subtraction. He or she is learning geometric shapes, colors, and simple logic and problem solving. While most of the games dealt with some logic and problem solving, there was a lack of attention to the treatment of letter sounds and word formation, or phonics. Perhaps the best way to display the results of my study is to list the game in order from educationally least effective to most effective and outline some of the more prominent positive and negative qualities that each game had. In my estimation, the games I tested rank in this order from least effective educational games to most effective: "The Polar Express," "Winnie the Pooh and the Honey Tree," "101 Dalmatians," "Phonics 4 Kids," "Blue's ABC," "Math Blaster (4-6)," "Reading Blaster (6-7)," "Reader Rabbit-Thinking Adventures," and "Arthur's Reading Games."

1. "The Polar Express"

"The Polar Express" is perhaps the most disappointing of all the games I tested, because of my expectations from the publisher. It is created by Houghton-Mifflin Interactive. Houghton-Mifflin is one of the top textbook publishers in the nation. I have used many of their textbooks while teaching elementary and high school. Their textbooks are engaging and educational, using dynamic layouts and interesting images and graphics to augment a creative text. Therefore, when I found that "The Polar Express" is merely a read through book, or as I suspect for the age range that would be interested, a listen-through book, I felt let down. The text is above a seven-year-old and there is nothing that is intended as an assistance to help the child read it, such as clicking on a word to hear it read individually or to give a definition. The images are strikingly beautiful and serene, with a small dose of animation, so it is worth watching. The noted humorist, author, and radio personality Garrison Keillor narrates the story and in his usual interesting style, so it is worth listening to the story as well. However, I can not find it educational except that a nine-year-old may want to confirm his individual reading with Keillor's reading.

2. "Winnie the Pooh and the Honey Tree"

"Winnie the Pooh and the Honey Tree," created by Disney Interactive is a charming story with a good bit of animation, and written in the same Winnie the Pooh style. That is, the text is above the probable audience of five to seven year olds. It would benefit a nine year old better, but I do not know how many of them would seek out Winnie the Pooh to read. Ironically, too, the three games that are included in this storybook are so simplistic that they are really

suited more for the three to four year range. The games include finding a hidden pot of honey (exercises the use of the computer mouse), choosing a colored toy (color knowledge), and putting an object inside its outline (again, using the mouse, as well as shape/silhouette recognition). It is a fun and interesting story, though its twenty-five pages seem rather long for an animated storybook. It is not very educational, and therefore it occupies the second to least effective spot in my study.

3. "101 Dalmatians"

"101 Dalmatians" by Disney Interactive occupies the next spot for similar reasons. While both "Winnie the Pooh" and "101 Dalmatians" have excellent navigation schemes which are thematic, they fail to truly educate the audience who would probably purchase these storybooks. Overall, "101 Dalmatians" employs the use of animation in a fun and interesting way, giving a little animation at the beginning of each "page" and then Pongo, the main character, reads the text at the bottom of the page. Then, the user is given the opportunity to search for hidden animations within the scene, such as a fish in a fishbowl swimming if it is clicked or a person saying something funny if clicked. This is a clever way of engaging a child and keeping them interested in the story.

There are two games within the "101 Dalmatians" storyline. One is a dull maze in which a the dog has to collect all the objects that begin with the given letter. Unfortunately only objects with that letter are present, so there is no real discernment of letter sounds. The other game has great potential as it matches dogs owners with their dogs. The first level matches them by looks. In the third level, the dog's name is on its bowl and the owner calls out the name. However, many of the names are difficult for the emerging reader to read (e.g. Precious, Noodles, and Duchess). So, it is suited for the eight year old and above, though I am not sure that that age group would be interested in this story in the beginning. On the other hand, for the older age group, it gives definitions and synonyms for some of the words, if you click on them. On average, there are three clickable words per page. These definitions and synonyms are helpful for the seven and above age group, and are a good idea for keeping the reader informed. However, there are many high level words that do not still have the benefit of definitions and synonyms.

