Washington and Lee Law Review

Volume 66 | Issue 3 Article 7

Summer 6-1-2009

Developmental Implications of Children's Virtual Worlds

Kaveri Subrahmanyam

Developmental Implications of Children's Virtual Worlds

Kaveri Subrahmanyam*

Abstract

As virtual worlds for children increase in popularity, it is important to examine their developmental implications. Given the limited research on this question, we use extant social science research on youth and digital media to understand how children's participation in virtual worlds might mediate their development. We identify four different pathways by which new media can potentially mediate development. Then we review relevant research on video games, which, like virtual worlds, contain three-dimensional online fantasy worlds; we also review research on online communication forums, which are like virtual worlds in that they allow users to create online selves and interact with one another. These studies also provide concrete examples of the pathways by which media influence development. We examine three specific questions about children's use of virtual worlds: what they typically do in them, their learning potential, and whether virtual world participation mediates development. We conclude that children's virtual world activities resemble their offline ones, indicating that their offline and online worlds may be connected. The potential for learning from virtual world participation is as yet unknown and requires further research. Children's online selves are connected to their offline ones and this has implications for their safety; although their interactions in virtual worlds appear to mirror offline patterns, we do not as yet know their potential benefits or costs. The Article concludes that although children's virtual world activities and interactions may be connected to their offline lives, there are several pressing questions about their participation that must be addressed.

* California State University, Los Angeles; Children's Digital Media Center, Los Angeles.

Table of Contents

I. Introduction

Virtual worlds for young children such as *Club Penguin* and *Webkinz* are relatively recent entrants among online contexts targeting children.[1] The marketing firm, eMarketer, recently estimated that approximately 20 million or 53% of online youth between three and seventeen years of age will visit virtual worlds by 2011.[2] Another recent analysis by Virtual Worlds Management indicated that, as of January 2009, there were approximately 200 online youth virtual worlds either live or in active development.[3] Thus, these newest online forums appear poised to become as popular with younger children as instant messaging and social networking sites are with adolescents.[4]

---

1. *See, e.g.*, Dawn C. Chmielewski & Alex Pham, *Disney Adds Fantasy Lands*, L.A. TIMES, Jan. 28, 2008, at C1 (noting that Disney and other entertainment companies are "rushing to capitalize on the latest internet phenomenon: the rise of virtual worlds for kids").

2. *See, e.g.*, Marketing Charts, U.S. Child and Teen Internet Users Who Visit Virtual Worlds (2006-2011) (Sept. 26, 2007), http://www.marketingcharts.com/interactive/virtual-worlds-are-trendy-spot-for-kids-and-teens-1794/emarketer-kid-teen-virtual-worldsjpg/ [hereinafter Marketing Charts Website] (last visited Sept. 29, 2009) (showing data about the youth use of virtual worlds) (on file with the Washington and Lee Law Review).

3. Dean Takahashi, *More than 200 Kids Virtual Worlds in Development*, VENTURE BEAT, Jan. 26, 2009, http://games.venturebeat.com/2009/01/26/more-than-200-kids-virtual-worlds-in-development (last visited Sept. 29, 2009) (on file with the Washington and Lee Law Review).

4. *See generally* Kaveri Subrahmanyam & Patricia Greenfield, *Online Communication and Adolescent Relationships*, 18 FUTURE CHILD. 119, 120 (2008) [hereinafter Subrahmanyam & Greenfield, *Online Communication and Adolescent Relationships*] ("The communication functions of electronic media are especially popular among adolescents.").

Virtual worlds that target young children, such as *Club Penguin*, *Webkinz*, *Neopets*, and *Whyville* are three-dimensional environments where children engage in a variety of activities.[5] Virtual world inhabitants assume *avatars*, which are their in-world three-dimensional representations, or "online faces," that other inhabitants see.[6] Today's enhanced graphics capabilities allow participants to edit any feature of their virtual world avatars, including hair, skin, tone, and other accessories (for example, clothes).[7] Some of the activities that children or their avatars engage in within virtual worlds include playing games, interacting and communicating with other avatars, dressing up their avatars, buying virtual goods such as furniture or accessories to decorate their in-world homes, and even caring for their virtual pets.[8] Children also can answer trivia, take quizzes, and participate in math, science, and social studies activities.[9] Most worlds use their own virtual currency (for example, *Kinzcash*) and often children can earn it by engaging in different activities; online transactions can even include bartering and pawning goods.[10] Although such online virtual contexts are not new and have been around for many years, they are a relatively new phenomenon in the lives of young children.[11] Indeed, research suggests that children are using electronic media at younger ages than

---

5. *See, e.g.*, Christy Matte, *Virtual Worlds for Kids: Pretend Play Online*, ABOUT.COM: FAMILY COMPUTING, http://familyinternet.about.com/od/websites/tp/virtualworldskids.htm (last visited Sept. 29, 2009) (summarizing several virtual worlds that are designed for child users) (on file with the Washington and Lee Law Review).

6. *See, e.g.*, Carolyn Jabs, *Talking with Your Children About Online Avatars: Understanding the Difference Between Imagination and Reality*, INDY'S CHILD, ONLINE COLUMN: GROWING UP ONLINE, Feb. 1, 2009, http://www.indys child.com/Articles-i-2009-02-01-230763.112112_Talking_With_Your_Children_About_Online_Avatars.html (last visited Sept. 29, 2009) (discussing the role of avatars in virtual worlds and noting that an avatar is "a virtual representation of a person") (on file with the Washington and Lee Law Review).

7. *See generally* YASMIN B. KAFAI, DEBORAH A. FIELDS & MELISSA S. COOK, YOUR SECOND SELVES: RESOURCES, AGENCY, AND CONSTRAINTS IN AVATAR DESIGNS AND IDENTITY PLAY IN A TWEEN VIRTUAL WORLD 31–32 (Situated Play, Proceedings of Digital Games Research Association 2007 Conference) (Tokyo, Japan 2007), *available at* http://www.digra.org/dl/db/ 07311.32337.pdf (providing examples of the avatar features that participants in virtual worlds can modify).

