




Virtual interaction and adolescent cognitive development

HOW DOES THE USE OF TECHNOLOGY IMPACT LEARNING AND THINKING IN ADOLESCENTS. SURESH JOSHI EXPLAINS THE BENEFITS AND CONCERNS.



Adolescents are always up-to-date with the new and cutting-age technology available in the market. This generates a growing concern among academicians, educationists, policymakers, and parents about the ways in which technology exposure and use can impact learning and cognitive development in the tech-savvy generation.

A survey by Rideout et al in 2010, found that on an average, children and adolescents have 10 hours and 45 minutes of exposure to media and entertainment in a day. Surveys conducted by the *Pew Internet and American Life* Project indicate that 87 per cent students go online every day.

Lenhart's study in 2015 found that an average teenager sends 67 text messages daily; in another investigation in 2010 Lenhart et al found that 80 per cent of teens keep their phone with them even when they sleep.

The above examples illustrate the increasing importance of technology in the lives of modern teens. But, does information and communication technology influence adolescent thinking and learning?

Virtual interaction and education

Do students feel that technology enhances learning? In a study conducted by Strom et al in 2009, 25 per cent of school children felt that learning was more conducive with online instructions and wanted their school policies to encourage curriculum that emphasises the use of the Internet. In addition, 29 per cent students felt that they should be allowed to use school computer labs after school as well as on weekends. The study also pointed out that although students gathered knowledge from multiple sources, 25 per cent expressed interest in learning from the Internet.

Students were interested to learn from multiple sources.

24%

discussion with classmates

24%

direct instruction from the teacher

13%

books and other print sources

14%

watching television programmes or DVDs

25%

and, the option most often selected, from the internet

Erhan et al argue in their 2014 study that the nature of learning online has changed with new technology allowing customised learning catering to learners' needs and interests. This can be elaborated by citing Kumar's study in 2010 and Petty & Rosen's study in 1987—online videos once limited to 'play, pause, forward, or rewind' now allow for embedded functions that give the viewer more control and interactivity. Additionally, Sparrow et al's investigation in 2011 on cognitive consequences of having information at fingertips suggests that people think of computers as an easy and informal tool for knowing something or sharing information.

The positive outcomes of technology on learning are outlined below:

■ As early as 1994, Flynn observed that the sudden explosion of images available through technology may have factored into the measurable increases in nonverbal intelligence scores seen in the past century.

■ Research by Orleans and Laney in 2000 and Heft & Swaminathan in 2002 found that shared computers in schools help adolescents in optimising collaboration, group interaction, and in effective communication.

■ In 2000, Blanton et al's research study conducted to explore the effects of a computer-based after-school programme showed that children participating in such programmes improved their skills in reading comprehension, mathematics, grammar, familiarity with the computer, and following directions that eventually resulted in higher achievement in school tests.

■ According to Erhan et al, creatively designed online video-based learning environments have been found to be effective instructional tools in comparison with existing online tools.

■ In 2000, Subrahmanyam et al, stated that Internet use has been linked to increasing visual intelligence skills.

■ Another study by Jackson et al 2012 found that, videogame playing was somehow related to the different dimensions of creativity, irrespective of gender and race as well as the type of videogame played.

Despite some notable advantages on the use of technology in education, Strom et al found that students are concerned about tech-based instructions that they receive from teachers and suggest that teachers should become more skillful in organising Internet searches efficiently. In describing how often homework requires students to go online, 11 per cent of them reported twice a week and 12 per cent reported daily; however, 23 per cent, reported never having to access the Internet to complete homework assignments.

23%

students were concerned about their teachers' reluctance towards preparing and assigning Internet-based activities

32%

students found it hard to choose the right websites to explore

31%

found online searches distracting

20%

struggled with finding the precise search keywords

18%

felt that cutting and pasting from the Internet, which ultimately leads to plagiarism, was a good option for completing their assignment.

