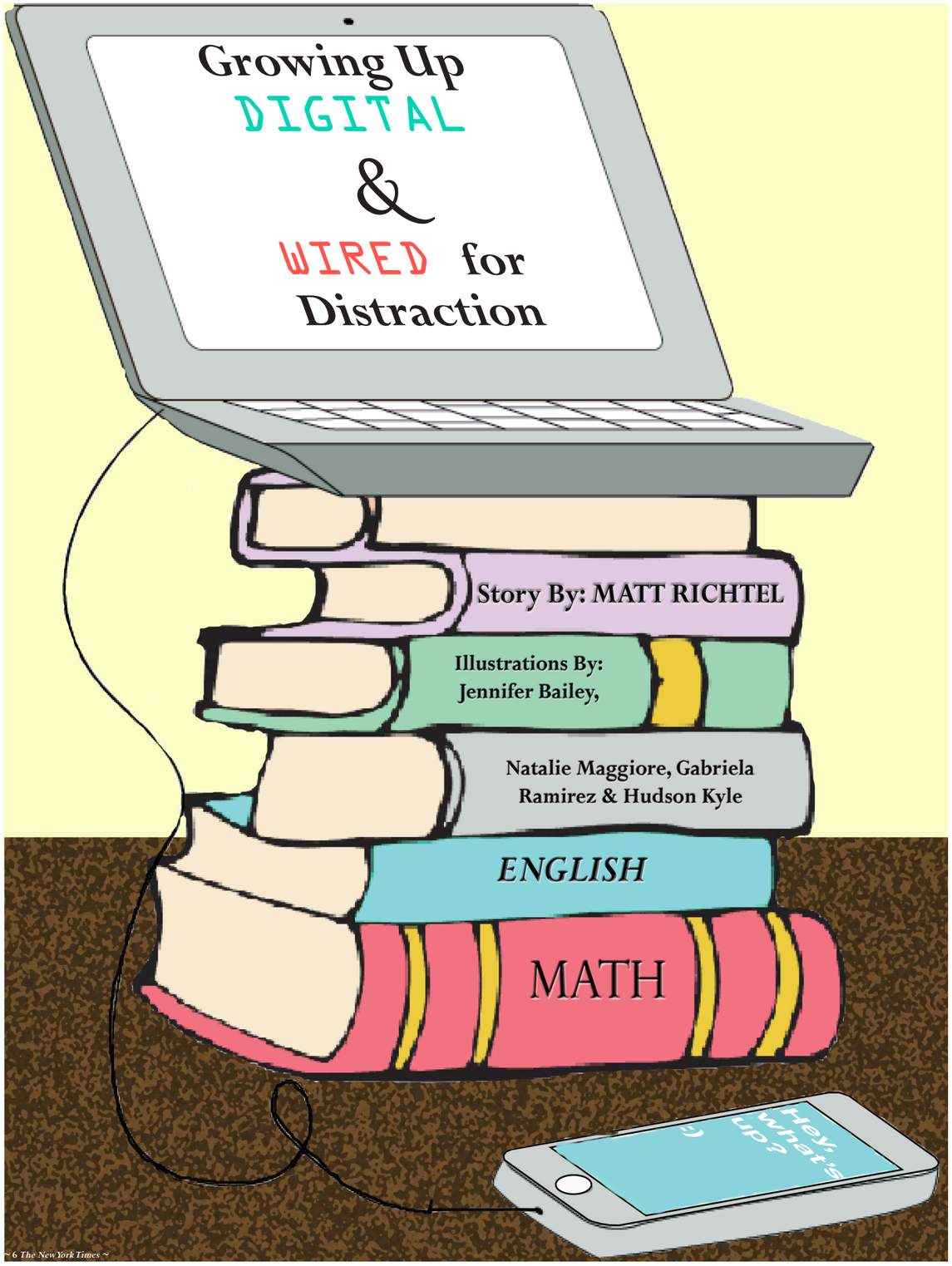


On the eve of a pivotal academic year in Vishal Singh's life, he faces a stark choice on his bedroom desk: book or computer?

By all rights, Vishal, a bright 17-year-old, should already have finished the book, Kurt Vonnegut's "Cat's Cradle," his summer reading assignment. But he has managed 43 pages in two months.

He typically favors Facebook, YouTube and making digital videos. That is the case this August afternoon. Bypassing Vonnegut, he clicks over to YouTube, meaning that tomorrow he will enter his senior year of high school hoping to see an improvement in his grades, but without having completed his only summer homework.