8. *See generally* Matte, *supra* note 5 (discussing some of the activities that children can perform in virtual worlds).

9. *See, e.g.*, Christy Matte, *Webkinz World Review*, ABOUT.COM: FAMILY COMPUTING, http://familyinternet.about.com/od/websites/fr/webkinzreview.htm (last visited Sept. 29, 2009) (summarizing the features and activities for online users in the virtual world *Webkinz*) (on file with the Washington and Lee Law Review).

10. *Id.*

11. *See* Paul Messinger, Eleni Stroulia & Kelly Lyons, *A Typology of Virtual Worlds: Historical Overview and Future Directions*, 1 J. VIRTUAL WORLDS RES. 1, 3 (2008) (discussing the historical progression of virtual worlds).

before[12] and news reports suggest that children as young as three are participating in virtual worlds.[13]

In view of the growing popularity of virtual worlds,[14] it is important to determine what exactly children do when they participate in such contexts and equally critical to determine the potential of such participation to mediate their development—in particular, the costs and benefits that might accrue to children as a result of their participation in these online forums.[15] Not surprisingly, research on this topic is sparse, and, in order to understand the implications of virtual worlds for children, we will use extant social science research on youth and other digital media such as video games and online contexts such as chat rooms, instant messaging, and social networking sites. Like video games, virtual worlds are three-dimensional, interactive, online fantasy worlds and, like online communication forums, they enable participants to create online selves and to interact and communicate with other users.[16]

This Article begins by presenting a theoretical framework to understand the potential role of electronic media in young people's lives; specifically, it presents four pathways by which these newer forms of media potentially can mediate development. Parts III and IV review existing research on youth and digital media—Part III examines research on youth and video games and Part IV focuses on youth and online media. Additionally, the research presented in both sections serves to illustrate the pathways of influence identified in Part II. Part V examines three specific research questions in order to understand children's immersion in virtual worlds and the developmental implications of these online activities. Part V.A focuses on what young children are doing in virtual worlds and in particular whether their online

---

12. *See generally* VICTORIA J. RIDEOUT, ELIZABETH A. VANDEWATER & ELLEN A. WARTELLA, ZERO TO SIX: ELECTRONIC MEDIA IN THE LIVES OF INFANTS, TODDLERS AND PRESCHOOLERS (Henry J. Kaiser Family Foundation, 2003), *available at* http://www.kff.org/entmedia/upload/Zero-to-Six-Electronic-Media-in-the-Lives-of-Infants-Toddlers-and-Preschoolers-PDF.pdf ("Recent years have seen an explosion in electronic media directed at the very youngest children in our society.").

13. *See* Chmielewski & Pham, *supra* note 1 (noting that some virtual games attract "children as young as 3").

14. *See, e.g.*, Marketing Charts Website, *supra* note 2 (discussing the increase in child and teen visits to virtual worlds).

15. *Id.*

16. *See generally* Charles Jenkins, *Your Own Virtual World: Play God - Be God (Even If It's Only Electronically)*, ARTICLESBASE: FREE ONLINE ARTICLES DIRECTORY, June 26, 2009, http://www.articlesbase.com/computer-games-articles/your-own-virtual-world-996244.html (last visited Sept. 29, 2009) (discussing video games and virtual worlds and noting that "virtual reality is a hypothetical three-dimensional visual world created by a computer") (on file with the Washington and Lee Law Review).

activities resemble their offline ones. In Part V.B, the issue of learning potential is addressed: Can learning occur by way of participating in informal contexts such as virtual worlds and most crucially, if such learning does occur, can it transfer to the formal context of the class room? Part V.C explores how virtual world participation might mediate children's development. It starts by examining research on children's avatars and online interactions within virtual worlds; using these findings as well as the results of prior research, it identifies questions that must be answered in order to understand the impact of online self-presentation and interaction on children's identity, relationships, and well-being. Part VI concludes the Article by summarizing what is known about children's virtual world participation and reiterating the main questions for future research on this topic.

II. Theoretical Framework

The developmental framework regarding the role of media that we adopt draws on Vygotsky's sociocultural theory that contexts play a mediating role in development.[17] Developmental psychologists traditionally have considered parents, schools, and peers to be the important contextual influences in children's lives.[18] As youth are growing up enmeshed in media, it is becoming evident that interactive media must be viewed as an important social context for development.[19] Vygotsky further specified that cultural tools such as the abacus, language, and mathematics are essential for the development of higher mental functions.[20] Extending this idea, we have noted that different cultural tools elicit and develop different sets of cognitive skills.[21] We have argued that

---

17. *See* Kaveri Subrahmanyam & Patricia Greenfield, *Media Symbol Systems and Cognitive Processes*, *in* THE BLACKWELL HANDBOOK OF CHILDREN, MEDIA, AND DEVELOPMENT 166, 166–67 (Sandra Calvert & Barbara Wilson eds., 2008) [hereinafter Subrahmanyam & Greenfield, BLACKWELL] (introducing a framework for considering media as tools for human development); LEV S. VYGOTSKY, MIND IN SOCIETY: THE DEVELOPMENT OF HIGHER PSYCHOLOGICAL PROCESSES 1–9 (Michael Cole et al. eds., 1978) (introducing Vygotsky's theoretical approach to psychology).

18. *See* LAURENCE STEINBERG, ADOLESCENCE 133–214 (McGraw-Hill, 2008) (discussing the significance of families, peer groups, and schools on adolescents).

19. *See* Kaveri Subrahmanyam, David Smahel & Patricia Greenfield, *Connecting Developmental Constructions to the Internet: Identity Presentation and Sexual Exploration in Online Teen Chat Rooms*, 42 DEVELOPMENTAL PSYCHOL. 395, 395 (2006) ("[T]he primary function of the Internet for this age group is the importance of the Internet as a social context for adolescent development.").

