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Children, Adolescents, and the Internet: A New Field of Inquiry in Developmental Psychology

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With this special section on children, adolescents, and the Internet, we survey the state of a new field of enquiry in developmental psychology. This field is important because developmentalists need to understand how children and adolescents live in a new, massive, and complex virtual universe, even as they carry on their lives in the real world. We have selected six empirical articles to showcase various aspects of child and adolescent development in this virtual universe. These articles reflect three major themes of this new field:

1. *Communication on the Internet.* Two articles analyze how adolescents interact to co-construct their own communication environments. These environments can be, on the one hand, mostly “normal” (Subrahmanyam, Smahel, & Greenfield’s analysis of behavior in teen chat rooms) and, on the other hand, mostly pathological (Whitlock, Powers, & Eckenrode’s analysis of self-injury bulletin boards).
2. *Cognitive development, academic achievement, and the Internet.* Jackson et al. focus on academic achievement; Yan, in contrast, treats the Internet itself as an object to be cognized.
3. *Adolescents in a globalized Internet world.* Cassell, Hufaker, Ferriman, & Twersky examine interaction in an online community consisting of over 3,000 adolescents representing 139 countries. In contrast, Borzekowski, Fabil, & Asante document the growing importance of health information on the Internet for adolescents in Accra, Ghana, and, by implication, the Internet’s potential as a health information source for adolescents throughout the Third World.

These three sections reflect one of our major editorial goals: to sample various relevant aspects of development as they relate to

the Internet. Encompassing the broad areas of cognitive and social development, these articles address a number of different specific developmental functions. Yan analyzes the factors influencing the development of an understanding of the Internet in both its technical and social dimensions. Jackson et al. demonstrate the positive impact of home Internet access on the reading achievement of low-income, mostly African American children. In the arena of social development, articles deal with five important foci of adolescent development: identity (Subrahmanyam et al.); self-worth (Whitlock et al.); sexuality (Subrahmanyam et al.; Borzekowski et al.); health behaviors (Borzekowski et al.; Whitlock et al.); and leadership (Cassell et al.).

The selection of articles reflects a second editorial goal: to sample both the positive and negative aspects of the virtual world in which children and adolescents are increasingly living. For example, from Whitlock and colleagues, we learn about the negatives of Internet bulletin boards that spread practices of adolescent self-injury in the United States; but this mostly negative picture is balanced by Borzekowski and colleagues who present a very positive image of adolescents using the Internet for health information in the Third World, where traditional sources of such information are less available.

Another of our editorial goals was to sample as large an age range as possible. The six articles in this section cover the range from elementary schoolchildren through adolescents; however, four of the six articles focus exclusively on adolescents. This is not exactly a sampling problem. We believe that this emphasis in the field reflects an actual developmental fact: Adolescents use the Internet much more than children do (e.g., Thornburgh & Lin, 2002). However, the age of first Internet use is rapidly descending (e.g., Wartella, Vandewater, & Rideout, 2005), and developmental researchers are beginning to follow the age trend downward. Meanwhile, developmental psychologists face the significant challenge of how to study Internet use among young and older adults from a life span developmental perspective, complementing the industrial psychology and cognitive psychology perspectives that are currently popular.

We also utilized a very broad definition of development. The six articles include traditional operationalizations of development, such as cross-sectional age comparisons (Yan), short-term longitudinal study (Jackson et al.), and development as a life cycle stage (Whitlock; Subrahmanyam et al.; Cassell et al.; Borzekowski et al.). The Internet environment also brought new challenges in operationalizing development. How should researchers handle self-described age or gender in an anonymous virtual environment like a self-injury bulletin board or a teen chat room? In their discussion section, Subrahmanyam et al. offer some perspectives on this methodological issue. This is a unique challenge that

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developmental researchers are facing: Age, race, and gender are basic demographic information that has been routinely reported in regular developmental research; however, in the cyberspace, age, race, gender, and all other identity information become virtual and collecting accurate information is no longer a trivial task.

Last but not least, we sought out and found methodological diversity. The importance of analyzing the Internet environment itself implies the use of mixed methods, that is, the integration of qualitative methods for discourse and content analysis with quantitative methods. The value of this type of methodological synthesis is seen particularly in the articles by Cassell et al., Subrahmanyam et al., and Whitlock et al. On the other hand, the three remaining articles show that a variety of more traditional methods, such as questionnaires, interviews, and tests, are as applicable in the virtual world as they are in the real world. Among our authors is an unusually large number of young researchers, reflecting, we are sure, their greater comfort and understanding of the Internet and its affordances. Indeed, the field itself is of course very young. If we consider the Carnegie-Mellon study of home Internet's effect on preadolescents' and adolescents' well-being as the newborn period of Internet study in developmental psychology (Kraut et al., 1998; Subrahmanyam, Kraut, Greenfield, & Gross, 2000), then this special section might signal the beginning of the field's early childhood, as it examines a wide variety of issues that have significant theoretical implications and broad social impacts.

