MARKLE FOUNDATION

# Children and Interactive Media

## A compendium of current research and directions for the future

**A Report to the Markle Foundation**
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**Executive Summary**

Why another study? Indeed, why a study ***about*** studies? And why now?

Today we are in the middle of a new revolution in both technology and culture; a revolution in which our children are often in the vanguard. For they are the first generation that is truly "growing up digital." Of course, interactive media for young people is not entirely new. But since the first video games were introduced more than two decades ago, the digital content industry has experienced enormous growth in size and technological sophistication. In recent years, the Internet, more affordable home computing and a host of other digital game and formats have helped make the use of such interactive media a dominant activity of modern childhood. In the years ahead, it's clear that digital media will have an even more central role in the educational and social experiences of young Americans.

Concerned parents, teachers, content producers, child advocates and policy-makers want to understand much more about how such a pervasive experience can contribute to, and certainly not detract from our children's intellectual, social and physical development. We sense that, because of their unique properties, well designed interactive media have an extraordinary potential to not only help young people learn, but also engender a true love of learning.

But are our assumptions borne out by the facts? What kind of evidence do we already have about the power of digital media to influence children's health and well being? What sort of new research do we need to better understand the role of these media in children's lives? And how can we as researchers, media producers, policy-makers and parents better shape that role from knowing the answers?

Because of questions like these, the Markle Foundation commissioned a review of all publicly available research to see how much is known about the role of interactive media in children's lives. And the startling answer from experts in the field is: very little. In fact, there are far more questions than there are answers about what computer and video games and Internet use mean to the social, intellectual and physical development of children today. As a result, we risk losing an extraordinary opportunity to help shape a robust environment that rewards editorial quality and educational value – an environment in which new media producers can thrive by understanding children as more than just a commercial market.

We all share a powerful interest in finding out more: Children's content developers who could learn more about how to create engaging, educational interactive experiences; parents who could learn more about what media products might be helpful or even harmful to their children; policymakers and advocates who could build future policies on a firm foundation of empirical knowledge; and finally, researchers themselves, who might learn a great deal more by bringing together across academic disciplines work that often goes forward on autonomous tracks.

This summary provides only a snapshot of the extensive detail that can be found in a more than 200 page report and annotated bibliography exploring the current body of research discussing the effect of interactive media on children. They provide interested readers not only with specific citations, but also a far more comprehensive discussion of existing research on children and interactive media. The goal is to provide a clear picture of just where we really are in our understanding of children and interactive media; a sense of direction of where we need to go in finding answers; and an invitation to others to join us on that important journey.

The report focuses on how children use emerging communications media—video games, CD-ROMs, the Internet and other computer software—outside the classroom, in their homes. It is organized into four sections: (1) interactive media use and access; and its impact on children's (2) cognitive development, (3) social development, and (4) health and safety. Finally, we have a series of questions and proposals rooted in the understanding that the medium alone is not the message; that creative ideas and human values will ultimately determine whether communications technologies fulfill their enormous potential to educate, inform and inspire.

## 1. Interactive Media Use and Access

The Kaiser Family Foundation's recent report *Kids & Media @ The New Millennium* found that children today are immersed in media. Their lives are increasingly devoted to video game playing, browsing the Internet and conversing in chat rooms. We know that children now spend as much time using media as they do in school, with family or friends. So we have a powerful incentive to understand how such a pervasive experience affects their development.

One challenge for researchers is that "new media" present a constantly moving target. During the course of the 1990s patterns of children's media use changed radically as their range of options kept growing. A decade that began with video games and CD-ROMs saw the explosion of the Internet and the World Wide Web. Today's developments in media convergence, wireless Internet and pervasive computing will certainly alter the terrain in new and unexpected ways in the years ahead. But the most important focus for researchers in the field is less on the technology platform, but on the kind of content that children experience.