On YouTube, "you can get a whole story in six minutes," he explains. "A book takes so long. I prefer the immediate gratification."

Students have always faced distractions and time-wasters. But computers and cellphones, and the constant stream of stimuli they offer, pose a profound new challenge to focusing and learning.

Researchers say the lure of these technologies, while it affects adults too, is particularly powerful for young people. The risk, they say, is that developing brains can become more easily habituated than adult brains to constantly switching tasks — and less able to sustain attention.

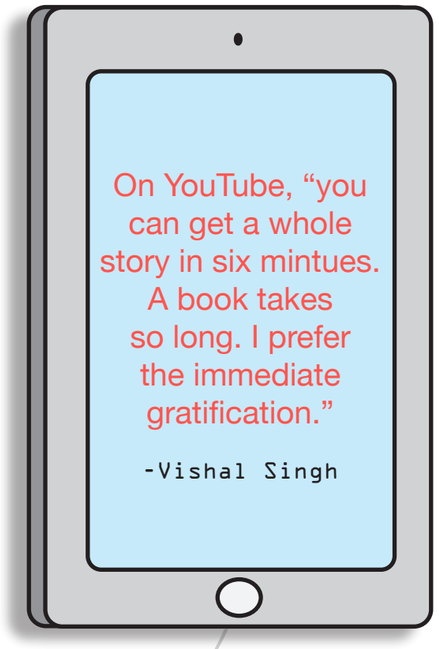
"Their brains are rewarded not for staying on task but for jumping to the next thing," said Michael Rich, an associate professor at Harvard Medical School and executive director of the Center on Media and Child Health in Boston. And the effects could linger: "The worry is we're raising a generation of kids in front of screens whose brains are going to be wired differently."

But even as some parents and educators express unease about students' digital diets, they are intensifying efforts to use technology in the classroom, seeing it as a way to connect with students and give them essential skills. Across the country, schools are equipping themselves with computers, Internet access and mobile devices so they can teach on the students' technological territory.

It is a tension on vivid display at Vishal's school, Woodside High School, on a sprawling campus set against the forested hills of Silicon Valley. Here, as elsewhere, it is not uncommon for students to send hundreds of text messages a day or spend hours playing video games, and virtually everyone is on Facebook.

The principal, David Reilly, 37, a former musician who says he sympathizes when young people feel disenfranchised, is determined to engage these 21st-century students. He has asked teachers to build Web sites to communicate with students, introduced popular classes on using digital tools to record music, secured funding for iPads to teach Mandarin and obtained $3 million in grants for a multimedia center.

He pushed first period back an hour, to 9 a.m., because students were showing up bleary-eyed, at least in part because they were up late on their computers. Unchecked use of digital devices, he says, can create a culture in which students are addicted to the virtual world and lost in it.



"I am trying to take back their attention from their BlackBerrys and video games," he says. "To a degree, I'm using technology to do it."

The same tension surfaces in Vishal, whose ability to be distracted by computers is rivaled by his proficiency with them. At the beginning of his junior year, he discovered a passion for filmmaking and made a name for himself among friends and teachers with his storytelling in videos made with digital cameras and editing software.

He acts as his family's tech-support expert, helping his father, Satendra, a lab manager, retrieve lost documents on the computer, and his mother, Indra, a security manager at the San Francisco airport, build her own Web site.

But he also plays video games 10 hours a week. He regularly sends Facebook status updates at 2 a.m., even on school nights, and has such a reputation for distributing links to videos that his best friend calls him a "YouTube bully."

Several teachers call Vishal one of their brightest students, and they wonder why things are not adding up. Last semester, his grade point average was 2.3 after a D-plus in English and an F in Algebra II. He got an A in film critique.

"He's a kid caught between two worlds," said Mr. Reilly — one that is virtual and one with real-life demands.

Vishal, like his mother, says he lacks the self-control to favor schoolwork over the computer. She sat him down a few weeks before school started and told him that, while she respected his

passion for film and his technical skills, he had to use them productively.

"This is the year," she says she told him. "This is your senior year and you can't afford not to focus."

It was not always this way. As a child, Vishal had a tendency to procrastinate, but nothing like this. Something changed him.

GROWING UP WITH GADGETS

When he was 3, Vishal moved with his parents and older brother to their current home, a three-bedroom house in the working-class section of Redwood City, a suburb in Silicon Valley that is more diverse than some of its elite neighbors.