20. *See generally* VYGOTSKY, *supra* note 17, at 38–57 (discussing the use of mathematics and simple tools in Vgotsky's studies on child psychology and development).

21. *See* Ashley Maynard, Kaveri Subrahmanyam & Patricia Greenfield, *Technology and*

computers, digital games, and the Internet are the newest cultural tools in technological societies, and likely will influence the development of thinking and learning.[22]

Within this theoretical framework, we examine four potential pathways of influence to understand the role of media in development. First, consider the fact that media use not only involves time spent on that particular activity but presumably also takes time away from other potentially more valuable activities, a proposal called the time displacement hypothesis.[23] For children, time using media could thus take away from book reading, engaging in physical activities, and interacting face-to-face with friends and family members.

The second and third pathways stem from the nature of media themselves. In prior work, this author has argued that to understand the influence of media on thinking and learning we have to distinguish between different aspects of media such as "the physical platform or hardware (i.e., the television set, computer, or video game system), formal features (i.e., audio visual production features that characterize a medium), and the content (i.e., the topic or focus of a television program, software program) within it."[24] The second pathway of media influence is via the formal features of a medium, which are the symbolic and representational systems—for instance, enactive (action-based representations), iconic (image-based representations), or symbolic (symbol-based representations)—that the user has to decode to grasp the message.[25] Thus, use of media forms likely will lead to internalization of the skills utilized by the medium and consequently influence the developments of those particular representational skills.[26] The third pathway of influence involves the content of media, which consists of the message conveyed by the formal features—in

---

the Development of Intelligence: From the Loom to the Computer, *in* INTELLIGENCE AND TECHNOLOGY: THE IMPACT OF TOOLS ON THE NATURE AND DEVELOPMENT OF HUMAN ABILITIES 29, 29 (Robert Sternberg & David Preiss eds., 2005) ("This chapter will also show that different tools in different cultures not only utilize, but also develop particular sets of cognitive skills.").

22. *See id.* at 49–50 (discussing the conclusion that new technology, specifically internet-based technology, will lead to new definitions of verbal intelligence and the development of new cultural skills).

23. *See* Norman H. Nie & D. Sunshine Hillygus, *Where Does Internet Time Come from? A Reconnaissance*, 1 IT & SOCIETY 1, 2 (2002) (explaining the time displacement hypothesis and noting that "increased time on the Internet often comes at the expense of other activities").

24. Subrahmanyam & Greenfield, BLACKWELL, *supra* note 17, at 166.

25. *See id.* ("Just as the words of a language are symbols that a listener has to decode, the formal features of media consist of symbols systems that the user has to decode to understand the message.").

26. *See id.* at 182 ("The representational systems of media become internalized and become intellectual tools, developing the valued skills of a particular culture, be they visual or verbal in form.").

online contexts, messages could include aggressive, pro-social, or academic themes.[27] Just as we expect particular formal features of media to mediate development, we similarly can expect message content in media forms to influence development.

A fourth pathway of influence involves the communication environment within online contexts such as social networking sites, games, and virtual worlds. Several features of these contexts are relevant, such as the ease with which users can interact with others, their lack of face-to-face cues, including eye contact and gestures, as well as the potential for contact with strangers.[28] Scholars have speculated that, because of these reasons, online communications might be more superficial and lead to weaker ties that provide less support than face-to-face offline interactions.[29] Alternatively, young people may use these sites to connect with individuals from their offline lives and consequently online communication might be beneficial to them.[30]

III. Evidence from Studies on Youth and Video Games

In this section, we present findings from video game studies that we will consider in Part V to answer the research questions about children and virtual worlds that we laid out at the beginning of the article. One pervasive finding is that there are gender differences in both the extent of video game play as well as in game preference.[31] Boys typically spend more time playing video games; Sherry and Dibble note that, across all ages, boys averaged "an hour and a half

---

27. *See id.* at 168–69 (noting that understanding of content is distinct from recognizing the formal features and symbols of a medium).

28. *See* Subrahmanyam & Greenfield, *Online Communication and Adolescent Relationships*, *supra* note 4, at 130 ("Because online interactions lack important features of face-to-face contact, they are believed to be less rich than offline ones.").

29. *See generally* Robert Kraut et al., *Internet Paradox Revisited*, 58 J. SOC. ISSUES 49, 50 (2002) ("Many writers have worried that the ease of Internet communication alone might encourage people to spend more time alone, talking on-line with strangers or forming superficial 'drive by' relationships, at the expense of deeper discussion and companionship with friends and family.").

30. *See id.* ("Because the Internet permits social contact across time, distance, and personal circumstances, it allows people to connect with distant as well as local family and friends, with coworkers, with business contacts, and with strangers who share similar interests. Broad social access could increase people's social involvement . . . .").

31. *See generally* Kaveri Subrahmanyam & Patricia Greenfield, *Computer Games for Girls: What Makes Them Play?*, *in* FROM BARBIE TO MORTAL KOMBAT: GENDER AND COMPUTER GAMES 46, 46–71 (Justine Cassell & Henry Jenkins eds., 1998) [hereinafter Subrahmanyam & Greenfield, *Computer Games for Girls*] (discussing game features that girls find appealing).

more game play."[32] Similarly, boys and girls find different games appealing and, based on the results of four studies, Sherry and Dibble concluded that boys find action, fighting, shooting, adventure, and sports games more appealing than do girls, who are more likely to play platform games, puzzle games, and educational games.[33] To explain these differences in game appeal, we analyzed children's offline play as well as television and literature preferences, and suggested that girls like electronic games that are nonaggressive and that are set in familiar settings with familiar characters.[34]

A second line of prior video game research that is relevant to virtual worlds is work on the cognitive impacts of video game playing.[35] This line of work is premised on the second pathway of media influence described earlier, which suggested that the formal features of media can influence thinking and learning.[36] Video games are spatial, iconic, and dynamic, and have multiple happenings at different points on the screen and these features utilize and, therefore, might develop a variety of attention, spatial, and iconic skills.[37] There is now a solid body of research that suggests that playing a computer or video game does impact the particular attentional, spatial, and iconic representational skills that the game utilizes.[38] For instance, Green and Bavelier found improvements in attentional skills following training on an

---

32. *See generally* John L. Sherry & Jayson L. Dibble, *The Impact of Serious Games on Childhood Development*, *in* SERIOUS GAMES: MECHANISMS AND EFFECTS (Ute Ritterfeld et al. eds., Routledge) (forthcoming 2009).