How should we think of the Internet from a developmental perspective? One approach is the effects model popular in TV research (e.g., Zillmann & Bryant, 2002). That model has led to central questions such as "What is the effect of TV violence on aggressive behavior?" This model somewhat fits one of the articles in the special section, since it in fact demonstrates the effect of Internet use on the reading achievement of low-income children (Jackson et al.). However, the effects model is based on viewers rather than actors. In contrast, the interactivity of the Internet and the activity of its users render the viewer role less important, thus reducing the generality of the effects model for Internet research. Indeed, the effects model fits none of the other five articles in the special section. Thus, it is clear that our theoretical perspectives must go beyond the effects model that characterizes most of the research on the role of TV in child and adolescent development.

The Uses and Gratification model from communication studies moves us theoretically at least one step further in the right theoretical direction (Borzekowski et al., this issue). In this case the model asks, "What are the uses to which the Internet is put and what do children and adolescents get from it?" Indeed, one of our selection criteria was to include articles that would sample the most important uses and the variety of gratifications to which young people put the Internet.

For adolescents, communication is the most important use of the Internet (e.g., Gross, 2004), and communication is well represented in this section. Subrahmanyam et al. analyze teen chat, while Cassell et al. and Whitlock et al. analyze specialized types of bulletin boards. Moving from use to gratification (a communications studies term for what psychologists would call *motives* or *needs*), we see that the gratifications from these communication media range from global leadership experience (Cassell et al.) to identity and sexuality (Subrahmanyam et al.) to self-injury and self-concept (Whitlock et al.). Each of these gratifications is especially prominent in adolescent development, whether it is con-

sidered pathological (e.g., self-injury) or healthy (e.g., identity construction, sexuality dynamics, or leadership development). Another potential gratification or need fulfillment that flows from the Internet is health information and advice, as exemplified in the article by Borzekowski et al. on the use of the Internet for information on general health and sexual health by adolescents in Accra.

However, on a theoretical level, we must expand beyond both "effects" and "uses and gratifications" to comprehend the developmental "constructions" by younger users of the Internet. Specifically, this expansion of developmental constructions must take place in four new directions.

First, we must see the Internet as a new social environment in which universal adolescent issues such as identity, sexuality, and a sense of self-worth are played out in a virtual world in ways that are both new and old (Subrahmanyam et al.; Whitlock et al.). However, as a social environment, it is important not to see the Internet as an external environment that is doing something or other to the adolescent (the effects model). In the popular communication functions of the Internet such as e-mail, instant messaging, blogs, chat, and bulletin boards, adolescents are basically co-constructing their own environments (notwithstanding the minority of older-than-adolescents who may participate; see Subrahmanyam et al. and Whitlock et al.). Hence, cultural theories, such as those from linguistic anthropology or conversational analysis that emphasize co-construction become very relevant (Duranti, 1997).

The studies that utilize chat or bulletin boards as their virtual research site offer a rare glimpse into adolescent peer interaction and adolescent peer culture in this particular historical period (Subrahmanyam et al.; Whitlock et al.). Indeed, we can think of the Internet as providing researchers with a window into the secret world of adolescent peer culture, even as it offers young people a new screen for the projection of adolescent developmental issues.

The Internet is also unique as a social environment in that it offers an expanded and potentially globalized social milieu. Networks can be small and intimate, as in instant messaging—just a new way of communicating (perhaps more frequently and faster) with familiar others (Gross, 2004). They can also be very large—either national or global. Large national networks are found in the chat rooms and bulletin boards studied by Subrahmanyam et al. and Whitlock et al., respectively. A global network for adolescents has been created by Cassell et al., which then takes the development of leadership to an international scale, a scale that would hitherto have been virtually (pun intended!) impossible.

Another important aspect of the Internet as a global communication tool is its popularity among adolescents in Accra, Ghana, as a source of health information. Here Third World adolescents, even (and especially) school dropouts, are using the Internet to seek information on sexual and other aspects of health information to which they would probably not have access in their own local environment.

Second, we must see the Internet as a new cultural tool (Vygotsky, 1935/1978) or, better, as a cultural tool kit. The Internet is *cultural* because it is shared, norms are developed, and these norms (e.g., communication norms, Greenfield & Subrahmanyam, 2003) are transmitted to new generations of users, even as the new users, greater access, and technological innovation create new

norms. The Internet is a *tool kit* because it is an infinite series of applications, each with its own use.