Thin and quiet with a shy smile, Vishal passed the admissions test for a prestigious public elementary and middle school. Until sixth grade, he focused on homework, regularly going to the house of a good friend to study with him.

But Vishal and his family say two things changed around the seventh grade: his mother went back to work, and he got a computer. He became increasingly engrossed in games and surfing the Internet, finding an easy outlet for what he describes as an inclination to procrastinate.

"I realized there were choices," Vishal recalls. "Homework wasn't the only option."

Several recent studies show that young people tend to use home computers for entertainment, not learning, and that this can hurt school performance, particularly in low-income families. Jacob L. Vigdor, an economics professor at Duke University who led some of the research, said that when adults were not supervising computer use, children "are left to their own devices, and the impetus isn't to do homework but play around."

Research also shows that students often juggle homework and entertainment. The Kaiser Family Foundation found earlier this year that half of students from 8 to 18 are using the Internet, watching TV or using some other form of media either "most" (31 percent) or "some" (25 percent) of the time that they are doing homework.

At Woodside, as elsewhere, students' use of technology is not uniform. Mr. Reilly, the principal, says their choices tend to reflect their personalities. Social butterflies tend to be heavy texters and Facebook users. Students who are less social might escape into games, while drifters or those prone to procrastination, like Vishal, might surf the Web or watch videos.

The technology has created on campuses a new set of social types — not the thespian and the jock but the texter and gamer, Facebook addict and YouTube potato.

"The technology amplifies whoever you are," Mr. Reilly says.

For some, the amplification is intense. Allison Miller, 14, sends and receives 27,000 texts in a month, her fingers clicking at a blistering pace as she carries on as many as seven text conversations at a time. She texts between classes, at the moment soccer practice ends, while being driven to and from school and, often, while studying.

Most of the exchanges are little more than quick greetings, but they can get more in-depth, like "if someone tells you about a drama going on with someone," Allison said. "I can text one person while talking on the phone to someone else."

But this proficiency comes at a cost: she blames multitasking for the three B's on her recent progress report.

"I'll be reading a book for homework and I'll get a text message and pause my reading and put down the book, pick up the phone to reply to the text message, and then 20 minutes later realize, 'Oh, I forgot to do my homework.' "

Some shyer students do not socialize through technology — they recede into it. Ramon Ochoa-Lopez, 14, an introvert, plays six hours of video games on weekdays and more on weekends, leaving homework to be done in the bathroom before school.

Escaping into games can also salve teenagers' age-old desire for some control in their chaotic lives. "It's a way for me to separate myself," Ramon says. "If there's an argument between my mom and one of my brothers, I'll just go to my room and start playing video games and escape."

With powerful new cellphones, the interactive experience can go everywhere. Between classes at Woodside or at lunch, when use of personal devices is permitted, students gather in clusters, sometimes chatting face to face, sometimes half-involved in a conversation while texting someone across the teeming quad. Others sit alone, watching a video, listening to music or updating Facebook.

Students say that their parents, worried about the distractions, try to police computer time, but that monitoring the use of cellphones is difficult. Parents may also want to be able to call their children at any time, so taking the phone away is not always an option.

Other parents wholly embrace computer use, even when it has no obvious educational benefit.

"If you're not on top of technology, you're not going to be on top of the world," said John McMullen, 56, a retired criminal investigator whose son, Sean, is one of five friends in the group Vishal joins for lunch each day.

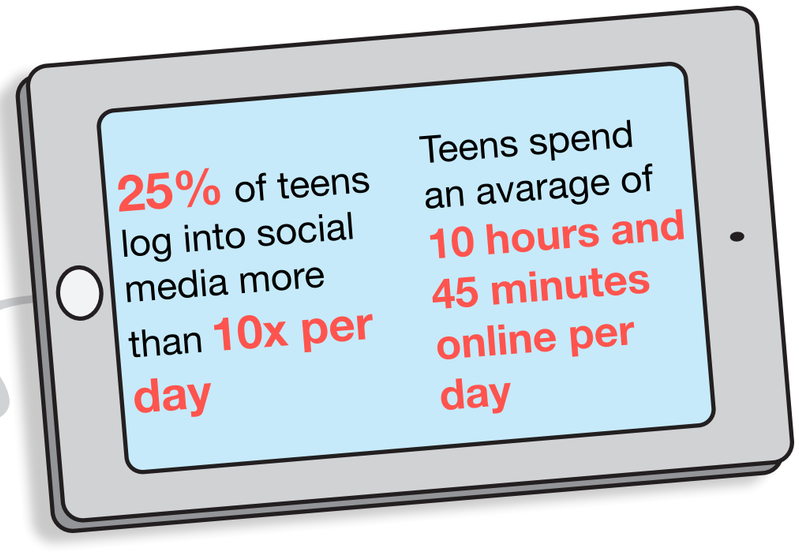
Sean's favorite medium is video games; he plays for four hours after school and twice that on weekends. He was playing more but found his habit pulling his grade point average below 3.2, the point at which he felt comfortable. He says he sometimes wishes that his parents would force him to quit playing and study, because he finds it hard to quit when given the choice. Still, he says, video games are not responsible for his lack of focus, asserting that in another era he would have been distracted by TV or something else.