33. *See id.* at 10 ("Also dramatic are the clear differences in genre preferences between boys and girls. Across four studies, boys prefer action, fighting, shooting, adventure, and sports games, while girls prefer classic platform games, puzzle games, and educational games." (internal citations omitted)).

34. *See* Subrahmanyam & Greenfield, *Computer Games for Girls*, *supra* note 31, at 52–59 (discussing the characters and settings of *Barbie Fashion Designer* and other computer games that appealed to girl game users).

35. *See generally* Subrahmanyam & Greenfield, BLACKWELL, *supra* note 17, at 174–78 (discussing recent studies on video games that "show that computer game playing does have an impact on the specific cognitive skills that are utilized in the game").

36. *See id.* at 166–67 (discussing how formal features of media influence the cognitive process).

37. *See* Maynard et al., *supra* note 21, at 132 ("[A]ction games, which are spatial, iconic, and dynamic, have multiple, often simultaneous, things happening at different locations and the ability to 'read' and utilize the information on computer screens may therefore require a variety of attentional, spatial, and iconic skills.").

38. Subrahmanyam & Greenfield, BLACKWELL, *supra* note 17, at 175 ("There is now a solid body of work that has shown that computer game playing does have an impact on the specific cognitive skills that are utilized in the game such as attention and representation (iconic and spatial).").

action game, *Medal of Honor*.[39] In an earlier training study of ten- to eleven-year-old children playing the video game, *Marble Madness*, for just 2.25 hours led to improvements in the particular spatial skills utilized by the game, such as anticipating targets and visualizing paths.[40] Although we do know that the formal features of a medium influence cognition, there is much that we do not know about the specifics of this influence.[41] The final line of research on video games and youth relates to content effects; drawing on the third pathway of influence identified earlier, there is now a body of work that demonstrates playing violent video games does increase aggressive thoughts, behaviors, and actions, and reduces pro-social helping behavior.[42] This line of work and its implications for children and virtual worlds is addressed by Whitaker and Bushman in this issue of the Washington and Lee Law Review and is not discussed further in this paper.[43]

IV. Evidence from Studies on Youth and the Internet

Much of the extant research on youth and the Internet concerns adolescents, for whom the communication and interaction uses are the most popular.[44] The communication applications of the Internet include email, instant messaging, blogs, social networking sites, and virtual worlds.[45] The first

---

39. *See* C. Shawn Green & Daphne Bavelier, *Action Video Game Modifies Visual Selective Attention*, 423 NATURE 534, 534–35 (2003) ("These results indicate that VGPs [video-game players] possess enhanced attentional capacity.").

40. *See* Kaveri Subrahmanyam & Patricia M. Greenfield, *Effect of Video Game Practice on Spatial Skills in Girls and Boys*, 15 J. APPLIED DEVELOPMENTAL PSYCHOL. 13, 13–14 (1994) ("Video game practice was significantly more effective than the word game in improving spatial performance on the posttest assessment.").

41. Subrahmanyam & Greenfield, BLACKWELL, *supra* note 17, at 181–83 (discussing the current scholarship on media symbols and development of cognitive processes and discussing implications for a new theory of media and further studies).

42. *See generally* Craig A. Anderson, *An Update on the Effects of Playing Violent Video Games*, 27 J. ADOLESCENCE 113, 113 (2004) ("An updated meta-analysis reveals that exposure to violent video games is significantly linked to increases in aggressive behaviour, aggressive cognition, aggressive affect, and cardiovascular arousal . . . . Experimental studies reveal this linkage to be causal.").

43. Jodi L. Whitaker & Brad J. Bushman, *Online Dangers: Keeping Children and Adolescents Safe*, 66 WASH. & LEE L. REV. 1053 (2009).

44. *See* Subrahmanyam & Greenfield, *Online Communication and Adolescent Relationships*, *supra* note 4, at 120–22 (discussing studies on the many online communication tools used by adolescents).

45. *See id.* at 120 ("Teens are heavy users of new communication forms such as instant messaging, e-mail, and text messaging, as well as communication-oriented Internet sites such as YouTube, interactive video games, and virtual reality environments such as Second Life.").

and fourth pathways of influence described earlier raise questions concerning the relation between the time that young people spend online and its impact on their well-being. To date, the research on the impact of internet time use on adolescent well-being has been equivocal, and a recent examination of the contradictory findings suggested that time may not be that important; rather, variables such as the type of online activities and offline-resources (e.g., social support) might mediate the relation between internet use and well-being.[46] For instance, internet effects could vary depending on whether a teen uses online communication tools to meet and interact with strangers or whether she uses it to expand on her existing offline relationships.

Research from a variety of online contexts suggests that, for teens, online and offline worlds are psychologically connected; in other words, youth users "bring people and issues from their offline worlds into their online ones."[47] One study of instant messaging showed that adolescents used it to communicate with school friends about events at school, gossip, and similar matters.[48] Similarly, teens seem to project offline concerns, such as sexuality and identity to their online contexts; detailed analysis of chat discourse revealed that identity presentation, sexual comments,[49] and partner selection[50] dominated in online teen chat rooms. Thus, it appears that youth, at least adolescents, are not using the Internet to create new behavior or meet strangers online, but are using it to help them connect with the people and issues in their offline lives. Parts V.A–C use the foregoing research to answer the three research questions that were raised in the Introduction.