**FOR BOYS, GAMES RULE**

Researchers have found that playing games is the most common way young people of all ages 2–18 use computers. They have found that boys reported significantly more time commitment than girls in playing computer and video games. Evidence from the few studies that have analyzed different categories of game content show that boys and girls prefer different types of games, with boys generally preferring sports, action adventure and violent action games; while girls generally prefer educational, puzzle, spatial relation and fantasy-adventure games.

While many assume that interactive games are frequently played in isolation, they are often the focus of vibrant social contact for boys, who compare notes about levels of game play and scores they made. One study found that boys age 11 – 17 who report frequent game playing were also those likely to see their friends more often outside school.

Another faulty assumption exists about girls' seeming disinterest in computer technology. A report released by the American Association of University Women Educational Foundation emphasized that girls are critical of the computer culture rather than computer phobic. They dislike both the violence in most interactive games, as well as the narrow, technical focus of computer programming classes. What's more a March 2000 survey by the National School Boards Foundation (NSBF) found that boys and girls are equally involved in using the Internet, albeit in different ways. It found that girls are not "phobic" or even disinterested when it comes to the Internet. They were more likely to use the Internet for education, schoolwork, e-mail, and chat rooms, while boys were more likely to use the Internet for entertainment and games.

**THE YOUNGER THE BETTER**

Regardless of gender, children's media choices and preferences change as they mature. Evidence suggests that patterns established at an early age tend to be highly predictive of later media-related

preferences. But surprisingly, there are very few current studies of children's interactive media use that include children of pre-school age.

The newest studies available reveal that younger children are more likely to prefer educational games than older children. This preference for educational games decreased as a function of age for both girls and boys alike.

But there are several gaps in our knowledge about age and new media use. For example, there is little research exploring variations in interactive media use among children of different ethnic groups and among children less than eight years old. We are especially limited in our understanding of how and why children use networked services from their homes.

**ACROSS THE "DIGITAL DIVIDE"**

Not every American family and child has access to computers, the Internet and interactive media. Persistent differences across socio-economic and ethnic lines have rightly generated an important public policy debate about possible implications and solutions to this inequality. But the most recent research suggests that access to computers and the Internet is rapidly spreading in the United States and that closing the "digital divide" will depend less on technology and more on providing the skills and content that are most beneficial.

For example, video game consoles and software, which are less expensive than computer systems, are widely spread across all socio-economic levels. In fact, ownership of video game equipment was more common in lower-income households than in higher-income households. Unfortunately, even though similar *entertainment* content is available for both computer and video gaming systems, the vast majority of *educational* software is available only for those who have access to a computer or perhaps a net appliance.

We need to know whether and how children may be affected by living on the wrong side of the "digital tracks." Evidence suggests that children who have access to home computers demonstrate more positive attitudes toward computers, show more enthusiasm, and report more self-confidence and ease when using computers than those who do not. Our specific concern regarding the issue of the digital divide is in providing not only access to hardware but training and software that makes computers useful and meaningful.

Much of the research on children's use of media has focused on the uses of *particular* media (e.g., books, television, computers, Internet) and not on the whole media environment. The literature on print literacy has virtually no overlap with the literature on children and television, and these in turn have little connection with literature on children and computers. While this may have been a useful simplifying strategy in the past, it appears increasingly less useful in an age of media convergence, when children are surrounded by an increasingly seamless web of multiple media experiences.

Future research needs to study not just the level of media use, but specific media content. For instance, rather than just studying children's use of the Internet, we should consider the genre of the content involved, the kind of interaction it provides; whether it uses audio, text, or audiovisual messages; and whether the user is involved in networked activities and how children use these experiences in their social lives.

## 2. Cognitive Development

### WHAT TECHNOLOGY TEACHES…AND WHAT IT DOESN'T

We have long understood that children learn and grow, socially, intellectually and even physically from playing games. They also learn skills, information and behavior from their parents, siblings and peers; from television, music, movies and comic books. But how much do we understand about whether the introduction of interactive media into the equation affects how and what children are learning? Is the very interactivity of newer technology a distinction that makes a real difference in what children learn? In simple terms, does playing collaborative learning games make children more likely to act collaboratively? Or playing violent video games make children more likely to act violently?