Some other slight drawbacks is that the user can not skip the animations at the beginning of each page nor move to another page until the animation is finished. Also, the credits at the end play all the way through before the user can exit the game (rather annoying). While the reading level is at the seven to eight year old level, it leaves younger readers to just listening to the story. Therefore, no substantial learning is occurring for them, other than learning to navigate through a story. Even for the

older age group, however, there is no real way for them to check their reading skills through the story pages or the games (except the third level of the matching game). The cover does not set an age level for the animated story, but I believe it should, so that unsuspecting parents will not buy it for their younger children in the hopes that it will help them with their reading skills. "101 Dalmatians" is not particularly educational, though it has some rewarding areas.

4. "Phonics 4 Kids"

"Phonics 4 Kids," created by Swift Jewel, is an attempt to directly educate the player with basic phonics. While there are numerous word building games contained within this game, it really falls short in a number of categories. First, the animations are either non-existent or very dull. The main drawback is perhaps the navigation. There are three levels. The first contains the options of Alphabet, Consonants, Consonant Blends, Short Vowels, and Long Vowels. Within each of these sections, there is another menu with games geared toward that phonics topic. Then, the player gets to the actual game. The problem is that there are games geared toward three to four year olds (e.g. matching sounds) listed alongside games for seven to eight year olds (e.g. finishing sentences), without any distinction of difficulty or hierarchy. The player would only realize the difference of level once he or she opens that particular game. There is the potential for a great deal of frustration for the younger player if he or she opens the higher level games first. Not being able to get any correct answers would cool their enthusiasm very quickly. On the flip side, the older player may open a few of the lower level games and think that all the games are like that and lose interest quickly as well. There should be some distinction for the player, such as different levels or different age groupings for the activities. The player could choose to advance to the next level when he or she felt ready. This would be a simple restructuring of the menu, with no great change to the games themselves.

By restructuring the menu, "Phonics 4 Kids" would be well on its way to being an adequate educational game for children. The game employs the actual use of phonics, with matching letters (upper with lowercase, sound with letter, letter with image it starts with), word construction (spelling words), finishing a sentence, and discerning rhyming words. These games are set within the larger framework of the alphabet, consonants, consonant blends, short vowels, and long vowels. Still, the animation and imagery is wanting. Also, the navigation has no theme, but is rather a grouping of dissimilar buttons.

5. "Blue's ABC Time Activities"

"Blue's ABC Time Activities" by Humongous Entertainment Game is based on the popular children's television show "Blue's Clues." The fact

that it is based on an already popular television figure gives it an extra edge in being more interesting to the target audience of three to six year olds (unless, of course, the child does not like Blue's Clues—but then again, how could you not like Blue's Clue's?). The television show is one of the more successful "interactive" shows, in that the main character Joe, formerly his brother Steve, talks to the viewer. He asks questions and waits for a response, then he pretends to get the answer incorrect in order to invite more responses. Finally, he will get the answer correct and thank the viewer for his or her help. Frequently, the viewer will hear a child's voice answering the question as well. The "voice" never has a person attached and is therefore meant to represent the viewer, or at least prompt the viewer to call out answers to the show host. It is rather fun to watch young children telling Joe or Steve where the not-so-hidden clue is. "Over there...no, over there..." is gleefully called out while pointing feverishly at the corner of the screen.

This interactivity is brought to fruition in the children's game "Blue's ABC Time Activities." The player is invited to create a word book like the host Steve made. The objective is to play the different games and collect words that will be placed in a "book." Then the words will be chosen by the player to fit within a story. It is a clever theme, but it may be a bit complicated for the four and five year olds. However, with a little instruction from an older child or adult, I think they can work within the wordbook structure. The navigation between the games is intuitive and fun. The main screen is the "house" from Blue's Clues and the different objects and creatures (salt and pepper shaker, mailbox, picture frame, etc. all have personalities) are the gateway to particular games. Once within the individual games, a large yellow arrow at the top left brings the player back to the main screen. While it is not initially clear where the arrow will lead the player, it is consistent and the player should be able to figure out what it does in a short period of time.