"Video games don't make the hole; they fill it," says Sean, sitting at a picnic table in the quad, where he is surrounded by a multi-million-dollar view: on the nearby hills are the evergreens that tower above the affluent neighborhoods populated by Internet tycoons. Sean, a senior, concedes that video games take a physical toll: "I haven't done exercise since my sophomore year. But that doesn't seem like a big deal. I still look the same."

Sam Crocker, Vishal's closest friend, who has straight A's but lower SAT scores than he would like, blames the Internet's distractions for his inability to finish either of his two summer reading books.

"I know I can read a book, but then I'm up and checking Facebook," he says, adding: "Facebook is amazing because it feels like you're doing something and you're not doing anything. It's the absence of doing something, but you feel gratified anyway."

He concludes: "My attention span is getting worse."

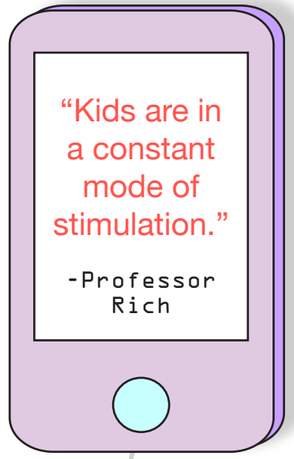


THE LURE OF DISTRACTION

Some neuroscientists have been studying people like Sam and Vishal. They have begun to understand what happens to the brains of young people who are constantly online and in touch.

In an experiment at the German Sport University in Cologne in 2007, boys from 12 to 14 spent an hour each night playing video games after they finished homework.

On alternate nights, the boys spent an hour watching an exciting movie, like "Harry Potter" or "Star Trek," rather than playing video games. That allowed the researchers to compare the effect of video games and TV.



The researchers looked at how the use of these media affected the boys' brainwave patterns while sleeping and their ability to remember their homework in the subsequent days. They found that playing video games led to markedly lower sleep quality than watching TV, and also led to a "significant decline" in the boys' ability to remember vocabulary words. The findings were published in the journal Pediatrics.

Markus Dworak, a researcher who led the study and is now a neuroscientist at Harvard, said it was not clear whether the boys' learning suffered because sleep was disrupted or, as he speculates, also because the intensity of the game experience overrode the brain's recording of the vocabulary.

"When you look at vocabulary and look at huge stimulus after that, your brain has to decide which information to store," he said. "Your brain might favor the emotionally stimulating information over the vocabulary."

At the University of California, San Francisco, scientists have found that when rats have a new experience, like exploring an unfamiliar area, their brains show new patterns of activity. But only when the rats take a break from their exploration do they process those patterns in a way that seems to create a persistent memory.

In that vein, recent imaging studies of people have found that major cross sections of the brain become surprisingly active during downtime. These brain studies suggest to researchers that periods of rest are critical in allowing the brain to synthesize information, make connections between ideas and even develop the sense of self.

Researchers say these studies have particular implications for young people, whose brains have more trouble focusing and setting priorities.

"Downtime is to the brain what sleep is to the body," said Dr. Rich of Harvard Medical School. "But kids are in a constant mode of stimulation."

"The headline is: bring back boredom," added Dr. Rich, who last month gave a speech to the American Academy of Pediatrics entitled, "Finding Huck Finn: Reclaiming Childhood from the River of Electronic Screens."

Dr. Rich said in an interview that he was not suggesting young people should toss out their devices, but rather that they embrace a more balanced approach to what he said were powerful tools necessary to compete and succeed in modern life.

The heavy use of devices also worries Daniel Anderson, a professor of psychology at the University of Massachusetts at Amherst, who is known for research showing that children are not as harmed by TV viewing as some researchers have suggested.

Multitasking using ubiquitous, interactive and highly stimulating computers and phones, Professor Anderson says, appears to have a more powerful effect than TV.

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