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A Developmental Lens for Designing Virtual Worlds for Children and Youth

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ABSTRACT

Section:

Virtual communities have been extensively examined—including their history, how to define them, how to design tools to support them, and how to analyze them. However, most of this research has focused on *adult* virtual communities, ignoring the unique considerations of virtual communities for *children and youth*. Young people have personal, social, and cognitive differences from adults. Thus, while some of the existing research into adult virtual communities may be applicable, it lacks a developmental lens. Based on our work of designing and researching virtual worlds for youth, we describe six important aspects of virtual worlds for children, with each aspect manifesting itself differently at each stage of human development: (1) purpose, (2) communication, (3) participation, (4) play, (5) artifacts, and (6) rules. By understanding how these six aspects impact youth virtual communities, researchers will be better able to evaluate and design them.

Introduction

Section:

Virtual communities have been extensively examined—how to define them, how to design technological platforms to support them, and how to analyze them in terms of usability and desired outcomes. However, most of this research focuses on *adult* virtual worlds, ignoring the unique considerations of virtual worlds for *children*. Young people have personal, social, and cognitive differences from adults. Thus, while some of the existing research into adult virtual communities may be applicable, it lacks a developmental lens.

This article presents a developmental context for looking at virtual worlds for children. It proposes addressing four different age groups, each with its own developmental needs: young children (under 5 years old), children (between 6

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and 10 years old), tweens (10 to 12 years old) and teens (13 to 18 years old). For each age group, examples of popular virtual worlds are presented, focusing on design considerations as they support developmental trends.

Popularity of Virtual Worlds for Young People

Section:

Prescott (2007) reported that of the five top virtual world sites, four of them were youth focused¹ and were higher rated than adult-oriented equivalents such as *Second Life* and *World of Warcraft*. The Association of Virtual Worlds published a report entitled "The Blue Book: A Consumer Guide to Virtual Worlds" (Association of Virtual Worlds 2008) in which descriptions, links, and categories for hundreds of virtual worlds are provided. A count of these worlds reveals that approximately 110 are categorized as being for kids, 115 for tweens, and 140 for teens (some worlds, however, are designed for multiple age groups; for example, kid and tween are often combined, as are tween and teen).

The increasing popularity of virtual worlds for children is reflected in the 1141 percent increase in visits to the site Webkinz in one year (Prescott 2007), from fewer than one million to over six million (Tiwari 2007). Also in the past year, Club Penguin doubled in popularity, from 1.9 million to 4.7 million visitors (Shore 2008). For many of the sites, however, this increase is linked with commercial endeavors; for example, Club Penguin was acquired by Disney for \$350 million (Barnes 2007), and U.S. retail sales of the Webkinz dolls in 2006 earned \$45 million (Tiwari 2007). Many sites tie physical toys to their websites, such as the popular Webkinz animals or the new Bratz fashion dolls, which are sold with a USB key disguised as a necklace that allows the buyer to unlock the [Be-Bratz.com](#) virtual world.

[BarbieGirls.com](#), by Mattel, registered four million users in the first three months after its launch, with an average of 45,000 new girls a day. In a recent *New York Times* interview regarding this surge in participation, Sherry Turkle said, "For young people, there is rather a kind of fluid boundary between the real and virtual world, and they can easily pass through it" (Richtel and Stone 2007).

There are popular virtual worlds that have a less commercially focused approach. For example, [ZulaWorld.com](#) (based on the children's TV show *Zula Patrol*) focuses on math, science, and technology, and the Panwapa virtual world immerses children "in a unique and novel exploration of self, community and cultures from around the world" in order to "empower a new generation of children, ages 4 to 7, to be responsible global citizens" (from the website). Panwapa and many of its design features will be discussed in greater detail in sections to come. Other virtual worlds such as Quest Atlantis (Barab et al. 2005; <http://atlantis.crlt.indiana.edu/>), River City (Dede et al. 2004, 2005; <http://muve.gse.harvard.edu/rivercityproject/index.html>), Second Life in Education (<http://sleducation.wikispaces.com/>), MOOSE Crossing (Bruckman 1996; <http://www.cc.gatech.edu/elc/moose-crossing/>), Whyville (<http://www.whyville.net/smmk/nice>), 3DLearn (<http://www.3dlearn.com/>), Jumpstart (<http://www.jumpstart.com/>), and Zora (Bers et al. 2007; Bers et al. 2001; <http://ase.tufts.edu/devtech/tools.html>), to name just a few, are designed by researchers with the hope of engaging young people in learning and education (visit <http://ase.tufts.edu/devtech/publications/AppendixA.pdf> for a table showing additional examples of popular commercially available virtual worlds for young people).