The games are colorful, fun, and educational. In the alphabet trail, the player chooses the correct path or maze that makes the alphabet complete. In the jungle game, the player finds animals whose names start with the given letter. It goes through the entire alphabet and you collect the names in an alphabet book (separate from the wordbook described earlier) with short descriptions and an image of the animal. Most animals are clearly understood—M for monkey, T for Tiger. In the rhyming game, words and pictures are used within a sentence to make a rhyme. The player chooses the word that rhymes to finish the sentence. The words are shown and read by one of the characters. There is a game for letter recognition, in which the player is expected to choose the correct letter that is sounded out for the beginning of the word. All these games have a strong educational foundation and are very engaging.

The main drawback to “Blue’s ABC Time Activities” is that it is really meant for three to four year olds and the emerging five year old, at least the games are structured for that level. Most games center around single letter recognition. There is virtually no opportunity for the child to test his or her reading with any of the games, so the five and six year olds who are beginning to read will not be challenged by the game. The game should state that it is for the three to emerging five year old range or it should state that it is geared toward letter recognition and sounds. The animation is very simplistic as well. It is not terribly fun. In its defense, the television show has very simplistic animation, so it is true to that style. However, the television show has the main live action character (Steve or Joe) who drive the show and make it more animated, while the children’s game only has Steve during a brief introduction. Then we are left with only the simplistic animation. Despite these drawbacks, “Blue’s ABC Time Activities” is very good resource for the pre-reader to use in learning the letter sounds. Perhaps even more effective are the next set of the educational games.

The next three games that I will evaluate are very similar in their effectiveness at educating the child in a fun and engaging way. The games “Math Blaster (4-6),” “Reading Blaster (6-7),” and “Reader Rabbit-Thinking Adventures” reach the target audience in a relatively effective and interesting way. Still, each has areas in which it can be improved.

6. “Math Blaster (4-6)”

“Math Blaster (4-6),” created by Knowledge Adventure has fun animations in which the blaster pals interact with the player to lead him or her through the different games in a planetary exploration theme. There are two main sections. One has learning aids, such as addition principles, counting hash marks, shapes, and a number line. This section is to help the user play around with the concept for remedial help. For example, three segmented worms can be lengthen or shortened within an addition sentence. As the addend worms are lengthened, the sum worm is lengthened so that the number sentence always remains true. My test subjects did not really understand what the purpose of this section was, but after a little explanation, they began to get the point. Overall, I believe it to be a useful set of tools. However, the main drawback is that the menu rollover “buttons” that lead to these tools occupy a more prominent place on the screen than does the actual learning games. The learning games are pushed way into the left side and up toward the corner. Visually, after some use, this makes some sense, since it is supposed to represent the front window of the spaceship. The screen contains the interior of the ship and the blaster pals and learning aids are placed inside the ship. The destination planets are seen through the front window of the ship, but the placement is rather

awkward. The planets contain the learning modules that are the main part of this game.

It is on these planets that the main games are played out. There are four planets and each has one game. The player must complete each game on each planet in order to reach the next level. The player must also complete the planets in the specified order, as the default setting. Therefore, the player is locked into a specific route and can not skip to the next level if he or she is already competent at the easier levels. He or she must play it all the way through. There is a danger of making this tedious for the more advanced users who do not realize that there is a “Free Play” option to the side of the intro screen. The advanced user may give up before even making it to the higher levels that would adequately challenge him or her. Perhaps a “test” should be performed at the beginning that would place the user at the appropriate level to avoid boredom. Another drawback to this system is that the user can not skip around between the different games if one game becomes tiresome. It may be better to be able to jump between games because the player wants to work on one game or concept today but wants to do a different one tomorrow that is not necessarily in the predefined sequence. In the game’s defense however, it should be noted that the present system is useful in a school setting. A student can log in with his or her name during the computer activity time while the teacher is working with other students. At any time, the teacher can either log in as the student or watch the student to determine exactly how many concepts he or she has mastered, which would be obvious by the student’s given level and planet on which he or she left off. If the child could have jumped around among the levels, he or she might have chosen a level that is too high and is just guessing their way through the games rather than actually solving the problems. In order to keep the ability to choose one’s own level and the order of play, a more advanced method of recording progress could be employed in which a grid is accessed that shows what areas or game sections the student has fully completed.