And as prior media research has shown, it is not the medium itself that affects children's perceptions, attitudes, or awareness. It all depends on the specific kinds of *content* with which they carry out specific kinds of *activities*, under specific kinds of external or internal *conditions* for specific kinds of *goals*. In order to understand the impact of interactive media, researchers will have to focus on the details of that interactivity, on whether and how it allows children to engage the content in a truly responsive way.

## COLLABORATION BEATS THE COMPETITION

We know that in a traditional "analog" environment, interactivity in the form of collaboration is a proven learning strategy. Studies have shown, for example, that children's communication with peers about how to solve a science problem can improve science learning. Others demonstrate that stimulating collaboration in young children's story-telling play lead to improved writing skills.

In another study examining collaborative learning in 4th grade children using an educational software program showed that pairs of children who could play together got more right answers than the pairs who had to play against one another. Other findings provide encouraging evidence that informal, collaborative experiences with quality educational software can help develop skills that are not only content-specific, but that can also be transferred to new situations.

## IS HOME PLAY LIKE HOMEWORK?

What about the impact of interactive media experiences outside the classroom on academic performance? Does using a computer or playing video games help or hurt?

In general, research suggests that where interactive video games have been designed to teach certain skills, they can be highly effective learning tools. But there has not been enough research on games that are already in the marketplace to determine what their effect is on other cognitive skills. And until there is more research, we simply don't know enough to say whether children's access to and use of computers at home significantly influences their achievement in school. While early studies have suggested that home computer access may be associated with higher test scores, a variety of other factors in the home and family environment could also be relevant. Given the fact that the primary reason cited by parents for purchasing a home computer and connecting to the Internet is education, we have very little research to document whether using interactive media at home actually contributes to achievement at school.

## GETTING DOWN TO SPECIFICS

It's impossible to give any single answer about the influence of new interactive technologies on children's cognitive development. There appear to be many different answers depending on the type of technology, the genre of the content and the children. For example, interactive toys probably engage children differently than interactive computer games. Within the same technology, there are significant differences in both content and presentation style.

Clearly, we have to be much more specific about what we mean by "interactivity." Developing a more detailed road map would allow researchers, as well as parents, teachers and policy-makers to evaluate specific elements of these media – such as audio, video, text, depth, style and structure of interaction -- and their impact on children of different ages and situations. In short, the actual content is more important than the technology.

We have already learned some important things about effective, educational "interactivity" from studies of how parents teach children to read. As adults read bedtime stories, product labels, advertisements and signs, instructions for games and toys, they give children a framework of prompts, hints, pointers and dialogues that can support the first tentative steps toward reading and writing. This sort of support is a cornerstone of good interactive design because it allows even very unskilled users to navigate an interface with visual pointers, dialogue boxes, hints and help systems. Further research could only help refine such effective tools for media producers, as well as useful ways to help parents judge quality content for their children.

**3. Social Development**

**DIGITAL FRIENDS AND FAMILY**

Children don't experience media in a vacuum. Past research on the impact of television tells us that immediate family, such as parents and siblings, heavily influence what children take away from the viewing experience. Family environment also provides a key context for how young people experience computers. Recent studies have found that students' perceptions of their parents' desire for them to learn about and use computers was a significant predictor of heavy computer use.

Specifically, the degree to which parents 1) are available to their children and involved in their children's learning activities, 2) are attracted to and use the computer themselves, and 3) are knowledgeable about the value and quality of academic software influenced whether children embraced the computer and Internet for creative, educational purposes, rather than primarily game play.

Recent findings are not nearly as encouraging when it comes to parental involvement with teens and interactive media. One researcher recently concluded that "the image of the solitary youngster seated in

front of a computer is accurate for over 60% of adolescents." One reason for this is that so many young people often know more than their parents about computers and Internet use, often serving as the technical "gurus" of the family.

But the use of interactive technologies is not necessarily an isolating event for young people. For many, it has become an important social activity. Social researchers may have found that more American adults are "bowling alone," but there's little evidence that children and teens are using computers completely alone. Recent research with children and families suggests that rather than being isolating, the Internet helps connect children (and parents) to others.