---

46. *See* Kaveri Subrahmanyam & Gloria Lin, *Adolescents on the Net: Internet Use and Well-Being*, 42 ADOLESCENCE 661, 661–62 (2007) ("However, other research has not found a link between adolescents' time online and psychological wellbeing (e.g., dispositional or daily wellbeing, loneliness, depression) as well as aspects of social networks, such as size of local and distant social circles and amount to face-to-face communication." (internal citations omitted)).

47. Kaveri Subrahmanyam et al., *Online and Offline Social Networks: Use of Social Networking Sites by Emerging Adults*, 29 J. APPLIED DEVELOPMENTAL PSYCHOL. 421, 421 (2008).

48. *See* Elisheva F. Gross, Jaana Juvonen & Shelly L. Gable, *Internet Use and Well-Being in Adolescence*, 58 J. SOC. ISSUES 75, 86 (2002) ("In addition, on-line communication was reported to be mainly devoted to ordinary yet intimate topics (e.g., friends, gossip) and motivated by a desire for companionship.").

49. *See* Subrahmanyam et al., *supra* note 19, at 400–03 (discussing the results of a study examining teen discussion of sexual topics and partner selection).

50. *See* David Smahel & Kaveri Subrahmanyam, *Any Girls Want to Chat Press 911: Partner Selection in Monitored and Unmonitored Teen Chat Rooms*, 10 CYBERPSYCHOL. & BEHAV. 346, 348 (2007) ("Pairing-off and romantic partner selection, quintessential adolescent activities, are found online just as they are ever-present in the offline world.").

V. Understanding Children's Use of Virtual Worlds

A. What Are Children Doing in Virtual Worlds?

To begin to understand the developmental implications of children's virtual worlds, we need to start with what children are doing within them. From prior research on youth and online communication forms, we can expect that young children similarly will use virtual worlds for things they do in their offline lives.[51] This was indeed what researchers Guantlett and Jackson found in their case study of BBC's *Adventure Rock* virtual world, a themed island for six- to twelve-year-olds.[52] *Adventure Rock* is a 3D virtual world that allows children to independently explore and create (e.g., music, drawing, or animation) within the online space, and also to interact with other users via a website and message board.[53] From interviews with the participants as well as diary records of a participant observer, the researchers found that children adopted different roles while exploring the virtual world, including those of explorer-investigators, self-stampers, social climbers, fighters, collector consumers, power users, nurturers, and life-system builders.[54] The researchers suggest that the children seemed to be using the online spaces to try out things but with the added advantage of not having to deal with the consequences that likely would follow if they tried them out in the offline world; examples of what children said they were able to learn included using a keyboard, using animation, and learning to explore.[55] From a developmental perspective, it is

---

51. *See* Thomas J. Hanson, Virtual Worlds—Westminster Professors Discuss Research (July 7, 2008), http://www.openeducation.net/2008/07/01/virtual-worlds-westminster-professors-discuss-research (last visited Sept. 29, 2009) ("We found children wanted to rehearse real life in Adventure Rock, therefore it was a very useful tool for practicing skills.") (on file with the Washington and Lee Law Review).

52. *See* DAVID GAUNTLETT & LIZZIE JACKSON, VIRTUAL WORLDS—USERS AND PRODUCERS: CASE STUDY: ADVENTURE ROCK 13–20 (Presentation at the Children in Virtual Worlds Conference, May 22, 2008, Westminster, UK), *available at* http://www.childrenvirtualworlds.org.uk/pdfs/Gauntlett_and_Jackson_May_2008.pdf (discussing the preliminary findings of a study on how children used the virtual world *Adventure Rock*).

53. *See, e.g.*, LIZZIE JACKSON, DAVID GAUNTLETT & JEANETTE STEEMERS, CHILDREN IN VIRTUAL WORLDS: ADVENTURE ROCK USERS AND PRODUCER STUDY 11 (2008), *available at* http://www.bbc.co.uk/blogs/knowledgeexchange/westminsterone.pdf ("Adventure Rock is one of a suite of new services which provide new kinds of creative environments for children. The 3D virtual place offers exploration, gaming and studios (for the creation of music, cartoons, animation, video, dancing, and 'inventing things').").

54. *See id.* at 25 ("The research study found the children had eight 'orientations to' *Adventure Rock*, explorer-investigators, social climbers, collector-consumers, life-system builders, selfstampers, fighters, power-users, and nurturers.").

55. *See id.* at 46–47 (discussing the values of virtual worlds for children including

worth noting that the gender and age trends found in the virtual world paralleled offline play.[56] Whereas fighters were more likely to be male and older, nurturers were more likely to be younger and, when older, more likely to be female; older children preferred group interaction-based activities, whereas younger children preferred solo play.[57] Further evidence that young children take their offline behaviors to their online spaces comes from researchers Fields and Kafai's observation of cheating, bullying, stuffing ballot boxes, and other similar negative behavior within *Whyville*, a virtual world for eight- to sixteen-year olds.[58] Although these findings are only preliminary, they indicate that young children's lives in virtual worlds may be psychologically connected to their offline ones. More research is necessary, but if confirmed, we can look to children's offline lives to understand their online ones.[59] These findings also suggest that, when designing virtual worlds for children, designers should seek to connect them to children's offline lives, bearing in mind that, although designers create and control the structural features of the online world, players construct its virtual culture.[60]

B. Learning from Virtual Worlds?

Since the first generation of video games and other entertainment technologies, their potential for learning has been a big question.[61] The second

---

"rehearsing having responsibilities").

56. *See id.* at 56–57 (discussing the ownership and use of media by age and gender).