The individual games are creative and fun, with appropriate animations accompanying them. One has a stage play, in which eggs are added to or subtracted from the main actress’ basket as she interacts with other characters, whom the user chooses. The user must determine how many eggs are remaining after the given number of eggs are removed or added to it. This is a clever means of teaching addition and subtraction, but the problem is that there is a verbal description and the number sentence is shown, but no visual representation of the number of eggs is displayed. Therefore, the user would have to know how to represent them on paper, their fingers, or in their own head to get the correct answer. In another game, the user hammers a monster who has jewels in his mouth. The jewels are added up as each new monster is hammered, until the goal has been reached. This does require some

counting skills, since the player can get too many jewels and will have to remove the correct number of jewels to equal the target amount. A third game is one in which a rocket is built using the pattern of shapes or completing shapes that are broken apart. The final game is an ingenious marble maze in which gears, levers, traps, and other fun mechanisms are controlled by the user to allow the target number of marbles to fall into the final slot. The higher levels add color specifications (3 blue and 2 red) or have the player guess how many marbles it would take to fill a given shape (e.g. a large triangle or a s-shape). I believe this game is the most educational since it not only deals with logic (opening and closing the mechanisms), but also deals with adding and subtracting numbers to get a target number.

Overall, “Math Blaster (4-6) is a good educational tool when compared to a some of the previously mentioned children’s games, but often the animations are more prominent than the actual learning tools, as with the small marbles and gems or the eggs that are not visually represented. The learning deals mostly with counting numbers (up to 20), some addition and subtraction, and shape recognition and logical ordering. The educator should be aware that older five year olds and the six year olds may not be challenged enough, especially at the lower game levels.

7. “Reading Blaster (6-7)”

“Reading Blaster (6-7),” also created by Knowledge Adventure, is on the same level as “Math Blaster (4-6)” in the effectiveness category. The main difference is that the user can move about between the different games with ease. There is a sort of adventure park theme and the player is to gather the keys for the grand prize by completing each section. Three of the games miss the mark educationally, but two are rather good. The three sub par games are sorting letters, making a face, and creating number words. The sorting game has the user catch socks that fall with words on them. The user is meant to catch only the socks beginning with the given letter. However, no reading is necessary, but only matching the given letter with the beginning letter of the socks to catch. Another game is one in which the player makes a face by following the directions, and at the end a title for the face is chosen from a list of titles. However, in some of the examples the correct title that was to be chosen did not correctly describe the face. In one instance the title was supposed to be “My big round nose,” while in fact, the nose was not very large at all. The third game is one in which the user collects number words by moving arrow keys. It reads the word when the user gets close to it, so no real knowledge of reading is required to play the game. Some word recognition can occur with the word being spoken in unison with the word being shown in written form, however.

The two games in “Reading Blaster (6-7)” that have great potential are the train words and the balloon

words. In the train words, parts of words are chosen to make one complete word. If the correct parts are chosen, then a train is animated to move down the track. In the balloon words, balloons containing letters must be reorganized to spell the given word. Both these games are very fun, the animation is appropriate, and effective education is occurring. However, they are geared more for the emerging reader (ages 5-6), and may not be challenging enough for the advanced 6 or 7 year old. Overall, “Reading Blaster (6-7)” is a good attempt at providing some phonics and reading, but it falls a bit short in some areas.