Technology and cognitive development

In 2009 Straker et al concluded that enhanced cognitive development and higher school achievements have evolved as potential benefits of computer use, in addition to reduced barriers for social interactions. Sparrow et al designates Internet as the primary form of external or transactive memory where information can be stored collectively outside human minds.

Jay Giedd says in his 2012 commentary in the Digital Revolution and Adolescent Brain Evolution 'the link between adolescent brain evolution and the digital revolution does not lie in a selection pressure wherein those with greater capacity to handle the demands of the technological changes have greater reproductive success'.

Attree et al found in 2009 that virtual reality was more appropriate for children who find computer-based tasks more engaging compared to paper-pencil based tasks, and Harris & Reid in 2005 confirm this as the reason for children showing more interest in participating in such tests. Picard et al demonstrated in 2017 that examinations using laptop computers (generating 3-D models of a virtual environment, a town,

etc) and joysticks revealed that virtual reality can be helpful in assessing critical aspects of episodic memory development in adolescents.

Jochen Peter and Patti Valkenburg in 2006 argued that adolescents with greater socio-economic and cognitive resources used the Internet more frequently for information and less often for entertainment than their peers with fewer socio-economic and cognitive resources. Further, they concluded 'the emerging digital differentiation approach describes current digital divide phenomena more adequately than the disappearing digital divide approach'.

Genevieve Johnson's 2006 examination describes the Internet as 'a cultural tool that influences cognitive processes and an environmental stimulus that contributes to the formation of specific cognitive architecture.'

According to Cavanaugh et al's study in 2016, digital technology is reshaping the student experience in and out of the classroom and it is reforming the ways student read and think. Willoughby in 2008 stated that Internet if used moderately can positively impact academic performance in comparison with extreme users or non-users.

Challenges

Information and Communications Technology (ICT) provide teens the opportunity to develop 21st century skills, and at the same time create legitimate concerns about potential negative effects, which includes threats to child safety, cyberbullying, inappropriate content, exposure to violence, Internet addiction, reduced physical activity, social isolation, sleep disturbance, vision problems, musculoskeletal problems, and obesity. (For more on this read Biocca, 2000; Hinduja & Patchin, 2010; Straker et al 2009)

Furthermore, Turow's study in 1999 and Madden et al's in 2012 reveal that parents embrace the Internet and computers as use

Subrahmanyam et al in 2000 quoted a 16-year-old, 'I really want to move to Antarctica – I'd want my cat and Internet access and I'd be happy'.

There are gender differences in the use of technology. In 2008, Willoughby pointed out that males accessed the Internet and computer games significantly more often in comparison with females. In 2015, the Pew Research Center reported that 84 per cent of teenage boys played video games online or on their phone, in contrast to 59 per cent of teenage girls. In the same year, Lenhart added that teenage girls were more likely to engage with image-based social media such as Instagram or Snapchat.



ful learning sources but at the same time the majority are worried about the content to which their children are exposed through gaming and other activities available on the Internet and how kids manage their reputations online.

Boyd & Harittai in 2013 found that 63 per cent of parents of 10–14-year-olds were extremely concerned that their child may interact with a stranger online. Cyberbullying, a word coined as recently as 2008, also concerned a third of the survey participants.

Kathryn's study in 2014 and 2016 says that the constant attachment of adolescents to their mobile devices is a matter of concern for their parents and teachers, and even for policy makers due to the possible negative impacts of the mobile device on adolescent development in areas such as agency, cognitive processing and social understanding.

In sum, several studies have described how the adolescent use of technology influences their cognitive development. The situation described in these studies may be expected to be similar in India and South Asia, although such extensive studies are not yet available. It is pertinent to note that screen time of adolescents is certainly increasing in the digital age, and is a predominant concern of researchers. On one hand, students' perception of technology highlights several positive aspects of its use, while on the other, technology has also brought many challenges with it, some of which pose a concern to parents and teachers. Judicious and moderate use of technology can limit its adverse impacts, and is the only way to tackle challenges associated with technology use among adolescents. **T**



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