57. *Id.*

58. *See* DEBORAH A. FIELDS & YASMIN B. KAFAI, STEALING FROM GRANDMA OR GENERATING CULTURAL KNOWLEDGE? CONTESTATIONS AND EFFECTS OF CHEATS IN A TWEEN VIRTUAL WORLD 194–95 (Situated Play, Proceedings of Digital Games Research Association 2007 Conference) (Tokyo, Japan 2007), *available at* http://www.digra.org/dl/db/07312.48067.pdf. Fields and Kafai state:

> In this paper we look at the cheat sites created by players of one MUVE, Whyville.net, that encourages youth ages 8–16 to play casual science games in order to earn a virtual salary (in 'clams'), which youth can then spend on buying and designing parts for their avatars (virtual characters), projectiles to throw at other users, and other goods.

Id.

59. *See id.* at 194–196 (discussing the implications that the use of cheat sites may have in a player's online and offline interactions).

60. *See id.* at 195 (querying what the existence of cheat sites reveals "both about the designers of the sites and the nature of the science games themselves").

61. *See generally* Subrahmanyam & Greenfield, *Computer Games for Girls*, *supra* note 31 at 46–47 (discussing issues and trends in research on the effects of video games on cognitive processes and learning).

research question that we address here is whether children's virtual worlds similarly offer the potential for learning and, if they do, whether the learning that occurs within such informal contexts will transfer to the more formal context of the classroom. A recent panel on what children could learn in digital worlds identified the following topics: socialization, social interaction, problem solving, science concepts, reading and writing, spelling literacy, learning about technology, and citizenship and consumerism.[62] Research on this question is scarce, and as before we turn to prior research on video games for some clues, specifically whether the form and content of media can influence thinking and learning. We look at both possibilities in turn.

As noted earlier, formal features of video games have been tied to representational gains and playing games such as *Marble Madness* and *Medal of Honor* has been found to improve spatial and attentional skills, respectively.[63] To date, we do not know of any empirical work that has investigated the effects of the formal features of online contexts. However, in earlier work, we speculated that, because online communication applications involve the comprehension and production of text, one area of influence was likely to be verbal representational skills.[64] Based on an analysis of discourse in a teen online chat room, Greenfield and Subrahmanyam noted that young users are creating new chat codes, such as shortened and incomplete sentences, eliminating writing conventions (for example, no capitalization or absence of apostrophes), shortened words ("u" for "you"), and even new forms such as "lol" ("laughing out loud") and "nvm" ("never mind").[65] As instant messaging, text messaging, and hand-held devices have proliferated, such compressing of written language has become pervasive and most readers are undoubtedly familiar with acronyms ("TTYL"), all lower case writing ("i will do that"),

---

62. *See* University of Southern California, Network Culture Project Website, The Wonders and Worries of What Kids Learn in Virtual Worlds (Conference: What are Kids Learning in Virtual Worlds? Nov. 14, 2007), http://networkculture.usc.edu/insidencp/newsroom/8-news/31-the-wonders-and-worries-of-kids-being-in-virtual-worlds.html (last visited Sept. 29, 2009) (summarizing the conference and the major topics addressed by panelists) (on file with the Washington and Lee Law Review).

63. *See generally* Subrahmanyam & Greenfield, BLACKWELL, *supra* note 17, at 176–77 (discussing studies on the effects of computer games on spatial skills and other cognitive processes).

64. *See id.* at 179 ("While the information applications of the internet largely require comprehension of text, the communication applications (e.g., email, instant messaging) require both the production and comprehension of text.").

65. *See* Patricia M. Greenfield & Kaveri Subrahmanyam, *Online Discourse in a Teen Chatroom: New Codes and New Modes of Coherence in a Visual Medium*, 24 J. APPLIED DEVELOPMENTAL PSYCHOL. 713, 725–35 (2003) (discussing the results of a study on teen use of chat codes in online chat rooms).

shortened words, and telegraphic speech ("c u ltr") that seem to have become an integral part of our electronic lexicons.[66]

Rosen calls these informal writing styles "textisms," and he and his colleagues found that greater use of textisms relates to lower writing scores, even after controlling for gender and age.[67] Children's virtual worlds predominantly entail text-based activities and interactions, and young people's immersion in them likely will have benefits and costs—on the one hand they do provide opportunities to read and comprehend text; at the same time, prior research leads us to speculate that the informal language styles used within them might spill over into narrative and expository writing forms that are expected in formal settings such as schools and the workplace.[68] Avatars are also a part of the formal representational language of virtual worlds; for instance, an avatar with few accessories signifies a "newbie" and children inhabiting virtual worlds must learn this "language" in order to successfully navigate within them.[69] As with the use of writing, research is needed to evaluate avatars as symbol systems and to assess how use of these newer symbols might relate to young children's online and offline self-presentation and perception of others.

Content effects of computers and video games are more mixed—although aggressive games have negative effects,[70] educational games have revealed limited to no academic effects.[71] With regard to content learning in virtual worlds, Kafai and colleagues conducted a participatory simulation study, where a virtual experience was integrated with participants' science curriculum at

---

66. *See* NetLingo, The Internet Dictionary, http://www.netlingo.com (last visited Sept. 29, 2009) (defining commonly used acronyms in electronic media).

67. *See* Larry Rosen, Commentary: The Impact of Textisms on English Literacy (Mar. 26, 2008), http://www.csudh.edu/psych/Commentary%20on%20the%20Impact%20of%20Textisms%20on%20English%20Literacy.htm (last visited Sept. 29, 2009) (discussing the results of a study on the impacts that "textisms" have on writing in teens) (on file with the Washington and Lee Law Review).

68. *See* Greenfield & Subrahmanyam, *supra* note 65, at 735–36 (discussing trends in language use by children in online worlds).

69. *See id.* at 736 (noting the unique language used by young people in online discourse and noting that first "native speakers" of the chat register are children and adolescents).