From another perspective, KZERO Research ("Resident experts in virtual worlds"), a UK-based company that aims to understand "the marketing dynamics relating to virtual worlds," examined the current state of virtual worlds by looking at the total registered accounts as of the second quarter of 2008.² Their research clearly indicates how prevalent virtual worlds for youth are: The largest virtual world for adults (over age 20) has 13 million registered users, while the largest for children or youth has 90 million users (and there are six additional worlds with between 17 and 45 million users for people under 20). As a final indication of the prevalence of virtual worlds for youth, eMarketer reports that 24 percent of the 34.3 million U.S. child and teen Internet users visited virtual worlds once a month in 2007, a figure expected to rise to 34 percent in 2008 and 53 percent by 2011 (Williamson 2008). Virtual worlds are clearly an important component of youth online experience.

What Are Virtual Communities for

Section:

What Developmental Theory Can Tell Us about Virtual Worlds for Young People

In the offline world, environments for children—including their homes, schools, and playgrounds—are designed to accommodate their particular developmental level and age. For example, schools are designed for different ages of children: Preschool classrooms look very different from elementary school classrooms, which look different from middle school classrooms, which look different from high school classrooms. Playgrounds too are designed to be best for the age group they are meant to serve.

Virtual worlds are just one more type of environment that can serve children. As Subrahmanyam and Greenfield (2008) wrote: “ For today’s youth, media technologies are an important social variable and...physical and virtual worlds are psychologically connected; consequently, the virtual world serves as a playing ground for developmental issues from the physical world, such as identity...” (p. 124). In the same way that much research has been devoted to how classrooms should be designed to be developmentally appropriate, research about how virtual worlds should be designed to be developmentally appropriate should also be undertaken.

In general, most child development research falls under one of three very broad but important aspects of childhood: social, emotional, and cognitive (intellectual) development. These three areas are not mutually exclusive, however, as each informs the growth and development of the others (at least in “ normal” development; e.g., this is not true for prodigies). In addition, within the field, there is disagreement among theorists about different aspects of development; for example, attachment to caregivers can be examined from Freud’s drive-reduction explanation, Erik Erikson’s psychosocial explanation, or John Bowlby’s ethological explanation (Cole and Cole 2001). This article will examine the ideas of several developmental theorists as they relate to the various aspects of designing developmentally appropriate virtual worlds for youth. These theorists include some of the major names in the field, such as Jean Piaget, Erik Erikson, and Lev Vygotsky.

The following sections of this article are based on our research in designing and evaluating a virtual world for youth called Zora. The Zora platform is an example of a tool that supports the formation of a virtual world for youth ages 11 to 14 (Bers et al. 2001; Bers, Gonzalez-Heydrich, and DeMaso 2001). Zora has been used since 1999 with several very different populations of young people, including those with end-stage renal disease undergoing dialysis treatment (Bers, Gonzalez-Heydrich, and DeMaso 2003), multi-cultural groups of freshmen in college (Bers 2008; Bers and Chau 2006), post-transplant pediatric patients (Bers et al. 2007; Satoh et al. 2007, 2008), and participants in national and international after-school computer-based learning centers (Beals and Bers under review). However, because projects using Zora are only research-based studies for a well-defined age group and with small, targeted populations of youth, the sections below will use the most popular virtual communities currently available for each age group as examples.

We will focus here on six aspects of virtual communities: (1) purpose, (2) communication, (3) participation, (4) play, (5) artifacts, and (6) rules (see figure 1), and describe how they manifest themselves in virtual worlds for young people in each of the four age groups—young children, children, tweens, and teens.

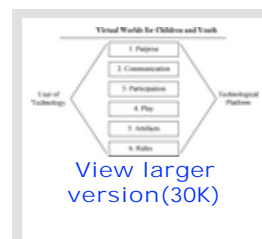


Figure 1 □ The six important aspects of virtual worlds for children and youth.

We will provide examples from popular virtual worlds. For young children (3 to 5 years) we focus on Panwapa (<http://www.panwapa.com/>), a virtual floating island that travels the five oceans of the world, developed in collaboration with Sesame Workshop and Merrill Lynch (figure 2). Launched in December of 2007, 50,000 children signed up for the site within the first five months (Shore 2008).



Figure 2 □ Screenshot of the Panwapa virtual world for preschoolers.

For children (6 to 10 years), Neopets (<http://www.neopets.com/>), a fun virtual pet site, will be used as an example. Children can create their own Neopets, feed them, and look after them, as well as communicate with others, play games, and create their own web pages (figure 3).



[View larger version\(90K\)](#)

Figure 3 □ Screenshot of the Neopet virtual world.