8. “Reader Rabbit Thinking Adventures”

“Reader Rabbit Thinking Adventures” is created by The Learning Company and is aimed at the four to six year old range. It is in the same effectiveness grouping as the above Math Blaster and Reading Blaster games. The overriding premise is that there is a surprise birthday party for one of the characters, and the player can collect different items for the party by completing the different games. The navigation is very awkward and takes some time to fully get used to it. For example, within each game the player must mouse over the bottom of the screen to reveal a “back” arrow in order to return to the main menu page. Also, the signs on the main page are not legible unless the user mouses over them to reveal the menu option.

There is a section that lists the concepts that are learned by using the game. This is useful for the educator and is a fairly accurate and complete list. Basically, the areas can be grouped into logic and problem solving, as the title suggests. There are eight games. The user can navigate between them freely and choose between different levels of difficulty within each game. The games include pin-the-tail-on-the-donkey (moving the game piece across and down a grid the correct number of spaces), dance patterns (choose the next step in a dance sequence), wrap a present (patterns, box shapes), sorting toys (need some reading skills to place in proper category), painting (duplicate a sequence or color scheme of an image), similar and different cards (very confusing and awkward interface in which the user makes some cards the same except for one or two differences as indicated by the number of lines between the cards), sorting bags of goodies (on a grid, the user has to place the correct goodie in a bag based on the top and sides of the grid), and making cookies.

Overall the “Reader Rabbit Thinking Adventures” game is fun and well animated. The idea of collecting items for the surprise party was lost on my subjects, but a little bit of guidance should be able to remedy that. The game reaches its goal as stated in the title—Thinking Adventures. However, for the five and six year old, this game may become tiresome, as it is not very challenging, except for the same/different card sorting that is very advanced. It

seems that the creators could have introduced some phonics and simple reading or math to further advance the idea of thinking adventures that apply to concrete practices in life, but that may be reserved for a different title.

9. "Arthur's Reading Games"

"Arthur's Reading Games" by The Learning Company is by far the most complete and effective educational game compared to the other titles I studied. The target age is five to seven, and this gem should very well reach them. This game is based on the popular after school television animation "Arthur," in which school aged children are shown in situations and dilemmas with which most children can identify. The characters in "Arthur" are anthropomorphic animals who walk, talk, and dress as humans. Arthur and his friends are in the third grade. However, the stories often involve the other family members of Arthur and his friends.

"Arthur's Reading Games" is only two levels deep with an intuitive menu system. The player begins the game with the image of a school library with Arthur, his friends, and his teacher in the library. By clicking on one of the friends, the player can enter into the game. Arthur is present throughout the menu and games in an upper corner window to explain how the menu works or how to play the game. Each game has multiple levels (up to seven), of varying degrees of difficulty. The player can freely move about between the levels and games.

The six games are mostly geared toward actual educational concepts in the realm of language arts, while a couple do not promote much learning. For example, the spelling game (3,4, or 5 letter words) is more like "Wheel of Fortune" since the player is not told what he or she is spelling, but merely guesses until enough letters are placed to make a logical guess. While thinking skills are being employed, it is not the best educational tool, since it rewards guessing mostly. Also, it is a more abstract concept than typing the name of a word that is spoken. The story creation game is similar to "AdLibs," the paper and pen game in which someone calls out nouns and verbs that are placed into a story. Only after all the proper blanks have been filled is the story read is the comical and nonsensical stories are read aloud. It is fun and it emphasizes parts of speech to a certain degree. The dance sequencing reinforces the understanding of patterns and sequencing to music.

The other games are very effective in balancing education with a fun setting. With the word-o-matic, the player builds words that are spoken by the host. To do this properly, the child must be able to sound out the word sections to put them together as one complete word. There is a matching game that is cleverly set on "television screens," and the user must click on the screens to reveal either objects, words, or rhyming words behind the default image.