70. *See generally* Anderson, *supra* note 42, at 120 ("[T]he significance of violent video game effects on key aggression and helping related variables has become clearer.").

71. *See* Kaveri Subrahmanyam, *Computers as Learning Tools*, *in* CHICAGO COMPANION TO THE CHILD (University of Chicago Press) (forthcoming 2009) ("Despite the proliferation of educational computer games, in the classroom, there is little hard evidence of specifically academic benefits from educational computer games.") (manuscript on file with the Washington and Lee Law Review).

school.[72] They used *Whyville*, where participants can engage in science and social activities.[73] Students from two sixth-grade classrooms experienced an epidemic of a virtual infectious disease, "Whypox" within *Whyville*, while at the same time learning about natural infectious diseases as part of their science curriculum.[74] Using students' answers on a pre- and post-test, the researchers concluded that, although there were significant advances in their understanding of natural disease, most explanations still emphasized pre-biological mechanisms (for example, mechanical transfer of disease through contact) versus truly biological ones (for example, biology of germs or white blood cells).[75] This finding is consistent with our earlier point that the content effects of digital media have generally been slight or even downright disappointing.[76] A recent year-long study conducted by the Department of Education (DOE) found no gains on reading and math scores following the use of reading and mathematics software in the classroom.[77] For virtual worlds to live up to their hypothesized learning potential, we not only have to show that they lead to learning but, more importantly, the learning in question must transfer to academic contexts. The latter challenge is a fairly serious one—Kafai and Fields's science learning study was conducted at an elementary school affiliated with a School of Education; the science teacher was knowledgeable about *Whyville* and actively integrated the virtual with the physical.[78] Yet, despite these advantages, the virtual simulation was not effective in bringing about

---

72. *See* Nina Neulight et al., *Children's Participation in a Virtual Epidemic in the Science Classroom: Making Connections to Natural Infectious Diseases*, 16 J. SCI. EDUC. & TECH. 47, 47–58 (2007) ("This paper investigates the integration of a multi-user virtual environment (MUVE), called Whyville, within classroom curriculum about infectious disease.").

73. *See generally* FIELDS & KAFAI, *supra* note 58, at 195–96 (discussing the nature of the virtual world *Whyville*).

74. *See* Neulight et al., *supra* note 72, at 48 ("In this study, two classes with a total of 46 sixth-grade students became members of Whyville and were able to access the website at home and during science class where they learned about infectious diseases.").

75. *Id.* at 55–56 ("We found that while the majority of students still reasoned with pre-biological causal explanations, there was a significant change in students' responses between pre and post from pre-biological to biological explanations, . . . twice as many students reasoned about natural infectious disease with a biological reasoning at the end of the study.").

76. *See, e.g.*, Subrahmanyam, *supra* note 71 (discussing the lack of evidence that computers are useful as educational tools).

77. *See generally* MARK DYNARSKI ET AL., EFFECTIVENESS OF READING AND MATHEMATICS SOFTWARE PRODUCTS: FINDINGS FROM THE FIRST STUDENT COHORT 15 (United States Department of Education Report to Congress, Mar. 2007), *available at* http://ies.ed.gov/ncee/pdf/20074005.pdf (summarizing the findings of the study and noting that "test scores were not significantly higher in classrooms using selected reading and mathematics software products").

78. *See* Neulight et al., *supra* note 72, at 57 (discussing the science teacher's significant role in the study).

fundamental changes in students' understanding of natural infectious disease, an admittedly complex concept. It is thus too early to know whether virtual worlds can have positive effects on children's thinking and learning, and, if they do, the particular contexts (for example, academic versus nonacademic) in which they are most likely to occur.

C. Developmental Implications of Virtual Worlds?

The last question we examine concerns the developmental implications of young children's virtual world participation. To do so, we focus on aspects of online communication contexts that have received the most attention. First, online contexts afford users the ability to remain as anonymous as they choose to be and most are disembodied, in that information about their bodies is not readily available; consequently, user names, nicknames (or screen names), and avatars are their online representations, and it was speculated that users would take advantage by experimenting with alternative identities.[79] Second, they allow users to interact and communicate with others, both strangers as well as people from their offline lives, leading to questions about the quality of online relationships and their impact on users' other relationships as well as on their well-being.[80] Here, we examine these two issues in the context of virtual worlds.

Within virtual words, children use three-dimensional avatars to represent themselves and, from a developmental perspective, it is important to understand what role virtual participation might play in young people's identity construction and development.[81] Insight into their online self-presentation also has important implications for their online safety. A qualitative study of *Whyville* actually found that users adopted a variety of avatars, some were like users in offline life, others were different, and still others were either for or against a popular trend.[82] But research on a children's multiuser domain

79. *See generally* Subrahmanyam & Greenfield, *Online Communication and Adolescent Relationships*, *supra* note 4, at 139 ("Early on, some observers saw the Internet, with its potential for anonymity and disembodied interaction, as a perfect venue for such identity exploration and experimentation.").

80. *See generally id.* at 125 (discussing the effects of electronic media on relationships with friends and family).

81. *See* KAFAI ET AL., *supra* note 7, at 31 (discussing a study of how young people construct avatars for interaction in a virtual world).

82. *See generally* YASMIN KAFAI, DEBORAH FIELDS & MELISSA COOK, YOUR SECOND SELVES: RESOURCES, AGENCY, AND CONSTRAINTS IN AVATAR DESIGNS AND IDENTITY PLAY IN A TWEEN VIRTUAL WORLD 37–38 (Situated Play, Proceedings of Digital Games Research Association 2007 Conference) (Tokyo, Japan 2007), *available at* http://www.digra.org/dl/db/

(MUD) by Sandra Calvert and her co-researchers revealed that children's avatars mostly mirrored offline properties such as gender and interests.[83] Even more interestingly, gender-bending (the phenomenon where children assume an avatar whose gender is the opposite of their offline gender) was not very frequent, but when it did occur, it generally did so when the child was in the MUD with familiar peers.[84] These findings are consistent with prior research on adolescents in chat rooms, which suggests that young people's online nicknames typically reflect their gender, an important part of their offline identity.[85] Although young people do not seem to go online to assume different selves and identities, they nonetheless use online contexts for self-representation and to construct narratives about themselves.[86] We cautiously suggest that young children similarly do not use virtual worlds for identity exploration, and their online selves may even mirror their offline ones. This conclusion has implications for online safety, as parents, educators, and other adults may need to specifically talk to young children about safeguarding their privacy by not making their avatars too similar to their offline selves.

