EXPLORING A COGNITIVE DEVELOPMENTAL APPROACH TO CYBERSAFETY FOR YOUTH

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Abstract

New discoveries on human brain development can provide very useful and practical insight to the all-too-often puzzling emotional and behavioral responses of children and youth who access digital technologies and engage in global exchanges. Implications of brain research for safety prevention initiatives that focus on cyberawareness and literacy are discussed within a global child advocacy framework, and recommendations for using knowledge of developmental levels to prepare youth to successfully harness the potential of the net are explored.

Keywords

Adolescence, Internet and Education, Brain Research

Introduction

Youth in today's world do not merely consume information from the diverse media sources which are accessible online. Young people are active agents who can manipulate, adapt, create, and disseminate ideas and products through communication technologies. As mobile phones, PDAs, laptops with wireless computing, digital cameras, and digital videos figure more prominently in the list of readily available tools which are accessible to children and youth, technology has become increasingly demanding on the development of skills necessary for engagement in an environment which is not constrained by time or space. In this age of information overload, the ability to access and sift through information is essential for citizens who are immersed in an interconnected environment. Ideally, youth who are empowered with the skills to analyze, critically evaluate, and produce media may take on a proactive role in exerting their voice and influence as they connect with others.

Emerging technologies are designed to engage users in an active networked realm, thereby necessitating that technological competency include skills in communication and collaboration. This adds complexity to the demands of technology on the functioning of young people who must not only master the tasks required by the tools but also simultaneously function as part of a networked group as it shapes the social space in which it resides. Individual characteristics of young people can affect readiness to participate in these social interactive experiences online.

Recent advances in the understanding of human brain development in adolescents have implications for the ability of young people to function in a digital world. Cyberliteracy requires a continuum of skills, such as constructing messages, interpreting perspectives, and responding to attempts to manipulate individuals into action.

This paper is intended to stimulate thinking and discussion about the complex interaction that occurs when human society converges with information technology. Time and experience are revealing significant differences between engagement in the real world and virtual world, particularly with regard to social and behavioral norms. Shifting boundaries for human interconnectedness are especially intricate in a technological environment that has optimized the free exchange of information regardless of physical proximity or individual characteristics. As we search for solutions to ensure the well being of children and youth in a complex technological world, we rely on the resources of the brain to assist us in thinking, communicating, and reasoning a unique awareness of identity and safety within a global network.

> The brain struggling to understand the brain is society trying to explain itself.
> Colin Blakemore (from Mechanics of the Mind, 1977)

What is Adolescence?

Before exploring the interaction between the human brain and the challenges of our modern world, it is important to clarify the phase of life referred to as adolescence. This stage of development has no distinct boundaries and is often culturally defined as representing a transition from the dependence of childhood to the independence of adulthood. In the United States, adolescence is commonly defined by the ages 12-18 years (Spear, 2000).

However, the transition from childhood to adulthood is not restricted to specific age ranges, and the boundaries often are extended or shortened as a result of demands placed on the individual by his/her surroundings (White, 2002). Despite variations in the onset and offset of adolescence, there are typical changes which characterize this developmental span, including increased focus on peer interactions, greater conflict with the family, greater tendency to engage in risk-taking and exploration, changes in sleep patterns, and onset of puberty (Spear, 2000).

Developmentally, children typically do not begin attenuating to risk until middle childhood, thereby necessitating that adults serve critical protective roles. Even in the teen years, the ability to make informed life choices is still in a state of flux. Adolescents have often been described as particularly vulnerable to risky behavior, including poor decision-making and several speculative theories have been explored to explain these actions. Some researchers have suggested that risk taking is associated with (a) personality traits (i.e., characteristics associated with sensation seeking and self-esteem) which disinhibit action by minimizing or distorting potential for harm (Zuckerman, 1979; 1994); (b) learned behavior resulting from poor interactions in the family system (i.e., vulnerability as a function between the presence of risk and lack of protection; Jessor, 1992); (c) a developmental phenomenon in which lack of experience leads to an error of judgment regarding level of risk (i.e., part of typical exploration throughout the maturation process) or in which a youth's sense of invulnerability results in a failure to consider risk or the need to act in a deliberative way (i.e., specific to the egocentrism of adolescence; Greene et al., 2000); and (d) failure to categorize actions as falling within the moral

domain of behavior so that personal gain is emphasized over safety for self and others (Willard, 2000).