If a match is made, then the word disappears and part of an image is revealed. After all words have been properly matched, a scene is displayed on the screens as a reward. This is an ingenious way to heighten interest as the player progresses through the game.

One of the best games is the spellathon. Mr. Ratburn, Arthur's teacher, leads a panel of three children through a spellathon. He speaks a word and the contestants write it on a piece of paper and then hold up their spelling. All three spellings are similar but only one is correct. The player must decide whose spelling is correct. If the player clicks on Mr. Ratburn, he will repeat the word. This game reinforces word recognition and reading, while the amusing animations of the contestants keep it light-hearted and fun. This game might be brought to the next level by giving an option for the player to type in a word if none of the contestants are correct.

In sum, "Arthur's Reading Games" employs just the right touch of animation that complements each educational game. With an intuitive navigation and numerous difficulty levels, any of the target range of ages five to seven should find enough educational opportunities that are both challenging and engaging.

2. Additional Research

In addition to researching CD-ROMs, I reviewed a couple of websites that cater to children, including PBS Kids' "Dragon Tales," and Nick Jr.'s "Dora the Explorer." Both these sites spring from popular children's television shows and draw from the characters, scenarios, and themes from the shows.

1. PBS Kids' "Dragon Tales"

URL: <http://pbskids.org/dragontales/choose.html>
Although the site does not specify the age range that it is designed for, it is best suited for children ages 4-7.

There are eleven activities on the main menu. Most of the activities are very simplistic and contain a few variations of the same theme. The viewer can print out coloring pages, paint online, or play a simple matching game. Some of the more educational activities include the "Dragon Games," in which the viewer reads the short passage and constructs a picture to match it, using the available props and characters. This is the electronic version of the old felt board activities. It can be very educational and fun. The "Dragon Tunes" is very good in that the words to a popular children's song has some words removed. The viewer is to place the picture objects into the proper place to fill the blanks. This will help develop the viewers reading skills. Perhaps the best section is "Search for Mami," which is an animated storybook. The viewer is presented with a page to read that has a picture to illustrate the text. The viewer can click on

individual words he does not know to hear them spoken, and he can click on the narrator's image to hear him read the entire passage. There are fun little animations in the illustration that play when the viewer clicks on them. I believe that this approach to reading is the best I've seen. It is second only to having a proficient reader sitting alongside the emerging reader and assisting with words he does not know and reading the entire passage back after the young reader has plodded through it.

The navigation is fairly intuitive with the use of pictures for buttons. They remain consistent throughout most of the activities, with the main PBS Kids button in the upper left, and in the lower right there is the button that brings the viewer back to the Dragon Tales menu. In some of the activities, the main character will give the directions verbally (e.g. "Dragon Tunes," "Search for Mami"), which bypasses the need for reading. In others, however, the only option is to read the directions, which are sometimes lengthy (e.g. "Treasure Hunt Maze"). Still, with many of the activities, the directions are only a couple of words since the activity is so simplistic (e.g. "Mushroom Match," "Singing Springs"). With these, the objective is intuitive and should not require any reading skills.

In sum, this site has a strong enough educational component to be useful even in a school setting—especially the "Search for Mami," "Dragon Tunes," and "Dragon Games" activities. For the most part is very fun and engaging to maintain the young viewer's interest.

2. Nick, Jr.'s "Dora the Explorer"

URL:

<http://www.nickjr.com/playtime/shows/dora/index.html>

Although the site does not specify the age range that it is designed for, it is best suited for children ages 4-7 (eight year olds and up would probably not be very interested in the site since Dora seems to be a younger character).

The Radio section contains songs that either have some Spanish words, are basic educational songs (ABC's, animal song), or are just fun. The games employ some basic color knowledge and counting, just as the TV show does, but there is little else that is educational. The stories are simple and engaging. The text is displayed while Dora reads it, but there is no incentive and little opportunity for the child to try to read it first. The Video section has short clips that look like they are segments from the episodes. Some educational value in learning Spanish words.