The second issue we consider is that of children's communication and interaction within virtual worlds. Here, too, connectedness between online and offline lives has been documented.[87] In the MUD study by Calvert, the researchers found that the participants showed gendered modes of online interactions.[88] When interacting with children of the same sex, boys showed

---

07311.32337.pdf (discussing the results of a study on avatar design by teen participants in the virtual world *Whyville* and the connections between avatars and real life identities).

83. *See* Sandra L. Calvert et al., *Gender Differences in Preadolescent Children's Online Interactions: Symbolic Modes of Self-Presentation and Self-Expression*, 24 J. APPLIED DEVELOPMENTAL PSYCHOL. 627, 635–40 (2003) (discussing the results of the study on the selection and activities of avatars in comparison to children's offline lives).

84. *See* Sandra L. Calvert et al., *Preadolescent Girls' and Boys' Virtual MUD Play*, 30 J. APPLIED DEVELOPMENTAL PSYCHOL. 250, 260 (2009) ("[W]e find that children gender bend more often with familiar than with unfamiliar peers, where only 1% of children engaged in gender bending. Gender bending amongst familiar peers occurred in 13% of the total sessions, and it more than doubled between the first and second sessions from 8% to 18%.").

85. *See generally* Subrahmanyam et al., *supra* note 19, at 401–02 (discussing the results of a study related to self-identification by gender in online chat rooms).

86. *See generally* Kaveri Subrahmanyam et al., *In Their Words: Connecting Online Weblogs to Developmental Processes*, 27 BRIT. J. DEVELOPMENTAL PSYCHOL. 219, 220 (2009) (discussing the methods of self-representation by teens in online settings).

87. *See generally* Calvert et al., *supra* note 83, at 640–43 (discussing the results of a study examining whether play patterns of children in a multiuser domain were similar to those observed in real life).

88. *See generally* Calvert et al., *supra* note 84, at 263 ("The results suggest that MUDs provide a space that reflects classic developmental issues concerning sex differences in children's play styles, social interactions, modes of thought, and identity construction.").

action-based patterns, whereas girls used less action and more writing.[89] These patterns, however, were tempered when the children interacted with a member of the opposite sex.[90] In previous work with chat rooms we similarly found that teens displayed gendered patterns of behavior.[91] An important question is with whom do children interact in virtual worlds—offline friends or strangers? Prior research with adolescents shows that adolescents mostly interact with offline peers;[92] online interactions with strangers, although rare, appear to help alleviate the sting of social rejection.[93] This is an issue meriting further study as it has tremendous implications for young children's development.

VI. Conclusions

In conclusion, as virtual worlds become more popular among very young children, it is important to discover more about the activities that children engage in while within them and, even more important, to consider their potential implications for development. Given the paucity of research on children's virtual worlds, we drew from research on related digital contexts frequented by older youth—video games and online communication forums.

First, it appears that children's activities in virtual worlds resemble their activities in offline ones; this includes both the good, such as rehearsing real-life social roles, and the not so good, such as cheating and bullying. Thus, it

---

89. *See generally* Calvert et al., *supra* note 83, at 641 ("In our study boys were more playful, both in the role-playing activities that they assumed, as well as in the propensity for making up games such as hide-and-seek, peek-a-boo, copy cat, and I'm taller than you, that took advantage of their online setting.").

90. *See id.* ("When children were in mixed-sex pairs, boys played the role less, moved less, changed scenes and emotional expressions less, and talked more than when they were in same sex pair, and girls talked less and moved more than when they were in same-sex pairs.").

91. *See* Subrahmanyam et al., *supra* note 19, at 404 ("[T]here were statistically significant tendencies for self-described males and females to adopt complementary but traditional roles in sexualized interaction: Self-described males were more active (more frequent use of explicit sexual themes), self-described females were more passive (more frequent use of implicit sexual themes, sexualized nicknames, gendered nicknames).").

92. *See* Subrahmanyam & Greenfield, *Online Communication and Adolescent Relationships*, *supra* note 4, at 125–26 (discussing the results of studies indicating that teens use electronic media primarily to communicate with friends as a substitute for face-to-face or telephone interactions).

93. *See* Elisheva F. Gross, *Logging on, Bouncing Back: An Experimental Investigation of Online Communication Following Social Exclusion*, *in* 67 DISSERTATION ABSTRACTS INTERNATIONAL: SECTION B: THE SCIENCES AND ENGINEERING 5442, 5442 (U. Mich. Press 2007) ("In sum, the present findings provide preliminary support for the idea that even a fleeting, computer-mediated interaction with an unknown peer can soothe the sting of rejection by providing participants with an experience of social connection.").

appears that, as with older youth, younger children's virtual lives may be connected to their offline ones. This psychological connectedness also seems to extend to their avatars, or their online selves, and their online interactions. But several questions remain. We do not know whether offline gender differences are mirrored in online avatars, nor the identity of whom they interact within virtual worlds. If children interact mostly with offline peers within virtual worlds, what are the implications for their development? Contrarily, if they do interact with unknown others, are these interactions good for them? Finally, while researchers have speculated about the potential for learning within virtual worlds, such learning is by no means assured, and the challenge of transferring the learning to academic contexts is a vexing one. These are some of the pressing issues for future research to address.