For tweens and teens (11 to 18 years), the Habbo world (<http://www.habbo.com/>) will be used as an example. Habbo is based on the metaphor of a hotel in which youth can “ meet new and existing friends, play games and simply have fun. It is a richly colorful, multi-dimensional virtual community and game environment to which users join by creating a fully customized online character called a Habbo” (Sulake Corporation 2008) (see figure 4).



[View larger version\(59K\)](#)

Figure 4 □ Screenshots of the Habbo virtual world. (Retrieved from http://www.sulake.com/press/image_bank?navi=4.2. Copyright 2008 Sulake, Inc. All rights reserved.)

A Sense of Purpose in the Virtual World

Purpose, or the reasons why individuals would want to join a community in a virtual world, is one of the three main components, along with *people* and *policies*, of good *sociability* to support social interaction online (Preece 2001, p. 349). When developers of a community determine its initial purpose, they are also determining its initial sociability. Kim and Frank (2003) wrote, “ When designing an online community, both in the initial blueprinting stage and throughout its implementation, the builder must be able to define the type of community being built, why the community is being built, and whom the community will serve” (p. 1461). These important questions should be re-addressed as the community grows in order to ensure the needs of the community are still being met as intended. A clear definition of a community's purpose allows users to immediately understand the goals of that community (Preece and Maloney-Krichmar 2003). However, as the community grows, and detaches itself from the original goals of its developers, a new sense of purpose can emerge. At that point, the technological platform that supports the virtual world might need to be adapted.

There can also be several levels of purpose in a virtual community; for example, a purpose for new members may be to just play games and earn points, while a purpose for more experienced members may be to reach out to the new users and guide them through the world. It is important, then, that the purpose of the community be clear, both when members first join and as they become more experienced. (Andreatos 2007; Corbit 2002; Barab, Kling, and Gray 2004; Barab et al. 2005; Lim, Nonis, and Hedberg 2006).

When developing virtual worlds for young people, several issues need to be taken into consideration regarding purpose. These issues include whether the world (or part of the world experience) has an associated fee; how open the community is, both in terms of age and other specifics of the population being served; and how tailored a world's purpose should be to developmental stage. For example, some virtual communities for youth are free to use, some require payment (or purchase of a toy), and some are a combination (some aspects of the community are free, others must be paid for, as in the case of Habbo and Neopets). Some communities for youth are open to anyone of a particular age, such as Habbo, while others are restricted to members of a particular group, such as teenage post-transplant patients from a particular hospital (Bers et al. 2007; Bers et al. 2001). This is important in much the same way that playgrounds in real life are often divided into different areas for children of

different ages. By providing a safe, monitored “ playground” that is created appropriately for a particular age, children are more likely to be interested and to have a positive experience.

The purpose of virtual worlds for youth can mirror their real life goals. As an example from one theory of development, Erikson (1963, 1982) defined eight stages, or crises, of development, spanning from birth to old age. From the ages of 12 to 20, according to Erikson, youth are in a stage called “ identity versus role confusion,” in which questions of “ Who am I” ? become important (1963, 1982). During this time youth establish their social and occupational identities while struggling with understanding how to fulfill adult roles. In addition to Erikson, other theorists have remarked about the importance of purpose for adolescents; those who do not find a purpose may feel a sense of “ drift” that may lead to personal and social pathologies (Damon, Menon, and Bronk 2003). Damon et al. (2003) define purpose for adolescents as: “ a stable and generalized intention to accomplish something that is at once meaningful to the self and of consequence to the world beyond the self” (p. 121). While perhaps not a definition intended for the virtual world, it is applicable. Virtual communities designed for teens should allow for identity exploration (Bers 2001; Turkle 1995) as well as the ability to create a sense of purpose in one’s experiences. A similar exercise—looking at developmental theories to inform how purpose in a virtual world can be tied to purpose in real life—can be explored for the other age groups as well.

A sense of purpose is important for the healthy development of children and youths, though how purpose manifests itself at each age level differs. For young children, purpose drives them to explore their world. For children, purpose drives them to develop their social skills with peers. For teens, purpose drives them to explore their identities. In virtual worlds, purpose is also a motivator as activities throughout the world mirror real life developmental stages. General considerations regarding purpose for all ages in virtual worlds include associated costs, openness of the community, and experience level of the user.