Eric Erikson (1950) discusses adolescence as a time establishing personal identity through discovery. Marcia (1980) describes adolescence as a time of moratorium or "…an acute stage of crisis/exploration (where the adolescent) is actively searching for values to eventually claim as his/her own." Moreover, this developmental stage lays the foundation for bridging the gap between concepts of social justice and individual reasoning. If the developmental tasks are successfully negotiated, an individual will subsequently acquire skills essential for ethical decision-making (Kuther & Higgins-D'Alessandro, 2000).

Inside an Adolescent Brain

> I could wile away the hours, Conferrin' with the flowers
> Consultin'with the rain, And my head I'd be scratchin',
> While my thoughts were busy hatchin', If I only had a brain.
>
> I would not be just a nuffin', My head all full of stuffin'
> My heart all full of pain, I would dance and be merry
> Life would be a ding-a-derry, If I only had a brain.
>
> (Scarecrow, *Wizard of Oz*)

Human brains evolved over time to serve the needs of primitive hunter-gatherer societies. Small bands of people migrated as they followed herds of animals and foraged for fruits, grains, and vegetables. The brain's primary capabilities focused on sensing, processing, perceiving, storing and acting on information to form an internal representation of the external world. The brain continued to develop and express new functions, although specialized skills to facilitate social affiliation, communication, and symbolic representation had primary importance (Perry, 2002). The ability to communicate and develop interpersonal connections became the hallmark of survival for human equipped brains that could continue to adapt to the changing demands of the environment.

Human beings extend a great amount of evolutionary expense toward the functioning of the brain. Weighing approximately three pounds, the human brain represents approximately two percent of the body's weight, but requires 20 percent of the body's energy to function (Blakemore, 1999).

> These three pounds, composed primarily of water and fat, allow you to walk and talk, to laugh, cry, and touch, to love and hate, to create and destroy. Everything you do, think and feel, every wish, dream, regret, and hope you experience is mediated by your brain. By sensing the world around you -- storing some fragment of each unique moment, cataloguing, sorting, organizing, and acting on your experiences -- your brain defines you. (Perry, 2002)

In addition to the changes in brain potential which have emerged as a result of evolution, brain development progresses along a complex trajectory throughout each individual's lifespan. Early work on the brain highlighted the critical first three years of life for brain growth; however,

recent research indicates that the brain continues to undergo a tremendous amount of development throughout adolescence and into young adulthood.

Despite previous assumptions that all major changes in brain organization and function were complete during early childhood, brain research has demonstrated that changes in brain activity define the teen years (Begley, 2000; Spear, 2000). These changes were not originally perceivable since the overall size of the brain changes very little between early childhood and adulthood (Giedd et al., 1999; Gogate et al., 2001); however, advances in technology revealed a development in brain wiring during adolescence which results in structural and functional changes in the brain. Researchers (Casey, Giedd, & Thomas, 2000; Lange et al., 1997; Paus et al., 1999; Rubia et al., 2000; Sowell at al., 1999) have used neuroimaging technology to trace the development of the brain from childhood through adulthood. Their research has discovered that the brain's maturation continues through adolescence and is not complete until the early 20s. More specifically, the noted changes occurring in the brains of adolescents demonstrate a shift in processing, moving from the amygdala in the limbic system to the frontal lobes in the neocortex.

The frontal lobes are located at the front of the brain, immediately behind the forehead. We rely on the frontal lobes of the brain for behavioral inhibition, the ability to control emotions and impulses. The frontal lobes are also thought to be the place where decisions about right and wrong, as well as cause-effect relationships are processed. Throughout adolescence, the frontal lobes simultaneously undergo organizational changes as well as changes in activity which shape and fine tune this area of the brain for efficiency during adulthood. To compensate for the underdevelopment of the frontal lobes, adolescents rely on another area of the brain to determine behavior—the amygdala.