Interactive environments, particularly networked technologies can have a positive influence on social behaviors and intellectual development. There has, for example, been a popular – but still understudied – boom in communities of young media users who create their own web pages. Such personal online publishing offers a sophisticated way for young people to connect with their peers and others interested in the same topics. And many are seizing that opportunity with enthusiasm and creativity.

**MORE THAN A GAME?**

A decade before the first digital computer was conceived, Margaret Mead pointed out that playing games provides a critical opportunity for children to acquire the distinctive perspectives of social identities and voices. And more recent research has shown that children's fantasy play – like having an "imaginary friend" – can be a productive strategy in their own social development.

Some researchers suggest that online interaction through chat rooms and game-playing can have a similar function, allowing young people to take on identities they wish to explore and even helping them deal with difficult issues in their "real" lives. Conversely, some young people may use these media to "act out" in hostile or unhelpful ways both online and off. While a few studies have examined the formation of online personal relationships and their ability to satisfy social needs of adults, we know much less about the nature of those relationships, particularly for children and teenagers.

Online communications lack many of the characteristics of traditional relationships such as geographic proximity and physical appearance, cues about group membership and the broader social context. But

the very absence of some of these qualities in online communication may have great advantages, especially for children and teens. The emphasis on shared interests rather than social or physical characteristics can be empowering for all people, and especially for members of disadvantaged social groups, those who may be geographically isolated, or physically disabled.

Can the Internet enable awkward teens to find social niches that might otherwise elude them in their real world? Or may it lead them to withdraw and become isolated? (Certainly, parents also have legitimate safety concerns about child predators who seek to have socially inappropriate interactions with children both online and off.) In short, we have much more to learn about consequences – both positive and negative -- of networked relationships and communities for children's healthy social development.

**VIOLENCE AND AGGRESSION**

One of the most often expressed concerns about the old and new media is the impact of violent content on children and teenagers. The problem researchers have long identified with much popular media is that they present a combustible formula in which violence has no context, causes no bad consequences and results in no remorse. Today's generation of computer and video games are indeed more graphic, violent, and realistic than ever before.. But does the interactive, repetitive nature of these games increase the likelihood of subsequent aggressive behavior?

There are certain characteristics of violent computer and video games that make them powerful media experiences for children: First, identification with aggressive characters, particularly in games that allow children to not only choose their character but also select particular traits. Second, game players are active participants whose own behaviors lead to success or failure. Third, children receive constant reinforcement of aggressive choices by acting them out, and then being rewarded (with points, sound effects and access to new game levels) for doing so.

Theoretically, these qualities should increase the power of interactive games to teach and reinforce aggressive behavior. But there is only recent and very limited empirical evidence to substantiate this claim. Researchers have found some relationship between video game play and aggressive behavior by teenagers.

Several researchers have examined the short-term impact of violent video game play of children from 4 – 10 years old. Their results suggest that playing violent video games encourages relatively immediate increases in aggressive behavior, attitudes and thoughts – but only in the short-term. There has been little systematic research on the long-term influences of interactive game play, and especially limited attention given to young children.

One recent study examined the effect on 3rd and 4th grader's after playing a violent video game (*Mortal Kombat II*) or non-violent one (*NBA Jam:TE*). Steps were taken to "rig" the *Mortal Kombat II* game so that the young subjects would not experience its graphic violence in full; for example, no mutilation moves or spurting blood. That even relatively brief exposure to this "tamed-down" version of the game elicited aggressive responses by the children raises concerns about the long-term impact of the most violent games that are available daily on home computers, video gaming systems and arcades throughout the nation.

With limited long-term studies to date – and scholars themselves using different definitions of violence -- more research is needed to fully understand the potential impact on children of the current generation of interactive games.