Communication in the Virtual World

Developmentally, language (communication) serves many important purposes. A brief overview of a few major theories will help elucidate the importance of language learning in childhood. From an environmental-learning perspective, children learn language by relating what they hear to what is going on in the world around them. Language is a means to communicate with others, but, more importantly, language allows for a greater understanding of the world, and thus a higher form of thinking (Bandura 1986; Skinner 1957). Piaget (1926, 1983) believed that the ability to think symbolically, which occurs at the end of infancy, allows for language development. From this perspective, however, language reflects thought, but thought is not influenced by language. From a nativist perspective, Chomsky (1980) believed that humans have a unique “ language acquisition device” (LAD) that is a self-contained mental module, and thus language and thought do not depend on each other. From a cultural-context perspective, Vygotsky (Vygotsky 1934/1987, 1978) believed that the experience of learning language is a social one, in that words are communicative acts, allowing for mediation with others. Vygotsky believed that around the age of 2, language and thought become intertwined (as opposed to developing independently in the previous years), thus “ language becomes intellectual and thinking becomes verbal” (Cole and Cole 2001, p. 329). In general, most developmentalists believe that language and thought are important to each other; it is the specifics of *how* that cause debate.

Language and communication are means to socialize with others, with the development of language allowing for participation in community. The terms “ community” and “ communication” share the Latin root *communis*, which means common—thus it is not surprising that they impact each other. “ Without ongoing communication among its participants, a community dissolves. Communication is therefore vital to communities both online and off.... Communication creates, re-creates, and maintains community through the continued interaction of participating members” (Watson 1997, p. 104). Communication in a virtual world can be public (at least public to the community)—when other users can see each other’s chat, as in a public room, or private—when only the person to whom the communication is directed can see it. For public chat rooms, the languages of the users become an important consideration when deciding whether to include this feature, as users may find it difficult and frustrating to not understand the content of conversation that often moves very quickly. Safety becomes a key issue with private communication, as the content of the communication cannot be easily monitored. Furthermore, privacy issues surrounding the monitoring and recording of private communication become important considerations, especially with teens who are trying to seek autonomy.

Preschoolers are, in general, pre-literate and thus traditional text-based communication mechanisms are not feasible. Instead, alternate means of communication are necessary, such as by using symbols to convey feelings

(e.g., icons representing different facial expressions) or by having messages spoken. In the Panwapa world, children can communicate with each other by exchanging Panwapa cards, which have a pre-scripted simple message chosen by the sender, such as: " We like some of the same things, and some different things!" and " I like your house. Please visit mine!" (Panwapa 2008).

Messages can also be played out loud by clicking on them so that the children do not have to be able to read in order to be able to communicate with others. These opportunities to engage in learning both spoken and written words are an important function that virtual worlds can provide to complement real-life learning. As children's vocabularies increase, along with their cognitive ability to use complex sentences, they are better able to think about more complicated events and communicate better with others. Furthermore, as children learn the language necessary to place people, objects, domains, etc. into categories, they are able in turn to better organize their knowledge, including learning to group objects according to multiple criteria. As children's linguistically coded knowledge increases, other language-related abilities also increase, such as being able to take someone else's perspective in conversation and being able to sustain longer conversations (Cole and Cole 2001). As described above, Vygotsky (1934/1987, 1978) believed that language must be learned in a social context, which is inherent in virtual worlds.

For tweens and teens, communication serves a different purpose—to aid in the establishment of interpersonal connections and identity construction. Online communication is just one means to fulfill these purposes. Adolescents use online communication tools, such as instant messaging and social networking sites, " to reinforce existing relationships, both friendships and romantic relationships, and to check out the potential of new entrants into their offline world" (Subrahmanyam and Greenfield 2008, p. 120). Because establishing social networks takes place in this age group, it is especially important that both asynchronous and synchronous communication be possible in the virtual world. As these worlds become increasingly international, youth are more likely to be friends with other youth in different time zones, or even locally on different schedules, so they need to be able to leave messages for friends who are not online at the same time. In Neopets, users can communicate with each other via NeoMail, chat (NeoChat), and message boards. Children can send requests to other users to become their " NeoFriends," which the receivers can accept or refuse. There are also " guilds" —groups of users with similar interests; guilds have their own message boards and can be public or private.

Language and communication are important skills for children to learn, as increased language allows for increased cognition (and/or vice versa, depending on the theoretical perspective) and an increased ability to interact socially. Communication is both a developmental tool and a product of development; communication is itself shaped by virtual communities. In other words, children and youth are communicating differently and expecting different things from their co-communicators by virtue of the fact that a screen now comes between those engaged in conversation. Investigating the details of how and why communication and virtual worlds impact each other is an important next step in the research. Virtual worlds are one medium by which language and cognitive development can be practiced and developed by youth and, considering their popularity, researchers and educators can use this to create developmentally appropriate virtual worlds to further allow youth to develop necessary communication skills.

Online Participation

Without people, there is no community. According to Kendall (2003), " For a virtual community to succeed, its members must spend time online.... The ability of virtual communities to connect people who cannot practically meet face-to-face provides the motivation in some cases for people to make the time to participate" (p. 1459). Virtual communities, when designed correctly, can be an important tool to facilitate youth participation in new forms of community.