In contrast to the frontal lobes, the amygdala is involved in instinctive "gut" responses and reactionary decision-making. The amygdala tends to respond based on instincts. The research on brain development suggests that adolescent brains are not yet equipped with the hardware to rely on rational decision-making, and the control of impulsive behaviors remains a work in progress into adulthood. Biologically, adolescents typically lack the necessary brain structure to anticipate consequences, control impulses, and make decisions which mediate their actions. As young people grow they eventually acquire the capacity to regulate emotion, solve problems more effectively, and plan their behavior.

Understanding the cognitive capacity of youth in a technological society

Young people are often equipped with powerful technology which communicates through an enticing amalgamation of images, words, and sounds. However, multiple sensory inputs are demanding on cognitive resources and can overwhelm children's capacity to engage in thoughtful decision-making (Anderson, 2002). While the digital environment continues to bombard the senses with rapid transmission of complex messages, the dazzle of cyberspace and wired communication can place brain processing in a state of imbalance. The resulting brain overload can reduce the ability of youth to make sense of what is presented or to respond in a judicious manner.

These findings are further exacerbated by research which notes that images which pervade digital messages elicit a response from the limbic system, the part of the brain which tends to be impulsive and emotional. Devoid of cues and the physiological hardware to initiate deliberate and thoughtful critical thinking, young people may act or react without reflection on the implication for self and others (Bergsma, 2000). As a result, adolescents typically underestimate the influence of digital technologies on their behavior or the potential for risk. Influences are especially powerful when youth cannot readily perceive potential threats nor access skills to create a barrier from harm (Berson & Berson, 2003).

Nonetheless, modern technologies captivate youth because they draw on one of the most powerful genetic biases of the human brain—a preference for visually presented information. A visually oriented digital environment attracts and maintains the attention of young people. Youth are further enticed by interactions via digital modalities which allow them to "manipulate" the environment and appeal to the brain's evolutionary tendency to engage in social exchanges.

While drawing on the visual and social preferences of the human brain, digital technologies also limit the brain from optimizing its full potential to recognize and protect youth from threatening interactions. As the brain develops, it creates a catalogue of familiar verbal and nonverbal exchanges. Unfamiliar or mismatched visual information elicits an alarm response in the brain until the potential threat is deemed to be benign (Perry, 2002). This capacity to match incoming information with prior knowledge that is stored in the brain enables the recognition of deceitful behavior. The brain can sense a multi-sensory mismatch when the nonverbal signals do not validate the verbal information received. However, in cyberspace, pseudoanonymity of the environment facilitates interactions without regard to age, gender, or other physical characteristics. Many technologies have removed the role played by facial expressions that allow the brain to accurately decide about the familiarity and intent of an interaction. Without direct human contact and the benefit of visual information, reliance shifts to other cues (i.e., a peer-like manner of interaction) to identify someone as familiar or good. The immature brain structure of adolescents may contribute to the tendency of young people to take more risks in online settings. The developing frontal cortex lacks the capacity to make reasoned choices about behavior, and subsequently the young mind may be more likely to engage in errors of attribution, misjudging the relative risk or threat by failing to recognize mismatches in the information received (Berson, in press).

In summary, modern technologies require young people to make sense of an overload of information. Despite the amplification of the quantity of data available, the nature of the sensory input restricts and often distorts the quality of visual and tactile cues, the primary modalities used by the brain to represent experience. While filled with superfluous data, virtual interactions provide limited access to the critical signals needed to differentiate safety from harm (Anderson, 2002). Moreover, without the biological structure necessary for deliberate and thoughtful action, young people may impulsively act and react in cyberspace without forethought to the influence of powerful sensations or be easily lured by the artificial distinctions between virtual encounters and real life activity (Berson & Berson, 2003).