There are basically four sections to this site: Storybooks, Games, Radio, and Video. There are numerous links to the other sections of the Nick Jr site, but it should be fairly clear to a child which links are connected only with the Dora site, since they are centrally located and the other links have

images of the characters from the other shows. The five buttons mentioned above each have an image that helps the emerging reader determine what that section is. It may take a bit of trial and error to fully understand the navigation, but if an adult were to explain it briefly, any child of the target range would be able to navigate freely with no difficulty.

The only drawback is the Radio section. You have to navigate through the main Nick Jr site to get back to the Dora interface. Also, in the video section, the menu changes and may be awkward for the child who can not read very well.

Other than that, most directions are spoken by Dora or Boots or the icons are very clear.

In sum, this is a great site for relaxing and having fun. If you are looking for educational opportunities, other than using the mouse and some of the keyboard keys, there is not much here.

Part IV: Summary and Recommendations

Children watch an incredible amount of television, and most programming shuns educational content for pure entertainment. Thus, a great deal of time during the formative years, children are not being encouraged to exercise their minds. Increasing the number of educational programs has inherent road blocks. Educational programming, by its very nature, is aimed at only certain age/learning groups which limits its viewer base—and therefore sponsors shy away from it.

Instead of focusing on increasing the presence of educational television, a more realistic approach may be to take the best of television programming and repackage it in a way that will draw the children away from the television to a more educational environment via the computer. Educational computer games, if given proper funding, can take on a life of their own and become more attractive to the child than television. Successful games will be animated with recognizable characters. There will be sufficient interactivity for the children to become "involved" with the outcome of the game and scenarios. There will also be different difficulty levels so that each child can find a comfortable level to engage the game—and strive to improve from there.

Sound educational principles can further guide the creation of the games without detracting from their appeal. Piaget's creative play is found in the interactivity inherent in computer use. Gardner's multiple intelligences can be expounded with the visual, aural, and kinesthetic intelligences in use during play. Skinner and Pressey's studies with the importance of immediate feedback is apparent as the child can learn whether the answer is correct instantaneously.

By conducting the above study on nine current children's educational games, I was able to properly pinpoint specific areas that need to be addressed in educational games. Some of the key areas included are intuitive navigation, interesting animation, and solid educational concepts. An intuitive navigation system like "Arthur's Reading Games" with the characters leading to different games, or the Disney games' thematic interfaces assist the player in quickly identifying the appropriate games to play. Animations must serve the education of the game without becoming more important. "Reader Rabbit Thinking Adventures" and "Arthur's Reading Games" employed this use of animation well, in that the characters' activities and antics added to or helped complete the educational track of the games. Having fun "extras" to click on for amusement is acceptable as well, as in "Winnie the Pooh and the Honey Tree" and "101 Dalmatians."

To enhance the educational journey, a series of levels for the games is useful, so that the player can find the comfortable range of challenge and success while learning. The animated storybook must focus on learning, as in "Phonics 4 Kids" or "Arthur's Reading Adventures" and the trio "Math Blaster," "Reading Blaster," and "Reader Rabbit Thinking Adventures." However, I propose that an even more effective reading game will take it to the next level, allowing the child to truly have to read in order to solve the games. Helps and assistances will be in place, but the opportunity to practice actual reading and receiving a reward (e.g. a fun animation or graphic or verbal acclaim) will be the focal point.

Children's educational games, whether online or in CD-ROM form, need the assistance of sponsors and companies willing to place an emphasis on education. As computers become more commonplace in schools and homes, teachers and parents can become instrumental in furthering the mental development of children by guiding them to educational games rather than entertainment television. I believe children will respond if the proper amount of time and effort (and of course money) is placed on the creation of these games, so that they are engaging, fun, interactive, and educational.

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