Developmental theory describes one of the jobs of growing older as taking on different forms of participation in the adult world. One way to think of this task is in terms of " legitimate peripheral participation." Lave and Wenger (1991) wrote, " Legitimate peripheral participation provides a way to speak about the relations between newcomers and old-timers, and about activities, identities, artifacts, and communities of knowledge and practice. It concerns the process by which newcomers become part of a community of practice" (p. 29). Newcomers to the community are allowed access to the activities of the more experienced members, but have tasks that are shorter and simpler in order to teach them the skills needed to become more experienced members of the community (Lave and Wenger 2000). In Neopets, for example, new users can easily outfit their Neopet from the several shops available within the community. Eventually, as a user becomes more skilled at navigating the world and the commerce policies, he or she can create a shop of their own in which they can sell to others.

Unlike the other attributes, participation is difficult to quantify by age level, as it is based on many factors, including the purpose of the community. For example, a virtual community designed for a particular group of youth, such as in a

specific hospital, may have a maximum possible population of 50 users, whereas a virtual community designed to be available to any youth around the world between the ages of 13 and 18 will have a much, much larger population to pull from. Thus the "definition" of participation in each would look very different. In addition, the expectations for each may be different: In the small community, perhaps being one of only a few other members online at a time is acceptable, whereas in the larger community, thousands of members need to be on simultaneously in order for members to feel like they are part of a community. While more research in this area needs to be completed, we hypothesize that a community's definition of participation has to be internal, based on the population served and its purposes. Although there is an objective "level of participation," which may be measured by number of participants enrolled, number of lines of chat, ratio of lurkers to non-lurkers, etc., each community needs a clear understanding of the needs of the participants served in order to understand what participation means for their community.

In their face-to-face lives, children are part of many types of communities. However, virtual worlds can provide youth with opportunities for participation in two ways that may be difficult in the real world. First, an appropriately designed site will allow users to experience legitimate peripheral participation, in which their experience in the community is scaffolded from when they first enter until they become more experienced. Second, virtual worlds can allow youth to participate in communities of users that would be geographically inaccessible offline; youth can meet other youth from very different backgrounds, experiences, and locations, allowing for an increased understanding of the global nature of today's world.

Playing in Cyberspace

Play is a vital aspect of healthy child development and is one of the main features of childhood. As Erikson (2000) wrote, "Play is to the child what thinking, planning, and blueprinting are to the adult, a trial universe in which conditions are simplified and methods exploratory, so that past failures can be thought through, expectations tested" (p. 195). Much like the term "community," the term "play" does not have one accepted definition; for the purpose of examining virtual worlds, however, play can be defined as what children see as play, including "having fun...being with friends, choosing freely, not working, pretending, enacting fantasy and drama, and playing games" (Scarlett et al. 2005, p. 3). There are many different types of play theories, including psychoanalytic, such as that of Erikson; cognitive-developmental, such as those of Piaget, Vygotsky, and Bruner; cultural-ecological; and evolutionary and comparative. As children develop cognitively, socially, and emotionally, their play also matures.

During early childhood, play is dominated by make-believe in order to realize impossible wishes, such as driving a car, and to explore interests and fascinations, such as dinosaurs and playing alongside others. Make-believe play has important functions for cognitive development (e.g., helping children understand reality, acquiring new tools for thinking, developing a framework for thinking, and the development of multiple intelligences), emotional development (e.g., helping them put symbols between their impulses and actions and reducing the intensity of conflicts), and social development (e.g., connecting and developing friendships with others) (Scarlett et al. 2005). There are several classification schemes for the play of young children, including that of Piaget (1951) and Parten (1932). Piaget described three stages of play, in which children's ability to think symbolically corresponds to the structure of the play. In early childhood, when there is a shift from the presymbolic play of infancy, make-believe games and symbols are central. Parten described four categories of the play of preschoolers, starting with the least socially complex: nonsocial play (children watch others but play solitarily, ignoring others), parallel play (children play side-by-side but not together), associative play (children may share materials, but still have their own plans and do not work together to achieve a shared goal), and cooperative play (children collaborate with each other to achieve a shared goal).

The intersection of these two classification schemes has important ramifications for youth virtual communities. In adult virtual communities, the playing of games may not be seen as a means for development of the community or as a legitimate mode for interaction among members; instead it may seem to be an ancillary and non-essential component of community development. However, for children and youth, and especially for young children, virtual worlds need to allow for game-playing, with an emphasis on make-believe play, as this mimics their real-life cognitive, social, and emotional development. Virtual worlds designed for preschoolers should take into account the stages of play and cater to the range of developmental levels of the children who may be visiting the world. For very young children who are still learning to play with others, it cannot be expected that they will be able to play collaboratively with others, and thus solitary or parallel games (games in which they can see others' progress through the game but do not have an impact on each other) should be available. For older preschoolers, games in which they can practice simple collaborative activities should be available.