**VAGUE WARNING SIGNS AND CONFUSING ROAD MAPS**

In 1994, the U.S. Congress required the computer and video game industries to develop some type of parental advisory label to be placed on game packaging. By far the dominant system is provided by the ESRB [Entertainment Software Rating Board], a ratings board created by the interactive game industry, labels game content based on five age-based categories: Early Childhood (EC), Everyone (E or K-A), Teen (T), Mature (M), and Adults Only (AO). There may also be specific content descriptors (edutainment, mild animated violence, comic mischief, realistic violence, mild language, suggestive themes and others) with the rating symbols.

The RSAC [Recreational Software Advisory Committee, now reconceived as the Internet Content Rating Association], an independent and nonprofit organization, developed content-based ratings derived from manufacturers' responses to a series of questions about violence, nudity, sex, and offensive language. Classification icons on game packaging or in advertisements appear as thermometers with four "temperature" readings. The temperature readings represent the level of intensity for these four behavioral categories and may also be accompanied by content descriptors.

Do ratings really provide useful information? Do parents even pay attention to them?

Of the thousands of products rated by the ESRB, 71% of those products are rated "E" for everyone. That one category can include everything from games that provide challenging, skill-building adventures to those that include violence or other undesirable content raises serious questions about the usefulness of such ratings. At the same time, researchers, parents, children, and commercial game raters have very different definitions of violent content, especially cartoon-type or fantasy violence.

In any event, there is little evidence that parents even use these rating systems when making purchases. Surveys indicate that after the first two years of being in effect, consumer awareness and use of the ratings was extremely low.

**4. Health and Safety**

**Health Education**. Interactive media, both online and off, has demonstrated an extraordinary potential to help children live healthier, safer lives. Interactive programs such as the *Life Adventure Series: Diabetes CD-ROM* or *Starbright Explorer Series: Exploring your Incredible Blood* are extraordinarily effective tools for helping children understand and manage their health conditions.

*Click Health's* action-adventure computer and video games -- like *Bronkie the Bronchiasaurus* for asthma or *Packy & Marlon* for diabetes -- demonstrably improve children's self-care for chronic illness. A clinical trial of *Packy & Marlon* found that diabetic children and adolescents who had access to the game at home for six months experienced a 77-percent decrease in diabetes-related emergency and urgent care clinical visits, compared to a control group of youngsters who had an entertainment game at home.

**Physical Effects**. Many adults who work constantly with computers have experienced a range of physical and ergonomic problems, from eyestrain to Carpal Tunnel Syndrome. But could the mouse and joystick prove to be as dangerous to young wrists as the curve ball proved to be on young Little Leaguers or repetitive workouts for young gymnasts? There is little existing research on how interactive media can affect children's physical health and development.

**Addiction**. A 1995 survey of 868 adolescents found that 50%, the majority of whom were boys, reported behaviors that would score high on an addiction scale. They reported playing on six or more days per week, playing for more than one hour at a time, feeling they play longer than intended, and neglecting homework to play. Other researchers, using criteria similar to those for pathological gambling, found that of 387 teens between 12 and 16 years-old, 20% were currently dependent on game playing and 25% had been so at some point in their lives.

**Weight and Lifestyle**. American children are more over-weight, slower and weaker than their counterparts in other developed nations and seem to be developing sedentary lifestyles at an earlier age. It may be that interactive game use and television viewing are displacing involvement in sport and other physical activity. While amount of television watching seems to predict whether children may be overweight, viewing behavior has not been shown to cause decreases in physical activity. Surprisingly, we found no published research exploring causal relationships between interactive media use and obesity. Only future research can tell us whether there is a connection between how much children watch TV or play interactive games and other sedentary behaviors that can affect their long-term health.

**THE PRIVATE LIFE OF CHILDREN AND FAMILIES**

Online privacy is developing into a major public policy issue as more and more Americans spend their time and money on the Internet. From advertisers whose "cookies" silently track surfing behavior to the potential for disabling viruses and credit card fraud, computer privacy and security presents a range of sensitive new issues. Questions of privacy and deceptive online advertising are especially significant with respect to children.