Focusing in this special section on communication technologies, we see that, like any other technology, each application can be used for good and for ill. For example, Whitlock and colleagues document that, on the one hand, self-injury bulletin boards are used to transmit and encourage means of harming oneself, unquestionably pathological behaviors; and, on the other, they are used (albeit in a more minor way) to help self-injurers stop the practice. We also have the example of Internet health tools—probably an amalgamation of bulletin boards (Suzuki & Calzo, 2004) and informational Web sites—that play a unique role in providing health information in the Third World (Borzekowski et al.).

Just as we cannot ask whether a knife is inherently good or bad, we cannot ask whether the Internet is good or bad; we can simply document how it is used. Because tools are culturally constituted (i.e., they are normative objects), this approach goes beyond the uses and gratifications framework, with its emphasis on individual functions and needs.

Third, we must see the Internet as a new object of cognition, neither a concrete artifact nor a visible social partner, but a gigantic virtual complex network of networks. As such, its interpretation becomes a locus for manifesting cognitive development, as Yan shows. In contrast to the extensive developmental literature that has documented when, how, and why children come to understand natural, social, and mental concepts (e.g., Carey, 1985; Gopnik, Meltzoff, & Kuhl, 1999; Keil, 1989; Wellman & Gelman, 1998), research into children's understanding of complex artifacts such as the Internet is scarce. The Internet is a hybrid of artifactual (e.g., computer screens and keyboards), social (e.g., communications with people), and mental-like systems (e.g., invisible virtuality). To study their understanding of the Internet challenges the boundaries between the traditional categories of cognitive development, social-cognitive development, and social development.

Contrasting with TV as an artifact system with enormous social complexity and with the personal computer as an artifact system with enormous technical complexity, the Internet has both enormous technical and social complexity. As an artifact system with enormous technical complexity, the Internet is a gigantic but almost invisible universe that includes thousands of networks, millions of computers, and billions of users across the world, as well as multilayer communication protocols, various physical connection devices, and numerous application programs. As an artifact system with enormous social complexity, the Internet has not only had pervasive positive impacts on modern society, but has also caused various societal concerns about privacy, security, pornography, Internet crime, virtual community, and intellectual property rights. This unique combination of technical and social complexity makes children's understanding of the Internet both challenging and important to developmental researchers.

Fourth, we must see the Internet as a source of new methods for developmental research, as well as a new research environment that requires the development of new methodologies. As a source of new methods, applications for public communication, represented in this special section by chat rooms (Subrahmanyam et al.) and bulletin boards (Whitlock et al.), provide a locus for observing peer interaction that is usually hidden from the view of adults in general and researchers in particular.

These new research sites require the development of new methodology. To utilize new sites, such as chat rooms and bulletin boards, with their unique virtual characteristics, we need to develop new techniques for collecting and analyzing data. On a concrete level, this involves learning how, technically, to take data from the Internet. On a more conceptual and abstract level, this involves methods for analyzing data on the cultural level—for analyzing a communication environment where multiple interactions in shifting and overlapping groups render the individual as a unit of analysis useless for certain purposes (Greenfield & Subrahmanyam, 2003).

In this situation, each participant has a dual role—as an individual who may be affected by the social environment and as a participant whose interaction with others is co-constructing, that is, creating that same social environment. Both Subrahmanyam et al. and Whitlock et al. address this duality and methodological problem by shifting their focus of attention and their units of analysis. They shift from analyzing the sociocultural environment in which an environmental unit—the utterance—is the basic unit of analysis to utilizing the individual—represented by a distinctive screen name—as the unit of analysis. Whitlock et al. make the shift from social environment to individual between Studies 1 and 2, whereas Subrahmanyam et al. do it within the framework of a single study.

Besides this challenge, the dynamic, complex, and gigantic Internet challenges researchers to develop methods for analyzing massive amounts of online data quickly, effectively, and efficiently. Four of the articles (Subrahmanyam et al., Whitlock et al., Jackson et al., and Cassell et al.) involve the examination of extraordinarily large qualitative and quantitative data sets.

In conclusion, the Internet is more exciting and challenging as a research environment than earlier media because it is a complex virtual social and physical world that children and adolescents participate in and co-construct, rather than something that is merely watched (TV) or merely used (PC). It becomes a complex virtual universe behind a small screen on which developmental issues play out in old and new ways, offering new views into the thoughts, feelings, and behaviors of children and adolescents. This universe will continue to expand as Web-connected cell phones and other new Internet applications emerge. Thus, existing theoretical models, research programs, and methodological techniques in developmental psychology are both challenged and stimulated by interactions between youth and the Internet. This is an important and healthy sign of a new and growing area of research.

Together with articles on children, adolescents, and the Internet that will follow in subsequent issues of *Developmental Psychology*, this special section, we believe, represents the current state of knowledge into this complex phenomenon on the level of both content and methodology. However, the expanding universe of the Internet requires us also to expand our research efforts. We therefore hope that this special section will inspire and stimulate many additional researchers to join us in exploring the implications of the Internet's virtual universe for child and adolescent development.

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