For young children, play, perhaps in the form of games, has a very close tie to *purpose*. With play and make-believe being such an integral component of their real-life development, the ability to extend this play to online technologies provides a purpose to be part of the communities. The games, however, may be related to the purpose: One purpose of the development of Panwapa was to expose children to other children from around the world, and thus one of the games involves a treasure hunt around the make-believe Panwapa world.

Simple games may not suffice as the sole purpose, but may still be an integral component of *why* children choose to become part of the community, at least initially. Play in late childhood allows for learning about how to interact with others, in the form of peer groups and the development of friendships. Playing together is an important way in which children learn to navigate friendships. In addition, as will be discussed in a later section, play can be influenced by the rules of a virtual world.

Another key component of play during this age is the gathering of collections, such as baseball cards. Through collections, children continue to learn about socialization, as collections are often traded using a rule-based system. Collections allow for continued development of imaginative play, as do board games, video games, and storytelling.

Electronic play for older children (older than 12) is different than for younger children. After the age of 12, electronic play is interesting and exciting because it allows the children to socialize with others as well as to explore aspects of their identity (such as in *Dungeons & Dragons*) and challenge authority (such as in the series of *Grand Theft Auto* video games), both of which are central crises of the teenage years (Scarlett et al. 2005). In Habbo, the idea of play is manifested in explicit traditional games, such as *BattleBall*, *SnowStorm*, *Wobble Squabble*, and *Lido Diving*,³ as well as other available activities, which are a more implicit form of play, as they allow participants to explore issues of identity, such as designing their avatar (representation of themselves), designing their rooms, and using furniture that can be purchased from a catalog. Thus, for teenagers, playing in virtual worlds takes on different forms that support socialization and identity exploration, which are important developmental tasks for this age group.

Virtual Artifacts

In traditional face-to-face communities, the artifacts created by members help solidify their membership in the community; the same is true of virtual worlds. The creation of artifacts is one way to show participation in the virtual community. In the earliest history of virtual communities, such as Usenet, the artifacts of that community were the recorded and archived threaded conversations of its users that future users could go back and read. In essence, it was a historical record of that community. In a more current example of an adult virtual world, artifacts in *Second Life* are the objects that are created by members to populate the world.

User-generated content is becoming a major component of digital media for youth (Shuler 2007). The Pew Internet and American Life Project found that nearly two-thirds of online teens participated in online content creation (Lenhart et al. 2007).⁴ This trend, when analyzed using the theoretical concept of constructionism (Papert 1980, 1999), reveals that allowing for user-generated content is an important design feature for online communities of youth, as it engages youth in a learning experience.

The theory of constructionism is based on Piaget's constructivism (Piaget 1965). It asserts that people learn better when they are engaged in building personally meaningful artifacts and sharing them with others in a community. From this perspective, then, one goal of the design of technology should be to provide the tools and resources necessary for individuals to be able to create personally meaningful projects (Bers 2008). Content creation can also be tied to the development of self-esteem. By age 4 or 5 children can already have a sense of self-esteem, which research has suggested is based on a child's history of attachment with his or her mother (Bowlby 1988) as well as how his or her competencies are perceived by teachers (Shaffer 2000). Harter and Pike (1984) studied children's (ages 4 to 7 years) self-evaluations and found that children judged their self-worth based on two main categories: competence and acceptance. For 8- to 12-year-olds, Harter (1982) described four categories of self-esteem. These included cognitive competence, social competence, physical competence, and general self-worth. For adolescents, self-esteem is also tied to identity formation (Damon 1983), a major developmental task as described throughout this article. Virtual worlds, when designed in a developmentally appropriate manner, allow children to explore and improve on competencies that they feel are important, thus improving their self-esteem (Harter 1986; Shaffer 2000).

For young children, the ability to produce complex artifacts may be difficult because of the fine motor skills needed to manipulate objects in the virtual worlds with a mouse interface, and due to cognitive limitations of their age. However, this does not mean that they cannot create artifacts; it just means that

the technology has to support them at a developmentally appropriate level. In Panwapa, children have the ability to create three different kinds of objects, called Panwapa Kids, Panwapa Homes, and Panwapa Flags. While children can customize each of these three items, their choices are limited. Customization of a general type of available object in the virtual world is one way to allow for user-generated content in a developmentally appropriate way for young children.