Web sites often ask children and adults alike to provide personal information such as name, age, gender and e-mail address. Researchers have found that children and teenagers are much more likely than parents to say it is OK to give sensitive information to commercial Web sites in exchange for a free gift.

We don't know much about how children perceive advertisements on the Internet, although past research on television suggests that a great deal depends on age. But unlike television and print media, online advertising is often subtly integrated within the content itself. Entire web sites provide an opportunity for children to interact with product brands and characters. A small exploratory study

suggests that even children 9 – 11 years may not be aware of the commercial intentions of many web sites.

In 1998, Congress recognized the need to regulate online marketing to children and passed the Children's Online Privacy Protection Act (COPPA), which provides safeguards against the collection of personal information from children under age 13. COPPA authorizes the Federal Trade Commission to develop and enforce data collection rules for commercial Web sites targeted at children, and requires advertisers to disclose how they collect and use such data.

**A Research Agenda for Quality Interactive Media**

We believe that the content industry, academic and market researchers, producers and parents, advocates and policy-makers all share an interest in doing the kind of research that can result in high-quality interactive media that provides not only successful, engaging entertainment, but also promotes healthy, happy and better educated children. To that end, we propose a potential national research agenda that includes:

**Building Common Ground Among Researchers**. All too often, groundbreaking theory-based research on children and interactive media languishes unnoticed in academic journals across different disciplines -- such as education, communication, psychology and sociology – which largely exist in isolation of one another. There is also a gulf between academia and the industry-based market researchers who play a key role in designing interactive media products for children. Clearly, we – and our children -- could all benefit from a more robust collaboration among scholars in different fields and between academic and market researchers. Scholars can gain critical insights into the market realities that drive what media experiences children have. While product-driven market researchers might gain broader insights into the role of media in children's social, intellectual and physical development.

**Research that is Useful to Content Producers**. As the success of products like *Sesame Street* and *The Magic School Bus* prove, a developmental approach to interactive media design can thrive in the marketplace. It will help parents make more knowledgeable purchasing decisions. It will help educators teach media literacy skills and instructional designers integrate interactive media into

children's learning environments. And it will help advocates and policy-makers set realistic priorities about how and when to bring public rule-making to bear on the private marketplace.

To support such research and collaboration we believe it's essential to:

- Provide funding to support developmentally based research on the uses, design, and effects of interactive media;
- Create a multidisciplinary research infrastructure that will provide a diverse pool of scholars the opportunity to study new media and children's issues systematically;
- Facilitate the exchange of ideas among a community of scholars, educators, and producers so they can translate current knowledge into entertaining and educational interactive media products for children;

**A Community of Scholars**. We should build a multidisciplinary community of scholars from both industry and academia fields devoted to studying children and media, a forum that brings together the best thinking and research not only across different academic disciplines, but also among those in the content industry and those in academia.

**National Media Lab**. We need a "road map" that classifies different types of interactive experiences children might have and the kinds of content they might encounter. We should establish a national media laboratory or consortium of media laboratories to examine, review, and evaluate new computer games. The national lab would not be a government ratings board, but an independent repository – both online and off -- for the huge variety of interactive media products and research findings about their design, usability and content.

Such a research consortium would be a natural point of organization for the community of scholars, by sponsoring such activities as:

- Regular multi-disciplinary and multi-industry conferences generating high profile, peer-reviewed publications of academic and industry-based research.
- Publishing an annual review of top research in the field.

- Disseminating research findings and, in clear, understandable language, interpreting the practical implications for parents, educators, children's media producers, policy-makers and the press.
- Speakers' Directory and a Consultants' Directory of affiliated researchers, so that other organizations could find trusted experts in the field.

We know can we can help foster an enlightened and successful generation of interactive producers and products through research on children that is developmentally based, multidisciplinary, cumulative, useful to content developers and responsive to the concerns of the public and policy-makers. But we cannot do so without first understanding much more than we do today about how these new media affect children – their thoughts, emotions, social relationships, and even their health. By generating an ongoing flow of credible, useful, systematic research, we can profoundly affect the lives and futures of next generation of Americans who are "growing up digital."