New Ways of Knowing

Despite our biological limitations, the adolescent years do not have to be relegated to a period of hopeless despair for adults concerned with safeguarding the well being of youth in cyberspace. The human brain only exercises a small portion of its potential, and we can enhance our efforts to mediate risk and prevent harm by considering the integration of brain behavior with identifiable environmental forces which can impinge upon effective cybersafety initiatives.

We need to be cautious in attributing problems encountered by youth online solely to deficits in their brain functioning. There are multicausal explanations for behavior, and information on brain processing provides additional clues regarding the strengths and weaknesses of current Internet safety strategies. This knowledge does not negate the role of social interventions, but rather suggests that the field of cybersafety is still in an embryonic state and has much to learn and explore. Simplistic beliefs and solutions are not sufficient to address the complex interaction between humans and information technology.

Information resources have become central rather than peripheral to the day-to-day functioning of youth. Yet while living within a media-saturated world, young people often rely on skills that facilitate the passive absorption of information. Conversely, immersion into an information-rich society necessitates deeper reflection; understanding of point of view; identification of interests and motivations that are represented; sensitivity to how we respond to the form or presentation of messages; and discernment of the accuracy, balance, or distortion of information presented.

We cannot help our youth to achieve competency with digital technologies through rote learning of basic rules or amid filtered environments that set up conditions that fail to optimize use of their intellectual capital. Efforts which place emphasis on the role of young people as active builders and explorers of knowledge will allow youth to enhance the power of their brain functioning by adding to their existing schemas for learning and development. Young people need opportunities to create, test, and revise their constructs about online environments. The optimal structure will enable them to build their skills through a carefully crafted learning environment which supports them in this endeavor. This refinement of capabilities is best suited in a context of discussion, debate, and active engagement.

Effective cyberawareness, digital literacy, and Internet safety necessitate much more than simple replication of personal safety programs within a computer interface. Successful initiatives are not just a mere amplification of awareness training on what is undesirable or frightening in cyberspace. The future of our efforts are still unfolding; however, it is clear that our success depends on our ability to engage youth in making sense of their experience in cyberspace through more expansive ways of thinking about the sensory data available to us. “We have not mastered the ways of inner dialogue or the methods of the unmediated experience” (Ohler & Levinson, 1999, p. 10).

> Imagine a world where learners are equally versed in making sense of the world using all their senses and can enter worlds where they can explore, engage in sense making beyond what they can initially see, hear, or feel and then use that information to connect disparate information together to form new understandings and knowledge which they can in turn

> use to create new virtual or even real worlds. If this is the learning environment that is in store for us I can't wait! (Advanced Network and Service, 2003, p. 17)

Concluding Thoughts

> It is not the brains that matter most, but that which guides them—the character, the heart, generous qualities, progressive ideas.
>
> Fyodor Dostoyevsky (1821 - 1881) Russian novelist

Prevention initiatives for cybersafety and digital literacy can be strengthened when based on a developmental and research framework. In order to optimize the opportunity to refine behavioral control in digital environments and foster critical decision-making, it is essential to build on the existing skills of youth so that they can acquire the capacity to decipher complex messages in an informed and knowledgeable way and, thereby, counteract the temptation to react without forethought to the influence of powerful words, images, and sounds.

The evidence on brain development suggests that the careful attention to safety and supervision, which we offer to children during the early years, will have the greatest benefit if we continue direct involvement and attention to these issues throughout the course of a child's life into young adulthood. As parents, educators, and other professionals know when working with adolescents, it is crucial to provide young people with guidance and support to use their own senses in discovering the world. Young people require this mentoring because their brain is still developing, and these experiences are instructive for positive growth.

The challenge of identifying the most salient protective factors to safeguard youth not only for the technology that they encounter today, but also the future innovations which we have not yet imagined serves as a beacon to guide us into exploring new directions. Reconceptualizing our existing knowledge and applying new ideas to these efforts offers the opportunity to expand the ability of young people to think and learn on a social and sensory level. Our brains hold the promise for progress, but the solutions may not be based on sterile rationalization but rather achieving success in accessing the creative and humanistic potential of our cognitive abilities.

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