Tweens and teens can create virtual world artifacts that are more complex. While some older forms of virtual worlds, such as MOOSE Crossing (Bruckman 1996), engaged youth in the creation of text-based artifacts, most virtual worlds today engage different forms of graphical objects. In Neopets, children can create a new Neopet (by August 10, 2008, 237,138,604 Neopets had been created)—which includes choosing the Neopet's species, gender, and personality—set up their own shop, and submit content for the weekly electronic newspaper called *The Neopian Times*. The creation of artifacts serves the developmental need of this age, which is the mastery of new skills and engaging in peer networks.

In Habbo, tweens and teens can customize their own avatars, including selecting hair color, hair style, clothes, and accessories. Each user can have a guest room that they can customize with furniture, wallpaper, paint, flooring, pictures, and stickies. Similarly, in Neopets, users can win and gather points for games and win badges for being guides to other users that showcase their competence and participation in the various aspects of the virtual world. Users can also use a "Traxmachine" to create music tracks, which can then be played on some types of furniture, on jukeboxes, or can be burned to a disc and mailed to the user.

The Partnership for 21st Century Skills (<http://www.21stcenturyskills.org>), a nonprofit organization that is a leading advocate of infusing twenty-first-century skills into education, describes several skills that children need to learn "to succeed as effective citizens, workers and leaders in the 21st century" (Partnership for 21st Century Skills 2004a). These include information, media, and technology skills, such as "using digital technology, communication tools and/or networks appropriately to access, manage, integrate, evaluate, and create information in order to function in a knowledge economy" (Partnership for 21st Century Skills 2004b). Affording youth the opportunity to create digital projects can serve two important developmental purposes—it can allow those youth who enjoy working with digital media a way to showcase their competency, resulting in higher self-esteem, and it can allow youth to practice and explore skills that are needed to succeed as adults. In much the same way that children in school create artwork, play music, work on projects, and produce materials they are proud to show off, virtual worlds have the potential to allow youth to create content in ways that give them skills to succeed in today's technology-infused world.

Rules that Regulate Virtual Interactions

Policies are one of the three components of sociability as defined by Preece (2000; Preece and Maloney-Krichmar 2003). Rules are an important aspect of virtual communities for youth, not only to keep the community functioning properly but also to ensure that participants are safe. Preece and Maloney-Krichmar (2003) described the role that policies play in virtual communities and how rules "come to be" (again, in adult communities): The rules can be democratic or they can be set by the developers. Having rules, however, requires a means to enforce the rules, which may include using moderators or automatic language filters. Rules in communities for youth can be imposed by the adult designers of the community or can be decided by the youth participants, or a combination of both.

Developmentally, rules are important components of social interactions, including during play, at home, and at school. Complex rule systems require higher-level cognitive processing, which is why for young children, rules are often very simple. Older children are able to retain the long-term requirements of a task while pursuing short-term goals and taking into account the perspective of others, and thus they are better able to work with and understand complex rule systems (Cole and Cole 2001). As children develop, participation in rule-based games allows for more children to play together for longer periods of time on their own initiative, because they are capable of using social rules to regulate their behavior. Thus for virtual worlds, rules for the community or for games within the world need to be appropriate to the age of the target demographic; older children can have more complicated rules while younger children need simple rules.

These characteristics of childhood must be taken into consideration when designing for play in virtual worlds for ages 6 to 12. Clearly it is important to have games, but it is also necessary to have games with different types of rules. For children at the beginning of this stage, game rules must be rigid and clearly defined. Games should also be available for children toward the end of this stage with more flexible rules that facilitate them learning to navigate the world and make friendships. For older children, as they become familiar with the community and other children, there should be games in which collaborative

play, with the possibility of adapting the rules to the wishes of the group, is encouraged.

Finally, rules are meant to keep a real life community safe and functioning. For example, children are introduced to formal rules when they start school—rules about classroom procedures, rules about how to do classroom work, rules about relationships with others, and rules about the subject matter (Boostrom 1991). As previously stated, rules also allow children of different experience levels or familiarity with each other to play together. This is much the same as in virtual worlds: Rules dictate how users can interact in a way that is best for the safety of its members as well as to keep the world functioning as intended.

One of the major developmental crises for teenagers is challenging authority (though younger youth may experience it as well), and thus clear rules need to be stated to justify moderation behavior (Erikson 1982). For these age groups, something like a “ Code of Conduct” is helpful, but participants should also have the means to add to or modify the code in a democratic fashion. Monitoring of the world in light of the rules is important; this may be done through automatic filters, as it is for language (but creative ways to get around the filters are often found), or through “ real person” monitoring. For example, in Neopets, message boards are monitored 24 hours a day and there are filters to help stop offensive messages from being posted. In Habbo, the Code of Conduct is called the “ Habbo Way” (see <http://www.habbo.com/help/51>). It includes a series of rules that users are supposed to adhere to, including, for example, not giving out their passwords, not using hate speech, not telling people information about their location in real life, and not acting out violently.

An understanding of rules reflects a child's developing moral sense. For young children, rules are simple and derive directly from adults. Older children begin to learn that rules can be flexible and can change if all participants agree. Teenagers are cognitively capable of higher reasoning, meaning that they can take into account the many perspectives that may be important when deciding on behaviors in relation to rules. Virtual worlds should have rules, both to keep children safe but also to encourage their moral development as they learn to become full-fledged members of adult communities.

Limitations of Developmental Approaches and Future Steps

Section:

This article has presented an initial insight into how developmental theory can, and should, inform the design of virtual worlds for children and youth. However, while developmental approaches provide a way of organizing normative youth development to identify potential pathologies, “ ages and stages” theories have been criticized by sociocultural approaches that emphasize the interdependence of social and individual processes in the co-construction of knowledge. Human activities take place in cultural contexts, are mediated by language and other symbol systems, and can be best understood when investigated in the context of their historical development; in order to understand young people's use of virtual worlds, we also need to understand their sociocultural and historical context. It is not enough to identify their psychological and developmental needs; we should also address their “ place in the world,” as that factor will greatly influence and determine their approach to technology.

A new research agenda is needed to explore in more depth the issue of development and virtual worlds. This agenda should include: (1) further exploration into how developmental theory can inform each of the six aspects, (2) creation of a succinct framework that will explain the relationships between each of the six aspects as well as the relationships between the aspects, the technology, and the child or youth immersed in the world, and (3) operationalization of each of the elements in order to create a method for measuring and evaluating the quality of a virtual world from a developmental perspective for both parents and researchers.

Some of the ideas raised in this article (e.g., about interactivity and communication) are themes that are present in the study of other media as well (e.g., making television more developmentally appropriate for children). Virtual worlds as a medium are similar and related to, yet distinct from, other electronic media. Further research should examine how virtual communities compare with other media in order to create a richer understanding of developmental appropriateness in virtual worlds for children and youth. Finally, this article has attempted to highlight the potential of virtual communities for children's healthy development, although we recognize that for many of these aspects (in particular communication, play, rules), there is research that suggests the potential for problems (e.g., bullying). Thus, future research should examine the potential for

negative behaviors in virtual worlds, how they may be uniquely manifested in a virtual environment, and how administrators of virtual worlds can be aware of this in order to prevent and/or address these problems appropriately as needed.

Conclusion

Section:

Virtual worlds are becoming an increasingly large part of children's and youth's online experience, with estimates that over 50 percent of online youth will participate in a virtual world by 2011 (Williamson 2008). The largest virtual world for youth boasts over 100 million users, while the largest for adults has a little over 10 percent of that population (KZero Research 2008), yet much of the research about designing for and understanding virtual worlds has focused on the adult perspective, ignoring the unique considerations for children and youth.

Virtual worlds are becoming one additional environment—like school, home, and the playground—where children can learn, play, and grow. The physical and the virtual are becoming interconnected; it is important for researchers to understand how this will affect children's development and how virtual worlds can be designed to best serve children's developmental needs. From our experience in designing the Zora virtual world and running several programs over the past 10 years with youth utilizing this software, we have gathered an understanding of how developmental psychology can inform the design of virtual worlds, which we have presented in this article.

By focusing on six aspects of virtual worlds—purpose, communication, participation, play, artifacts, and rules—and looking at them through a developmental lens, we are proposing a way to think about and design virtual worlds for youth that can be developmentally appropriate. By integrating developmental psychology literature and virtual communities research, this article presents a snapshot of how ideas about children's development can impact the design of the virtual world. To support these six aspects, examples from the most popular current virtual worlds, such as Panwapa, Neopets, and Habbo, were presented. While much additional research regarding virtual worlds for youth needs to be undertaken, we hope this article sheds light on to how to understand and design virtual worlds for youth from a developmental perspective.

Notes

Section:

1. According to the report, the top five sites are: Runescape, Webkinz, Neopets, Gaiaonline.com, and Club Penguin.
2. For a figure showing the year/month of the launch of each virtual world, its current size, and worlds that are currently in development, visit <http://www.kzero.co.uk/blog/wp-content/uploads/2008/05/virtual-world-numbers-q2-2008.jpg>.
3. It should be noted, however, that *BattleBall* and *SnowStorm* are free games while the other two require the purchase of Habbo credits.
4. For the purposes of their study, they defined online content creation as: creating or working on a blog; creating or working on a personal webpage; creating or working on a webpage for school, a friend, or an organization; sharing original content such as artwork, photos, stories, or videos online; or remixing content found online into a new creation.

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